

Political Economy After Economics

Scientific method and radical
imagination

David Laibman

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Preface

The ten chapters that comprise this book were (with one exception) all previously published. They cover topics ranging from Marxist concerns with value, accumulation and crisis in capitalist economies, through various issues in micro-and macroeconomics, to the theory of the socialist economy. They all, to varying degrees, use quantitative methods – the formal models of economic theory, in the form of simple algebra, analytic geometry and two-dimensional geometric representations of relations among variables, calculus and optimization, matrix algebra, and ordinary differential and difference equations.

Readers who have no prior contact with quantitative analysis may find some of this to be tough sledding. I venture to think, however, that other readers, with strong mathematical backgrounds but perhaps less acquaintance with the Marxist tradition in social thought, may find other aspects of the arguments difficult to follow, as these involve rigorous use of *qualitative* abstractions and tackle the less familiar (and more controversial!) inner layers of social reality. I hope both groups will come away with a sense that encounter with the previously unexperienced dimensions (whichever they are) has been worthwhile. Without wanting to seem presumptuous, I would like to repeat Marx's warning, from the Preface to the French edition of *Capital*: “There is no royal road to science.” I will leave it to others to decide whether the works collected here do indeed contribute to science, and (need I say?) to human progress (the general philosophy tying this collection together is developed in the Introduction). I also, of course, wonder whether my arguments (validity aside) could be made more simply. I do, however, insist that the investigatory techniques are themselves worth pursuing, and – like Aristotle's Third Class of Goods – not merely a means to an exterior end.

I have supplied short “Introductory perspectives” sections at the heads of the chapters. Each of these provides, in an informal voice, some context for the argument of its chapter, and tries to capture the core of that argument in non-technical terms. Readers who wish to approach the formal models cautiously may want to read through all of the “Introductory perspectives” pieces first, to get a sense of the whole. There is no substitute for tackling the actual arguments themselves, however; otherwise, you have to “take my word for” too much. Perhaps the material can be approached in three stages. First, the introductory pieces. Second, read a chapter through to the end, to get a sense of the whole. Finally – at least this is what I have to do when I read similar literature – take paper and pen, write out the models, noting in your own hand the definitions of every item of notation (so you can easily find them) and deriving for yourself the various steps in the exposition. I sincerely hope that

you will *not* find any errors! (But if you do, let me know; that is also part of the “royal road to science.”) I also sincerely hope that you *will* find weaknesses, simplifying assumptions that you would like to drop, new avenues that I do not pursue but that are suggested by my argument, and so on.

Another hint: don't be afraid to work out numerical examples and cases of your own, so that you become completely certain about some property or other. The intimate synergy between *scientific method* and *radical imagination* is the unifying theme of this book, which is otherwise devoted to a rather bewildering variety of topics. The habit of *calculating* is essential to the capacity to prevision, and democratic prevision – the shared vision of an alternative social path – therefore requires wide dissemination of that habit. John Reed once described the Russia of 1917 as a “nation of orators.” Perhaps we could turn this into a more general prescription: we need a world full of nations of orators, *and* calculators.

The articles reproduced in this volume had footnotes in the original published versions, not for documentation but for tangential remarks: qualifying comments, warnings about possible misinterpretations, suggestions about wider issues, definitions (where needed). There are not too many of these, and I always tried to avoid the literary excess of “footnotes for footnotes’ sake.” Some notes remain, however, and I found, while preparing the manuscript, that it would be awkward and distracting to incorporate them into the main text. But I also hesitated to have them placed as endnotes. As a reader of books, I have often been bothered by the imposed need to toggle constantly back and forth between main text and endnotes, and I do want to encourage readers to read the notes in context. The editors at Routledge have kindly agreed to allow me to present the tangential remarks as *sidenotes*. These appear within the main text, at the end of the paragraph following the passage to which they refer. They are separated from the main text by being set in a smaller point size, and both the paragraph and the sidenote are marked with a dagger (†). This small editorial innovation thus makes it possible to combine ease of book production (page formatting) with ease of reading.

I cannot hope to acknowledge the help of every person whose advice and insight I have received, and hopefully absorbed, over the years during which these papers were produced. With apologies to everyone I am leaving out, I would like to mention David Barkin, Al Campbell, Ann Davis, Alan Freeman, Harvey Gram, Robin Hahnel, Julio Huato, Andrew Kliman, Michael Lebowitz, Dimitris Milonakis, Gary Mongiovi, Bertell Ollman, Paddy Quick, Alejandro Ramos, Anwar Shaikh, Gil Skillman, Frank Thompson, Thom Thurston, Yanis Varoufakis, Andriana Vlachou, Vivian Walsh, Richard D. Wolff, numerous anonymous referees, and several generations of students. As always, everyone who has contributed to my work is absolved from any responsibility for choices I have made, or errors committed.

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Permissions and original sources

Permission has been granted, and is here gratefully acknowledged, to reprint articles that appeared originally in the following publications.

Chapter 1: “Value and the Quest for the Core of Capitalism,” *Review of Radical Political Economics*, Vol. 34, No. 2 (Spring 2002), pp. 159–178. (Permission from Union for Radical Political Economics.)

Chapter 2: “Rhetoric and Substance in Value Theory: An Appraisal of the New Orthodox Marxism,” *Science & Society*, Vol. 64, No. 3 (Fall 2000), pp. 310–332.

Chapter 3: “Technical Change, Accumulation and the Rate of Profit Revisited,” *Review of Radical Political Economics*, Vol. 28, No. 2 (June 1996), pp. 33–53; “Accumulation, Technical Change and Prisoners’ Dilemmas: A Rejoinder to Frank Thompson,” *Review of Radical Political Economics*, Vol. 30, No. 2 (June 1998), pp. 87–101. (Permissions from Union for Radical Political Economics.)

Chapter 4: “Okishio and His Critics: Historical Cost Vs. Replacement Cost,” *Research in Political Economy*, Vol. 17 (1999), pp. 207–227; “Two of Everything: A Response,” *Research in Political Economy*, Vol. 18 (2000), pp. 269–278.

Chapter 5: “Is There a Classical Theory of Supply and Demand?” In *Growth, Distribution and Effective Demand: Alternatives to Economic Orthodoxy (Essays in Honor of Edward J. Nell)*, edited by George Argyrous, Mathew Forstater, and Gary Mongiovi. M.E. Sharpe, Inc. (2004), pp. 279–292.

Chapter 6: previously unpublished.

Chapter 7: “Non-Constant Returns, Pareto Optimality and Competitive Equilibrium,” *Review of Political Economy*, Vol. 13, No. 4 (2001), pp. 471–481.

Chapter 8: “Broadening the Theory of Aggregate Supply: A ‘New Critical’ Proposal,” *Eastern Economic Journal*, Vol. 32, No. 2 (Spring 2006), pp. 241–257. (Permission from Palgrave Macmillan.)

Chapter 9: “Revisioning Socialism: The Cherry Esplanade Conjecture.” In *Contemporary Economic Theory: Radical Critiques of Neoliberalism*, edited by Andriana Vlachou. Macmillan Press (1999), pp. 113–132.

Chapter 10: “Incentive Design, Iterative Planning and Local Knowledge in a Maturing Socialist Economy,” *International Critical Thought*, Vol. 1, No. 1 (March 2011), pp. 1–22.

Introduction

This Introduction seems to want to begin in an autobiographical register.

Recently retired from full-time teaching (at the City University of New York), I naturally gave some thought to producing a collection of articles, written over a number of years and not previously brought together, which might have some claim to lasting relevance (“The collected scientific papers of ...” – but that would be begging a question!).

With several exceptions, the papers thus collected turned out to have two characteristics. First, they are all written from a political-economic perspective, by which I mean that they seek to grasp and explain the real social relations underlying economic phenomena. To get hold of that substratum of what is normally seen as the “economic” necessarily means to embrace the contradictory – that is, evolutionary, relative, transformational – qualities of social systems and social life.

Second, these papers make use of the sort of quantitative formalism that has become a characteristic of modern economic theory. Herein lies an assumption (to which I will return): quantification is not merely a methodological device; it is ontological, a feature of social reality itself – of both the outward, perceived experiences and the inner determinants of those experiences, related both to market forms and to other aspects of the progressive abstraction of human relations that marks the path of social development. The quantitative aspects of the objects of political-economic investigation must therefore be addressed, and gotten right, if political economy itself is to prosper and achieve its objectives. To give this book some semblance of unity and focus, I dropped several papers that do *not* have a significant quantitative model-building component. The papers that form the ten chapters of the book are what remain.

Looking them over, however, one sees another striking feature. The works presented in these chapters have an admirable (or not so admirable, depending on your point of view) characteristic: they are enormously diverse in subject matter. Not to put too fine a point on it: they are all over the place! They range from classical themes in Marxist theory (the law of value; technical change and the falling rate of profit) to topics in microeconomics (Pareto optimality, supply and demand in classical theory, rationing and price control), to macroeconomic stabilization policy, to the theory of the nature and logic of socialism. This, too, requires an attempt at explanation.

As to why so much of the work collected here is quantitative in nature, I first need to plead guilty to one count (no pun intended) of *loving mathematics*! This does *not* mean that I am particularly good at, or well trained in, math. I remember coming home one day from

second grade (teacher: Mrs. Brandmarker) full of wonder at the existence of *four* arithmetic operations (that I then knew of: addition, subtraction, multiplication, division), and speculating about the possibility of *inventing* yet another one! (The early formation and subsequent continuity of mental styles is an amazing thing.) My new arithmetic operation, sadly, turned out to be nothing but combinations of the four existing ones, so I lost interest in that project. I enjoyed high school algebra (teacher: Dr. Strauss), and saw, I think, the *beauty* of something as simple as $x^2 - y^2 = (x + y)(x - y)$. Much later, I learned to marvel at such mathematicians' delights as $e^{i\pi} + 1 = 0$. Perhaps most important, I knew I needed to get to the bottom of the famous “transformation problem” in Marxist value theory (see [Chapters 1 and 2](#)), as I discovered it in college while reading Paul Sweezy's *Theory of Capitalist Development*, and I remember covering *reams* of notepaper with (undoubtedly primitive) scribbling as I tried to sort out the equation systems allegedly deriving prices of production from labor values. This was where I think it really started: I had decided (unlike most of my student comrades in the 1960s left political movement, it must be said) that if we were going to build the left into a force that could truly bring about revolutionary change we would need a solidly grounded theory, carefully constructed from first principles. *Theory was important.*[‡]

[‡] This attitude, too, had deep roots in my childhood. When I was eight years old, I attended a “lefty” summer camp in Vermont, which was a converted farm. The camp director had an old rifle, and for a special treat once or twice during the summer we kids were allowed to take turns shooting the rifle, at a target across the pond. When my turn came, I dutifully (theoretically?) lined up the sights (the ball and the “v”) and took aim. The counselors joyously pointed out that the rifle was pointing about 30° away from the target. Of course I missed, but I remember feeling satisfied: *in principle* I had aimed correctly! The *empirical* fact that this old gun had been lying around the farm for decades, and that its sights were no doubt bent and battered beyond all use, did not detract from my *theoretical* sense of a mission well accomplished.

Early predilections soon gave way to more mature conviction. It became apparent to me that the older literary tradition in political economy, despite its many rich contributions to understanding, could not *by itself* secure the kind of theoretical foundation I was seeking. This can be briefly illustrated. Various solutions to the “transformation problem” (better thought of as the capitalist value determination problem; see [Chapter 1](#)) relied on the use of (what I call) *persuasive semantics* to establish their claims. The burgeoning literature in Marxist economics, in the second half of the twentieth century, is filled with wordy arguments seeking profound status, as representing the most complete application of Hegelian categories to, or the most dialectically rigorous understandings of, concepts such as abstract labor, forms of value, the commodity, money, capital, etc. In some cases, the arguments amount to a denial of the quantitative dimension as such, and a tacit retreat from confrontation with the dominant ideology, and its withering critiques, on this terrain.

Perhaps the most indicative example of the non-progressive quality of the older style in Marxist political economy is the interminable debate concerning the distinction between productive and unproductive labor, which surfaces in every period with disappointing predictability. As this is written, yet another go-around on this is under way on an email discussion list of Marxist economists, and there seems to be an almost inherent failure of the

combatants to “cross swords” (see Laibman, 1992a, [Chapter 4](#), for an earlier survey of the topic). Similarly with present-day discussions of finance, and financial structures and priorities as sources of economic crisis. The popular prints (and cybersites) are full of descriptive prose condemning financial parasitism and greed, and blaming “finance” and “financialization” for the Great Recession. We have, however, barely begun to understand what financial relations as such actually are, not as an eternal verity (any mainstream text will tell you that finance emerges “whenever someone has something but doesn't need it, while someone else needs it but doesn't have it”), but as an instance of evolving capitalist production relations. Without careful – and this means, among other things, quantitative – theoretical development, our understandings of economic phenomena will be driven by current events, and by the winds blowing from the ideological mainstream. We will wind up spinning our wheels, and reinventing them at the same time!

The key political–economic relations, in both capitalist and post-capitalist contexts, are simultaneously qualitative and quantitative. The quantitative dimension, in turn, is not just a reflection of the market, or commodity, form (although that is certainly an important component); it presents itself in social life and human experience as soon as societies evolve to a size and complexity at which social and political relations become abstract. All of this will emerge in greater detail from the contents of the various chapters of this book; here I simply record the general conclusion that, I think, motivates and ties together the various studies, and the seemingly disparate topics: Marxist political economy, if it is to make progress, cannot ignore the “economic” turn that began at the end of the nineteenth century. It must incorporate that turn, and place mathematical tools at the service of revealing, rather than obscuring, the qualitative levels of social–economic reality and the social relations underlying the surface appearances of “economic” phenomena. Hence: *Political Economy After Economics*.[‡]

[‡] Many readers will see the continuity between my title and that of the seminal work by Ian Steedman, *Marx After Sraffa* (1977). Steedman's point was also directed toward requiring rigorous formulation of the quantitative aspects of the theory of the capitalist economy, in the manner set forth in Piero Sraffa's *Production of Commodities by Means of Commodities* (1960). I disagree with Steedman, however, concerning the outcome of this confrontation. I by no means think that major components of Marx's project will have to be jettisoned if that project is subjected to careful analytical treatment – provided that treatment does not serve as an (intentional or unintentional) cover for losing track of the political–economic foundations for economic theory.

The task, however, is daunting. Powerful forces are at work everywhere that drive apart the qualitative, and revolutionary, insights of Marxist political economy, on the one hand, and the skills and conceptual grids of quantitative formalism, on the other. Part of the problem is simply that ruling classes, capitalist ones in particular, have long mastered the technique of providing relative advantages to professional and technically expert strata of working populations. The entire ethos of class domination creates a favorable environment for meritocratic hierarchies, which then reinforce the class structure by depriving the subaltern sectors of leadership, and encasing expertise in an ideological web that is completely at the service of existing power and privilege. Only the wealthy “know” how to run society; consider, for example, the well-known formula from John Adams: “the rich,

well born, and able.” Quantitative forms of expertise are the most explicit and measurable, and also most closely connected to the sense of actually running things. Quantitative proficiency thus comes to serve as a sorting device, and the myth arises that genuine science must necessarily confirm the eternal truth of the dominant social paradigm.

There is also the fatal attraction of equilibrium-as-ideology. Mathematical models are useless and unsatisfying unless they can be solved. “Well posed” problems therefore almost inevitably come to focus on systems that are at rest, in the sense that unique positions of all of the variables have been obtained, and the system as such does not deviate from those positions. Even when we create models of economic growth (which, after all, is inherently about change) we make them tractable by assuming that a system consisting of heterogeneous elements is in a “steady-state” configuration – one in which every element is growing at the same constant proportional rate – thus neatly separating growth from structural change, internal tension, transformation (see Halevi *et al.*, 1991; Nell, 1998). Of course many of us insist that our steady states are nothing more than methodological devices designed to highlight underlying properties of systems that are in fact in states of continual qualitative evolution. To borrow a distinction from Jon Elster, *methodological* equilibrium must be clearly distinguished from *ontological* equilibrium (Elster, 1985; he applies the two adjectives to “individualism”). This, however, makes real change exogenous to the systems we spend so much time studying. The political economists insist that preoccupation with quantitative formalism inherently turns our attention away from genuine contradiction, internal sources of change, explosions. Does pursuit of finely tuned structure force us to miss the *essential*? Joan Robinson stated the matter well in her famous comparison of Marx and academic economists: “Marx's intellectual tools are far cruder, but his sense of reality is far stronger, and his argument towers above their intricate constructions in rough and gloomy grandeur” (1966, 2).

Lenin, perhaps a bit schematically, identified the “three sources and three component parts of Marxism” (1969) as English political economy, French socialism, and German philosophy. These correspond, respectively, to the scientific, emancipatory, and critical moments whose tense unity comprises the project as a whole. I am compressing together (somewhat) the critical and emancipatory elements, and linking the scientific to the quantitative (also perhaps a bit schematically!). We may sort through this entire conceptual puzzle at some later point; for the moment, it is the tension between the scientific/quantitative and the critical/emancipatory/qualitative poles that appears as the obstacle to progress requiring attention.

And an obstacle it is! It seems ubiquitous, appearing in multiple times and places. In his “Testament,” released by the Democratic Republic of Vietnam shortly before his death in 1969, President Ho Chi Minh wrote:

The Working Youth Union members and our young people in general are good; they are always ready to come forward, fearless of difficulties and eager for progress. The Party must foster their *revolutionary virtues* and train them to be our successors, both “red” and “expert,” in the building of socialism.

The explicit distinction between “red” and “expert” suggests that these two qualities do not automatically coalesce, and that different individuals may find themselves on opposite sides of what appears as a divide. Here are some additional and more recent illustrations. At the University of Havana, there are two departments within the Faculty of Economics: the Department of Micro and Macroeconomics, and the Department of Development. Marxist political economy tends to be concentrated in the latter. Most members of the former are – at least based on this writer's personal knowledge and contacts – politically committed to the continuing progress of socialism in Cuba, but they are haunted by the idea that the *goals* are separable from the *science*; that realism dictates use of “economic tools”; that the tools of the dominant neoclassical economic theory are neutral with respect to different possible applications; and – consequentially – the neoclassical paradigm is inextricably embedded in all quantitative model building and formal reasoning.[‡] At the Chinese Academy of Social Science in Beijing, the Institute of Marxism occupies one floor; the Institute for Quantitative and Technical Analysis is on another. All of these instances speak of a clear separation between heart and mind; whatever the dictates of the heart may be, the mind is in a different place altogether, and we seem to be forced into a cruel choice between the two.

[‡] “Neoclassical” is the term that has evolved in recent decades to identify the dominant position within economics, as that discipline has come to serve as the main ideological foundation for capitalist economic policy. In the world as seen through neoclassical eyes, completely unregulated markets are sites of “perfect competition”; such markets tend to equilibria, and a general equilibrium of all such markets, that are unique, stable, and (with important qualifications) socially optimal; property, class, and power are institutional or sociological matters that do not enter into core economic processes and outcomes; competitive market equilibrium is an eternal, non-evolving basis that, once achieved, separates economics from history; competition and markets completely characterize the “private” sector (whatever deviations from perfection may occur there), and therefore establish political discourse as entirely constituted by the relative balance between “public” and “private.”

My insistence on seeking to transcend this dichotomy, then, is a crucial source of the wondrous diversity of the essays collected in this book. I don't know whether I have ever succeeded in being either truly “red” or truly “expert,” but I always wanted to be both! My audience has therefore lain at the very small intersection of two sets: those attuned to the political voice, and those attuned to the quantitative formalism. This perhaps accounts for the deafening silence my work has occasioned. Again, I illustrate. My concept of “social reproduction prices” – a model for socialist price calculation, not presented in this volume; see Laibman, 1992a, Chapter 15 – just might be seminal, a major generalization of modern classical price theory (that again would be for others to judge), but if so that quality would only emerge as others engage with the work, discover errors, inconsistencies, alternative formulations, empirical applications, etc. Since this didn't happen, my own work in that area came to a halt, and I had to move on. Repeat the silence in each instance, create many such “movings on,” and the result is, well, the polyglot legacy brought together in this volume.

I'm not complaining! It is what it is, and I have loved every minute! To be clear, I still stand by the essential contents of each chapter. Any qualifications or re-evaluations are covered in the separate chapter introductions, to which I have given the name “Introductory perspectives.” I would not, however, republish these studies if I did not continue to think they are basically on target. On the other side of the red-expert divide, quantitative

formalism in economic theory is often deployed to obscure and evade, to make it almost impossible even to consider questions of power, exploitation, conflict, the structural sources of instability and irrationality, etc., as these qualities appear in present-day capitalist economies. The papers collected in this volume, while clearly falling short of a systematic treatise on the subject, seek to demonstrate that the economic theory searchlight can be turned to radical purposes, rather than necessarily serving the *status quo*. My hope is that readers will be able to point that searchlight over wider terrain, and use the arguments developed here in that effort, even as I also use them to make a wider methodological point.

But I do want to make that point – about *Political Economy After Economics* – in the strongest way I can, because I think it goes to the heart of the worldwide need for transcendence of the insufferable neoliberal capitalist pall that has settled over the globe and that cries out for reversal. If “There Is A Revolutionary Alternative” (TIARA, my proposal for a counter to Maggie Thatcher's TINA), it must struggle to bring science and emancipation together, which means – on the terrain of political economy – incorporating economic theory, with all of its quantitative elements, into the mix.

Indeed, at the deepest level, this is about a crucial difference between the “revolution” we must now contemplate, and various political revolutions of the past, in particular those of the seventeenth and eighteenth centuries.†

† I would even include in this differentiation the socialist revolutions of the twentieth century, as those were accomplished in highly underdeveloped and adverse conditions in which the socialist content could not be immediately manifest.

Marx and Engels understood this point better than we do. One general feature of capitalism is that it systematically attacks and thins out intermediate strata, creating a polarized class structure in which revolutionary agency must come from the direct producers themselves: the exploited subaltern population has become the source of oppositional politics. In the earlier bourgeois revolutions, by contrast, insurgency resided in an intermediate (literally, “middle”) class, which could mobilize the propertyless masses as a force against the feudal or post-feudal nobilities and monarchies to capture state power away from them. All that was needed from the underlying working population was misery and rage.†

† To be sure, capitalist classes and their representatives quickly saw the danger in mobilizing popular forces over which they could easily lose control, and so made cowardly compromises with the various *ancien regimes*, initiating a pendulum-like movement that, in some countries, even began to constitute a *lowlevel equilibrium trap* (to borrow a concept from the theory of economic growth), delaying the onset of capitalist accumulation. See, e.g., Marx, 1954.

But return now to the present context. The working class in capitalist society – still, after all the efforts of academic social science to “deconstruct” it, the only agent that can project a genuine alternative to capitalist power, privilege, exploitation, and crisis – cannot, like its counterparts in an earlier era, simply express rage and opposition; it must develop the *actual capacity to assume power*, to take the reins of social and economic control away from those who currently hold them. And therein lies the deepest meaning of the drive to unify the red and the expert. If war is too important to be left to the generals, then economics is too

important to be left to the “economists.” Moreover, quantitative methods in social science are too important to be left to academic strata that develop these methods in an ideological vacuum that removes the deep structure of social reality from view. It is not just about counteracting ideological forces that obscure and occlude true realities and possibilities; it is about building up the capacities and perspectives in working people that *constitute* those possibilities.

Some of the math in this book may look formidable to readers not accustomed to working with quantitative formalism. I must, however, again insist that my work is at the lower end of the mathematical spectrum within economics. (I am not a “mathematical economist,” in the generally accepted meaning of that term.) There is nothing here but some algebra and analytic geometry, a little calculus, and (in the very first chapter, unfortunately) matrix algebra. Whatever Dr. Strauss didn't teach me in 10th grade I learned *en route*, and – this is a recommendation – I learned it *because it appeared necessary if I wanted to get to the bottom of some political–economic puzzle*. I am, for example, *still* trying to extract the valid kernel from Marx's enormously complex qualitative reasoning about what he called the law of value ([Chapter 1](#)), and I am convinced, as I was some 45 years ago when I first started working on it, that without getting the quantitative aspects right, we will flounder at a much lower level than otherwise.

Some readers may feel that formal results in socialist economics are much more precise than any values we might ever be able to assign to the parameters. What good, for example, does it do us to know that an enterprise within a central–decentral socialist planning system will adopt a plan that *exceeds* its own perceived best-practice level by $(a/4bc^2)^{1/3}$ ([Chapter 10](#)), when we have little chance of knowing what the values of a , b , and c might be? I can answer this. First, the formal result prompts us to search for ways to estimate (or create policy to determine) a , b , and c – something we might not have thought to do otherwise. Second, results like this suggest new avenues of exploration within the theory – and again, these avenues might have been closed to us without the formal inquiry that prompted them. Third, I find that I can always hold on to ideas best once those ideas have been given a formal shape, and the ideas in question sometimes come up against huge odds. A combination of ideology, psychology, and self-interest makes it extremely hard to grasp the idea of multilevel, iterative planning as an alternative to “the market”; one simple model result helps me hold on to that idea, and so it may help others. *Just because the parameter values are fuzzy doesn't mean our thinking should be fuzzy as well.*

Let me offer one more example. Thinking about macroeconomic policy (monetary and fiscal policy, in a capitalist context) has been dominated in recent years by the notion that, once all spontaneous forces have played themselves out, policy measures can have no effect whatsoever on real output and employment. Mainstream macroeconomists believe that this result is uniquely dictated by the *logic* of macroeconomic models – all or any of them – however unruly the empirical reality might be. To the contrary ([Chapter 8](#)): a simple model is proposed that is just as good (or bad!) as the dominant one, and it has the opposite result: it is the price level, not output, that is invariant to policy. Now let's suppose that both models have all of the weaknesses attributed to formal economic reasoning by its detractors, among

institutionalists, empiricists, and many Marxists. Still, the standoff between the two models (which I call “New Classical” and “New Critical”) actually widens the space for serious thinking about the possibly contradictory and certainly complex effects of macroeconomic policy. The *unreality* of the abstract world of quantitative model building offers deeper insights into the *reality* of (well) “reality” than would have been possible otherwise. At least I believe this is the case.

I will not rehearse my sense of the deeper meaning of each of the chapters here. For that purpose, the reader should consult the “Introductory perspectives” sections. These try to situate the chapters’ main topics and conclusions, and especially to motivate less-well-prepared readers to try to tackle them. Please do not misunderstand: I would provide a super pill that facilitates digestion of mathematical presentations (if I could!). The chapter introductions are no substitute for any good textbook introduction to mathematical methods in economics.[‡] I do think that non-mathematical readers should not be afraid to tackle mathematical material, and to “read through” the more difficult parts to get to the core argument. You should also not be afraid to try scribbling away at your own bits of economic reasoning! (To work things out, as Joan Robinson once urged us Marxists to do, on the backs of old envelopes.)

[‡] My absolute favorite, by the way, is the now-classic Alpha C. Chiang, *Fundamental Methods of Mathematical Economics* (Chiang and Wainwright, 2005). I need hardly state that Prof. Chiang, and his collaborator in later editions, Kevin Wainwright, cannot be held responsible for the uses to which I have put the mathematical techniques and theoretical traditions to which their text has given me access.

Why? Because each of us must *become part of* that revolutionary alternative to the existing order of privilege, domination, and irresponsibility. Working people who can't think formally, rigorously, *and* quantitatively will never build the collective muscle to acquire leadership of society and create the social and economic democracy that is increasingly possible. Political economy after economics is surely *one* crucial training ground for that leadership.

1 Value and the quest for the core of capitalism

Introductory perspectives

I once invited Dr. Robert Heilbroner, the prolific heterodox political economist, to give the Inaugural Lecture for a new Master of Arts Program in Political Economy that I was helping to found. His (tongue-in-cheek) advice to us: “Be wary of political economy. It is too ‘*meta!*’”

Is there a “meta”? Is there a level of reality that is not immediately apparent to ordinary understanding, but is still accessible within the canons of science? This chapter is about the central terrain on which these questions have played out since Marx's work came to its mature form in Volume I of *Capital* (1867): the theory of value, or what Marx more often called, with deceptive simplicity, the law of value.

Many Marxist investigations reach out for a deep layer of reality, by locating certain palpable aspects of our experience, tracing the failure of those aspects to capture the heart of that experience, and, finally, showing that they are actually genuine but superficial manifestations of an underlying reality. Thus, in philosophy we can easily grasp the “physical” (just reach out and touch it); also, the “real” (it is “what exists”). The *material*, however, partakes of both of these limiting concepts and yet transcends (or subtends) them, being neither “everything” (it is, after all, opposed to its “other,” the *ideal*), nor only that which is tangible or corporeal. Closer to home – *i.e.*, political economy – we have the mysterious notion of a “ruling class,” which is somehow neither (or both) a structural element in a system of social relations, nor (or and) a political agency that has the capacity to “rule.” The concept lies beyond both the adjective and the noun.

And so, *value* is neither (both) an ethical concept, a bestowal of desiredness or desirability or justification according to some standard; nor (and) an economic one: exchange values, the swap ratios that get called “prices” when they take on a monetary form. It is a social substance that partakes of its outward forms, but is not reducible to them.

In the spirit of this book's overarching theme – political economy after economics – this chapter tries to nail down the meaning of “value” in Marx's work and in the political economy tradition engendered by that work. “Economics” deals in individuals, the outer perceptible manifestations of the social relations that define human experience. At the level of rational individuals, and their institutions, coalitions, etc., value predictably gets lost.

This is why the school of “Analytical Marxism,” aligned as it is with the naive positivism of mainstream economic theory, concludes that value is an indefensible residue of earlier habits of thought. But if there are levels of social reality – within market economies in general and capitalist market economies in particular – that cannot be reduced to the machinations and consciousness of rational individuals, then Marx's value concept may hold the clue to how we might access those levels. That is the “*quest*.”

In the spirit of this book, the quest for the *essential* (in a literal sense of this word, partaking of the inner essence) must pass through its forms of appearance, or outward expressions, and in particular the entire system of price formation, as that is revealed in the sorts of (political) economies we are studying. I am not a Hegel scholar, but I think I have learned from that master's Marxist students (Marx included) that the true nature of things can only be grasped when the essence is seen as constituted by its phenomena (external representations). If we separate the inner from the outer expressions that continually reproduce and constitute it, we mystify it and lose its true connection to the world. If, to the contrary, we lose track of it altogether and see only the appearances, we fail to grasp the inner connections of those appearances. The methodological dialectic requires that we grasp the inner and outer at once, without reducing one to the other, and keeping the intense circulation between them always in focus.

If we can do that, then value may yet teach us something that is important but not obvious about capitalism, and how it works – something you will not find in “economics” books. But to get there, we have no choice but to *address* – thoroughly, in a rigorous manner, and cheerfully! – the *quantitative* dimension of price and value formation.

This chapter, unfortunately, contains some of the more advanced math that you will find in this book. Matrix arithmetic and algebra apply the ordinary arithmetic and algebra of numbers to more complex entities (vectors and matrices) that consist of many numbers at once. A vector is an ordered set of elements – a listing of those elements ordered in a line, where the order in which the elements appear matters. A matrix is an ordered *array* of elements; each element is assigned a specific place in a row and column of the matrix. All of the money prices of goods in a capitalist economy, for example, each corresponding to one of the commodities that is being produced, can be set up in a vector or list called \mathbf{p} , containing elements p_1, p_2, \dots, p_n , all of which are the money prices of the goods labeled 1, 2, \dots , n . So we write the vector $\mathbf{p} = (p_1, p_2, \dots, p_n)$. If we define a matrix \mathbf{A} as the set of per unit inputs of each of the n goods into each other one, so that an element of this matrix, called a_{ij} , is the amount of good i used up per unit of output of good j , then $\mathbf{p}\mathbf{A}$, the product of \mathbf{p} and \mathbf{A} , turns out to be another vector (or ordered list): it is the (summed up) money value of all of the inputs used in the production of one unit of each of the n goods.

As explained in the Introduction to this book, I cannot provide all of the tools needed to master every aspect of a chapter in that chapter's short “Introductory perspectives” section. But here is a hint about [Chapter 1](#): the matrix algebra part is entirely contained in Section 2, and you can skip that section entirely the first time through and still follow the core argument

of the chapter. The only drawback in this procedure is that you will have to take my word for certain conclusions that are used in the final section of the chapter. That is not for the best. I don't want you to take *Marx's* word for anything, so you *certainly* shouldn't take mine!

But I truly think that this quest – the value quest – is absolutely necessary, and highly rewarding. We may have to prove this over and over again, to others and to ourselves, but grasping the inner nature of an exploitative social formation is very tough, especially when the social relations involved take the outward form of simple (impersonal) “economic” relations, and grasping the inner qualities of capitalism has got to be one of the keys to formulating a viable vision of an alternative (see [Chapters 9](#) and [10](#)). It may not always be easy to distinguish between science and wishful thinking, but if you make this too easy by simply defining “science” to mean the study of the readily observable, and only that, you wind up with only surfaces, and no insides, and you may well then conclude that capitalism is the only reality, to which “there is no alternative” (TINA). But that is like giving the game away before the opening kickoff.

To outside observers of the value theory debate, both within and beyond the Marxist tradition, the continuing discussion – of value as the representation of capitalist social relations, of labor as the substance of value, of abstract labor and the money form, of the “transformation problem,” etc. – must seem, well, bizarre. It goes on endlessly, and never seems to reach any sort of consensus (let alone conclusion). It also, to be frank, does not appear to be saying anything useful.

At the same time, however, as the world economy lurches from crisis to crisis and its behavior appears more and more to reveal the classical immanent tendencies of capitalist accumulation, the problem of placing Marxist theory at the service of genuine explanation and analysis becomes ever more urgent. In this climate, it is appropriate to ask: what *can* Marxist value theory contribute? Can any sense be made of the enduring claim that the value categories, and they alone, are able to ground a successful and sufficiently rigorous theory of capitalist reality?

This chapter is an attempt to survey the territory anew, but also to move quickly to its frontier. The first section sets the conceptual table and reveals the author's preferences. To center on the relevant questions, it will be necessary to present a sharp picture of the relation between this investigation and other current trends in value theory. I believe, in fact, that there are a number of “false trails” – so characterized because they systematically divert us from addressing the questions that have the potential to move value theory forward.[‡] In saying this, I assume that candor is desirable in order to focus the discussion. I am concerned that many of those outside observers simply do not see that anything relevant is being discussed; to bring them in, we will have to call things as we see them. My hope is that partisans of one or another of my “false trails” will still read through to the end, to see if there is anything in my version of fruitful development that they might wish to assimilate into their own understandings – even if, in their view, *I* am following a false trail of my own!

[‡] It should be clear from the outset that the trails under consideration are characterized as “false” only in an objective sense,

in that they focus on secondary aspects or partial perspectives rather than successfully going to the heart of the matter. The characterization implies nothing at all, and certainly nothing derogatory, concerning the motives, integrity, or competence of the individuals participating in the discussion. False trails must be identified, so that we can back off them and proceed along fruitful ones.

Section 2 then proposes, on the basis of the conceptual foundations laid down earlier, a new way of formalizing the essential quantitative value relations of an abstract capitalist economy. This proposal draws on many of the insights already present in the literature; perhaps most significantly, it shows (I think) that the problem of *quantitative determination of value* – incorrectly grasped over many years under the rubric of the “transformation problem” – is a non-problem; or, rather, has an inherent solution.[‡] Section 2, however, is based on a crucial premise: the *existence* of a coefficient, often called the “money expression of labor time” (MELT) linking the surface structure of money prices to a deep structure of values created and measured in units of abstract labor. This premise, which amounts to postulating a labor-time dimension underlying the apparent monetary form of value, is simply invoked in the interest of establishing the quantitative properties of the value system; a rationale for the existence of the value substrate as such is not provided.

[‡] I feel I lead a charmed life: it is not given to everyone to “solve” the transformation problem, not once (see Laibman, 1973–74), but twice, in a single lifetime! Of course, the second solution casts doubt on the first – like the thirteenth chime of a clock – and raises the question, will there be a third? (One sincerely hopes not.)

The third section, therefore, embarks on the true expedition: the substantiation of the value premise and its contribution to our journey to the core of capitalism. Here the *goal* is to provide – finally – an answer to the question, what does value theory actually *do*? (other than provide a medium for endless discussion of value theory; cf. Laibman, 1992a, [ch. 1](#)). To use Robert Heilbroner's apt distinction (1985), value theory is about the “nature,” not the “logic,” of capitalism: what capitalism *is*, rather than how it *evolves*. We will not, for example, expect the value dimension as such to govern the theory of cyclical crisis, or of long-run developmental tendencies, in the sense that these aspects of capitalism's *logic* cannot be investigated without using value. On the other hand, it is presumably important to know *what it is* that is evolving when capitalism evolves. At that level, we can legitimately expect the value categories to contribute, in a non-empty and non-circular manner. Moreover, “what it is” and “how it evolves,” while distinct issues, are also ultimately inseparable, and interdefined.

Before the reader slogs through to Section 3, however, a confession is in order: this is an ongoing expedition, and we will be airlifted out before arriving at The Answer! The conclusion will set the stage for the next expeditionary attempt by pulling together what we may have learned from the present one. The Answer, however, still eludes us. Anyone seeking complete closure in this account will, I am afraid, be disappointed.

I VALUE AND CAPITALISM: BACKGROUND AND CONCEPTUAL ISSUES

1 Background

We posit an abstract capitalist economy in which competition is *unrestrained*:[‡] both capitalists and workers are able to move without restriction among alternative employments of their capital (in the case of the former), and their labor power (in the case of the latter). Moreover, there is sufficient knowledge of possibilities, at least at the margins of choice, that a tendency exists for wage rates in different occupations to converge to a common rate, and for profit rates in different sectors to converge to a common rate.[‡] In the interest of revealing central tendency and deep structure, we assume henceforth that the convergences of wage rates and profit rates are complete, so that we can speak of “the” wage rate and “the” profit rate. Although this never happens in the world of direct experience (the “real” world), the assumption guarantees that we are looking at properties of the inner structure of capitalist production, valuation, and distribution, rather than at fortuitous results of contingent factors or temporary positions. This, in fact, I take to be at the heart of value theory: to reveal (“lay bare”) the underlying core of capitalist reality, stripped of its specific and historically concrete but non-essential variety.

[‡] I of course avoid the ideologically tainted notions of “free” competition and “perfect” competition. I owe the term “unrestrained competition” to conversation with Anwar Shaikh.

[‡] For present purposes we ignore regional, ethnic, skill, etc., differentiations among different sorts of labor, treating labor as homogeneous and uniform. We also ignore stratification of capitals into degrees of monopoly power, pervasive barriers to entry into and exit from sectors, and separation or segmentation of markets. All of these of course exist, and complicate the formation of wage rates, profit rates, and prices, especially perhaps in late capitalism. It should go without saying that the abstract capitalist economy under consideration also ignores the existence of intermediate classes and strata between the two defining classes, as well as the existence and role of the state sector.

The economy consists of an indeterminate number of sectors, or industries.[‡] The basic problems in value theory can be set forth in a framework that ignores fixed capital investments in each industry; we will therefore work with circulating capital only, to keep our story as simple as possible. The value of output in each sector (using the term “value” loosely, for the moment) is decomposed into three components representing, respectively, material input, wages, and profit. [Figure 1.1](#) describes this situation, with the symbol \otimes used simply as a place-holder (we are not here concerned with actual quantitative magnitudes).

[‡] Readers who are well conversant with the “transformation problem” literature may wish to skip immediately to section II.2. Comprehensive surveys of the periodical literature up to the time of each publication will be found in Sweezy, 1956; Laibman, 1973–74; Howard and King, 1989. From a mainstream non-Marxist standpoint, Samuelson, 1971.

Now the classical Marxian starting point for calculation of unit values, defined as quantities of (abstract) labor time per unit of output, is the concept of total labor embodied in commodities – the sum of the direct (current) labor, plus indirect labor inhering in the material inputs. The unit values, λ , result from a system of simultaneous equations constructed from the data in all the rows of [Figure 1.1](#).[‡] They reflect the assumption that all purchases and sales of each good, whether as final output or as input into the production process in one or another sector, take place at the same price; prices (as the outward expression of values) have converged to their systemic benchmarks, in a passage of

theoretical time that holds production conditions and the class balance of forces (wage-rate determination) constant. This calculation will produce absolute quantities of labor value in the cells of [Figure 1.1](#) such that the sum of wages and profit in each sector will be exactly the current labor input, or value added, in that sector. The ratio of wages to that sum is therefore the *wage rate*, and the convergence property suggests that this ratio (or, alternatively, the ratio of profit to wages) will be the same in each sector.

Material input costs	+	Wage costs	+	Profit	=	Value of output
⊗		⊗		⊗		⊗
⊗		⊗		⊗		⊗
⊗		⊗		⊗		⊗
-----		-----		-----		-----
D		C		B		A

		F				

		E				

Figure 1.1 Value structure and invariance conditions.

‡ Actually, for the λ labor values, only the technical coefficients relating material inputs and labor to outputs matter; the distribution of the net product between wage and profit income has no effect on them.

Bold type is used to indicate a vector: an ordered sequence of elements. Thus, $\lambda = (\lambda_1, \lambda_2, \dots, \lambda_n)$, the listing or enumeration of the unit values of all of the goods from 1 to n . The model is explained more fully in Section 2.

Now the classical difficulty with this imagery arises as soon as we observe that, owing to the specific and varying qualities of the production processes in all of the sectors, the ratios of material cost to wages (alternatively, the ratios of material cost to value added) will differ among sectors, and that there is no convergence tendency forcing *these* ratios to equalize. This suggests that for any meaningful measure of the *rate of profit* – the ratio of profit to material inputs plus wages, or the ratio of profit to material input alone – different sectors will have different rates of profit. It follows, of course, that the assumption of unrestrained competition leading to convergence in the capital market is violated.

If an equal-profit-rate condition is imposed on the solution to the system of equations implicit in [Figure 1.1](#), a different set of unit values, the vector π , emerges. Marx's term for these “transformed” values, in the standard English translations, is *prices of production* (Marx, 1982, Parts I and II).

The question arises: are these profit-rate-equalizing unit values, π , determinate and unique? If so, then the unit-value-times-quantity elements in the table of [Figure 1.1](#) are also

completely determined. In fact, however, the convergence property (the formation of a single rate of profit as a result of unrestrained competition) only sets the internal proportions among the elements in that table; their scale remains undetermined (Seton, 1957).[‡] This is the basis for the search for an additional postulate to fix the scale (the absolute levels of the value magnitudes in the table). Since the problem was originally formulated as one of “transforming” from the λ table to the π table, it became a matter of choosing one element in the former that would remain invariant in the “transformation,” and would therefore determine the scale of the latter; thus began the search for an *invariance postulate*.

[‡] This can be seen quite simply. First, *assume* that the table can be brought into proportions such that the profit rate is the same in all sectors. (The theorems of Perron and Frobenius on the properties of non-negative square matrices in fact assure that, under reasonable conditions, there is one and only one way of doing this; see, *inter alia*, Brody, 1970). Now since the profit rate is a ratio of two elements in any row of the table (or of one element divided by a sum of other elements), it is self-evident that changing the scale of the entire table (multiplying every element in the table by some number, or scalar) will leave all of the ratios unaltered. The profit rate is clearly independent of scale.

The various possibilities can be examined by means of the capital letters in [Figure 1.1](#), which refer to different aggregate magnitudes. A , for example, is the sum of the (gross) value of output in the economy; B is the sum of the profits generated in the period in question; etc. Now as we move from the table based on the λ principle to the one based on the π principle, it is natural to think that $A_\pi = A_\lambda$ (“the sum of the prices of production is equal to the sum of the values”), and that $B_\pi = B_\lambda$ (“the sum of the profit is equal to the sum of the surplus value,” where “surplus value” is the term used to designate profit in the λ system). These two propositions have received the most attention in the “transformation” literature – because they are the ones that appear most prominently in Marx's texts. They correspond to his useful intuition concerning the pooling and redistribution of surplus value created in production in each sector: the competitive process forces some capitalists to lose parts of the surplus originating under their control, and enables others to annex those parts. This suggests that the *sum* of the surpluses should not change; if the sums of the input elements (C and D) also do not change, then the value of gross output (A) will be invariant as well.

There are, however, other intuitively appealing invariances. In Laibman, 1973–74, I produced a semantically persuasive argument for $C_\pi = C_\lambda$:[‡] if the rate of exploitation is the most fundamental measure of the balance of class power, and if it is best represented by the relation between the wage paid to workers (in quantities of labor value) and the flow of current labor (considered to be given), then the sum of the value of wages (“variable capital”) should be the same in the λ system and the π system. Somewhat later, Duménil (1983–84) and his “new view” colleagues made an equally convincing case for $E_\pi = E_\lambda$: value added should be equal in both systems. Someone should have backed D (invariance of material cost outlays), or F (invariance of total cost outlays); no one, to my knowledge, did.

[‡] I should say: I *tried* to produce a persuasive argument! If it were persuasive (for others to judge), this would have been by virtue of its semantic properties alone.

The truth is that all of these invariance postulates are intuitively appealing, and a case can be made that all of them should hold. The truth, however, is also that, aside from special output configurations that cannot serve as the basis for a general theory, *no two* of these postulates can hold simultaneously! If the two tables have different internal proportions, it should be clear that equating any pair of sums (in the same position in the two tables) will result in causing the two elements of all other pairs to be different from one another (unless by accident the π -table/ λ -table ratios for a particular pair of positions in the table happen to be the same). There thus seems to be no way to determine the scale of the π table uniquely, without violating a whole host of intuitions. This makes π – the capitalism-determined labor values – arbitrary, and therefore suspect.

2 The false trails

At every stage in the development of this problem, opponents of Marx's project lost no opportunity to declare it hopeless, and the game lost. Schumpeter, of course, called the whole thing a “pseudo-problem” (1951); Samuelson (1971) issued his famous “erase and replace” challenge: to transform from the λ table to the π table, simply erase the former and replace it with the latter! For their part, Marxists have, I believe, become largely embroiled in the pursuit of a variety of *false trails*; these have made a sense of progress possible – and important elements that play a role in the continuing development of the theory have been discovered along each one. They have, however, also prevented us from truly coming to terms with the difficulties in value theory, as these have been bequeathed to us. The list that follows is analytical, and the various false trails are not necessarily to be found full strength in particular authors (who, indeed, at times pursue different ones within the same work). Listed in alphabetical order, they are: empiricism, formalism, mathematicism, monetarism, temporalism, and textualism. My comments on each issue are designed only to orient the ensuing discussion; they are not intended to serve as full critical analyses, or to exhaust the content and subtleties of the various positions examined.

2.1 Empiricism

Difficulties in theory can be avoided by looking at the “facts.” Several authors (Shaikh, 1998; Ochoa, 1989; da Silva, 1991) – raising up a witches’ brew of questions concerning methodology, reliability of the data used, arbitrary assumptions (especially concerning skill differentials in the labor force, a factor that does not enter at the level of abstraction of the general presentation of the value problem), etc. – have produced numerical estimates of labor values λ , and of their divergence from actually existing prices. They do this using input–output tables, for a variety of countries and dates. Aside from problems of methodology that make uncertain the degree of reliance that can be placed on the findings, it is not clear what one would *want* to find. Suppose one finds, for example, that 93 percent of the variation in actual sectoral prices is explained by labor values – David Ricardo's famous 93 percent theory of value (Stigler, 1965). Is that a lot or a little? Marx's propositions about the pooling and redistribution of surplus value, and about the ways in which capitalist value

formation *mystifies* the underlying social relations, suggest that the divergence of π from λ is an essential part of the theory of capitalist exploitation. How, then, does one “vindicate” Marx by purporting to show that the divergence is in fact insignificant?

The questions in value theory are essentially theoretical, not empirical. Data are extremely important to our overall project in many contexts; not, I think, in this one.

2.2 Formalism

Difficulties with the quantitative determination of values in the capitalist context – not to mention the slings and arrows of outrageous critics – have impelled some Marxist writers on value to avoid the quantitative aspects of the problem altogether. The “embodied labor problematic” and the actual modeling of π determination are relegated to the backwaters of “neo-Ricardian” thinking, in favor of much verbal discussion of the “value form,” the monetary expression of abstract labor, and so forth (Krause, 1982; Moseley, 1993). Now the formal – qualitative – aspects of the problem *are* important; careful attention must be paid to foundational concepts if we are ever to agree on a rigorous posing of the issues. The quantitative dimension, however, is also vital *at the level of theory*, and cannot be dismissed quite so easily. Formal theorizing alone misses the insight that value *is* the quantification of social relations. Put another way, and paraphrasing von Clausewitz, the quantitative dimension is too important to be left to mainstream economists.

2.3 Mathematicism

This is a relatively minor trend, the opposite of formalism. It does *not* refer to the use of ordinary mathematics to explore the quantitative dimensions of the value problem; see Section II of this chapter. It suggests, instead, that labor values are in fact tensor rings, or differentiable manifolds, or something else that most people (including this author) find incomprehensible! A Soviet economist once told me (in Moscow, in 1969) that when Marx used the term “socially necessary labor time” in Volume I of *Capital*, he was actually referring to the shadow coefficients of the dual objective function in a dynamic programming problem. I was delighted with the creativity manifested in this effort to reconcile present-day concerns with mandatory orthodoxy, but nevertheless found myself thinking: “render unto the nineteenth century that which is the nineteenth century's.” The general point is that mathematical structures can and should be used to clarify the issues in value theory, not to replace those issues with impressive (because widely inaccessible) substitutes.

2.4 Monetarism

Related to formalism, this detour has deep roots in the history of economic thought. Marx himself traces it to its likely origin in Aristotle's *Politics*. In pursuing the problem of exchange value, many authors from Aristotle to Hume lose track of their subject and identify the substance of value with money; this then leads into a discussion of the properties of money, coinage, etc. But money, as Marx saw clearly, cannot be the *substance* of value,

because it is itself a commodity (whether or not it is gold money or state-credit money, and whether or not its unit is related to a commodity that is produced by labor), and as such its own exchange value in relation to every other commodity must also be explained.

In some present-day Marxist writing on value, money is identified as *the* form of value in capitalism (Foley, 1982; Lipietz, 1982; Krause, 1982). The value determination problem is then conflated with that of fixing the relation between a unit of money and a unit of labor time: the MELT mentioned earlier. In one popular version, the choice of invariance $E_\pi = E_\lambda$ (see [Figure 1.1](#)) is confounded with the determination (definition) of the MELT using the monetary value added in the numerator and the current labor (in labor hours) in the denominator. Once the MELT is fixed (by whatever definition), one can consistently translate any of the aggregates (A , B , etc.), and indeed the entire π -value table, from labor-value units to money units. We then have, tautologically, the same proportional transformation of each aggregate from its value form into its money form. Although this dimensional transformation thus appears to solve the riddle of the invariances, it clearly does not. It is tautologically true that if $x + y = z$, then $\alpha x + \alpha y = \alpha z$.

The MELT, as we will see later, does play a role in the solution to the actual value-determination problem. Money is part of the world of capitalist representations, and must play a role in the theory. The false trail is not the presence of money in the theory as such, but rather its use to avoid addressing the underlying value-determination issues. Determination of the value substrate must be independent of the quantity of money and of any other variables of the monetary process, and therefore also of the MELT.

2.5 Temporalism

This false trail does have explicit champions, in the “TSS” (temporal single system) school (see Freeman and Carchedi, 1996; Kliman and McGlone, 1988). The TSS partisans seek to answer the critics of Marx's value transformation by asserting a *non-equilibrium* paradigm, in which inputs are purchased at one moment of time and outputs are sold at another, in a dynamic, or temporal, sequence without convergence. The problems associated with the *system* of π equations implied in [Figure 1.1](#) then simply do not arise: that system is simultaneous, whereas value formation is dynamic and sequential. Time passes, technology and social relations change, and prices change with them. Period.

This is truly a false trail (for fuller argument, see Laibman, 1999a; this volume, [Chapter 2](#)): an embracing of radical institutionalism and a retreat from theory. If everything is changing, nothing can be theorized! Temporalists disparage the “simultaneist” preoccupation with “stationary” prices, but this misses the point entirely. The values of the λ and π systems are stationary only in the sense that they represent the inner tendency of a situation at a given moment in time. Their study does not imply that actual situations are constant through time, and that actual prices do not change. On the contrary: the purpose of value theory is to grasp inner tendencies, precisely so that in the study of capitalist dynamics – which are indeed largely *dis* equilibrium dynamics – we can distinguish between significant and insignificant change.

2.6 Textualism

The final false trail can be found in conjunction with most of the others, but perhaps particularly in association with temporalism and formalism. There is no end to Marx's texts. In addition to the 4,000 pages of the three volumes of *Capital*, the *Grundrisse*, the *Critique of Political Economy*, the *Resultate*, and other writings, we now have the 1862–63 manuscript, the MEGA edition of the notebooks for Volumes II and III of *Capital*, and more to come. There is a belief in some circles that all will become clear if only we can finally get to the bottom of Marx's enormous *corpus*. (One colleague once called me in a state of high excitement to say he had found the secret of the whole thing – in a hitherto neglected footnote in Volume II!)

We should be able to dispense quickly with this reduction of Marxist theoretical endeavor to a form of Bible study. It is most unfortunate, as it tends to validate one of the stereotypes favored in anti-Marxist academic – and political – circles. There is still, regrettably, a significant number of Marxists, most prominently featured in the temporal school, who are convinced that they, and only they, are the possessors of the one true interpretation of Marx, who has been, it is said, woefully misunderstood by several generations of “Marxists” – particularly in the twentieth century.

3 A conceptual taxonomy

As a way of preparing for the more formal discussion in the next section, I have developed a diagram ([Figure 1.2](#), adapted from Duménil, 1983–84), which lays out the various positions in relation to my own.

A preliminary point is necessary here. The λ system was described earlier as resulting from a process of convergence, but since profit-rate equalization is not achieved, the question arises, convergence on what basis? The answer is that this model depicts a producer–trader market economy, in which each economically active individual both owns simple means of production (*e.g.*, tools, raw materials) and labors using those means of production to create products, which he/she then sells. This abstraction from the much more complex prehistory of capitalism is known as *simple commodity production*.[‡] In this sort of economy, in which labor and ownership are united rather than separated, neither a specific return to labor (wage rate) nor a rate of profit on capital (irrespective of labor performed) would make sense to the owner–laborers. Instead, these individuals maximize, and therefore bring about the competitive equalization of, the *net income ratio*: net income from sales, after deducting material input costs, per unit of labor expended. It can be shown that convergence of this ratio results in prices proportional to the unit direct-plus-indirect labor values, λ (Laibman, 1992a, ch. 1).[‡]

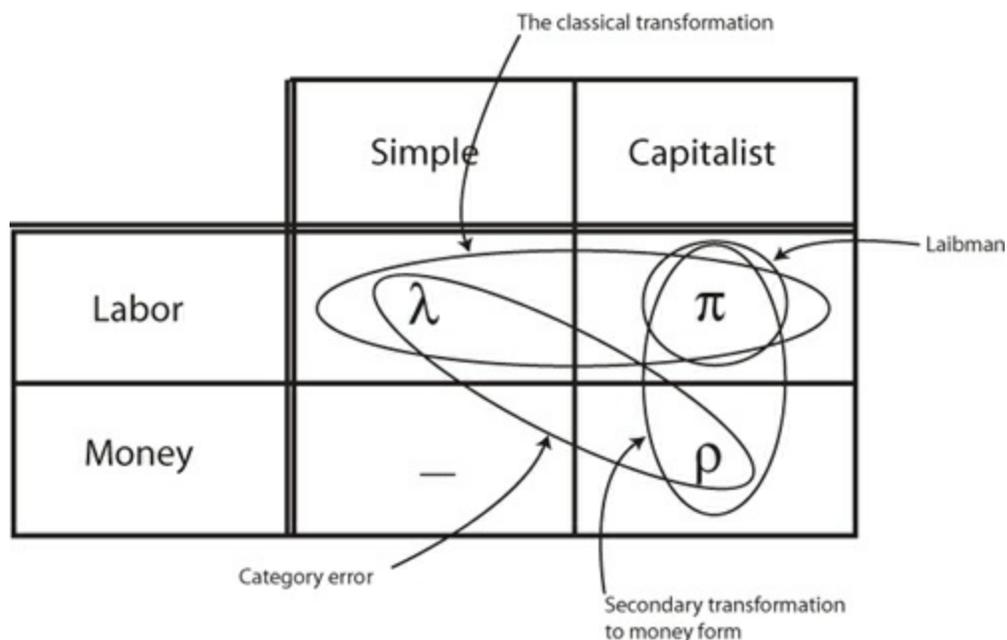


Figure 1.2 Taxonomy of transformation conceptualizations.

‡ This concept has been subjected to a singular level of abuse in much of the latter-day Marxist literature; it is, however, clearly present in the work of both Marx and Engels, including Volume I of *Capital*, and has the obvious interpretation described in the text. See Laibman, 1998b, for fuller discussion.

‡ Indeed, the net income ratio is equivalent to the *maximum* wage rate in a notional capitalist system with a zero profit rate, for which the λ proportions hold. Differences in “proportions of labor to means of production” will affect start-up costs of entering different industries or trades, but do not affect long-period prices. It should be clear that this model implies the non-existence of the significant wealth disparities that characterize capitalist economies, and that play a role in the explanation for the existence of a positive rate of profit.

With this in mind, we can look at [Figure 1.2](#). The columns represent, from left to right, simple commodity production and capitalist commodity production. The rows, top to bottom, show calculation in quantities of homogeneous abstract labor time and in money. The classical “transformation,” from surplus value to profit and from values to prices of production, is represented by movement along the first row (*i.e.*, within labor-value calculation, from the simple-commodity λ proportions to the capitalist, profit-rate-equalizing π proportions). The invariance problem described in Section I.1 applies to this formulation; it has, as we know, never been resolved. (This classical transformation could, of course, also be described in money terms, by using the MELT to form the equivalent proportions along the bottom row of [Figure 1.2](#); this description is not represented in the figure.)

The secondary transformation from capitalism-determined labor values π to their monetary counterparts ρ is shown in the downward movement, right column. This is the determination of the MELT. The movement diagonally from northwest to southeast, *i.e.*, from simple commodity *values* to capitalist *money prices*, is a category error – unfortunately, a rather common one – which confuses and combines two distinct transformations.

My own proposal (postponing full discussion until the next section) is contained entirely within the upper-right box in the figure. I have come to believe that, from a theoretical standpoint, there quite simply *is no transformation*. First, I should note that we are not

concerned with the historical transition to capitalism out of precapitalist formations, including simple market relations as overlain by obsolescing feudal and state-tributary forms (this is the “historical transformation problem”; see Morishima and Catephores, 1975). Our interest here is in the characterization of the abstract capitalist economy as such. *The λ system is quite simply not relevant for this purpose.* Labor value in the abstract capitalist economy under study here *exists* in conjunction with profit-rate equalization; it is not defined any other way. Similarly, the question of the MELT, or the transformation from labor value to money value terms, is of secondary (not *negligible*; literally *secondary*) importance, and can only be solved in the context of a solution to the value *determination* problem in the upper right box. This problem, stripped to bare essentials, is to demonstrate the quantitative uniqueness and non-arbitrariness of the elements of the π vector: not only its internal proportions but also its scale. Non-arbitrariness here means that this demonstration must rely on properties that are immanent in the problem itself; it cannot resort to what I earlier called “persuasive semantics,” or to argument based on textual authority.

The “transformation problem” that we all inherited and worked on, then, is quite literally an illusion. There is no procession “from” one thing (λ) “to” another (π).

Breaking with old habits of thought is, of course, quite difficult. The situation is very much like a teaser I remember from childhood: three people eat a meal in a restaurant, and the check comes to \$25. They each give the waiter a \$10 bill, \$30 in all. The waiter gets five singles from the cashier in change, of which three are returned, one each, to the three diners, and two are given to the waiter as a gratuity. Now each diner contributed (net) \$9 (the \$10 bill minus the single returned): $9 \times 3 = 27$, plus the \$2 that went to the waiter, equals \$29! *What happened to the other dollar?* After much merriment, you will realize that this is a trick question. There is no “other dollar,” because nothing has to add up to \$30.

Similarly, *there is no transformation, and therefore no aggregate equalities to be established.* The non-intuitive non-correspondence between “total price” and “total value,” for example, need not concern us, because *the latter does not exist* in the capitalist framework. Values in their capitalist form *are* π .

The question that now faces us is this: are these values fully determinate within capitalism? We shall see.

II THE CAPITALIST DETERMINATION OF VALUE

We will explore the value determination issues using a linear production model of the sort that has come into wide use.[‡] Great care, however, must be taken with the way it is used. One caution is necessary at the outset: when we speak of a relation between a quantity of labor and a quantity of output, or between a quantity of physical input and a quantity of output, that relation is social as well as technical. It is partly determined by the state of scientific and engineering knowledge in application to production, but it also (and significantly) reflects the balance of class power – the state of play in the labor market, the degree of dependence and insecurity experienced by sellers of labor power, the role of ideological factors – in short,

the entire weight of history and culture shaping expectations and norms concerning the pace of work, intensity of effort, quality of work discipline, channels of authority, and so forth. The claim that any use of production models of the sort deployed here is inherently technicist, reductionist, etc., is simply not valid.

‡ Excellent sources for the class of models used here are Brody, 1970; Pasinetti, 1977; Kurz and Salvadori, 1995.

With this in mind, for a capitalist economy divided into n distinct sectors each producing a single output, we may define, conventionally, a row $(1 \times n)$ vector \mathbf{l} , each of whose elements is a quantity of (homogeneous) labor per unit of output, L_i/X_i ; a square $(n \times n)$ matrix \mathbf{A} , each of whose elements is a quantity of good i used in the production of good j , per unit of good j , $X_{ij}/X_j = a_{ij}$; a scalar money wage rate, w ; a scalar rate of profit, r , together with the same variable in the form $R \equiv 1 + r$; and a row $(1 \times n)$ vector of money prices, \mathbf{p} . w and r are scalars (simple numbers), the result of complete competitive convergence (as explained in the previous section). In the formulation of the price system chosen, I am following the basic procedure of Sraffa (1960) in restricting attention to circulating capital only, so that the flow matrix \mathbf{A} represents the only physical inputs in production. Since there are no stocks of capital good inputs, the profit rate r is a pure number (ratio of flow to flow). It is, again following Sraffa, calculated only on the physical inputs; labor is paid after production takes place, so that wages are not advanced and profit is not formed on them. All of the properties with which we are concerned are perfectly general with respect to the full range of formulations, and it would be tedious to reproduce the argument in multiple versions.

The particular assumptions adopted imply the following vector equation for money prices, assuming full convergence to the benchmark (“equilibrium”) position:

$$\mathbf{p} = w\mathbf{l} + (1+r)\mathbf{pA} = w\mathbf{l} + R\mathbf{pA}. \quad (1.1)$$

This simply says that the money price per unit of output in each sector will be equal to the wage cost of the labor expended per unit in that sector, plus the money value of all of the goods inputs into one unit of output, plus profit on that same sum at the rate r .

This is a system of n algebraic equations with $n + 1$ unknowns r and \mathbf{p} (w , \mathbf{l} , and \mathbf{A} are given), and more information is needed to solve it.‡ (Note that we are not yet ready even to pose the problem of determining the *values*, $\boldsymbol{\pi}$.) As an example of an unacceptable method of closing the system, consider adding an equation $w = \mathbf{pc}$, where \mathbf{c} is a column $(n \times 1)$ vector of goods-consumptions per unit of labor (a sort of unit wage basket). The difficulty with this is that it violates a central social characteristic of the capitalist economy that is our object of attention: the vector \mathbf{c} cannot be treated as known or given, in advance of the formation of money prices, since it is only on the basis of those prices that workers – who are sovereign consumers, not slaves subject to feeding by their masters – themselves will determine the proportions of the wage basket. This constitutes a prime illustration of the difference between description and explanation, and the use of equation systems for each of these

purposes.

‡ The money wage rate, w , is *given* by everything that has brought the balance of class forces, as well as the money supply and its velocity of circulation, to their present configuration. Classical price theory seeks to show how money prices are determined on the basis of an entire series of elements (w , A , and I , together with competitive allocation of the surplus to capital ownership), which themselves are historical products whose genesis is to be explained on other levels. If one is tempted to think of A and I as given, while the “givenness” of w is suspect, remember that the “technical” input coefficients are in principle just as *social* in nature as the forces shaping the wage bargain.

We can begin by writing down a partial solution to (1.1),

$$\mathbf{p} = w\mathbf{1} [\mathbf{I} - \mathbf{RA}]^{-1} \quad (1.2)$$

and defining a vector of i -th commodity prices: the real relative exchange ratio of each good with some good i , arbitrarily chosen from among their number:

$$\mathbf{p}^i = \left(\frac{p_1}{p_i}, \frac{p_2}{p_i}, \dots, 1, \dots, \frac{p_n}{p_i} \right) = \frac{\mathbf{P}}{p_i} \quad (1.3)$$

Using the same arbitrary good i , we also form the i -th commodity “real” wage rate: the quantity of good i commanded per unit of labor by the money wage: $w_i = w/p_i$. These definitions enable us to process (1.2) as follows:

$$\mathbf{p}^i = \frac{w}{p_i} \mathbf{1} [\mathbf{I} - \mathbf{RA}]^{-1} = w_i \mathbf{1} [\mathbf{I} - \mathbf{RA}]^{-1} \quad (1.4)$$

Finally, defining a column basis vector \mathbf{e}_i :

$$\mathbf{e}_i \equiv \begin{bmatrix} 0 \\ 0 \\ 0 \\ \cdot \\ \cdot \\ 1 \\ \cdot \\ \cdot \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

with 1 in the i -th position and zeroes elsewhere, we can write

$$\mathbf{p}^i \mathbf{e}_i = w_i \mathbf{1} [\mathbf{I} - \mathbf{RA}]^{-1} \mathbf{e}_i = 1 \quad (1.5)$$

from which we have the scalar equation

$$w_i = \frac{1}{\mathbf{1} [\mathbf{I} - R\mathbf{A}]^{-1} \mathbf{e}_i}. \quad (1.6)$$

This equation determines the rate of profit, given w_i . Although we are not yet able to characterize this as a solution, since the full meaning of w_i has not been explained, we will provisionally write the R (and of course r) resulting from (1.6) as \bar{R} and \bar{r} , where the bar over a variable denotes a solution.

To establish that this is indeed a solution for the profit rate, we must show that \bar{R} is independent of the choice of commodity i . This can be done in a straightforward manner. We define row vector $\mathbf{x} \equiv \mathbf{1} [\mathbf{I} - R\mathbf{A}]^{-1} = \mathbf{x}(R)$, so that $\mathbf{p} = w\mathbf{x}$, and $x_j/x_i = p_j/p_i$, for all i and j . From (1.5), we have $w_i \mathbf{x} \mathbf{e}_i = 1 \Rightarrow \bar{R}_i$, and $w_j \mathbf{x} \mathbf{e}_j = 1 \Rightarrow \bar{R}_j$. For $\bar{R}_i = \bar{R}_j$ we need $w_i \mathbf{x} \mathbf{e}_i = w_j \mathbf{x} \mathbf{e}_j$. The chain

$$w_i \mathbf{x} \mathbf{e}_i = w_i x_i = \frac{p_j}{p_i} w_j x_i = \frac{x_j}{x_i} w_j x_i = w_j x_j = w_j \mathbf{x} \mathbf{e}_j$$

demonstrates this property. \bar{R} is therefore unique and invariant to the choice of the commodity serving as standard of exchange value.

With \bar{R} determined, we also have $\bar{\mathbf{p}}^i = w_i \mathbf{1} [\mathbf{I} - \bar{R}\mathbf{A}]^{-1}$. The next step, preliminary to introducing the value dimension, is to determine $\bar{\mathbf{p}}$. Since \mathbf{p} is a vector of money prices, the quantity of money, M , and its velocity of circulation, V , must enter into the story – an aspect of the value determination problem that has not always been fully appreciated. A general version of the familiar “quantity equation,” to be found in any macroeconomics text as well as in Marx's *Contribution to the Critique of Political Economy*, will do the job. Defining the column ($n \times 1$) vector of gross outputs, \mathbf{X} , we have

$$\mathbf{p}\mathbf{X} = MV, \quad (1.7)$$

from which, expressing \mathbf{p} as the product of the money price of the i -th commodity and the i -th commodity price vector, already determined, we have $p_i \bar{\mathbf{p}}^i \mathbf{X} = MV$, and the money price of the i -th commodity is determined as

$$\bar{p}_i = \frac{MV}{\bar{\mathbf{p}}^i \mathbf{X}}.$$

From here, finally, we have

$$\bar{\mathbf{p}} = \bar{p}_i \bar{\mathbf{p}}^i = \bar{p}_i w \mathbf{1} [\mathbf{I} - \bar{R}\mathbf{A}]^{-1}. \quad (1.8)$$

It should be observed that the determined money price vector has as arguments not only the technology (\mathbf{I} , \mathbf{A}) and the money wage rate w , but also the *effective quantity of money*, MV , and \mathbf{X} , which here represents the composition of output.

We are now ready to take the fateful step: we *assume* the values π exist. As indicated in the introduction, this is posited essentially without proof, in anticipation of the argument of Section 3, below. *If* there is a substratum of labor value lying behind the money exchange values \bar{p} apparent on the surface, there *must be* a coefficient linking them; this is the monetary equivalent of labor time (MELT). I will use its reciprocal, the “implicit value content of the money unit,” which I will call μ (see Mage, 1963). This coefficient must be defined in terms of gross output, since all output, whether net output or replacement of used-up means of production, must be circulated by the effective money supply. Since the (labor) value of gross output is πX , and the corresponding money magnitude is pX , we have a provisional definition:

$$\mu = \frac{\pi X}{pX} = \frac{\pi X}{MV}. \quad (1.9)$$

Of course, we cannot write $\bar{\mu}$ or $\bar{\pi}$ yet; in the definition they are mutually determining, given $p = \bar{p}$, but we need something additional to fix one or the other. We do, however, know – by definition – that $\pi = \mu p$. This yields, from (1.1),

$$\begin{aligned} \pi &= \mu w \mathbf{1} + \mu R p \mathbf{A} \\ &= \mu w \mathbf{1} + R \mu p \mathbf{A} \\ &= \mu w \mathbf{1} + R \pi \mathbf{A}. \end{aligned} \quad (1.10)$$

In effect, μw is the *value wage rate*: the amount of labor value corresponding to the money wage, per unit of labor time expended (this should be clear from the definitions of its two components). We can then define the pure number, ω , = μw . The value wage rate ω is conceptually equivalent to the *wage share* of value added by current labor. Anticipating the argument to come, I note that the conversion from money accounts to labor value accounts appears to focus the wage concept as a *share* of the product of labor, rather than having it remain at the level of an absolute amount of the product, the “real wage” (which is closely tied to w in a model in which changes in the price level are not under consideration).

The key to our problem – which turns out to have an obvious and inherent solution – is the definition of ω . It stands to reason that the only way this coefficient, which, as noted, has the characteristics of a wage share, can (should) be defined is in terms of the prices in which that share is actually experienced by the actors in our drama (capitalists and workers). We will see later that the wage share emerges as more than an accounting category; it is a crucial element in the evolution of norms and standards defining, and shaping, the class balance of forces. Let L be the (scalar) total current labor and \mathbf{Y} the column vector of *net* output, $\mathbf{Y} = (\mathbf{I} - \mathbf{A})\mathbf{X}$. Then remembering that $\omega = \mu w$ and $\pi = \mu p$, we have

$$\omega = \frac{wL}{pY} = \frac{\omega L}{\pi Y}, \quad (1.11)$$

and the second step of this chain equality clearly implies

$$\pi Y = L. \tag{1.12}$$

We find, therefore, a strikingly simple – but important – equality, between the current labor, L , and the labor value of the *net* product, πY . This emerges, it must be noted, *not* as an *assumption* based on some exterior theorizing, but as a direct implication of the structure of the model, once we impose the condition that the wage share be defined in the money prices of the world of experience.

The result $\pi Y = L$ bears a superficial resemblance to the “invariance postulate” put forward by some of the “new view” authors (Duménil, Lipietz), labeled $E_\pi = E_\lambda$ in Section I, with reference to [Figure 1.1](#). It is not, however, an invariance postulate: there is no premise here of a *transformation* from a λ system to a π system, and πY has been equated not to a category of a different value calculation scheme, but to the quantity of homogeneous current labor, L , which is a necessary parameter of the production regime as such, independent of value.

Noting that (using μ) we have

$$\frac{\pi X}{\pi Y} = \frac{pX}{pY},$$

we can process the definition of μ as follows:

$$\mu = \frac{\pi X}{pX} = \frac{\pi Y}{pY} = \frac{L}{pY}, \tag{1.13}$$

where the last step uses (1.12). Since the price vector has already been determined – $\mathbf{p} = \bar{\mathbf{p}}$ – this provides us with the quantitative determination of μ that we have been seeking:

$$\bar{\mu} = \frac{L}{\bar{p}Y}. \tag{1.14}$$

The completely determined value system can then be expressed using $\bar{\mu}$:

$$\bar{\pi} = \bar{\mu} \bar{\mathbf{p}} \quad \bar{\omega} = \bar{\mu} \mathbf{w}. \tag{1.15}$$

In (1.15) $\bar{\pi}$ is the quantitatively determinate vector of capitalist values (values emerging in the abstract capitalist economy). This vector, I submit, is the solution to the long-standing “transformation problem”; it constitutes the required demonstration of the determinacy and uniqueness of values in the context of the capitalist double-convergence, of w_i to w , and of r_i to r . There are, quite simply, no logical obstacles to the expression and exploration of the deep structure of labor value, meticulously and rigorously calculated. A quantitatively determinate general measure of the rate of exploitation, $\bar{\omega}$, also emerges; this enables us to define the rate of exploitation, or rate of surplus value, as

$$\varepsilon = \frac{1 - \bar{\omega}}{\bar{\omega}}$$

an expression that is clearly *not* independent of a wide variety of influences in both the real production and the monetary aspects of the balance of class forces being characterized.

For readers who would like to relate this result to the usual numerical illustrations of “transformation” (value determination), notice that the equality $\pi \mathbf{Y} = L$ sets the scale of the profit-rate-equalizing value table. Numerical examples and two-sector algebraic formulations are readily available, and have well-known properties. The key new results here are essentially observations, the most important of these being as follows: once we realize that the issue is capitalist value determination, rather than transformation from one regime to another, the entire burden of invariance properties also ceases to exist. There are only the labor values π generated under the abstract capitalist regime. These are quantitatively unique and completely determinate.[‡] They do not, of course, have the simple properties of the λ system that expresses the core of the simple commodity economy; why should they? In capitalist value determination, we do not, for example, have *sector-by-sector* equality between value creation (in labor hours) and labor expended; the ratio of value hour to labor hour varies around unity, and is equal to unity only in exceptional circumstances. (This equality does, of course, hold in the aggregate.) It remains to be shown that Marx's analysis of exploitation and surplus value in chapters IV through VIII of Volume I of *Capital* carries through in the more complex framework of fully capitalism-determined value. This, however, anticipates the quest of the next section of this chapter, for the ultimate rationale for introducing the μ (or π) postulate in the first place.

[‡] Perhaps I might be permitted the observation that this system of unique and systemwide profit-rate equalizing unit values is genuinely *non-dualist*, or *single-system*.

Before turning to that task, one more property of the solution arrived at here should be mentioned. Using all of the properties thus far derived, we can process the labor values $\bar{\pi}$ as follows:

$$\bar{\pi} = \bar{\mu} \bar{\mathbf{p}} = \frac{L}{\bar{p}_i \bar{\mathbf{p}}' \mathbf{y}} \bar{p}_i \bar{\mathbf{p}}' = \frac{L}{\bar{\mathbf{p}}' \mathbf{Y}} \bar{\mathbf{p}}' \quad (1.16)$$

Inspection of the right-most term reveals that the values turn out to be independent of the monetary variables MV (since the money price of good i , \bar{p}_i , drops out). The value vector, however, does depend on the composition of output, represented by \mathbf{Y} in the right-most term in (1.16). The money price vector $\bar{\mathbf{p}}$ clearly depends on MV . The relative price vector, $\bar{\mathbf{p}}^i$, and the profit rate \bar{r} , are independent of both MV and the composition of output.[‡]

[‡] In Laibman, 1992a, [ch. 1](#), I derived what I took to be an unusual and ironic result: that with what I then thought of as an invariance postulate such as $\pi \mathbf{Y} = L$ the real relative price vector and the profit rate were themselves sensitive to the composition of output. This seemed to follow from the fact that \mathbf{Y} appears in the expression determining the profit rate. I now believe this was an error: ω also appears in that expression, and when the definition of ω is applied the expression turns out to

be itself definitional, or tautological. The solution is therefore insensitive to particular values of the elements of \mathbf{Y} . This illustrates the care that must be taken in drawing conclusions from the apparent properties of matrix equations, or indeed even from their more transparent algebraic counterparts.

III NOW, THE QUEST: WHY *SHOULD WE* DETERMINE CAPITALIST LABOR VALUES?

One senses an all but unbridgeable gulf between two camps: the exoterics, who find the very notion of a substance of value – a *tertium comparationis* lying behind exchange values and money prices – to be a superstitious relic of an outmoded classicism; and the esoterics, convinced that without the value dimension (Fine, 1986) the core of capitalist reality will be forever concealed from view.

Much effort has been expended in the attempt to substantiate a value searchlight, which can then be turned on to the dark corners of capitalist reality. My own previous work is of this type. I tried to formulate a theory of capitalist exploitation as a matter of extraction of labor from an autonomous working-class household sector. The rate of that extraction is inherently linked to labor, since the labor within the household sector is not embodied in discrete commodity-products and therefore enforces a labor-time measure on the production sector as well (Laibman, 1992a, [ch. 3](#)). More recently, I have suggested that the value postulate – the *exchange of equivalents* presupposing the existence of an absolute substance, or standard, of value – may actually rest on the fact that valorization in capitalism is by its very nature incomplete, and that the legitimation and reproduction of market relations therefore requires secondary support in the form of a socially validated perception of *equal* exchange (Laibman, 1998b).

While there may be some useful insights in these speculations, I do not now think they drive their point home. The value substrate, if it exists, can only be revealed by a careful examination of the specifics of the capitalist social relation itself. Just as the quantitative determinacy of capitalist value emerges not from an ingenious argument imposed upon the value system from outside, but rather from properties inhering within it (Section II), so we will, I think, find that the existence of π (or, equivalently, of μ) emerges only from a completely adequate rendering of what takes place in capitalist social reproduction – especially from a full characterization of the relations between classes. Rather than deriving our theory of capitalist relations from value, then, we will find that value appears as a necessary byproduct of a complete specification of capitalism; it will therefore serve as a guide to, or confirmation of, that specification.

Consider the description of the core process in terms of the two convergences: $r_i \rightarrow r$, and $w_i \rightarrow w$. Capitalists pursue (and thereby bring about the tendential equalization of) the profit rate, and workers pursue (and thereby bring about the tendential equalization of) the money wage rate. In this story, workers act as individuals, and are assumed to be driven by personal gain in the form of maximizing real (or money) income. The emergence of w fixes its character as a *price*: a monetary exchange value that is inherent in every unit of a commodity by virtue of commodities' interchangeability. To the extent that the wage rate

achieves existence as the *complete* valorization of labor power, then, it succeeds in taking on price-like qualities: it is objective, external, and independent of the individual's actions or choices. The convergences that determine \mathbf{p} , therefore, describe the capitalist process as one of individual actors behaving parametrically. Once convergence is complete, the sale of labor power at the going wage rate becomes more or less automatic, since that rate exists outside of the control of the parties to the exchange.

In the capitalist world described to this point, the postulates of methodological individualism appear to hold without qualification (see Elster, 1985). Classes exist, of course, in the formal sense of aggregates of capitalists and workers, but there is only individual behavior in labor and capital markets, and no sense in which a class balance of forces is determined and in turn shapes the outcomes. The environment in which the *tertium comparationis* seems strange and out of place – in which *exchange of equivalents* has no apparent meaning – is one of individual utility maximization: the individual engages in constrained optimization, and when the greatest possible return to one's assets is obtained there is simply no point in wondering whether the exchanges that brought her/him to that point were, in any meaningful sense, “equal” exchanges or not. (Suppose they were *not* “equal,” however that quality is defined; if they resulted in constrained utility maximization, why would one care?)

This suggests that a deeper description of the way in which labor power is valorized, and outcomes in labor power markets formed, may lead to a formulation that necessarily goes beyond the twin convergences considered up to this point.

In *Capital*, I, [ch. 6](#) and elsewhere, Marx portrayed the valorization of labor power as intensely dialectical: the commodity sold by workers to capitalists acquires an abstract exchange value, w , as an outcome of the inner logic of capital; this commodification, in turn, is essential to the reproduction of proletarian subjugation and dependency, a process with both ideological and structural dimensions. But the valorization of labor power is never complete: it must be continually reproduced in a constant struggle against the working class, which is, for its part, continually striving to overcome this valorization. What is missing in the above account of convergence leading to the relative money prices \mathbf{p} is – the class struggle! In an illusory limit point of the capitalist process, perhaps, the class struggle is “solved,” and workers are reduced to atomized individuals amenable to analysis in the terms deployed in rational-choice models.[‡] It remains to inquire what happens when the struggle, and the contradictoriness that accompanies it, are brought into play (or kept in play).

[‡] Of course, if workers ever actually allowed the capitalists to “solve” the class struggle at their expense, they would be “degraded to one level mass of broken down wretches past salvation” (Marx, 1933a, 61).

The first element in our extension of the capitalist story is recognition of a simple reality: the abstraction resulting in a general wage rate is not only always incomplete; it is also always being regenerated from particular situations – the encounter of each particular capital with its own labor force – in which the formation of the wage rate and the extraction of labor are the result of a conflictual bargaining process and the ensuing institutionalized conflict at

the point of production. When the individual worker meets a prospective employer (or its representative), s/he cannot simply sign on the dotted line and get the “going rate” (a concept that must include both the wage to be paid and the conditions and duration of the labor effort expected in exchange). The conditions at each production site are simultaneously general and specific; abstract and concrete. Workers (individually or collectively) must therefore *bargain*, and in order to do so must cast up an estimate of the *relative specific balance of power*. They find they must think strategically about what they can get in determinate circumstances. The norms governing this process are, in large measure, ideological; this means, among other things, that they must be continually tested by efforts to transcend them.

Workers, then, will want to know, not just what the “going” wage rate is, but how their particular employer shapes up in relation to the norm – in terms of productivity, working conditions, market position; anything that may bear upon the balance of forces in the bargaining situation. The relative strength of an individual capital in relation to capital in general may be measured, of course, in many ways. In order not to foreclose prematurely on the problem of defining a variable that can serve as a central measure of the balance of class forces, I will simply use the symbol ϕ to represent the general balance, and ϕ_i to stand for its local counterpart (identifying the local with the individual sector for this purpose).

In this story, I am using the concept ϕ_i as a proxy for the relative strength of an individual capital, which workers will attempt to estimate when they bargain for the wage *rate* to be paid. They will not automatically get w_i , the going rate in the sector; the local wage achievable may be more or less than this benchmark, depending on the real and projected local class balance of power, as given by ϕ_i .

The argument is *not* that workers care about the local wage *share* as well as their own wage *rate*; this would suggest that they might agree to work for a lower wage rate, as long as their rate of exploitation was also lower. While this might be true in some circumstances, the general point does not depend on it. That general point is that the local balance of power (to the extent this can be known) will shape workers’ sense of what is possible; their resolve; and, consequently, the *actual* local wage rate w_i .

Once we arrive at a realization that the local situation ϕ_i is material in shaping the wider balance of class forces, we can reexamine the role of valorization, which not only mystifies and therefore enables capitalist exploitation, but also progressively forms the class relations between capitalists and workers, existing primitively in the form of local, concrete confrontations, into a capitalist *system*. The system-wide properties of the ensemble of local capitals emerge as a set of norms – a historically evolved *culture* that governs particular instances of class bargaining and production. Thus, in a given capitalist society at a given moment in its development, a general sense of the normal intensity of labor emerges, as well as a general understanding of the established hours of labor, environmental conditions for labor, breaks, etc. The production culture also contains a conception of the appropriate degree of autonomy (or lack thereof) in the work process, of the degree of devolution of creative and managerial functions, and so forth. Significantly, a set of norms also emerges surrounding consumption. These include the use of elite levels of consumption as a means of

drawing upwardly mobile individuals away from the working class and thereby reproducing that class' political dependency and lack of hegemony. They also signal the point at which elite consumption triggers a crisis of legitimation (Laibman, 1997, ch. 11; 2007, [ch. 3](#)). In both cases, the pivotal role of the general distribution of income between property ownership and labor is revealed.

Since the wider production/consumption culture in a given capitalist society shapes the bargaining process at each local production site, the outcome is the existence of a *third convergent process* – one that is systemic rather than individual, in that it does not depend on competitive optimization by workers or capitalists, and therefore cannot be contained within the rulebook of methodological individualism. This is the systematic convergence of local balances of power to a general one:

$$\varphi_i \rightarrow \varphi. \tag{1.17}$$

With the systematization of capitalist relations, general norms emerge governing the pace and conditions of labor. These norms reflect the systematization of those relations, and are not the result of competitive arbitrage. They embody the objectivity of crucial conditions of production – their law-like character – and thus serve as a complement to valorization as a means of rendering capitalist exploitation impersonal, “natural,” “eternal.”

While the sectoral wage shares, emerging as a result of the market/optimizing convergences, do *not* converge to a common system-wide wage share, the *general* wage share, ω , emerges as the most important measure of the general balance of class forces, φ . The convergence $\varphi_i \rightarrow \varphi$ thus implies the formation of a general wage share, ω . This, it should be noted, is only incidentally an average of the particular ω_i ; the replacement of the ω_i by the general and socially perceptible ω results from the system-wide formation of φ . This is the *real abstraction* of the labor process, the instantiation of abstract labor in its capitalist form. From the expression $\omega = \mu w$, finally, we are able to determine the (reciprocal of the) MELT, the implicit value content of the money unit:

$$\frac{\omega}{w} \rightarrow \bar{\mu}. \tag{1.18}$$

The fully determined absolute values, $\bar{\mu}$, are then given by (1.15).

If this approach to the substantiation of the value categories turns out to be fruitful, then the fact of value underlying exchange value, as well as the quantitative determination of value, will emerge in a straightforward manner from a sufficiently rigorous characterization of the capitalist process as such. This characterization notably goes beyond considerations of individual optimizing behavior – which remains present as *one* component – to a study of systemic features: the formation of cultural norms governing individual expectations in bargaining and in the labor process itself. The linking of individual behavior to norms governing class relations is essential if we are to grasp the class-structural aspects of capitalist production relations. Doing so then brings us beyond the relative price solutions of classical–Sraffian theory into the domain of – value.

It is thus not so much a matter of what value “does” that cannot be done without it. Rather, the formation of value is a necessary accompaniment to the formation of the capitalist *system* out of its individual-capital components. In parallel, value theory emerges as a component of a sufficiently rigorous – concrete/abstract, dialectical – understanding of the *nature* of capitalism (cf. Heilbroner, 1985). It emerges once we have grasped the non-intentional (systemic) aspects of the process, as well as the intentional (rational) ones. Value, then, does not “do” anything. Once we have reached deeply enough into the nature of capitalism to ground a fully adequate approach to its *logic*, we can go forward without it. However, our ability to determine value – to grasp its significance and qualities, *and* to fix its quantitative magnitude – serves as an ever-present test of the depth of our reach. The role of a trans-analytic (*i.e.*, value-theoretic) understanding of the nature of capitalist social relations in shaping the analysis of capitalism's laws of motion is a topic for another occasion.[‡]

[‡] The centrality of the wage share in the theory of capitalist production relations suggests that ω , rather than w , may be the significant indicator for the study of the path of technical change and its effect on the rate of profit; see Laibman, 1998a; [Chapter 3](#), this volume.

IV SUMMARY AND CONCLUSION

If the object of our attention is the core of the abstract capitalist economy, we should never have worried (as we so often have) about “transformation.” Our quest all along has been to find the theoretical rationale for labor as substance of value (the qualitative dimension), and to establish the determinacy and uniqueness of the value system (the quantitative dimension), in “pure” capitalist conditions.

The latter problem turns out to have an inherent solution. The money *form* of value is *real*: the national money unit is the only way people have to relate their sense of amounts of value to a definite quantity.[‡] The wage share is then originally grasped in money terms: $\omega = wL/pY$. Applying the *assumed* μ to numerator and denominator, this becomes $\omega L/\pi Y$, from which it immediately follows that $\pi Y = L$, and this condition unambiguously fixes the scale of the value system.

[‡] Consider the *anomie* experienced by tourists in a foreign country, for whom the money unit initially has no meaning; they are required to constantly refer to the exchange rate with their home currency in order to “grasp” value magnitudes.

Previous efforts, including my own, to look for an “invariance postulate” in the value system as such were marred, from this perspective, by a failure of dialectic: we were looking to establish value uniquely and non-controversially at the level of value-in-itself – essence, in Hegelian terminology. The error is a failure to realize that essence is constituted and revealed by its forms of appearance. This failure is the true meaning of “essentialism”: the isolation and rigid separation of the essence from its outward manifestations, which misses the ongoing reproduction of the essence in and through those manifestations. (To be sure, the term “essentialism” is hyperextended in some circles to mean *any* reference to an essential/phenomenal or basic/superstructural dichotomy within reality.) The “solution”

proposed here emerges directly from the problem itself, once we realize that the money form of value plays a role in determining its essential, labor-based, quantitative structure.

The former problem – the qualitative rationale for labor as the substance of value – is more complex, and I would not claim to have given it full consideration in this chapter; hence the modest reference in the introduction to an airlift out to safety, just as the quest for value clarity appears close to fulfillment! The problem is related to that of establishing a rationale for value-equivalence in exchange. There, earlier work has suggested that a sense of equivalence in exchange is factually present, and that this sense is moral: it plays a crucial role in legitimizing the exchange system and providing a quality of fairness that supplements and supports valorization (Laibman, 1998b). It remains to bring this insight closely on to the terrain of specifically capitalist production relations, by noting the role of the local balance of class power (at the level of the individual capital) in unifying the system-wide norms of the evolving production culture of a capitalist society, without which it could not function.

These norms are enforced at a sub-conscious level; they occur, in Marx's famous phrase, “behind the backs of” the actors in the economy, and therefore do not appear in their rational (optimizing) calculations. They do, however, result in the progressive formation of a *general wage share*, perceived throughout the sectors and among the individual capitals of the economy, and effective at all levels. This share then *establishes* a labor–value nexus, as it must be related to the money wage rate by $\omega = \mu w$. Since both w and ω are established by *real* convergent processes – $w_i \rightarrow w$, and $\varphi_i \rightarrow \varphi$ – the value content of the money unit is also progressively determined as $\bar{\mu} = \omega/w$. The *existence* of the labor value substance, then, is established once we acknowledge that there is more to the nature and reproduction of capitalist reality than the individual-optimizing aspects captured by $r_i \rightarrow r$ and $w_i \rightarrow w$. Methodological individualism pertains to a level of discourse about social reality – in particular, the necessary role of constrained optimal (rational) choice – that cannot be neglected, or rejected wholesale (as it is by many Marxist critics of “Analytical Marxism”). At the same time, however, a rational choice approach alone cannot arrive at the deepest levels of social theory, which must illuminate aspects of homeostasis and systematization that are not the result of intentional action and conscious optimizing behavior.

The value categories thus emerge as the necessary accompaniment to the full specification of capitalist production relations, including – crucially – the intense dialectic of the concrete and the abstract (the local and the general) within those relations. We do not “use” value to “prove” the existence of capitalist exploitation – although the concrete/abstract dialectic holds, in my view, much promise for the further development of exploitation theory. Value does not appear as a searchlight illuminating the otherwise murky terrain of capitalism. Achievement of an adequate understanding of the way in which capitalist production relations generate the ongoing abstraction of labor (and the conditions of labor), however, results in substantiation of labor as the substance of value, and therefore provides the long-missing scientific rationale for grounding the theory of the capitalist socioeconomy in labor-value categories. This substantiation, in turn, is a test of and criterion for a sufficiently rigorous political economy of the nature, and, eventually, the logic, of capitalism.

2 Rhetoric and substance in value theory

An appraisal of the new orthodox Marxism

Introductory perspectives

Along the road to discovery in political economy, there are many false trails; indeed, one can pretty much expect to be exploring those trails, or culs-de-sac, in the service of finding the high road to progress. This too is dialectics: if we knew in advance where the highway lay, the false trails wouldn't be false; they wouldn't be able to serve their distracting purpose.

The next three chapters of this book are explicitly polemical. This chapter, and [Chapter 4](#), are devoted to examination of a point of view that has sprung up in recent years, and has come to be called the “Temporal Single System Interpretation” (TSSI) of Marx's theory of value and crisis. The authors and their works are cited within the chapters, so those references need not be repeated here. I do need to explain, however, one aspect of this chapter's origin.

A debate developed during the 1990s within the International Working Group in Value Theory (IWGVT), which had been organized to hold annual conferences as part of the annual meeting of the Eastern Economic Association in the United States. (The IWGVT had significant participation from England, Mexico, Italy, Greece, and other countries.) This chapter first emerged in the framework of those meetings, and was prepared for inclusion in a book that subsequently came to be titled *The New Value Controversy and the Foundations of Economics* (Freeman et al., 2004). First proposed around 1997, the book was considerably delayed, and in the event I decided to publish the article on which this chapter is based in *Science & Society* (Laibman, 2000). I mention this only to explain the archaic quality of some of the terminology in the article, in particular the “orthodox” characterization and the acronym NOMist (“new orthodox Marxist”), which, while arguably accurate, is perhaps not the most elegant term, and certainly not the one (TSS, or TSSI) that subsequently came into general use. I have chosen to keep the original formulations, rather than doing *ex post* surgery: my little concession to historical time, as opposed to theoretical time (see [Chapter 4](#)).

The volume by Freeman *et al.* also contains responses to my argument, and I encourage readers to look at those responses to see whether or not they indeed come to terms with that argument. I will not address the responses here. I was not invited to prepare a rejoinder.

“Single system” is best understood as a response to the charge made by Paul Samuelson (1971): Marx's system of labor values is one thing, and the “true” (“really existing”?) competitive price system that a capitalist economy would presumably manifest is another entirely. One gets, or “transforms,” from one to the other by erasing-and-replacing; in particular, the price system is not in any sense based on or derived from the supposedly “underlying” values. If you are working through this book from front to back, you will already be aware of my response to this ([Chapter 1](#)). My analysis of the NOMist (more properly, TSSI) response is the topic of this chapter.

“Temporal.” What are we to make of the proposal that Marx's theory, his value theory in particular, is inherently temporal, in the sense that it embraces the ever-present passage of time, and the dynamic, changing nature of capitalist technical and social relations? At first glance, this makes all sorts of sense. *Of course* the capitalist economy – one wants to say “human society in general,” but we may even wish to suggest that the capitalist epoch has its own unique brand of dynamism – is subject to constant transformation, evolution, emergence of new qualities, and so on. To suggest otherwise would be ridiculous, and especially so in the context of Marxist thought, with its overall commitment to change, and to a dynamic view of the world.

And yet, the preoccupation with “constant change” puts the TSSI supporters into companionship with a wide variety of positions, across the political spectrum. The Austrian school, from Böhm-Bawerk to Frank Knight to von Mises and Hayek, with echoes in Schumpeter, builds its critique of both socialism and Keynesianism on a wholesale rejection of the “equilibrium” view of markets: for these thinkers, the beauty of markets and private property rests on the continual *violation* of equilibrium, the transformative implications of technical change, risk taking, and so on. In this view, the attempt of Arrow, Debreu, *et al.* to formalize Adam Smith's “invisible hand” into a system of *general equilibrium* makes dangerous concessions to the possibility of economic planning. From a socialist perspective, Janos Kornai's *Anti-Equilibrium* (1971) raised similar issues. The institutionalists of the early twentieth century hoisted the same “non-equilibrium” banner; arrayed across the liberal central portions of the political spectrum, they also cast deep suspicion on economic theory as such, but this meant, in context, that theory's preoccupation with “equilibrium.” All of this raises the question whether the TSSI approach truly exhausts the possible ways of incorporating time into Marxist economics.

When the TSSI label finally stuck, I was asked – since I had emerged at that time as a prominent critic – to identify *my own* position within Marxist value theory in some similarly succinct fashion. It would not do, of course, for me to say that my position was simply “Marxist,” or “Marx's”; unlike some of the TSSI authors (it must be said), I have always avoided the presumption that I could speak in Marx's name, or in the name of his entire tradition. So I came up with the following label for the view that I propose: *Theoretical Time/Consistent Structure Value Theory* (TT/CS). So far, no one has taken up my lead and adopted this term, but I remain hopeful!

The central idea is this. If we distinguish among different layers of reality, all of which

are subject to transformation through time, we arrive at the possibility of holding one or more layers constant *in theory*; that is, we do a thought experiment, a counterfactual exercise, in which those layers are *not* subject to change. The passage of time that we study is a theoretical one, applying not to the deeper layers, where the core relations (state of technical knowledge, balance of class forces) are determined, but to those closer to the surface. The evolution thus observed then reveals an inner tendency, a *deep structure* (see Laibman, 2007). The subjunctive mood in grammar captures this well: if the technical and social parameters of a given capitalist conjuncture *were* to be held constant, then prices *would* evolve (through theoretical time) into some set of proportions that reveal key properties of the inner structure. If, on the other hand, we allow everything to change at once, without distinctions among levels, or layers, then in effect all we can do is observe; we can't explain. The *undifferentiated* preoccupation with the temporal, then, amounts to an abandonment of theory and the theoretical project as such.

Capitalism – and, we must presume, much else – exhibits *both* transformative *and* homeostatic (or system-preservative) qualities. A proper political economy of capitalism must grasp both moments. Here is another way to put the dialectic: we need to know both what something is and how it changes, and each of these is both in tension with and necessary to the other. Thus: TT/CS.

This chapter is perhaps the *least* technical one in the book! In fact, “red” readers might well begin with this one, and then look (or look again) at [chapter 1](#). “Expert” readers, however, should not be bored: there is a *deep structure* of equations that require solution (page 50ff.). The math may be more implicit in this chapter than elsewhere in the book, but it is present nevertheless.

The end of the twentieth century is witnessing major defeats for left and working-class movements on a world scale. The most common response among Marxists and former Marxists, in this period of crisis, is a wholesale embrace of eclecticism and agnosticism, in the guise of a “postmodern” attack against “metanarratives” and replacement of class struggle with “identity politics.”

There is, however, a minor trend in the opposite direction, which deserves attention: a retreat to the doctrines of the nineteenth century in pure and unadulterated form. The new orthodoxy in Marxist political economy goes beyond the mere affirmation of the foundation concepts of Marxism as the most fruitful basis for continuing development of critical and revolutionary social science. The new orthodox Marxists (NOMists) assert that Marx's formulations, in both the theory of value and the analysis of capitalist accumulation and crisis, are *literally* and *completely* correct; that Marx made no errors, bequeathing to us a system that is complete in all essentials; that Marx was far ahead of his time, and totally misunderstood in the hapless twentieth century.[‡]

[‡] A range of contributions to this trend has been collected in Freeman and Carchedi, 1996; this volume contains some chapters with positions that differ from those specifically cited below, and that would therefore require separate treatment. Earlier articles in the genre include Wolff *et al.*, 1984; Ernst, 1982; Kliman and McGlone, 1988; Carchedi, 1984. Recent

contributions include Kliman, 1995; Giussani, 1991–92; Moseley, 1993; Freeman, 1996.

The NOMists, of course, deny that their intention is to defend *all* of Marx's work as *literally* correct, and some (not all) are uneasy with the “orthodox” label. In practice, however, as we will see, they reject any notion that Marx's value theory is in any way incomplete, or that its original formulations contain any errors or inconsistencies.

The position which I am describing as “NOMist” subsequently came to be called the “Temporal Single System” (TSS) view, following a terminological suggestion by Skillman, 1995. I am keeping the original label in this chapter.

The reverse side of this coin is a scathing condemnation of practically all work by Marxists since Marx. The list of epithets applied to the Marxist tradition includes “neoclassical,” “neo-Ricardian,” “neo-Walrasian,” “Sraffian,” etc. Ladislaus von Bortkiewicz, an early twentieth-century non-Marxist who voiced strident criticisms of Marx's procedures in transforming values into prices of production, comes in for particularly harsh criticism (see Bortkiewicz, 1966). Most twentieth-century Marxists are derided for capitulating to bourgeois economics, especially whenever they use simultaneous equations to model the interdependent structure of capitalist production, distribution, and price formation.

In this chapter, I examine the NOMists' arguments, confining attention to the theory of value and price.[‡] I assume general familiarity on the part of the reader with the “transformation problem” literature (for introduction and surveys, see Sweezy, 1956; Laibman, 1973–74; 1992a, chs. 1–2; Laibman, 2002a [[chapter 1](#) of this book]).

[‡] The NOMists insist that their interpretation of Marx's value theory has profound implications for the theory of capitalist crisis. In particular, they find massive support for a falling rate of profit, and declare the Okishio Theorem (Okishio, 1961; 1963) false on value-theoretic grounds (Kliman, 1995; Freeman, 1996). I do not address these issues in this chapter, although I hope to do so in subsequent work (see [Chapter 4](#) of this book).

1 The background

As is well known, Marx's early critics (Böhm-Bawerk, Tugan-Baranowski, Bortkiewicz) focused on his transformation procedure in Parts I and II of *Capital*, Vol. III. Marx saw inter-capitalist competition as a process of confiscation and redistribution of surplus value produced in each industry, each capitalist winding up with a share of surplus value that stands in a common proportion to capital advanced. In this process, the benchmark prices (toward which market prices gravitate) are transformed from *values* (determined as the sum of direct plus indirect embodied labor time) into *prices of production*. Marx's critics first saw this as “theoretical suicide”; either value proportions directly govern price (presumably Marx's theory), or the profit rate tends to equality (presumably what happens in reality).

In a second stage, the early critics accepted the concept of prices of production as a capitalistically modified form of value. They then, however, drew attention to what appeared to be an inconsistency in Marx's procedure – Bortkiewicz spoke of a “logical error” – according to which the general rate of profit is found as the sum of the surplus value divided by the sum of the capital advanced (formed as values, i.e., the direct plus indirect labor time embodied in the means of production), and this rate of profit is then used to reapportion surplus value among industries. The associated transformation from values to prices of production, however, must also affect the physical inputs (fixed and circulating) and wage goods, as these commodities are products of capitalist industries in which the

general rate of profit must also be obtained. To determine theoretically the formation of prices of production as transformed value, the input quantities must also be transformed, along with the output quantities; this means that the capital advanced is revalued, and the aggregate profit rate is different from the one originally calculated on the basis of (untransformed) values. The upshot is that prices of production must be determined *simultaneously* with the profit rate. In this simultaneous solution, however, the general profit rate that emerges is not (except in special and unlikely circumstances) the same as the rate calculated by Marx's simpler aggregative procedure. Moreover, the *two equalities* – between the sum of values and the sum of prices of production, and between the sum of surplus value and the sum of profits – can no longer hold at the same time (again, except in special conditions that cannot ground a general theory).

The critics of Marxism soon lost interest in all this, even declaring it to be a “pseudo-problem” (Schumpeter, 1951). (Paul Samuelson returned to it long after the initial flurry; see Samuelson, 1971.) Marxists, however, saw the matter not as a refutation of Marxist theory but as its extension and development. In this light, the capitalist transformation of value, rigorously grasped in all its complexity, is not a denial of the value principle, or of the insights afforded into capitalist production relations by their substantiation as value relations. On the contrary, it is a further development of a core insight: capitalist market relations mystify and obscure – and thereby enable – the class exploitation at the heart of the system. The relativizing of the pooling-and-redistribution metaphor by the loss of the two equalities, and the divergence of the actual average rate of profit from the “value rate of profit,” do not diminish the force of Marx's qualitative argument concerning capitalist exploitation. Indeed, that argument is enhanced by the realization that exploitation, far from taking place in mutually isolated sectors, is systemic and inseparable from the entire web of interconnections in the structure of production and exchange.

The general theory that emerges has at its core the source of profit (property income) in exploitation of labor, and the central argument of *Capital I*, grounding surplus value in an *equal* exchange: the purchase of labor-power by the capitalist. It also, however, reveals the layers of mystification in capitalist production and price formation: the sensitivity of benchmark prices (prices of production) to changes in the rate of exploitation (see *Capital*, III, ch. 11), and the relativity of *all* price-sensitive aggregates (the capital stock, value added, gross value, total profits). This is the “classical” conception of production prices, with distinctively Marxist components at its base. It is both socially illuminating and technically rigorous, and is in fact a *coherent* theory of price. (By contrast, the neoclassical alternatives – Walrasian and Marshallian – lose coherence at crucial points, the former in the arbitrage leading to profit-rate equalization, and the latter in the determination of the magnitude of profit.)

All this, however, is not good enough for the NOMists. Like unrepentant Newtonians, they cannot accept the relativity of value aggregates under the influence of comprehensive value transformation (affecting both inputs and outputs), and seek to defend Marx's original version of the pooling-and-redistribution metaphor. If the two equalities are to hold in the literal sense, then Marx must have been “right after all” in leaving the elements of constant and

variable capital (capital devoted to purchase of non-human inputs and that devoted to purchase of labor power, respectively) untransformed as surplus value is redistributed and values of outputs are transformed into their production price equivalents.

In fact, in developing their version of Marx's theory of production price formation, the “neo-Ricardians” played a “dirty trick” (see Moseley, 1993). First, they replaced Marx's method with their own, in which input prices, output prices, and the profit rate are determined simultaneously. Then they discovered an “error” in Marx, based on their own models! Of course, if “Marx's method” can only be evaluated internally, and if it is by definition what he did, then it is rendered immune from criticism. The point is that, according to the twentieth-century Marxists – perhaps Winternitz (1948), Dobb (1955b), Sweezy (1956), Sraffa (1960), Meek (1967), Brody (1970), Steedman (1977), Shaikh (1977), Harris (1978), Lipietz (1982), and Duménil (1983–84) may represent this category; see also Laibman (1973–74; 1992a) – the failure to transform inputs in the value tableaux is in fact a drawback, or an insufficiency, in Marx's presentation, which caused violations of either simple or expanded reproduction conditions and produced an incorrect measure of the profit rate, and was corrected by later generations of Marxists. It should be mentioned that Marx himself repeatedly referred to the “possibility of error” in disregarding the effect of prices of production on the valuation of inputs (see, e.g., Marx, 1982, 261, 265). Marx is therefore the first twentieth-century Marxist, despite strenuous, and admirable, efforts by some of the NOMists to discount and explain away those passages.

2 The new orthodox critique

The NOMists, however, insist on defending Marx's original procedure, as written. They do this in essentially three ways, which I will call the methodological, the retroactive, and the sequential.[‡]

[‡] Some members of the school prefer “temporal” to “sequential,” and link their concept of value formation *in time* to their rejection of what they see as the twentieth century Marxist dualist bifurcation of value and price of production into two distinct systems; thus, “temporal single system.” To avoid preempting discussion of differing interpretations of historical time (see below), I will retain “sequential” in the argument that follows; with some care we should be able to keep terminological choices from interfering with understanding.

The methodological defense is best represented by the work of Moseley, 1993; it rests on invocation of the sanctity of “Marx's methodology”: the non-transformation of constant and variable capital follows from the argument of *Capital*, I, chs. 5–8, in which surplus value is derived from purchase of these elements of capital at their values, i.e., via exchange of equivalents. Marx's argument seeks to show that capitalist exploitation in its pure form is based not on violation of the law of value, but rather on its fulfillment. In the formula M-C-M', the capitalist starts with a given amount of money capital, M, and acquires, at the end of the production/exchange process, an augmented amount, M'. To isolate the source of the increase in the purchase and sale of labor power, the original M must be constant. From this the methodological NOMists deduce that the value magnitudes of inputs are not transformed when values are transformed into prices of production.

The argument is a *non-sequitur*. There is no reason why the entire theory of the value of labor power and surplus value cannot be stated in terms of complete value transformation – i.e., of full production prices applying to goods functioning as inputs as well as (the same) goods functioning as outputs. The values of input commodities are *not* “constant” with respect to the transformation of value (an essentially logical problem in the concretization of the value categories in capitalist conditions). They *are* “constant” in that their purchase is not the source of surplus value. Marx's crucial metaphorical story (Marx, 1967; 1977, [ch. 6](#)) of the equal exchange between worker and capitalist leading to the formation of surplus value in production emerges with a capitalist complication: there is a coefficient differing from unity relating hours of (simple) labor time expended to units of value created. The constancy here refers to the fact that surplus value arises from the difference between value created by labor time and the *given* value magnitudes of the inputs, however these have been transformed by profit-rate equalization. The methodological argument, then, quite aside from its unassailable orthodoxy, confuses two different senses of the word “constant.”[‡]

[‡] In a recent paper (1996), Moseley argues that the given money sums of constant and variable capital are unrelated to *any* physical quantities, whether measured in (untransformed) value terms or in production price terms. This removes the formation of production prices from any concept of reproduction and the labor process, and in effect makes the magnitude of value and surplus value indeterminate. Here, as in many of the ultra-orthodox efforts to defend Marx, the result is the dismantling of his conceptual edifice. A deeper insight arises from this: a viable system of thought will tend to be destroyed, unless it is continually developed and transformed.

The retroactive argument is equally ingenious. In this view, there is no need to transform inputs in the value tableaux, because *they are already transformed* (Mage, 1963; Carchedi, 1984). Marx saved us the trouble of transforming them by doing so in advance. The pooling-and-redistribution of surplus value has thus already taken place for capital goods; it need only be illustrated for the outputs (presumably, consumer goods, or consumer goods plus capital goods appearing as outputs).

This argument exemplifies the curious NOMist tendency to isolate “inputs” and “outputs” into separate categories. In fact, the real “dualism” is this separation, rather than the supposed treatment of value and price of production as distinct “systems” – something done, so far as I am aware, only by Samuelson (1971) in his “erase-and-replace” discussion. Even accepting the notion of a two-stage pooling-and-redistribution, however, the argument is illogical. In the second transformation – taking place as Marx described it with inputs “already transformed” – the general rate of profit that is formed will be different from any rate on the basis of which the *prior* transformation of inputs had taken place. The prices of inputs will therefore have to change again, contrary to assumption.

Of the three arguments for untransformed inputs, the sequential, or temporal, is perhaps the most important (see Freeman, 1995; Freeman and Carchedi, 1996). The sequentialists realize that no amount of clever wordplay can ultimately escape the Steedman (1977) charge of absurdity – that failure to transform the value of a good appearing as an input while changing it when it appears as an output amounts to asserting that a good is bought and sold, *at the same moment*, at different prices – unless a dynamic process is under way, in which

the price of the good as input at time 0 is in fact different from its price as output at time 1.

The sequential position in fact can be divided into two sub-positions. The first explores the implications of an iterative approach to the formation of production prices, on the basis of a constant technology and constant balance of class forces. While this may be, and has been, done in the context of transformation from values to prices of production (a process of reconstruction of the concrete in theory), it may also serve to illustrate the trajectory of *market* prices, beginning from any arbitrary levels determined by some historical conjuncture.

In this iterative story, the purchase of inputs and production take place, and in equality of profit rates is discovered. The subsequent pooling-and-redistribution may be presented pretty much in Marx's original terms, but input prices are affected *only in the next production period*. (The first purchase of inputs is a historical done deal, never to be changed.) In that next period, then, production takes place with the new input prices and unchanged technology, and a second round of redistribution and price transformation takes place. This affects input prices only in the third period; and so on. An *iterative* process is under way, presented as an alternative method of solution by Morishima (1973) and Shaikh (1977); an example is presented in Section 3 below. The known result of this process – assuming constancy of techniques and viable techniques in each sector – is *convergence*: in each period, the newly formed production prices come closer and closer to the vector of production prices resulting from simultaneous solution of the production–price equations. In short, with iterations on the basis of a constant technology, prices converge to the much-maligned “neo-Ricardian” equilibrium prices! This, to the NOMists, is somewhat like an exodus across the desert to escape from an enemy, only to find that enemy waiting on the other side.‡

‡ It amuses me to hear Anwar Shaikh called a “neo-Ricardian.” I am reminded of a cartoon from the 1960s, showing an old lady in tennis shoes, demonstrating with a sign that reads: “The John Birch Society is soft on communism!” She is saying: “What's the matter? Ain't you never seen an extremist before?”

Everything therefore rests on the success of the second sub-position within the sequential approach. Here, the non-equilibrium, dynamicist rhetoric comes into its own. In this view, nothing is constant. “You can't put your foot in the same river twice,” says Heraclitus. Marx's economics is essentially a *non-equilibrium* economics (Freeman and Carchedi, 1996). Techniques are constantly changing. The quality of goods is constantly changing. *Any* measurement of output, capital stocks, or anything else for that matter, now becomes problematic. In this case it is clear that the price of a good used as an input at time 0 is quite definitely not the same as the price of that same good at time 1 (if indeed any good itself can be “the same” at two moments of time). Then there is nothing that can be said about the prices of the inputs, except that they are what they are, or perhaps that they *were* what they *were*. The value transferred by elements of constant capital to the product is simply the amount of money paid for those inputs (Freeman, 1996). That amount is undoubtedly constant, since (leaving aside *Star Trek* and other undeniably enjoyable sci-fi fantasy) time runs only in one direction and only occupies a given moment once.

This “historical–accidental” view of the value of the capital stocks is, however, a retreat to a crude empiricism, and a denial of the possibility of *any* price theory. If the capitalist economy can only be described in terms of perpetual non-equilibrium – anything else being an instance of “Walrasian psychopathology” – then no story about the formation of prices of production can be told, *including Marx's original one*. Once again, as in the case of the ultra-methodological defense, Marx's account of value–price transformation is rescued by being abolished, along with all other efforts to explain and understand the structure and behavior of capitalism. The non-equilibrium standpoint appears, in this sense, to be a variety of *institutionalism*; despite its rhetorical radicalism, the opposition to equilibrium in fact signals an opposition to the theoretical reconstruction of the concrete (in this instance, capitalism), and therefore to the possibility of identifying and transcending (in theory and in practice) the defining core of capitalist reality.

3 An analysis of a NOMist transformation tableau

The issues involved in both the simultaneous and the sequential (temporal) positions may best be illustrated *via* detailed analysis of a typical model. From many possibilities, I choose one numerical illustration for attention, by Kliman and McGlone, 1999, 56.

Kliman and McGlone (hereafter KM) are concerned to defend Marx against the criticisms of Bortkiewicz: that “logical error” is involved in the failure to transform inputs simultaneously with outputs; that Marx's procedure violates the conditions of reproduction equilibrium; and that Marx's equalities – between the aggregate value rate of profit and the uniform competitive rate, between the sum of values and the sum of prices of production, and between the sum of surplus value and the sum of profits – cannot in general hold.[‡]

[‡] Bortkiewicz uses simple reproduction (all surplus value is consumed) in his examples, although the point is perfectly general and extends to models describing expanded reproduction (and growth).

I reproduce (with some compression and change of notation) KM's Table 1 (see [Table 2.1](#)).

The first “period” (we come to the meaning of the “periods” presently) is an apt illustration both of Marx's transformation procedure and of Bortkiewicz's argument. It uses the three-sector format originated by Bortkiewicz, which is well adapted for the simple reproduction assumption. The sectors I, II and III are, respectively, capital goods, wage goods, and luxury goods. The column headings are, in order: constant capital, variable capital, surplus value, total value, profit, price of production, and the rate of profit.

In each sector, the rate of exploitation (ratio of S to V) is two-thirds; this implies mobility of labor power, a sort of working-class arbitrage pushing the value received for the sale of labor power per unit of labor expended, $V/(V + S)$, to equality in the three sectors.[‡]

[‡] This is precisely the kind of tendency-toward-equilibrium assumption that the sequentialists deny for the formation of prices of production!

Owing to different compositions of capitals (however measured) in the three sectors, the

value rates of profit differ, as shown in the last column. The average rate of profit is $80/(200 + 120) = 25\%$ from the TOTL row. Applying this rate to cost price ($C + V$) in each sector, we find the average (redistributed) profit Pr in each sector. Finally, adding this Pr to (unchanged) $C + V$ in each sector, we arrive at the prices of production P . The “twin equalities” $W = P$ and $S = Pr$ follow tautologically from this procedure, and can be seen from the column sums along the TOTL row. This exercise exemplifies Marx's famous “brother–enemy” metaphor: capitalists in each sector are forced by competition to pool the surplus value created in their sectors and redistribute it in proportion to capital advanced. In untransformed value terms, the tableau is in simple reproduction equilibrium: the output values of the three categories of goods, W , are equal to the respective sources of demand for those goods (the column sums of C , V , and S).

Table 2.1 A two-period transformation example

Period	Dept.	C	V	S	W	Pr	P	r
1	I	140	36	24	200	44	220	13.6%
	II	40	48	32	120	22	110	36.4%
	III	20	36	24	80	14	70	42.9%
	TOTL	200	120	80	400	80	400	25.0%
2	I	154	33	27	214	51	238	14.4%
	II	44	44	36	124	24	112	40.9%
	III	22	33	27	82	15	70	49.1%
	TOTL	220	110	90	420	90	420	27.3%

Now the problem observed by Bortkiewicz is that the capital goods and wage goods appear with two different prices, on the input and output sides of the calculation. The simultaneous defense must either deny any connection between the C and V magnitudes and commodities purchased and sold, or assert the simultaneous purchase and sale of a good at two different prices. In either case, as most of the participants in this discussion realize, the result is incoherence and absurdity.

The period 1 formulation further reveals apparent violation of the reproduction conditions: total demand for (replacement) capital goods is 200 against an output valued at 220, wage goods demand is 120 against department II output of 110, and luxury goods demand of 80 meets an output of luxury goods valued at 70. Now KM are at pains to show that Bortkiewicz's criticism is unwarranted; that Marx's procedure is consistent with reproduction equilibrium, provided a dynamic interpretation is allowed. In their “period 2,” input prices are indeed different. The numbers in the C and V columns are derived by multiplying the period 1 numbers by the ratio of P to W in period 1. For example, the new value of constant capital in department I, 154, is the original 140 multiplied by $220/200$. KM point out that the column sums of C and V in period 2 now correspond exactly to the prices of production in *period 1*: 220 and 110. This of course is what we should expect. These new input price figures represent market-clearing prices, given fixed quantities in production. The prices of capital goods in the accounting schema of period 2 must reflect the 10% rise in the price of capital goods in the redistribution of surplus value in period 1, and the fall in the

price of the wage good inputs mirrors the one-twelfth fall in the price of wage good output. Finally, KM note that the sum of the revenues left over in each sector after replacement of capital goods and wage goods exactly equals the price of production of luxury goods. Thus, capitalists in sector I have gross revenue equal to their price of production, 220, out of which they buy capital goods (from themselves) now worth 154 and wage goods (from sector II capitalists) now worth 33, leaving a revenue of 33 for themselves; capitalists in departments II and III similarly have revenues left over after replacement of 22 and 15; and these revenues sum to 70, precisely the price of production of luxury goods in period 1.

There are now two ways to complete the period 2 tableau; I will call these the *renewed production* variant, and the *surplus value redistribution* variant. KM choose the former, according to which production takes place in period 2, in real historical time, and with unchanged inputs, outputs, labor times, and techniques.[‡] They therefore find the surplus values in period 2 by holding the magnitudes representing current labor time, $V + S$, constant from period 1. Thus, in department I, current labor time was $36 + 24 = 60$; S in period 2 is therefore $60 - 33 = 27$. The surplus values found by this procedure are then again redistributed, using the same method as before, to generate the rest of the period 2 numbers.

[‡] This is necessary in order to answer Bortkiewicz's charge of disequilibrium. The alternative – setting aside the surplus value redistribution variant, to be discussed below – would be to revert to the temporal transformation position, according to which anything can happen and therefore nothing can be said.

Now KM are anxious to avoid the slippery slide down the iterative chute leading to what I have no hesitation in calling the fully transformed values – the production prices identified *via* simultaneous solution. They want to stop after two periods. It is clear, however, that, even in its own terms, the period 2 numbers cannot be the end of the story. To get from period 1 to period 2, the constant and variable capitals were transformed by the ratios of output value to input value, $220/200$ and $110/120$, respectively; this process is intended to illustrate the price adjustment required by the requirement of intersectoral equilibrium. The ratios $238/220$ and $112/110$, then, imply a third period, in which the profit rate turns out to be 25.1%, and the story continues. Comparison of input and output values *within a period* drives the relation between the two periods, despite KM's insistence that profit-rate equalization is established within a period, but the intersectoral reproduction conditions appear only between periods. If this were not the case, we would need a period 0 to define the input values in period 1, and a period -1 to fix period 0, etc.; in either the forward or backward cases, multiple periods are generated.

The average rate of profit of 27.3% (actually 0.272727 ...) in period 2 therefore clearly cannot be final. We are embarked on a (forward) *iterative process*, suggesting a period 3, and 4, etc., and must wonder whether the numbers in the table will converge, and, if they do, to what values. If the inputs continue to be transformed by the method explained above – the C and V elements being multiplied by the ratio of redistributed price to original price in departments I and II, respectively – the numbers do not converge. After five iterations, for example, the value rates of profit in the three sectors are 0.153, 0.526, and 0.677, and after ten iterations they are 0.115, 0.493, and 0.704. (If the C and V elements are multiplied by the

ratio of redistributed price to the original column sum for each department, the numbers do converge; see the analysis of the surplus value redistribution variant, below.)

We have, then, the following result of the renewed production variant. Reproduction equilibrium exists between periods (although there is an infinite regress problem in illustrating this), and profit-rate equalization occurs within each period (complete with the much adored twin equalities). The “price” paid for this orthodox imagery, however, is substantial: first, a possibly infinite number of sets of production prices, each set with its associated rate of profit (even in terms of KM's desire to limit the analysis to two periods, there are two such sets), corresponds to a *single* production schema, with its given inputs, outputs, techniques, and flows of labor. This alone invites a reiterated charge of absurdity. But, in addition, there is the ontological dimension: we are treated to a truly timeless vision – akin to one of those *Star Trek* episodes in which certain characters are frozen in time while others walk around them. In this vision actual time passes, but production remains the same from period to period! And this metaphysic is advanced in the name of a *temporal* analysis of capitalism!

The alternative is the surplus value redistribution variant, arguably the truly dynamic variant of this model. In this variant, the first period numbers alone represent production at a given moment in time. These numbers, whether defined as quantities of abstract labor time or their money counterparts, correspond to a real production process involving flows of direct and indirect labor. Only in period 1, then, do the V + S numbers represent flows of *current labor*. In the second period of the table, the output values (appearing in the W column) *are what they are*, i.e., the prices of production formed in the first (and so far only) pooling-and-redistribution process and given in the P column of period 1. The profits remaining after this process are then the difference between output value and input costs; in sector I, to illustrate, $220 - 154 - 33 = 33$. The second period is then represented as shown in [Table 2.2](#).

It will be seen that after the second pooling-and-redistribution, the reproduction conditions are still violated: total demand for wage goods, for example, is 110 against an output value of 106.7. This interpretation proposes a dynamic process of pooling-and-redistribution, deepening and extending Marx's original metaphor. On the basis of a *given* set of production conditions, visible directly only in the numbers of period 1, surplus value is repeatedly pooled and redistributed, and the successive tableaux reflect that process.[‡]

[‡] This interpretation uses a methodological conception of time, compressing the time needed for pooling-redistribution into packets contained within a unit of the time that passes as the characteristics of production change. This theoretical-methodological technique is not intended to suggest that *real* time behaves in that manner, or that in (what we choose to call) reality technical transformation does not occur before price of production formation is complete. I think that this theoretical use of time is not fully captured by the distinction between logical time and historical time, since all attempts to theorize the economic process construct and simplify time to some extent.

Unlike what appears in the renewed production variant, however, the profit rates appear to be converging – as indeed suggested by the entire imagery surrounding Marx's original presentation of the problem in *Capital* III. This suggests further convergence; and that, in fact, turns out to be the case, as the data for ten iterations show (see [Table 2.3](#), which gives

the results for periods 1–3 and period 10). (Numbers with similar proportions, but different scale, emerge from the alternative method applied to the “renewed production variant”; see the discussion of invariance conditions below.)

Table 2.2 The second period, revised

Period	Dept.	C	V	S	W	Pr	P	r
2	I	154	33	33	220	39.7	226.7	17.6%
	II	44	44	22	110	18.7	106.7	25.0%
	III	22	33	15	70	11.7	66.7	27.3%
	TOTL	220	110	70	400	70	400	21.2%

Several things can be learned from these numbers. First, notice that profit-rate equalization does take place, and that convergence is rather rapid (the structure of prices is essentially in place after five periods; there is only a small amount of further movement in a few of the numbers not captured by three decimal places after ten periods). Second, the reproduction conditions also reemerge with profit-rate equalization: the prices of production in the three departments are equal to the C, V, and S column sums.

Most important, the numbers emerging after sufficient iterations turn out to be *exactly* those predicted by the simultaneous transformation of values and formation of a general profit rate r , as given by these equations:

$$(140x + 36y)(1 + r) = 200x$$

$$(40x + 48y)(1 + r) = 120y$$

$$(20x + 36y)(1 + r) = 80z$$

$$200x + 120y + 80z = 400$$

Table 2.3 Surplus value redistribution, ten periods

Period=1 R=0.250							
Dept.	C	V	S	W	Pr	P	r
I	140.000	36.000	24.000	200.000	44.000	220.000	0.136
II	40.000	48.000	32.000	120.000	22.000	110.000	0.364
III	20.000	36.000	24.000	80.000	14.000	70.000	0.429
TOTL	200.000	120.000	80.000	400.000	80.000	400.000	
Period=2 R=0.212							
Dept.	C	V	S	W	Pr	P	r
I	154.000	33.000	33.000	220.000	39.667	226.667	0.176
II	44.000	44.000	22.000	110.000	18.667	106.667	0.250
III	22.000	33.000	15.000	70.000	11.667	66.667	0.273
TOTL	220.000	110.000	70.000	400.000	70.000	400.000	
Period=3 R=0.200							
Dept.	C	V	S	W	Pr	P	r
I	158.666	32.000	36.000	226.667	38.134	228.800	0.189
II	45.333	42.667	18.667	106.667	17.600	105.600	0.212
III	22.667	32.000	12.000	66.667	10.933	65.600	0.220
TOTL	226.666	106.667	66.667	400.000	66.667	400.000	
Period=10 R=0.194							
Dept.	C	V	S	W	Pr	P	r
I	160.846	31.533	37.403	229.781	37.403	229.782	0.194
II	45.956	42.044	17.110	105.109	17.109	105.109	0.194
III	22.978	31.533	10.599	65.109	10.598	65.109	0.194
TOTL	229.780	105.109	65.111	400.000	65.111	400.000	

These are, of course, the detested Bortkiewicz–Sraffa–Dobb–Seton simultaneous equations, toward which all roads, apparently, lead! So long as the transformation of value under the impact of competitive profit-rate equalization is considered on the *methodological* plane, and assuming it is appropriate to hold techniques of production in each sector constant, and to refrain from changing the class balance of forces – as reflected in the real (product) wage rate, *and* in the rate of exploitation revealed in the original value tableau, *and* in the production coefficients (which are *not* independent of the state and recent history of class struggle) – then the dynamic, iterative process appears as just another way of solving the simultaneous price–production equations. On the other hand, if techniques and social relations *are* changing *during* the transformation, then *no* transformation methodology will “predict” actual production prices and profit rates, *including* Marx's one-stage original procedure.

One observation remains. The iterative calculation applied in the surplus value redistribution variant suggests that what I once called *total value invariance* holds (Laibman, 1973–74, part 2); compare the TOTL price of production (P) of 400 in period 10 to the TOTL value (V) of 400 in period 1. In short, of the “two equalities,” one ($V = P$) appears to be vindicated, while the other ($S = Pr$) is not. It is a remarkable feature of the NOMists’ style of argument that, through all of the *sturm-und-drang* of non-equilibrium dynamics, technical change, class struggle, etc., the *two* “equalities” shine through like a constant beacon. The NOMists apparently do not realize that an entire range of invariances, each of which has strong intuitive appeal, is involved: equality of constant capital and the

value of the means of production, equality of current labor and value added (the so-called “new view”; see Lipietz, 1982; Duménil, 1983–84), equality of variable capital totals pre and post (and therefore of the ratio of total variable capital to current labor).[‡] In general, there is no reason to believe that *any two* of these will hold simultaneously (see Laibman, 1973–74; 1992a, [ch. 2](#)). But there seems to be no justification for the NOMists’ exclusive focus on just two of the several possibilities (which only arises, of course, because Marx’s exercise in *Capital*, Vol. III – written in 1865 and *not* chosen for inclusion in Vol. I – emphasized just those two).

[‡] It is intriguing to observe the intellectual gyrations of NOMists defending and proclaiming the equality of V and P, and of S and Pr, while at the same time asserting, as a matter of fundamental insight, that the value of the means of production and the value of constant capital are two different things, and that “Marx never intended” them to be equal (cf. Carchedi, 1984; Moseley, 1993).

In my own earlier work on value transformation (Laibman, 1973–74), I argued that one invariance condition had intuitive primacy over the others: this was the one called “rate of exploitation invariance” – equivalent to “variable capital invariance,” since the rate of exploitation is measured not by the (transformed value) profit to wage ratio but by the relation between variable capital and the (given) current labor flows. I now think that no intuitive argument of this kind can settle the matter, and that determining the absolute labor content of production prices requires a sophisticated analysis of capitalism’s inner nature; see [Chapter 1](#) of this book.

The question remains, however: does the iterative procedure outlined above vindicate total value invariance ($V = P$), after all? I think it does not, for this reason. The tableau method of approach to this problem, originated by Marx and refined by Bortkiewicz, is a rather clumsy one. In particular, to make sense of the price transformations shown in the tableaux, it must be assumed that quantity magnitudes are constant throughout the process. The value (price) sums are products of price relatives times quantities; a total value produced in a sector of 200, for example, means a unit value times a definite quantity (number of units). The only way to interpret a calculation such as $140 (220/200) = 154$ is to assume that the price shift is operating on a given quantity of capital goods. This assumption is highly restrictive, especially since the story of competitive alignment and realignment requires movements of capital into and out of sectors.

The transformation of value should therefore be reexamined, using more powerful and modern tools, such as the cross-dual dynamics of Flaschel and Semmler (1987). Awaiting that reexamination, then, not too much weight should be placed on the intuition arising from the application of any one theoretical model, as for example that of the iterative adjustment of prices of production and profit rates in a case in which quantities are fixed. The search for the *unique determination* of capitalism-transformed value continues, as part of (what should be) the real object of ongoing inquiry in the theory of value: the substantiation of the place of embodied abstract labor in the theory of capitalist (and other) relations of production.

4 Conclusion

What messages emerge from this critique? There are, perhaps, three. First, to build the

Marxist alternative to mainstream theory we need, above all, to retain a dialectical sense of the comprehensiveness and complementarity of concepts. Many processes in capitalism are sequential, and constant disruption and transformation are a fact of life. But sequential models alone do not capture this. There is also simultaneous determination. Simultaneous equation models in fact capture one essential aspect of the capitalist economy: interdependence among atomistically separated units of control. Simultaneity reveals structure; sequentiality reveals transformation. Both must be brought to bear on the task of grasping capitalist reality.

If we think of a sequential set of poolings/redistributions of surplus value, then we arrive at the eigenvector of production prices of the “twentieth-century Marxist” variety – to the analysis of which non-Marxists like Böhm-Bawerk, Bortkiewicz, Morishima, and Samuelson have undoubtedly contributed. (Marx always drew upon the best bourgeois practice of his time; why shouldn't we?) There should be no confusion between the *methodological* and the *ontological* uses of this eigenvector: Marxists do not imagine a serene process of competition leading to a stable – “stationary” – price–profit configuration (although perhaps some post-Keynesians or post-Sraffians might). But if the production price eigenvector is an immanent central tendency of price behavior in capitalist economies, then any attempt to theorize real processes in accumulation without it will be suspect; one will simply not know whether the results obtained are rigorous and general. Even the theories of surplus value and exploitation are incomplete unless they are placed on this foundation of the underlying tendency of price formation. Redeveloping the theory of surplus value – the core of Marx's analysis of the paradox of apparent “market” equality and reciprocity, on the one hand, and the reality of exploitation in the relations of production, on the other – in fact requires that *complete* – non-dualist! – production price formation be part of the “Hic Rhodus” conditions of the problem originally formulated in *Capital*, I, [ch. 5](#).

A similar point holds for disequilibrium and equilibrium. Capitalism is inherently crisis prone, and its accumulation path does not behave like the steady-state, tranquil models of neoclassical growth theory. It also, however, maintains a certain coherence over time. The homeostatic aspects must be balanced against the transformative, crisis-provoking ones. The term “equilibrium” is subjected to much abuse by the NOMists. It has different meanings, however, and some of them are crucial to the Marxist enterprise. (Marx, of course, described central tendencies and abstract structures underlying complex realities, beginning with value theory and continuing with models of simple and expanded reproduction.) As a *methodological* tool, equilibrium paths are the necessary ground for the study of *disequilibrium* dynamics. (By contrast, it is not clear that *non-equilibrium* describes anything at all.) This again is to be distinguished from *ontological* equilibrium: the view that the actual economy tends toward, rather than away from, its equilibrium center, and that the capitalist growth path is smooth, constant-proportional, and crisis free.

Second, in contemplating different conceptions of value and production price, rhetoric should be abated somewhat in the search for exact meanings. The twentieth-century Marxist (eigenvector) conception of production prices is arguably the closest thing available in all of economics to a coherent conception of price formation. It establishes the interdependent

qualities of the price system, avoids the obvious contradictions of the earlier Marxist formulations (assuming these are taken as completed theoretical tools rather than as good first approximations), and undercuts in a massive way the central neoclassical concept of *scarcity* as the foundation for price theory. The eigenvector conception is entirely consistent with intrinsic value (value as abstract labor); with the theory of exploitation and surplus value; and with disequilibrium dynamics. It is simply wrong and misleading to claim that eigenvector price formation precludes or denies the foundation concepts of Marxist theory. The simultaneous *quantitative* determination of the profit rate and prices does not inviolate the *ontological priority* of the profit rate, or reduce it to just another price (as the neoclassical theory in fact does).[‡]

[‡] Careful distinctions must be maintained: the Sraffa/classical/Marxist system is a model of *reproduction*; the Walrasian system is based on allocation of *fixed endowments*. They are both “simultaneous equation” systems, but of totally different kinds.

Most important, however, is the need to avoid dishonoring Marx by treating him as a holy prophet. The not-yet-the-Messiah attitude – which asserts that the entire twentieth century is a theoretical and practical wasteland, and that Marx will yet speak to us, once we come finally to understand Him, and lead us out of the capitalist morass – is simply not helpful as we face real problems requiring creative solutions.

Apparently there is a large amount of psychological fixed capital invested in the belief that Marx “was internally consistent” and that he “made no errors.” I would like to propose a distinction. An Error I is a crucial logical flaw that strikes at the heart of a theoretical system; the prime example that comes to mind is the “unobtrusive postulate” in neoclassical theory of a well-behaved production function grounding a stable and inverse relation between factor quantities and marginal products (see Laibman and Nell, 1977). An Error II is an inconsistency, whose removal through development of the theory leaves the foundations of the theory intact. Now I believe that Marx left us with a few Errors II. Böhm-Bawerk saw the very existence of production prices distinct from values as an Error I. Bortkiewicz, Laibman, and KM all disagree. Bortkiewicz, in turn, thought that any inconsistencies that might be found in Marx's formulation of the transformation would have to be considered Errors I. KM and Moseley apparently agree with Bortkiewicz on this, and are willing to stake the entire Marxist enterprise on the defense of those precise formulations against charges of inconsistency. I disagree; the inconsistencies referred to are Errors II.

The NOMists have considerable energy and enthusiasm, and have reminded us of the importance of continuing study of Marx. They need to be told, however, that there is only one path leading from the nineteenth century to the twenty-first, and that one lies through the twentieth.

3 Technical change, accumulation, and the rate of profit revisited

Introductory perspectives

Ever since Marx proposed his “law of the falling tendency of the rate of profit” – in *Capital*, Vol. III, Part 3, based on the 1865 manuscripts completed before Vol. I was published, and therefore not chosen for inclusion in that volume – a huge debate has raged. This is, in Marx's own words, “the most important law of modern political economy,” and yet it is surrounded by qualification, in the form of “counteracting forces” whose range of action remains unclear. Did Marx succeed in establishing that the tendency would prevail, in reasonably finite time, over its counter-tendencies? Most generally, in our continuing development and reconstruction of Marxist political economy, how should the crucial matter of secular crisis – long-term structural transformation that progressively undermines and problematizes systemic reproduction – be understood?

The oldest theory of capitalist crisis within Marxist thought is the one found in the *Communist Manifesto*. That theory, when compared with the intricacies of the later falling-rate-of-profit debate, is profoundly simple and transcendent. Capital accumulation necessarily, and inevitably, creates its own ultimate negation – its “gravedigger” – in the form of the proletariat. The bourgeoisie faces a monumental dilemma: it can't do what it must do, namely enhance its own wealth and power, without simultaneously creating a massive industrial (and post-industrial) working class, and equipping that class with the potential to overthrow it. The balance of class forces, to be sure, oscillates with the economic cycle; periodic crises temporarily destroy the workers' economic and political organizations, which must be painfully built up again in the ensuing phase of expansion. The secular underlying trend, however, is for working-class social power to increase, shifting the balance in its favor. This is reflected in a long-term fall in the profit rate due to a fall in the rate of exploitation. The crisis of accumulation here is inseparable from the effect of accumulation on the political (in the widest sense) power and consciousness of the workers.

What role, then, remains for structural tendencies toward crisis that do *not* depend on increasing strength of workers? Well, the counteracting tendencies to the class-relations theory summarized above may be legion: capitalists can undermine the solidarity of workers by decentralizing and “flexibilizing” production, by creating a layer of long-term un-, under-, and sub-employed workers partially supported by the state (Marx's “stagnant” component of

his “industrial reserve army of unemployed,” although perhaps managed politically to a degree that he did not anticipate), by deindustrializing and sending jobs overseas – and of course all of these mechanisms, and others, have been used in practice. The profound reach of capitalist ideological control over popular consciousness – hegemony, in Gramsci's sense – is surely demonstrated in recent experience. The theory seems to resolve into an indeterminate play of forces, and the ultimate outcome then seems uncertain. So the question reemerges: does Marxism offer any other dimensions of determinacy, lines along which crisis emerges as structural rather than contingent, necessary rather than merely possible?

It is here that the inquiry into ways in which historically specific capitalist social relations shape the path of technical change, and therefore the rate of profit, becomes significant. In [Chapter 4](#), I will resume my study of the Temporal Single-System Interpretation (TSSI) (see [Chapter 2](#) for an introduction to this), which here represents one pole of degeneration of this inquiry, one of two “reductions” to be avoided. The TSSI uses its fascination with “temporalism” to create an almost meta-analytic belief in the inevitability of a falling rate of profit, even at a cost of removing most of the actual theory of capitalist production relations from its purview. The opposite pole is represented, in this chapter, by the work of Frank Thompson, who shares this position with many authors, both proponents and critics of Marxism. Thompson argues that the link that Marx tried to establish between technical change and a falling rate of profit is unsound on its face, once we recognize that biased technical change – technical change that substitutes machinery for labor – must reduce the demand for labor, thereby lowering wages and *raising* the profit rate.

Between the two poles – the falling profit rate is inevitable, the falling profit rate is impossible – lies, I think, a path of investigation that not only magnifies our understanding of the profoundly social nature of technology but also enables us to create a sense of the historical limits of capitalism, one that incorporates both structural and class-relational elements. But to get there, we need, yet again, the searchlight of rigorous quantitative methods. Careful formalization can help us avoid sloppy thinking, as in the classic (and inadequate) Marxist argument that confuses the increase in the proportion of *physical* capital (means of production) to labor with the related ratio of the *value* of physical capital to the (correspondingly valued) flow of living labor. We can also bring into the picture the impact of technical change on conditions in the labor(power) market – as Thompson insists, correctly, that we do. But we can also use our model-building capacity to examine the link between specific features of the capitalist environment, such as short time horizons in the engineering culture and the deeply atomistic nature of competition for temporary profits in the short run, on the one hand; and the degree of capital-deepening resulting from best-practice technical change, on the other. This latter inquiry, my own contribution to the toolbox, is explained in this chapter, and linked to Thompson's interest in labor-market effects.

And in this way we make progress. It is not, I believe, about finding the ultimate theory of capitalism's inevitable breakdown. But we can establish multiple structural factors that interact with political–strategic ones to create the strong likelihood of increasing tension, or contradiction, and the accompanying boost to the sorts of social experience that make

development of a serious agential challenge to capitalist rule and arrangements more than a mere contingent possibility.

The argument in this chapter is strongly based on diagrams – visual representations of quantitative relations. All the reader really needs here is a good sense of measuring two variables in a two-dimensional space (a plane), one vertically and the other horizontally, starting from the origin where the two axes of measurement meet. Plus the idea of the ratio between these variables, the vertical y over the horizontal x , as given by the *slope* of a line drawn in the space defined by the two axes: “slope equals rise over run.” That slope has a numerical value, which we call

$$\frac{dy}{dx}$$

this is a positive number when the line slopes upward from left to right (y and x move in the same direction), and a negative number when the line slopes downward (y and x move in opposite directions). A hint: draw the figures on a sheet of paper, beginning with the elements connected to the beginning of the discussion of the figure and adding elements as the discussion proceeds. Verify each step in the reasoning; try not to take anything “for granted.”

There! You have just learned the essentials of calculus and analytic geometry. It is a small step toward applying science to the task of understanding capitalist accumulation and crisis, which in turn is a small step toward building up, in all of us, the capacity to replace capitalism with socialism. That capacity is, perhaps, the ultimate *crisis*, and gravedigger, of capitalism.

I TECHNICAL CHANGE, THE LABOR MARKET AND THE RATE OF PROFIT

In a recent paper (Thompson, 1995), Frank Thompson presents an argument against any plausible connection between capital-using technical change and a falling rate of profit. This long-debated issue in the theory of capitalist accumulation and crisis[‡] is addressed using a model of great simplicity and generality: one sector, one period of production. There are fixed proportions, so that one can imagine individual capitalists participating proportionally in the aggregate capital stock and output (see Thompson, 1995, 122, n. 1); the model thus incorporates both “micro” decision making and “macro” trends. No assumptions are made involving market imperfections, strategic decision making, etc. Thompson argues, correctly I think, that the simplicity of the model carries a presumption that its results may be *general* as well, a fact that enhances the importance of the conclusions drawn. Despite the austerity of its starting point, however, Thompson's model quickly becomes somewhat algebraically complex, and this tends to obscure the relation of his results to various assumptions made along the way.

[‡] The literature is enormous, and no comprehensive review can be attempted here. Marx's theory of the falling rate of profit is set forth in Volume III of *Capital* (Marx, 1909), part III. A classical critical review in English will be found in Sweezy, 1956. The story is carried forward to the debates of the 1970s in Howard and King, 1992, [ch. 7](#) and ch. 16, 316–318.

Defenses of some version of the classical theory include Dobb, 1972; Mage, 1963; Rosdolsky, 1977; Foley, 1986. Non-Marxist critics are legion; perhaps most often cited is Samuelson, 1957. Marxist and Marx-influenced critics of the theory include Steedman, 1977, van Parijs, 1980; Roemer, 1981. There is also a large empirical literature, which may be represented by Gillman, 1957; Mage, 1963; Moseley, 1991. This literature deploys a wide variety of concepts and concerns, not all of which are relevant to the present investigation limited to the connection between technical change and macroeconomic trends in capitalism.

In Section I.1, I present an alternative model of the same simplicity and generality, with the intent of placing the issues in the theory of technical change and accumulation on a clearer platform. In Section I.2, I will use this platform to address Thompson's main assumptions and claims. I will support his call to make explicit the connection between technical change and the real wage rate, which is established by the impact of technical change on the demand for labor. I will show, however, that Thompson's central argument – viable technical change cannot be the source of a falling rate of profit – rests on the artificial and restrictive assumption of “absence of positive accumulation,” i.e., simple reproduction. When this assumption is removed, the argument loses most of its force.

In the final section, I will describe my own work on a general non-steady-state model of capitalist growth, which includes endogenous and optimizing technical change, explicit representation of population growth and the accumulation (saving–investment) decision, and a dynamic version of adjustment in the labor (power) market. The model produces a general presumption that capitalist economies follow a path with a rising profit share and falling profit rate – what might be called a *critical path* (for reasons set forth in Section I.3, I prefer the term *consistent path*). This result depends, however, on certain parameters having values within clearly defined ranges; it therefore suggests avenues of empirical investigation to determine the relative likelihood of critical-path behavior, as opposed to steady-state behavior, in specific capitalist economies. The model is then used to address some of the wider issues – in effect asking: What do we (or should we) want to get out of all this?

Against Thompson's thrust of casting doubt on the central Marxist claim that individually rational capitalist behavior leads to systematically irrational results, my internal critique of his model, and the alternative one proposed, suggest the opposite: that the contradiction expounded in the classical literature is real, and that current work in redeveloping the classical insights on a technically rigorous foundation is an essential ground for other levels of research into capitalist economies and societies.

1 Technical change and macro trends: the model and the issues

The model, as indicated above, is a one-sector (one-good) macro model, in which a *stock* of capital, K , is combined with a *flow* of homogeneous labor, L , to produce a *flow* of output, Y .

The apparent simplicity and generality of this framework has been questioned in recent years by the Cambridge Criticism of aggregative models (see Harcourt, 1972; Laibman and Nell, 1977). This criticism, however, has been directed against *neoclassical* uses of the production function concept, which severs the connection between distribution and valuation in order to capture all economic relations within a supply-and-demand conceptual framework. By contrast, I will work with Marxist conceptual foundations, which clearly do

not require (indeed, refute) neoclassical notions of competitive equilibrium. While I cannot claim that results derived from aggregative analysis in a *Marxist* framework are unambiguously verified in a disaggregated model with rigorous price formation, it seems important to use the aggregate models to go where the disaggregated ones cannot yet go, in anticipation of further progress in pushing out the tradeoff between microeconomic articulation and macroeconomic efficacy.

In advanced capitalist conditions, the stock of fixed capital per worker is an important magnitude; by comparison, the money capital held to meet payrolls (the “stock of variable capital”) is negligible. The only profit rate that matters is the ratio of the flow of profit (surplus value) to the value of the stock of non-human capital. The profit rate, r , and the real wage rate, w , complete the elements of the basic price equation, which states that output is divided between wages and profits:

$$rK + wL = Y \tag{3.1}$$

It is possible to think of Y as representing *net* output, in an economy in which there are material input flows; in this case, L and K are *direct-plus-indirect* labor flow and capital stock, respectively. In this way, circulating capital, including a component representing depreciation of the capital stock, is implicitly included. In this case, however, some of the argument that follows would need to be reformulated; in particular, the distribution variables w and r would not have the usual interpretation. For present purposes, therefore, I propose sticking to the simple specification of the model as a “pure fixed capital” model with zero depreciation - i.e., infinitely long-lived capital stocks.

We next define the two required technical ratios. The composition of capital, Q , is equivalent to the *capital-output* ratio: $Q = K/Y$. This may require some explanation. First, note that $K/Y = (L/Y)(K/L) = \lambda K/L = C/(v + s)$, where λ is the unit labor value of the all-purpose good, and C , v , and s are the usual Marxian symbols for the stock of constant capital and the flows of variable capital and surplus value. In a clarification of and improvement upon Marx's various original formulations, which I venture to hope might someday become generally recognized (see Mage, 1963; Laibman, 1992a, 105), this definition of Q as the ratio of the value of the constant capital stock to the flow of living labor is invariant (leaving value-transformation issues aside for the present) to changes in the rate of exploitation (the proportion between s and v); any other definition must necessarily muddle discussions of the relation between biased (Q -altering) technical change and the rate of exploitation.

The other ratio, fortunately less problematic, is the labor input coefficient, $l = L/Y$, the reciprocal of labor productivity.

Dividing each term of (3.1) by Y , we can write the basic equation of the model in terms of the technical parameters, Q and l , and the production-relations parameters, r and w .

$$rQ + wl = 1 \tag{3.2}$$

And solving (3.2) for the profit rate (the central focus of the capitalists' attention, and therefore of ours), we find:

$$r = \frac{1-wl}{Q} \quad (3.3)$$

We are now ready to consider a new technique; to identify a new anything we write it with a prime. Thus, the new technical parameters are Q' and l' ; if the profit and wage rates also change we write the new ones as r' and w' . We begin with the standard Okishio assumption of a constant real wage: in this case the formula for the new profit rate contains w , not w' . We have two expressions. The first is the *viability condition*, showing what a rational capitalist would have to see if the new technique is to be introduced (namely, $r' > r$); the second is the *falling rate of profit condition*, in which (of course), $r' < r$.

$$r' = \frac{1-wl'}{Q'} > \frac{1-wl}{Q} = r \quad (3.4)$$

$$r' = \frac{1-wl'}{Q'} < \frac{1-wl}{Q} = r \quad (3.5)$$

It is clear that these two conditions cannot be fulfilled at the same time: this result is the famous Okishio Theorem (Okishio, 1961).

For a workable, and teachable, representation, form a figure describing the various possible configurations of the new technical coefficients, Q' and l' . Consider the borderline case between (3.4) and (3.5), in which $r' = r$. If the inner terms in (3.4) and (3.5) are solved as an equality, treating Q' as the dependent variable, and l' as the independent variable, we have:

$$Q' = \frac{Q}{1-wl} - \frac{wQ}{1-wl} l' \quad (3.6)$$

This is a downward-sloping straight line, with Q' -intercept and l' -intercept as shown in [Figure 3.1](#). On the figure the starting position (Q, l) is indicated. A little experimentation with the inequalities (3.4) and (3.5) will show that the inside of the triangle formed by the axes and (3.6) is the set of all new techniques that are viable (VIA), and that the unbounded area to the northeast of (3.6) is the set of all new techniques that lower the profit rate (FRP). The Okishio result, for this simplest of cases, is the observation that these two sets do not overlap.

The fun begins when we allow the wage rate to vary. When $w' \neq w$, the viability condition (3.4) is unaffected: competitive capitalists act in the immediately given environment seeking momentary advantage, and therefore take prices – in the present context, the wage rate – as given. The FRP condition (3.5), however, must be replaced by:

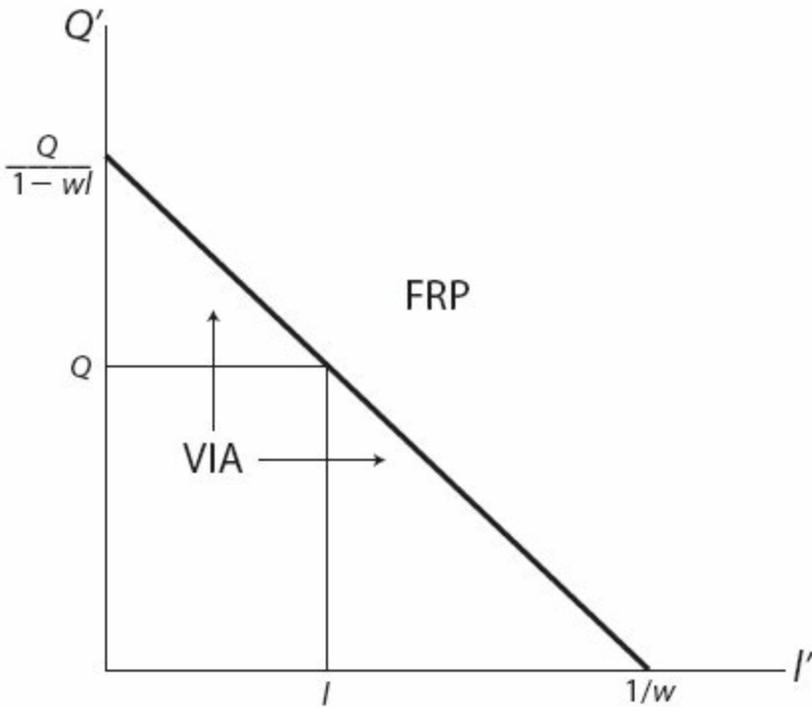


Figure 3.1 The Okishio Theorem illustrated.

$$\frac{1-w'l'}{Q'} < \frac{1-wl}{Q}, \text{ i.e., } Q' > \frac{Q}{1-wl} - \frac{w'Q}{1-wl}l'. \quad (3.7)$$

Equation (3.7) has the same (Q' -intercept as (3.6), but its l' -intercept will rotate when the wage rate changes. If $w' > w$ (as we will provisionally assume), that intercept rotates inward, as shown in [Figure 3.2](#).

The first thing to notice is that the region to the northeast of the new boundary line (the FRP region) and the inside of the (unchanged) viability triangle now overlap, forming the cone CJD. This entire area now constitutes a set of viable technical changes (ones that momentary-profit-hungry capitalists will rationally introduce) that also result in a lower profit rate once the wage rate increases from w to w' . Given the fact that the wage rate rises, we have the possibility that rational behavior entails choices leading to a falling rate of profit; this result is independent of whether or not the capitalists are able to anticipate the wage increase.

[Figure 3.2](#) also performs a complete classificatory function, given the rise in w . The ray from the origin OG has slope Q/l , which is $(K/Y)/(L/Y) = K/L$, the physical capital-labor ratio, or Marx's "technical composition of capital." Both low-brow theory (e.g., Marx, 1967, ch. 24; cf Mage, 1963) and casual empiricism suggest we should generally be to the left of OG. The rate of exploitation is constant when the wage share of output, wl , is constant; this is given by the condition $w'l' = wl$, or $l'/l = (1/w')/(1/w)$. Find F at the intersection of EG and JC, and produce the vertical line AFH. It can then be verified that $l'/l = OA/OB = EF/EG = OC/OD = (1/w')/(1/w)$. All points along this line are constant-rate-of-exploitation points, with productivity rising (l falling) in exactly the same proportion as the wage rate increases. Finally, the rising organic composition of capital is immediately apparent: it occurs

everywhere above the horizontal EG. We can thus identify the line segment FH as a sort of “Marxist golden age”: given the wage increase to w' , all new techniques along that segment are viable; moreover, they embody a constant rate of exploitation, a rising organic composition of capital, and a falling rate of profit.

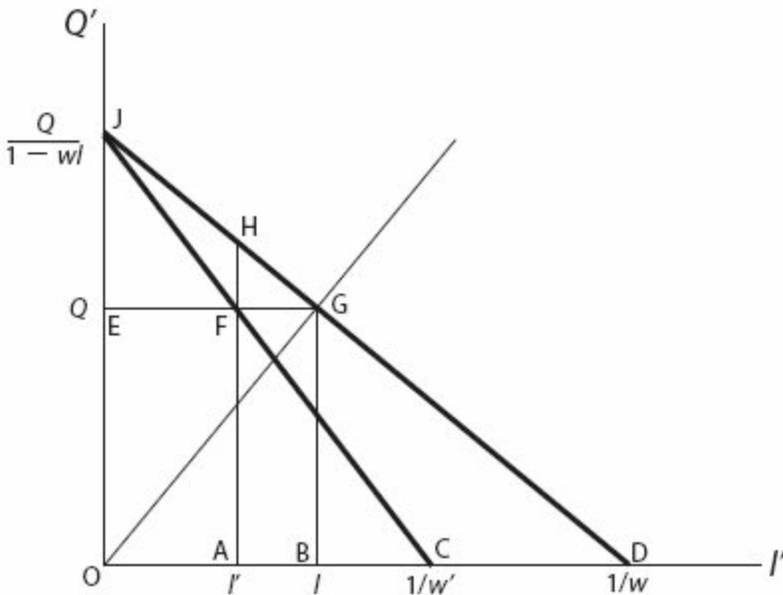


Figure 3.2 A cone of viable, FRP technical changes when the real wage rate rises.

Everything is thus fine, except that: (1) we still do not know how likely it is that technical changes along that segment will be available, or that among the available changes the *best* one will be in that segment; (2) the theory leading from technical change to the falling rate of profit still seems to require a rising real wage rate, as suggested by the Okishio Theorem; and (3) changes in the real wage rate will not in general occur in a vacuum, independently of changes in the demand for labor accruing at least partly from the technical change itself. It is this latter interface that concerns Frank Thompson. (The first two points will be taken up in Section I.3.)

2 The labor (power) market and accumulation

The change from w to w' will surely depend on the state of the demand for labor, which in turn is affected by the choice of technique away from the original (Q, I) . When this new link is fed back into the FRP boundary (3.6), the resulting expression is quadratic (the counterpart of Thompson's ellipses).

The matter can be explored without departing from the more manageable linear environment. Following (for the moment) Thompson's assumption of a stable function relating the wage rate to the demand for labor – I will argue below that a rigorous treatment of the labor-power market in Marxist terms does not require this rather extensive capitulation to the neoclassical apparatus of counterfactual demand and supply curves – we define the elasticity of the wage rate with respect to the demand for labor (L):

$$\varepsilon = \frac{dw}{dL} \frac{L}{w}$$

From this definition, the following relation can be derived by simple manipulation:

$$\frac{w'}{w} = (1 - \varepsilon) + \varepsilon \frac{L'}{L} \quad (3.8)$$

Thompson's "Minimal Assumption" (1995, 107) is that ε be greater than or equal to zero: that if labor demand increases, the wage rate does not fall. All cases may readily be examined, but the essential point can be made with the benchmark case of $\varepsilon = 1$, in which a certain proportional change in labor demand produces an equal proportional change in the wage rate: $w'/w = L'/L$.

Labor demanded is the product of labor required per unit of output and the desired level of output. Output, in turn, by the definition of Q with which we began, is K/Q . We therefore have

$$L = lY = \frac{lK}{Q}$$

from which

$$\frac{L'}{L} = \frac{l' K' Q}{l K Q'} \quad (3.9)$$

Using the assumption $\varepsilon = 1$, this becomes

$$\frac{w'}{w} = \frac{l' K' Q}{l K Q'}$$

or, translated for (Q'/l') ,

$$Q' = \left(\frac{K'/K}{w'/w} \right) \left(\frac{Q}{l} \right) l' \quad (3.10)$$

The term K'/K is greater than one if accumulation (saving, net investment) is occurring. We first examine the special case of "simple reproduction" – the case of zero accumulation, in which therefore $K'/K = 1$. Equation (3.10) can then be written:

$$\frac{Q/l}{Q'/l'} = \frac{w'}{w} = \frac{1/w}{1/w'} \quad (3.11)$$

The situation is analyzed in [Figure 3.3](#), which is drawn for a new technique with a higher technical composition of capital than the original one: $Q'/l' > Q/l$. It should be noted that the demand for labor is a function of this ratio, not of Q and l separately; this in fact is the basis of the inadequacy of Marx's classical argument (1967, ch. 25) that pressure from the reserve

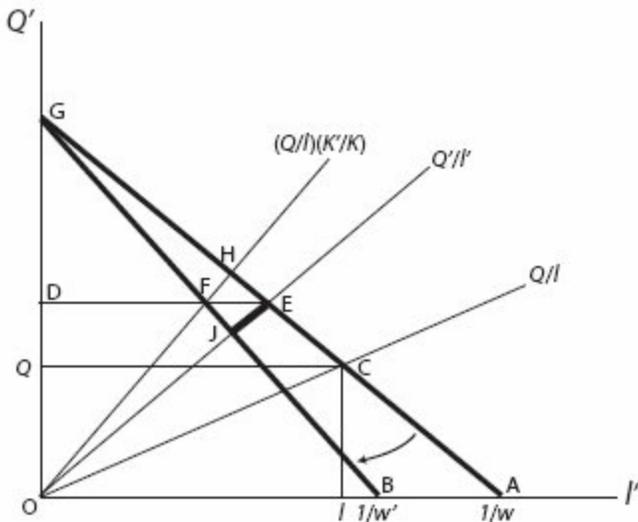


Figure 3.4 Positive accumulation enables viable FRP technical changes.

Now the importance of the qualifier “in the absence of accumulation” (in some wordings, “in the absence of *sufficient* accumulation”; more on this below) becomes obvious. The point is made throughout Thompson's article, usually with the qualifier “in the absence of ...”, although this is omitted on p. 105: “Introducing a minimal assumption that the real wage rate is nondecreasing in the aggregate demand for labor is sufficient to show that viable capital-using technical change does not *ceteris paribus* lower the equilibrium rate of profit.”

But, as we know, this absence entails – simple reproduction! Marx was clear on his intention to limit the assumption of simple reproduction to a minor role as a methodological baseline, a springboard for the true object of analysis, extended reproduction: “Simple reproduction on the same scale appears as an abstraction, inasmuch as the absence of all accumulation or reproduction on an enlarged scale is an irrelevant assumption in capitalist society” (*Capital II*, 456). Yet Thompson draws his major conclusions from the analysis centered on this assumption:

The analysis here provided no grounds for looking to capital-using labor-saving technical change, or, for that matter, technical change in which the organic composition of capital rises, as an especially likely impetus to a falling rate of profit.

(1995, 122)

If I were entitled to speak for a collective of Marxists interested in the study of capitalism's immanent contradictions – which I am not – I would say: let us immediately *stipulate* to the conclusion that *in the absence of accumulation* technical change cannot lead to a falling rate of profit. In the absence of accumulation, as argued by both Marx and Schumpeter, it is unlikely that profit would exist at all (on this see Goodwin, 1992). In the absence of accumulation, capitalism would not be capitalism. This observation is independent of the fact that individual capitalists can “cannibalize” their capital stocks for short periods of time by not replacing depreciating capital goods; it also does not preclude

moments of reproduction crisis in which aggregate net investment falls to zero. It does assert that capitalist reproduction *as such* involves the self-expansion of capital, manifested in positive accumulation of capital in its physical, money, and value forms.

It is therefore a matter of great interest – and not merely a side issue – to relax the no-accumulation assumption and repeat the analysis. With $K' > K$, and, as before, $\varepsilon = 1$, the labor demand relation (3.10) can be written

$$\frac{(Q/l)(K'/K)}{Q'/l'} = \frac{w'}{w} = \frac{1/w}{1/w'} \quad (3.12)$$

In [Figure 3.4](#), the ray $(Q/l)(K'/K)$ is drawn, and is of course steeper than (Q/l) , which intersects the viability boundary at the original position C. Imagine a new technique with a higher technical composition of capital Q'/l' , such that $(Q/l)(K'/K) > Q'/l' > Q/l$, as drawn in the figure. We then have $(Q/l)(K'/K)/(Q'/l') = (OD/DE) = DE/DF = OA/OB$, again confirming OB as $1/w'$. The presence of capital accumulation adds to the demand for labor and therefore puts upward pressure on the real wage rate, even with technical change that raises the technical composition of capital. The FRP boundary therefore rotates to a position within the viability boundary, and, along the ray representing the postulated technical change, a region JE opens up, in which the change is viable and Q -increasing, and yet lowers the profit rate.

A word here about the adjective “sufficient.” As noted above, Thompson in several places states his negative result as holding “in the absence of *sufficient* accumulation.” This implies that accumulation must not only be positive, but above some positive lower bound. As can be seen in [Figure 3.4](#), however, *any* accumulation at all such that $K' > K$ opens up a space for viable, r -decreasing technical change. The range of possibility increases, of course, as the accumulation ratio – the share of investment in profits – increases (and, incidentally, as the elasticity of the wage rate with respect to labor demand falls).

This leads us to inquire about how the availability of new techniques is determined; if there is some constraint upon movement away from the original position in (Q', l') space, it may even be possible to determine an optimal choice of technique (see Section I.3 below). Thompson writes that “the apparatus developed here suggests little in answer to these questions” (1995, 120). He sums up his argument as follows:

the here pivotal assumption, that *ceteris paribus* the real wage rate is nondecreasing in labor demand, is not easily impugned. If, in models which differ in this respect from those here investigated, the rate of profit would automatically fall with viable capital-using technical change, or a rising organic composition of capital is rendered consistent with a falling rate of profit even without positive accumulation, a central point of interest will be which models facilitate better explanations of economic reality.

(122)

I hope, however, to have shown that the truly pivotal assumption on the way to Thompson's results is the absence of positive accumulation. Much more dynamic approaches to the

response of wages to labor demand, or to changes in the unemployment rate, are possible, and more consistent with a Marxist approach to complexly determined capitalist relations of production than the assumption of a stable function relating the wage to the demand for labor; but even using the latter approach, the possibility of a structural, long-term contradiction at the heart of capitalist accumulation and determination of the path of technical change is revealed. To further examine that possibility, a fuller analysis of the endogenous determination of technical change possibilities is needed. What is clear from the foregoing is that Thompson's model, and the analysis flowing from it, do not substantiate the general conclusions drawn, given the centrality of accumulation of capital in both the reproduction and the transformation of capitalist economies.

3 Endogenous technical change, biased accumulation, and wider implications

The question remains: given the *possibility* of viable, Q -increasing technical change, can we say anything about its *likelihood*, assuming reasonable endogenous constraints on the path of technical change? Here I will sketch an argument that I have developed over a period of time, before considering the wider issues mentioned in the introduction to this chapter.[‡]

[‡] The basic model of constrained conjunctural profit-rate maximization was developed during the 1970s: Laibman, 1976; 1977. Two-sector versions appeared in Laibman, 1981; 1982. In the latter paper the same sort of input-space presentation as in the present chapter is used, in the context of a two-sector (capital-good, consumer-good) model. Full presentations of the growth model appear as Laibman, 1991 and 1992. The entire body of work is brought together in Laibman, 1992, Part Two, "Accumulation and Technical Change." A relaxed and accessible presentation, without formal models, is found in my *Capitalist Macrodynamics: A Systematic Introduction*, 1997.

Technical changes do not fall from the sky; there is a tradeoff between reducing one input coefficient (Q) and reducing the other (I). In the diagrams used in this chapter, this tradeoff would appear as a downward-sloping, convex-from-below curve, passing below the origin point (C in [Figures 3.3](#) or [3.4](#)) owing to the existence of a certain amount of autonomous technical progress (technical progress due to superior organization of work, or efficiency, and not requiring increase in capital stocks per worker). Capitalists are therefore constrained to seek a technical change along that curve, and they will trope toward the one that maximizes ρ , the momentary ("conjunctural") profit rate. The parameters of the technology constraint, along with ω (the wage share of output), determine whether or not technical change is Q -increasing.

Rates of growth are indicated by asterisks: e.g., Q^* is the growth rate of Q . The ρ -maximizing (optimal) Q^* turns out to be an inverse function of ω ; the growth rate of the technical composition of capital, k , varies directly with Q^* (see Laibman, 1992a, [ch. 7](#)). We therefore have

$$k^* = f(\omega), f' < 0 \tag{3.13}$$

It also emerges that there is a (relatively low) level of ω , called ω_s , at which $Q^* = 0$.

Call the demand for and supply of labor, respectively, L and N . The growth rate of labor supply, N^* , is a function of population growth and the (possibly changing) structure of the

labor force, but it is taken as constant for present purposes. The demand for labor is a positive function of the profit rate and of the accumulation (investment) share of profits, and a negative function of the growth rate of the technical composition of capital. The accumulation ratio, like N^* , is subject to further analysis but also taken as an exogenous constant in the present context. I posit a minimal dynamic relationship between the *rates of change* of the wage share (dependent variable) and of the ratio of labor demand to labor supply (independent variable):

$$\text{sign } \omega^* = \text{sign } (L^* - N^*) \quad (3.14)$$

This Minimal Assumption is less restrictive than Thompson's, yet it still satisfies the requirement that labor(power)-market effects be treated explicitly. Equation (3.14) says that when unemployment is rising ($L^* < N^*$), the wage share is falling, and vice versa.

Using the definition of the technical composition of capital, $k = K/L$, the growth rate of the demand for labor can be written as $L^* = K^* - k^*$. Dynamic balance in the labor market (equality between the growth rates of demand and supply) can therefore be represented by $N^* = K^* - k^*$.

We can now identify a *consistent point* in r - w space – a profit rate and wage share (r_0, ω_0) – with this characteristic: r_0 is such that (given the accumulation ratio), K^* is such that (given N^*) dynamic balance in the labor market is achieved at a k^* that (given ω_0) is optimally chosen (ρ -maximizing). This may be put another way. A particular r is linked to a particular ω by these causal chains: First, r determines K^* , which determines k^* (this chain uses as parameters the accumulation ratio and N^*); second, ω determines k^* (via ρ maximization). Since the two k^* values must be the same, a link is established between a particular r (r_0) and a particular ω (ω_0).

Suppose initially that the economy is at a consistent point, as just described, and also that at that point the ρ -maximizing technical change happens to be Q -increasing. First assume that the technical change–choice relation represented by (3.13) is *not* operative; $k^* = \text{constant}$. The logic of subsequent adjustment can be presented in the following schematic terms:

$$Q \uparrow \Rightarrow r \downarrow \Rightarrow U \uparrow \Rightarrow \omega \downarrow \Rightarrow r \uparrow$$

Taking $N^* = K^* - k^*$ into account, we see that with N^* and k^* constant, the downward pressure of the reserve army on the wage share will continue until K^* , and therefore r , are restored to their original levels. The labor market in this case fully offsets the declining- r tendency arising from viable, Q -increasing technical change.

However, when we restore (3.13) to its proper place, and allow the wage share to influence the optimal technical change choice by capitalists, the result is quite different.

$$Q \uparrow \Rightarrow r \downarrow \Rightarrow U \uparrow \Rightarrow \omega \downarrow \Rightarrow \begin{cases} k^* \downarrow \Rightarrow K^* \downarrow \\ r \uparrow \text{ (partially)} \end{cases}$$

The fall in the wage share now has two effects: it directly restores the profit rate, as before, but it also *slows down the optimal rate of capital-intensification*. The latter effect, given N^* , means that dynamic equilibrium in the labor market is restored at a lower K^* , and therefore at a lower r . The rise in r is therefore only partial, and in the new consistent pair (r', ω') both variables are lower than before. The locus of all such consistent points is an upward-sloping curve, and – given $Q^* > 0$ – movement along it is “downward” from northeast to southwest. The benchmark dynamic path, therefore, is a non-steady-state one with both a falling rate of profit and a falling wage share (rising rate of exploitation).

As noted above, however, movement downward along the consistent path culminates in a pair (r_s, ω_s) , at which ρ -maximizing technical change implies $Q^* = 0$; all further technical progress is therefore unbiased, and the economy sits on a steady-state growth path. This raises two interrelated questions: first, how likely is it for a capitalist economy to be on the consistent path, as opposed to being on that path's steady-state terminus? Second, how important is the immanent contradiction of Q -increasing technical change, in an overall conception of capitalist accumulation?

With regard to the first question, we can do a rough calculation as follows. It seems reasonable to assume an annual rate of labor force growth of 0.01, and autonomous technical progress also occurring at the same rate (i.e., productivity growth of 1% per year at constant k). The accumulation ratio must be estimated for the capitalist sector: a good proxy is the share of investment (including corporate retentions) in total capitalist profits (again including corporate retentions). A likely range of variation of this ratio is 0.5 to 0.75. Finally, the elasticity of productivity growth with respect to growth in k is much harder to estimate, but I will take it to be in the range 0.5–0.75.

On this basis, the steady-state profit rate r_s turns out to be in the range 0.04 to 0.10, and the steady-state wage share ω_s in the range 0.26–0.51. (Derivations and calculations will be found in Laibman, 1992a, [ch. 7](#).) The provisional conclusion is that if observed profit rates – by some relevant measure – are above 10%, and wage shares significantly above 50%, the falling- r /falling- ω dynamic will be in effect. By most available measures, typical rates of return to equity capital in US industry are above 10%, at times by significant margins; moreover, the empirical literature on economic growth usually assumes, as one of its “stylized facts,” a wage share of two-thirds (this has undoubtedly been falling in recent decades, as the theory in fact predicts). The least we can say is that the data imply continuing relevance of the Q -increasing, consistent-path hypothesis.

The second question – concerning the importance of Q -increasing technical change overall – breaks into several parts: (a) is there a dynamic running uniquely from technical change (i.e., without change in the wage) to a falling rate of profit? (b) Should the falling rate of profit be conceived as *the* central critical tendency in capitalist accumulation? (c) Are there other critical tendencies, and, if so, how are they connected? (d) What is the proper role (if any) of immanent critical tendencies in the theory of the capitalist economy?

The first subquestion (a) can be answered quite easily. Both the Okishio Theorem and [Figures 3.2](#) and [3.4](#), above, make it clear that the falling- r tendency is impossible without a

rising real wage rate. Whatever one makes of the tendency, it does not operate in a vacuum, independent of the entire set of interacting processes involved in accumulation: the rate of accumulation, the dynamics of the labor(power) market, etc. Several authors have focused on alternatives to the Okishio benchmark of a constant real wage rate, the obvious possibility being a constant wage share (Foley, 1986; Roemer, 1981; Laibman, 1992a, [ch. 6](#)). As Thompson argues, however, any assumed benchmark is inferior to a working model of the labor market, such as his $\varepsilon = 1$, or my equation (3.14), which allows the wage to vary under the influence of technical change and accumulation.

We are, however, up against a seemingly deeply rooted impression that processes emerging from technical change and inter-capitalist competition are structural and inherent – deserving of discussion in a chapter on “immanent critical tendencies” – while changes in the wage rate or share owing to a shifting balance of class forces are somehow ephemeral and arbitrary, glosses on fundamental theory but not in themselves part of that theory. We should nevertheless remember that the first-ever immanent contradiction attributed to capitalism in the Marxist tradition – the theory that is in fact found in the *Communist Manifesto* – is the formation and growth of the proletariat as a result of accumulation and industrialization, and the secular shift in economic, social, and political power toward the developing working class. If this minimally implies rising real wages, then rising real wages should be seen as an integral component of the “law of capitalist accumulation.” In fact, the actual or potential rise in real standards of living of the working class, as a result of growing productivity (development of the productive forces), may be the most basic contradiction: it impels social evolution in the direction of principled, participatory, and democratic production incentives and relations – in a word, socialism. Seen in this broad light, the role of rising real wages as part of the immanent contradiction involving biased technical change appears completely acceptable.

Concerning (b): I have long argued, and continue to argue, that the preoccupation with the falling rate of profit is misplaced. The ontologically prior question is: under what conditions will microrational behavior on the part of capitalists result in *Q-increasing technical change*? If a rising *Q* is established, then additional forces determine whether that rise will result in a falling *r*, or a falling ω , or (as on the consistent path) both. The focus has been on one branch of this dilemma, rather than on its root – rising *Q*. I believe the reason for this one-sided emphasis is a sense that a falling rate of profit is somehow consistently contradictory, while a falling wage share is not (analysis of this branch is presumably tainted with under-consumptionism). I have attempted to formalize a dual-crisis-path model, in which a falling rate of profit leads to crisis of one sort, while a rising rate of exploitation (falling wage share) leads to another (Laibman, 1992a, ch. 12). There is still considerable resistance to viewing a rising rate of exploitation as a critical tendency (see, e.g., Campbell, 1993); this resistance, however, suggests that the *other* pole of crisis theory, based on a falling rate of profit, is unproblematic and straightforward! I believe that the source and mechanisms of crisis are not at all obvious at *either* pole, and that both require much further investigation.

Given the existence of a steady-state terminus to rising-*Q* accumulation, however, the

further question arises: are there other contradictions? Would class struggle between dynamically evolving classes cease to operate, or operate differently, if the economy settled on to a steady-state path? I have tried to integrate into the model of contradictory accumulation two additional processes: the growing role of the state sector and the increasing importance of financial forms of accumulation (division between inside and outside capitals) (Laibman, op. cit.). There has also been much discussion recently of an ecological contradiction, either supplementing or replacing the traditional ones (see any recent issue of *Capitalism, Nature, Socialism*). The simple answer to subquestion (c) is therefore that there are indeed many contradictory sites; that these sites and their associated theories must be placed in a framework seeking synthesis, rather than merely being accumulated; and that a great deal of work is still required to achieve this. (For a preliminary attempt at a comprehensive modeling of critical processes and sites, see the final chapter, “Multiple Sites and Comprehensive Crisis,” in Laibman, 1997; Laibman, 2007, [ch. 4](#).)

It is precisely the need for rigorous synthesis – a propos of subquestion (d) – that suggests a continuing role for a reaffirmed theory of technical change, accumulation, and crisis, since this nexus is still the heart of capitalist dynamics. If we do not get that part right, I think the rest – including all of the recent stage theorizing: social structures of accumulation, modes of regulation, etc. – will degenerate into descriptive indeterminacy. The point of the theory of accumulation is not to convince ourselves that since capitalism is coming to grief we need not be overly concerned with the current details! The theory should point to empirical investigation, further elaboration, suggestions for policy, orientations for struggle, etc.

Finally, a rigorous theory of accumulation and crisis is an important corrective to the long-standing tendency among some writers working in a Marxist tradition to accede to the view that Marx was basically wrong! The thrust of the anti-FRP position, which is the dominant note in Thompson's article (see also Steedman, 1977; van Parijs, 1980), is that capitalism's *internal* processes are not contradictory; that micro- and macro-rationality basically coincide; and that, in general, orthodox economics (as distinct from various political uses to which it may be applied) is the only serious game in town. This emphasis suggests that the left agenda is in basic opposition to economic rationality – a move that concedes far too much ground to the other side. If we can safely leave technical change – at least in its macroeconomic, structural aspects – in the hands of the capitalists, we might just as well leave their property relations intact as well. Then there would truly remain nothing *radical* for us to say.

II A SECOND LOOK: ACCUMULATION, TECHNICAL CHANGE, AND PRISONERS' DILEMMAS

Frank Thompson and I now appear to agree on one essential result: when positive accumulation is occurring – and this is presumably the normal state of the capitalist economy – technical change *may* lead to a falling rate of profit, when the combined effects of accumulation and technical change on the labor power market are taken into account.

Moreover, biased technical change implies that *either* the profit rate is falling, *or* the profit share is rising. The profit *rate* describes the power of capital to self-expand – presumably a central indicator of the system's efficacy and potential for unending self-reproduction. The profit *share* reflects the intensity of exploitation, and is fraught with implications for working-class reproduction, effective demand, and legitimation. Crisis results from a *fall* in the *rate* of profit, that being its “critical” direction of change. By contrast, the critical change in the profit *share* is a *rise* in that ratio. Attention may therefore be directed to the likelihood of biased (*Q*-increasing) technical change, which enforces at least one of these two critical tendencies.

Thompson addresses the empirical side of these issues, and I will return to that later. First, I would like to focus on our differences at the theoretical level. The central difference is in fact quite substantial. Thompson puts the matter succinctly. In his view, accumulation is a *prisoners' dilemma* for capitalists; biased technical change is not. It is rational for each capitalist to accumulate as rapidly as possible; this, however, weakens capitalists overall in the labor (power) market, driving up the wage rate and therefore lowering the profit rate. Individual behavior leads to a systematically irrational result; thus, we have a “prisoners' dilemma.”[‡]

[‡] The prisoners' dilemma. Two prisoners are suspected of a crime, and are being interrogated separately: this is a clear metaphor for the isolated decision making of competitive capitalists (and, indeed, for competitive market-socialist firms, but that is another story). If neither confesses, both go free; there is no hard evidence. If both confess, they both receive nominal jail terms. If only one confesses, however, the other one receives punitive hard time. Since neither can tolerate the downside risk of not confessing, both prisoners wind up confessing, even though that is not their best joint outcome. (Note: the guilt or innocence of the prisoners is irrelevant to this parable.)

Note also the term in the text: “labor (power) market.” I will drop “power” from now on, in deference to easy usage, but in the hope that my respect for the careful conceptualizations of classical Marxism has been duly noted.

Biased technical change, on the other hand, acts as a “countervailing tendency” to the role of accumulation in driving up the wage: for any given rate of accumulation, the capital-intensifying bias lowers the demand for labor below what it would otherwise have been. In this way, *ceteris paribus* – i.e., for *any given*[‡] rate of accumulation – capital-intensifying technical change dampens the demand for labor and therefore *raises* the rate of profit above what it would have been otherwise. Thompson, in fact, comments wryly on the prevalence of the reverse conception that links capital-intensifying technical change to a *falling* rate of profit, calling the widespread acceptance of this false notion “an important uninvestigated question in the history of ideas” (Thompson, 1996, 91).[‡]

[‡] In this argument, the existence of the bias is taken for granted; we are only considering what would result *should* such a bias exist. Thompson does not address the *theoretical* issues pertaining to the likelihood of technical change taking a biased form. This was addressed in Section I of this chapter, and will be reexamined below.

[‡] It may be thought that a capital-intensifying bias has two effects: a direct one lowering the profit rate (by definition), and an indirect one through its impact on the wage. If the elasticity of the wage with respect to labor demand were small, the direct effect might predominate. This, however, is not an adequate response, as it fails to address the central implication of the Okishio Theorem: viable – rationally adoptable – technical change can only raise the profit rate, *unless* the real wage rate

risers. Any story leading from biased technical change to a falling rate of profit must involve a long-term tendency for the real wage rate to rise.

1 Preliminaries

Let me recapitulate the basic properties, and notation, of the model. It will be, once again, the simplest possible macro, or aggregative, formulation, in what I take to be the most obvious and accepted notation possible. We have output, Y , produced by a stock of physical capital, K , and a flow of labor, L . Output partitions unambiguously into wages and profit: $Y = W + P$. We define capital-to-labor and output-to-labor ratios: $k = K/L$ and $y = Y/L$; these are the “technical composition of capital” and labor productivity, respectively. We will need an *accumulation ratio*, the share of profits devoted to increasing the capital stock: $a = \Delta K/P$. The profit rate, $r = P/K$. The profit share, $\pi = P/Y$. The “organic composition of capital,” $Q = K/Y$, as explained earlier. (Thompson's strictures against this definition will be taken up briefly, below.) The last three ratios are related in obvious fashion: $r = \pi/Q$.

Growth rates are denoted by asterisks, as before: the growth rate (rate of change) of the profit rate, for example, is r^* . We will need to represent the growth rates of the supply of labor and demand for labor; these are, again as before, N^* and L^* .

The profit rate and its growth rate (this latter a consequence of standard algebraic treatment and approximately valid for small changes) are:

$$r = \frac{y-w}{k}$$

$$r^* = \left(\frac{y}{y-w}\right) y^* - \left(\frac{w}{y-w}\right) w^* - k^*$$

where w is the real wage rate, W/L . Implications for the profit rate of different types of technical change follow immediately:

$$k^* \begin{matrix} > \\ < \end{matrix} y^* \Rightarrow r^* \begin{matrix} < \\ > \end{matrix} \left(\frac{w}{y-w}\right)(y^* - w^*)$$

Balanced change, $k^* = y^*$, implies that r^* depends on the sign of $y^* - w^*$, and biased, or Q -increasing, change has $k^* > y^*$, in which case $w^* = y^* \Rightarrow r^* < 0$.

The growth rate of the supply of labor, N^* , will as usual be taken to be constant. The growth rate of the demand for labor depends directly on the profit rate and the accumulation ratio, and inversely on the growth rate of the technical composition of capital:

$$L^* = K^* - k^* = ar - k^*$$

Finally (for the present), we need some version of Thompson's Minimal Assumption concerning the impact of the state of the labor market on the wage. As we know, this assumption has static and dynamic variants, depending on whether we compare L to N , or L^*

to N^* . There is also the matter of whether the impact of labor-market imbalance is on the real wage *rate*, w , or on the wage *share*, $\omega = w/y$. Define a generic wage variable, ψ , to stand for either w or ω thereby avoid preempting this issue. Using the dynamic variant, we then have

$$L^* \begin{matrix} > \\ < \end{matrix} N^* \Rightarrow \psi^* \begin{matrix} > \\ < \end{matrix} 0.$$

2 Prisoners' dilemmas

Accumulation is not a prisoners' dilemma for capitalism. This conclusion, the direct opposite of Thompson's claim, emerges most clearly in the subcase with no technical change: $k^* = y^* = 0$. If we imagine an accumulation ratio high enough so that $ar > N^*$, the initial impact will be to alter the distribution of the net product through the labor market in favor of wages and against profits: this, however, sets up a *cycle* that takes the following form:

$$ar > N^* \Rightarrow \begin{pmatrix} \psi \uparrow \\ r \downarrow \end{pmatrix} \Rightarrow L^* \downarrow \Rightarrow \begin{pmatrix} \psi \downarrow \\ r \uparrow \end{pmatrix} \Rightarrow L^* \uparrow \Rightarrow \begin{pmatrix} \psi \uparrow \\ r \downarrow \end{pmatrix}, \text{ etc.}$$

The level of the accumulation ratio determines the amplitude of this cycle, given the initial position. The profit rate cycles around its center, $\hat{r} = N^*/a$ (the solution of the condition for labor market balance, $ar = N^*$). The cycle itself depends arbitrarily on the initial conditions, and its persistence would derive from “shocks” driving the economy away from its stationary center. If the economy were at that center, with $r = \hat{r}$, so that $ar = N^*$, the cycle would disappear:

$$\begin{pmatrix} \psi \text{ const} \\ r \text{ const} \end{pmatrix} \Rightarrow L^* \text{ const} \Rightarrow \begin{pmatrix} \psi \text{ const} \\ r \text{ const} \end{pmatrix}, \text{ etc.}$$

The situation is not much different with balanced, exogenous technical change, in which $k^* = y^* > 0$. The initial condition, expressing the apparent “prisoners' dilemma” of accumulation pressing down on the profit rate, is now $ar - k^* > N^*$. With productivity now increasing, a choice of minimal assumption becomes necessary. We have two subcases. In the first, absence of pressure from supply/demand imbalance in the labor market implies $w^* = y^*$ and ω constant. This view suggests that the wage *share* is important, and that a given balance of power, unperturbed by rising or falling unemployment rates, enables workers to achieve wage increases equal to productivity increases. The cycle is now:

$$ar - k^* > N^* \Rightarrow \begin{pmatrix} \omega \uparrow \\ r \downarrow \end{pmatrix} \Rightarrow L^* \downarrow \Rightarrow \begin{pmatrix} \omega \downarrow \\ r \uparrow \end{pmatrix} \Rightarrow L^* \uparrow, \text{ etc.}$$

This is again a constant cycle, around a profit-rate center defined by $\hat{r} = (N^* + k^*)/a$. With the cyclical movement of ω , the growth rate of the real wage rate fluctuates above and below the growth rate of productivity; it never needs to be negative (although it can be). Once again, the main result is that the accumulation ratio defines the center of a cycle; if a is higher, the

profit-rate center \bar{r} is lower. Even the short-run prisoners' dilemma of cyclical behavior is not guaranteed; it depends on initial conditions and shocks driving the system away from its steady-state center. More to the present point, no *long-run* tendency for the rate of profit to fall emerges from either the fact or the rate of capital accumulation taken by itself.[‡]

‡ It should be clear that accumulation may have other consequences that have long-term critical potentials: the concentration and centralization of capital, increasing polarization in the class structure, the consequent delegitimation of capitalist production relations, the rise of state control and influence, etc. If we posit a certain required level of upper-class consumption – the *power consumption* that grounds ideological control over the power elite and the managerial and professional strata – then reduction in the relative size of the capitalist ruling class may induce an upward drift in the accumulation ratio; this would entail a downward drift in the profit-rate center, \bar{r} . Of course, the need to support increasingly prominent state and private bureaucracies would work in the opposite direction.

It remains to consider the subcase based on the physicalist version of the minimal assumption: labor market pressures act on the real wage only. In this case, we again have a constant cycle:

$$L^* > N^* \Rightarrow \begin{pmatrix} \omega \uparrow \\ r \downarrow \end{pmatrix} \Rightarrow L^* \downarrow \Rightarrow \begin{pmatrix} \omega \downarrow \\ r \uparrow \end{pmatrix} \Rightarrow L^* \uparrow, \text{ etc.}$$

In this case, however, w^* fluctuates around 0 instead of around y^* . This implies an ever-increasing profit share, and one must wonder why this should happen: what story about the evolving class relations and/or structures supports an ever-increasing rate of exploitation? The real-wage formulation of the labor-market assumption in fact appears contradictory: with a rising profit share and constant Q , the profit rate must be rising, even though the center $\bar{r} = (N^* + k^*)/a$ is not. This increase in r must pull wages up eventually, although, under the present assumptions, not enough to generate a downward trend in r . The general point is this: focusing on w as the object of labor-market equilibrium is ultimately contradictory in a model in which productivity is continually rising.

Regardless of how the labor-market effect is formulated, however, there seems to be no way in which accumulation grounds a long-term, or structural, tendency for the rate of profit to fall. Declines in the profit rate due to labor-market pressure from accumulation are self-correcting. If accumulation is a prisoners' dilemma for capitalism, it turns out to be one that leads to early parole!

Biased technical change is, in all likelihood, a prisoners' dilemma for capitalism. To see this, it will first be necessary to return to the summary of results from work done over a number of years (Laibman, 1992a, part 2; Laibman, 1997; p. 68ff. earlier in this chapter).

Before technical change can be biased, it must be endogenous. Capitalists *choose* a path of technical change, adopting (in the macro framework) a (k^*, y^*) pair that maximizes their momentary, or *conjunctural*, profit rate, ρ . The possible choices of k^* and y^* are constrained by the *mechanization function* (or productivity growth function), which sets the range of productivity increases that is possible in the short period, increasing with higher degrees of mechanization, but with diminishing returns. There is a (k^*, y^*) pair that is optimal for individual capitalists, in that it maximizes the conjunctural profit rate (the

necessary target in the assumed environment of intense, ruthless, and atomistic competition). The optimal technical change choice turns out, crucially, to be a direct function of the wage share, ω .[‡] Using k^* to represent both technical change variables (since k and y move in the same direction), the position can be depicted in this way:

$$k^* = k_{opt}^* = k^* (\rho = \rho_{max}) = k^* (\omega)$$

$$\frac{\partial k^*}{\partial \omega} > 0.$$

In what follows, I assume that the parameters of the mechanization function, together with ω , are such that constrained maximization of ρ generates biased (Q -increasing) technical change: $k^* > y^*$.[‡]

[‡] Again, I must apologize to the reader for not being able to *derive* this result here. Intuitively, one might imagine that a higher ω will lead capitalists to find ρ_{max} at higher levels of k^* and y^* , and *vice versa*.

It is important to note that this result is *not* based on a choice of ω over w as the wage variable of interest. In the momentary or conjunctural situation in which the technical change choice is made, no adjustment is taking place in the labor market, and the ω vs. w issue does not arise.

[‡] Thompson addresses this conception, but believes the tradeoff is a static one: that in dynamics, the constraint relating y -increase to k -increase will shift outward (see his paper, 1996, p. 94, where the argument is formulated in terms of labor and capital input coefficients). This argument misses the mark: the mechanization function is formulated in terms of *growth rates*, not absolute levels, of the coefficients. The mechanization function assumes a certain potential rate of productivity growth that takes place independently of mechanization (autonomous productivity growth), and that further productivity growth entails rising k^* , with diminishing returns. It may of course be subject to slow drift over time as the parameters change; as a relation between *growth rates* of y and k , however, it is not displaced upward as a result of technical change itself.

This case can be described in a manner similar to the cases with no technical change, or with exogenous and balanced change. Once again, we could set an initial state leading to upward pressure on the wage: $L^* = ar - k^* > N^*$. The result may stand out more clearly, however, if the cycle emerges endogenously, with initial state $L^* = N^*$. As before, we first consider the labor-market assumption according to which $w^* = y^*$ in the “tranquil” state. The generating factor is biased technical change, and it first affects the profit rate without any change in the wage share. The resulting movement is:

$$k^* > y^* \Rightarrow r \downarrow \Rightarrow L^* \downarrow \Rightarrow \begin{pmatrix} \omega \downarrow \Rightarrow k^* \downarrow \\ r \uparrow \text{ partially} \end{pmatrix} \Rightarrow$$

$$L^* \uparrow \Rightarrow \begin{pmatrix} \omega \uparrow \\ r \downarrow \end{pmatrix} \Rightarrow L^* \downarrow, \text{ etc.}$$

The initial fall in r due to Q -increasing technical change sets up a cycle, even without an initial impetus of the form $L^* > N^*$. In this cycle, k^* will also fluctuate, following ω . The crucial point, however, is the one explained in Section I, in a different context: since k^* falls as a result of the deterioration in the position of the workers and the fall in ω , the profit rate does not rise all the way back to its initial level. The benchmark is labor-market balance, and

a look at $N^* = ar - k^*$ will reveal that if k^* is lower, then so is r . The growth rate of k , k^* , has its own center, \hat{k}^* ; since $\hat{k}^*_1 < \hat{k}^*_0$, we have:[‡]

$$\hat{r}_1 = \frac{N^* + \hat{k}^*_1}{a} < \frac{N^* + \hat{k}^*_0}{a} = \hat{r}_0.$$

The profit rate cycles, but its center falls over time, so long as $Q^* > 0$. The conditions for Q -increasing technical change require further substantiation, and it is by no means my intention to argue that they must inevitably hold. The case depicted, however, is a clear instance of a *genuine* prisoners' dilemma: competing capitalists scramble for maximum conjunctural profit rates, and consequently bring about Q -increasing technical change; this lowers the subsequent k^* resulting from the same technical-change-choice strategy, and therefore also lowers the benchmark (labor-market-balancing) rate of profit.

[‡] The accumulation ratio is assumed to be constant in these exercises, so that one problem can be examined at a time; but cf. Laibman, 1992a, ch. 11.

That this is not a hard and fast “law” of declining profit rates can be seen if we briefly consider the other subcase, in which w^* cycles around 0 depending on $L^* \gtrless N^*$. In this situation, it is doubtful whether a fall in r will result from rising Q , since, as noted previously, $y^* > 0$ and $w^* = 0$ imply a perpetually *increasing* rate of exploitation and profit share. If that is not a doomsday course, it is not clear what would be! Frank Thompson finds the long-standing adherence of Marxists to the view that a rising Q lowers the profit rate – rather than serving as a “countervailing force” – to be worthy of study as a major anomaly in the history of ideas. I, to the contrary, find the physicalist view of the wage (note the common terminology: the “real” wage), and the dogma that falling r is critical (prisoners' dilemma-like), whereas rising π is not, to be profoundly anomalous. The falling profit rate trend depicted above is based both on the presence of underlying conditions for rising Q , and on the centrality of the rate of exploitation and wage share in the long-term evolution of the balance of class forces. In the story of the “consistent path,” along which Q rises, π rises, and r falls, the “real” wage rate is rising (although not as rapidly as productivity); if it were not, the technical changes leading to a falling profit rate would not be Okishio-viable ones. But the key issue, prior to the outcome on the paths of π and r , is the rise in Q , which sets up the dismal alternative of falling r or rising π . The implications of both of these results for capitalist crisis need much further work and rigorous elaboration. The curious thing, to repeat, is the apparent presumption that the critical importance of falling r is self-evident, whereas a rising π does not matter at all.

3 Is there empirical support for rising Q ?

After a cursory reference to my “consistent path” construct, Thompson, using data for the United States from the Bureau of Economic Analysis (BEA) of the Department of Commerce, provides a set of regressions on time series for Q over the periods 1929–92, 1950–94, and

1982–94, with K defined in six different ways, and Y defined as Gross Domestic Product. (Net Domestic Product [NDP] would have been more appropriate, but I doubt if the trend results would be significantly altered by this change.) Predictably – since other studies using similar data in a similar manner have come up with essentially the same result – the trend in most of these Q s is mildly negative, supporting the null hypothesis that, far from rising in the twentieth century, Q either falls or is trendless.

I should first note that the consistent path, along which Q is increasing, r falling, and π rising, has a theoretical terminus at which Q stops rising, and the system settles into a steady state with a constant profit rate and share. The model (see Laibman, 1992a, [ch. 8](#); Laibman, 1997, [ch. 7](#)) suggests that – with reasonable assumptions concerning the autonomous productivity growth rate, the rate of onset of diminishing returns to mechanization, the growth rate of the labor supply, and the profit share – the US economy is still on the consistent path, rather than at its steady-state terminus; this, however, relies on back-of-the-envelope calculations, and could be wrong. If Thompson's data are correct and reliable, then we must conclude that the consistent-path style of biased growth is in the past, and that mature capitalism is steady-state (as, among others, Nicholas Kaldor (1957) argued). Would that mean that capitalism has ceased to be tension-ridden and contradictory? Would it represent the triumph of the “free market”? Hardly, as I think Frank Thompson and I would agree. The question, however, remains: can one simply take official data, particularly data on sensitive aggregates such as capital stocks, at face value, and draw conclusions from them? The question is rhetorical of course, but the answer is still “no.”

A seminal article by Victor Perlo on “Capital–Output Ratios in Manufacturing” (1968) challenged the time series produced by several authors working for the National Bureau of Economic Research. The general point is that we must be aware and critical of ideological and structural biases that affect the way the data are collected. Perlo's study, as its title implies, refers only to manufacturing, and his data points are limited to Census of Business years. He alludes to the fact that, in the 1920s, with extremely lax accounting rules in effect, the book values of capital stocks were liberally written up to correspond to the inflated stock market prices of companies; he speaks, in a memorable phrase, of book values of capital assets “launched on seas of watered stocks.” This, of course, produced an upward tilt in capital stock estimates for the early years, and a downward bias in the time series. Increasing use of accelerated depreciation for tax purposes in later years is another factor; the underestimation of capital stocks acquired by private corporations through sale-and-leaseback arrangements with the Federal Government is a third.

Robert Gordon (1994) has pointed to the implications of measuring the replacement value of capital goods, and therefore the relevant capital stocks, by the current prices of capital goods. List prices are not reliable; they overestimate actual prices. Prices of used capital goods must be factored in, and this is not done by the BEA. This upward bias in the relevant price indexes causes underestimation of the real (dollars over price) capital goods replacements, and therefore of capital stocks in the early years of the time series determined by the perpetual inventory method.

Another issue is correction of NDP for capacity utilization – a point that is again ignored

in the BEA data. While one might think that capacity utilization is cyclical, and would not affect the trend in estimates of Y and therefore of Q , there may be cycles in capacity utilization long enough to bias the time series. The low utilization rates in the 1930s, for example, compared with later decades, have the effect of giving the trend in observed K/Y ratios a downward bias, relative to the actual relation of capital stocks to their potential or rated levels of output.

Anwar Shaikh and E. Ahmet Tonak (1994) address these concerns, and produce estimates for the Marxian concept $C/(v + s)$, which is essentially equivalent to the capital/net output ratio. They find a cumulative 56.2% increase in this ratio for 1948–80 in the United States, although they also find a very small (4.8%) decrease in the decade 1980–89.[‡]

[‡] I must acknowledge some very useful conversations with Anwar Shaikh, which helped me greatly in the formulation of this section.

These comments are not meant to serve as a refutation of Thompson's data; only to raise what I believe are non-ignorable questions concerning the use of official data as an inherent part of what we do when we carry out empirical studies in support of Marxist economic analysis.

4 Miscellany

4.1 *Circulating vs. fixed capital; advanced vs. ex post wages*

Thompson is undoubtedly correct in stating that the results of similar analysis do not, or should not, depend on specific choice of assumptions; for example, whether or not profit is calculated on advanced wages, and whether or not one uses a pure circulating capital model (which he prefers), a pure fixed capital model (which I prefer), or some hybrid. Concerning the hybrid proposed in his footnote 3 (1996, 92), however, a note of caution is warranted. Labor can be paid at the beginning of the period, as most appropriate for the circulating capital case; or at the end of the period for the fixed capital case. In the former the profit rate is a pure number (ratio of flow to flow); in the latter it has reciprocal time dimensionality (ratio of flow to stock). One therefore cannot simply generalize between the two extremes by means of some coefficient, α . As fixed capital historically becomes more and more relevant, a critical point is reached and the nature of the profit rate is transformed; at that point, the “amount” of circulating capital in the form of raw materials and the wage fund ceases to be relevant in the calculation of the profit rate (except, of course, insofar as its magnitude reduces the flow of profits). It should be obvious that the pure-fixed-capital formulation is more relevant to post-industrial-revolution capitalism than the pure-circulating-capital formulation. Again, I can add to the list of anomalies in thought requiring further exploration the apparent fixation of many non-neoclassical economists, especially in Sraffian circles, on the circulating-capital model, which is alone regarded as representing a “true” classical system. Alternatively, and following Sraffa, one can only model fixed capital through joint production, which – apart from its capacity to generate endless paradoxes – essentially

reduces fixed capital to a species of circulating capital, and therefore fails altogether to capture the quality of “fixity” that is central to the dynamics of fixed capital in post-industrial-revolution capitalism.

I must also note that, while Thompson seeks to arrive at results that are independent of specific modeling assumptions, he also, and contradictorily, sounds a small note of triumph at being able to arrive at *his* conclusions in “Laibman's” model (1992, 100). This, of course, is no surprise. The conclusion in question is that, *ceteris paribus*, a rise in Q lowers the wage rate and therefore raises the profit rate. Once again, I am not denying this. I am arguing that *ceteris* is not *paribus*; that the effect in question may be offset by the ensuing fall in the optimal k^* ; and that this lowers the center around which the profit rate subsequently cycles.

4.2 Alternative definitions of Q

Thompson notes, correctly, that I choose “to call the capital stock/output flow ratio ... the ‘composition of capital,’ a formulation which strikingly renders the composition of capital entirely independent of labor” (1992a, 98). If this means “independent of wages,” then it is not only “striking” but also entirely intentional. My definition of the composition of capital (a more appropriate term might be “composition of capitalist production”) is, as noted above, conceptually equivalent to $C/(v + s)$ in classical Marxist terminology: the ratio of the stock of (fixed) constant capital, in either money or abstract labor time, to the flow of current labor. This is equivalent to the physical capital to net output ratio, as shown earlier in this chapter: with λ as the unit labor value of output, and remembering the pure fixed capital assumption according to which there is no indirect labor value flow, $C/(v + s) = \lambda K/L = (L/Y)(K/L) = K/Y$.

I use $C/(v + s)$ rather than Marx's c/v , not only to incorporate fixed capital into the definition, but also, and expressly, to make Q independent of the wage bargain and the rate of exploitation. It should measure a historically and socially evolved fact about the technical face of production (the “forces of production”), namely, the relative weights of current and embodied labor, or the “proportions of labor to means of production.” So changes in the wage, which affect the proportion between v and s , do not affect Q , and that is as (I think) it should be. I believe that Marx was striving for this resolution in his celebrated discussion of the technical, value and organic compositions of capital in *Capital* I, ch. 25, where he speaks of the organic composition as the value composition, “in so far as it is determined by its technical composition and mirrors the changes of the latter” (Marx, 1906, 671). (The effect of w on the price of production of the means of production in a multi-sector framework is another matter entirely.)

If this is correct, then the entire confusing panoply of “capital-using,” “labor-using,” “capital-saving,” “labor-saving,” borrowed from neoclassical growth theory, is unnecessary. Most importantly, having a composition of capital that is “increasing in the capital/labor ratio and decreasing in the real wage rate” (Thompson, 1996, 91) entirely begs and confuses the issue.

5 Summary and conclusions

Thompson's core argument is that a rising composition of capital reduces the demand for labor, restrains the rise in wages, and is therefore, if anything, a counter-tendency to a falling rate of profit. For any given rate of accumulation, a rise in Q raises the rate of profit above what it otherwise would have been. So the argument in Laibman (1996; this chapter) that with positive accumulation rising Q is consistent with falling r , while true, loses its force. *In itself*, Q -increasing technical change does not lower the rate of profit; accumulation, however, *may* do so.

In response, I have argued that accumulation, given initial conditions, will generate a cycle in the profit rate with alternating rising and falling phases, but cannot produce a falling trend. The presence of Q -increasing technical change, on the other hand, forces the cycle to move around a falling center, because the rise in the profit share lowers the growth rate of Q and of k (and also, by the way, of y); this causes dynamic balance in the labor market to be restored at a lower profit rate, ensuring that the cycle has a downward trend.

This result, however, depends on a crucial assumption: that changes in the relation between demand for and supply of labor, affecting the unemployment rate, change the relation of w^* to y^* , not the relation of w^* to 0. Thus, a rise in Q initially drives the profit rate down, since nothing has changed in the ability of workers to win wage increases equal to productivity increases. The demand for labor now begins to grow more slowly than the supply of labor and unemployment begins to rise. The growth rate of the real wage rate, originally keeping pace with productivity growth, then begins to slacken. Exceptionally, w^* may be negative; in general, however, it is positive. Its fall below y^* is sufficient for π to rise and for r to rise partially. Restoration of r by unemployment and falling wages, however, is not total, because of the fall in the *growth rate* of k . Dynamic balance – a position on the consistent path – is therefore restored at a higher π and a lower r .

It is in this sense, and this sense alone, that biased technical change leads to a lower profit rate, and therefore can be characterized as a prisoners' dilemma for capitalism. The argument relies, crucially but also cheerfully, on the assumption that the wage share is the principal measure of the balance of class forces, and in that sense is more “real” than the “real” wage rate. The argument implies a rising wage rate, as indeed it must if the Q -increasing technical changes that lead to a falling r are viable, in Okishio's sense. Anyone who wants to derive a falling rate of profit from technical change in isolation from labor markets, and from the role of the balance of class forces within capitalist production relations, will not be comforted by my argument.

Thompson's latest attempt to demonstrate the essential macrorationality of capitalist-controlled technical change, while not convincing (in my view), has revealed to me the extent to which my own argument depends on a dynamic, and relative shares–based, view of the importance – the reality – of the rate of exploitation in determining structural trends in capitalist accumulation. If this is a return to the insights of the *Communist Manifesto* in completing the project of *Capital*, so be it.

4 Okishio and his critics

Historical cost vs. replacement cost

Introductory perspectives

The tension between studying social realities by focusing on a moment in time, and studying them in their dynamic–temporal aspect, is inherent in their being (ontology), and therefore also in our modes of comprehending that being (epistemology). It is hard to look at movement through time without compressing that which is moving, abstracting from structure and nuance and texture. Temporality tempts us to lose focus on relations between inner and outer, essential and non-essential. On the other hand, bringing precisely those features into focus is accomplished by abstracting from time, examining a moment in isolation from the process of that moment's becoming. When we ask what capitalism *is*, we have a tendency to lose sight of how it *moves*, and vice versa. Heilbroner's distinction between the “nature” and the “logic” of capitalism (1985) must be relativized; important as it is to separate the theory of value and exploitation (nature) from that of growth, technical change, accumulation, and crisis (logic), these are ultimately inseparable aspects of a whole.

Hyperextension of either the static or the dynamic clearly distorts the science to which we aspire. Marx sets an example for us, I believe, by working against these hyperextensions and seeking the dialectical unity of the two dimensions. In the first instance, his method clearly embodies the strong case of rigorous abstraction from change, in order to hone in on essential properties of the object of investigation. For example, the exchange value of a commodity is its quantitative relations with other commodities in exchange, when the fortuitous circumstances giving rise to forces of supply and demand are abstracted away: when these forces cancel each other and thereby “cease to act” (see [Chapter 5](#)). The hypothetical case of a market that reaches such a condition of balance then *reveals* something essential about the determination of commodity value by abstract labor (however conceived or modified by the social relations underlying *capitalist* markets), and this is true even though – in what we call the “real” world – that balance is never actually achieved.

Modern economists would call that situation one of “equilibrium.” This is not Marx's word, but it clearly applies. Importantly, however, note that equilibrium is not merely a methodological device for arriving at properties of a political–economic reality that would not otherwise be perceptible (although it is that). Equilibrium has an ontological dimension as a state toward which a system always tends, but that very tendency can exist only in the form of its constant violation and disruption. The actual forces that propel a market toward equilibrium – for example, the excess profits or losses resulting from lack of balance

between supply and demand – are *dis* equilibrium forces, and the pressures to break away from equilibrium, e.g., to achieve temporary excess profits, are essential elements in the enforcement of the ever-present tendency toward it.

Still, the TSS theorists, whose approach to profit rate dynamics is the topic of this chapter, insist on breaking the dialectical unity of the static and the dynamic by insisting on a *non-equilibrium* method. Anything else is “simultaneism.” Time, in effect, must be worshipped; it can't be theorized. There is no inner reality, to be discovered by theory. All that exists is constant change, at every level: technical, social, institutional. That sounds very “temporal” and dynamic, but it actually abolishes any attempt to analyze – explain – in favor of what amounts to entirely untethered and contingent description.

I will not repeat here the critique that appears in the chapter. Instead, I would like to offer a hypothesis concerning the meta-theoretical source of the temporalist conception.

In the TSSI world, as readers will see, capitalists continually introduce technical changes as they accumulate capital. While these technical changes steadily reduce the cost of new capital goods, which has the potential to raise the rate of profit, the existing capital goods remain on the books at the levels of productivity and cost that were in effect at the time they were purchased. This is the temporal effect: the profit rate is a comparison between *current* profit and a *lagged* capital stock; a ratio that straddles two moments in time, and is (thus) temporal. The TSSI authors call this the “value rate of profit,” as opposed to the “material rate of profit,” the one that uses the current (latest practice) technique to value the capital stock, and is (therefore) “simultaneist.” Their models depict a steadily rising material rate – this is the one that capitalists actually pursue – and a steadily falling value rate.

Now, the falling (value) rate of profit is not perceived by, so presumably not consequential for, capitalists. It is never made clear how its fall could lead to crisis or be otherwise of interest in the theory of accumulation. Moreover, its fall is derived from a temporal construction alone; all of the ingredients that normally comprise analysis of Marx's falling profit rate tendency and its counter-tendencies – the trend in the rate of exploitation or profit share, the forces shaping the bias of technical change (see [Chapter 3](#)), the concrete or conjunctural qualities of capitalist competition – are missing. We have an analysis of the long-run trend in the profit rate for a capitalist economy that has lost its social-relational and historical specificity, and has become a vehicle for a view of *capital* as a disembodied force, standing in no particular relation to markets, forms of property, or the precise modes of embodiment of political and social power that arise in capitalist societies.

A “capital” that can suffer from a necessary fall in a rate of profit that it itself does not perceive is a mysterious thing indeed, a disembodied entity that can inhabit diverse social forms, just as an evil spirit can adopt numerous outward disguises. We discover, in other manifestations of work by TSSI theorists (here there is in fact some variation among them), a view that attributes to Marx the notion that capitalism can just as easily take a state form (state capitalism) as it can adopt the form of private property; so value is separated from exchange value, and one must wonder how this is reconciled in the minds of its proponents with what they take to be a close reading of Marx's value theory as such.

Against this, consider Marx's *clear* statement, in the topic sentences of the topic paragraph of chapter 32, *Capital* I, entitled: “Historical Tendency of Capitalist Accumulation”: “The knell of *capitalist private property* sounds. The expropriators are expropriated” (emphasis added). I cite this not to provide textual authority for my own view, but to offset the claims of the TSSI authors to represent the true Marx against the claims of his “Marxist” followers. The TSSI attitude is a property of the twentieth-century Western left, large parts of which sought to disassociate themselves entirely from the *post*-capitalist societies of that century by interpreting those societies as “state capitalist” (see van der Linden, 2007). The direct outcome: a theory of inevitable decline in an insubstantial profit rate that can be traced to no identifiable features of capitalist economic reality, as that reality is generally understood.

The TSSI debacle in the theory of capitalist accumulation, then, turns out to be one outcome of an unreconciled attitude toward the actual achievements of the left and working-class movements in the twentieth century – because those achievements did not result in instant utopia, came at a heavy cost, and challenged our ability to find a course in a complex world that combined support of “really existing” socialism with consistent devotion to moral principle.

Can I actually *prove* this connection between politics and theory? Of course not!

In the meantime, we still need, as usual, to dissect the TSSI claims at a rigorous formal level. This chapter uses nothing more than algebra, but some of it is a bit involved. You will need the algebra of exponents: $x^{-a} = 1/x^a$. Be sure to keep in mind what various superscripts and subscripts mean. For help with the ordinary difference equation of Section 2.3, I must refer the reader to a textbook treatment, perhaps Chiang and Wainwright, 2005, ch. 16. I should also mention that this chapter is based on two articles: an original, and a reply to subsequent criticism. I believe my argument can be followed without reference to the intervening paper by Freeman and Kliman (2000), but readers are urged to consult that paper and the others cited.

Contrary to much accepted wisdom in non-Marxist circles, as well as some Marxist ones, the theory of the falling tendency of the rate of profit remains central to the political economy of capitalism. Solidly grounded, it is an important weapon that Marxist political economists can place in the hands of the working-class movement – not because it justifies notions of the fatalistic inevitability of capitalist collapse, but because it contributes to an understanding of the ways in which capitalist society's contradictions deepen and intensify as capitalism matures. The link between technical change and structural trends in capitalism reveals a central aspect of the endogenous determination of technical change within capitalism, a revelation that offsets the mystification and reification of technology and thereby contributes to the advancement of working-class self- capability and power. Finally, grounding the theory of both cyclical and secular crisis in long-term structural transformation (without, indeed, *reducing* crisis theory to that transformation) militates against piecemeal and instrumental policies and solutions, helping to keep the revolutionary edge in the working-class response to crisis and exploitation.

In delivering weapons to the working class, however, it is of vital importance that the weapons we deliver do not blow up in their hands. In their zeal to vindicate Marx's theory (or what they take to be that theory), the TSS value theorists[‡] have advanced some arguments that simply do not hold water. They do this in order to refute the Okishio Theorem;[‡] to demonstrate that mechanization as such *must* lead to a falling rate of profit; and that the rate of profit indeed falls to zero over time. In the process, they claim that their non-equilibrium, or temporal, interpretation of value theory plays a unique role in this demonstration (see [Chapter 2](#) of this book). The circle of orthodoxy triumphant is closed with the assertion that the TSS position in value theory is, again, a uniquely valid interpretation of Marx's theory.[‡]

[‡] TSS, or “temporal single system” theory, refers to a recently developed school of thought, which may be represented by Ernst, 1982; Kliman and McGlone, 1988; 1995; Carchedi, 1984; Freeman, 1996. A range of contributions to this trend is collected in Freeman and Carchedi, 1996. “Temporal” reflects the role of time in the theory, while “single system” establishes opposition to the “two systems” view of some critics of Marx (e.g., Samuelson, 1971), according to which prices of production and values are two completely separate accounting systems, the former completely adequate and self-contained, and the latter therefore deprived of relevance. The “TSS” label is due to Skillman, 1995. Aspects of the TSS position are anticipated in Rosdolsky, 1977, and Mage, 1963.

[‡] The theorem, first proposed by Nobuo Okishio (1961; 1963), although anticipated by a number of others, states that if two multi-sector equilibrium systems are compared, in which the second incorporates a technical change in one sector that raises the momentary profit rate accruing to the firm that innovates it, *and* if the real wage rate is the same in the two systems, the profit rate in the second cannot be lower than the profit rate in the first.

[‡] I have examined the value-theoretic aspects of the TSS position, with special attention to the “transformation problem,” in Laibman, 2004 (see [Chapter 2](#) of this book). In that paper, I use the term “sequentialist,” borrowed from Alan Freeman, to characterize the position that subsequently became known as TSS. I should perhaps indicate a certain reservation concerning this terminology. Like most designations adopted by the proponents of that which is being designated, the label “TSS” begs some questions. The word “temporal” implies that alternative interpretations of value theory – putatively, those of the “twentieth-century Marxists” – are somehow timeless and “stationary.” Similarly, “single system” implicitly charges the Marxist alternatives with “dualism,” after the fashion of the Bortkiewicz–Samuelson notion of values and prices as distinct and non-interrelated systems. Most non-TSS Marxists of whatever century would, I think, reject this dualism; the entire “transformation” literature is about establishing the necessary links between the two, and the determinative role of values in establishing prices.

The key step in this equation is the assertion that – in Marx and in capitalist reality – capital goods, acquired at precise moments in time, remain valued at their *historical cost*, i.e., at the values for which they were purchased. The relevant profit rate is formed on capital stocks valued at historical cost, regardless of productivity increases occurring subsequently. These productivity increases do indeed lower the value of *new* capital goods, and therefore the *replacement cost* of capital goods in general. This replacement cost, however, is irrelevant to the actual value of the capital stocks on the books; money borrowed to finance their purchase, for example, must be repaid in full. Mechanization forces capitalists into a double bind: they get caught between the historically determined values of their capital stocks, and the declining value content of their products. This forces the profit rate down, even if real wages are constant over time – a clear rebuff to the Okishio Theorem, which insists (as noted above) that if real wages are constant, viable technical change (technical change that raises the *perceived innovator's* profit rate) cannot lower the

equilibrium profit rate.

To set the stage for an analysis of this position, it is necessary to clarify systematically and carefully the relation between historical-cost valuation of capital stocks and trends in profit rates. This will be done in the first section of this chapter. Section 2 will apply the results obtained to the TSS critique of the Okishio Theorem. In Section 3, I return to the larger issues surrounding the theory of profit-rate trends and their relation to capitalist crises (and crisis).

1 A model of historical-cost valuation and profit-rate trends

I have chosen, as representative object of analysis, the paper by Andrew Kliman, “A Value-Theoretic Critique of the Okishio Theorem,” from the Freeman–Carchedi collection (1996). Kliman's specific claims regarding the Okishio Theorem, value theory, and the falling rate of profit will be examined in Section 2. Here, I want to propose and study a model designed to elucidate the relation between technical change and historical-cost valuation, on the one hand, and the trend in the rate of profit, on the other.

The model is based on the one in Kliman (1996). Its central features are: one good, serving as capital good, wage good, and output; *continuous* technical change, with capital stocks and output growing through time at one constant rate and labor used in production growing at a lower constant rate; and a constant real wage rate. Output per worker and capital per worker are therefore growing at the same rate. Technical change is continuous; this is an advance beyond the comparative-static “one-time” change examined by Okishio and his followers. The real wage rate is constant, and the capital–output ratio is constant. The former feature is important in the effort to show that the profit rate can fall even without a rising real wage, and that Okishio's claim to the contrary is therefore false. It is not clear why it is important to set a constant capital–output ratio as a test for the falling profit rate. Kliman thinks it is important; he claims, for the case described, to have derived a fall in the rate of profit which “has faced two very strong tests ... – not only the constancy of the real wage rate, but also the constancy of the output/constant capital ratio” (219).

The model is a “pure fixed capital” model; the capital goods, once in place, live forever. I have introduced two simplifications, in relation to Kliman's formulation. First, I have suppressed the flow of material inputs in production (Marx's flow of constant capital). The entire labor content of output is therefore the flow of current labor time (taken, as in Kliman, to be homogeneous), and unit value is therefore identified as current labor per unit of (current) output. Nothing seems to depend on the presence of material input flows; I therefore choose to omit them for ease of exposition. Second, I will work directly with unit labor values, rather than converting them to quantities of money by means of a given and constant coefficient (ϵ , in Kliman). This coefficient is unanalyzed, and its use contributes nothing to the analysis. Working with labor-value categories makes it possible to represent value magnitudes explicitly, even in the austere one-good framework; there is no need for a further translation into money magnitudes.

In a model in which the stock of capital advanced is embodied in non-human elements of

production (“capital,” in the vulgar terminology of orthodox economics), the profit rate is formed on that stock alone: it is s/C , in classical Marxist notation, where C is the stock of *constant* capital and s is surplus value. This contrasts with the expression $s/(c + v)$, in which the profit rate is formed on the *flow* of circulating capital advanced: *constant* plus *variable* capital. Marx uses the circulating capital formulation (although not exclusively), and is followed in this by Kliman; my use of s/C is therefore another departure from that usage, one that seems appropriate in a post-industrial-revolution world where stocks of fixed means of production predominate.[‡]

[‡] The fixation of TSS theorists on circulating capital models (something they ironically hold in common with many Sraffians) is strange, in view of the clear predominance of fixed stocks of means of production in shaping the profit rate in modern capitalist economies. It is also, as we shall see, somewhat contradictory to the TSS project of focusing on historical cost valuation, which is clearly irrelevant in a circulating capital model in which the entire capital advanced is consumed within a single period of production.

A note on terminology: “capital,” in the most fundamental sense, is a social relation represented by the well-known formula for self-expanding value. In deference to easy usage, however, and with the rigorous political-economic conceptualization understood to be in effect, I will use the term “capital stock,” from everyday usage, to mean what would be more accurately termed “the stock of physical (non-labor-power) means of production advanced,” or (depending on context) the value of that stock.

The combination of accumulation of capital (to maintain necessary scale of output) with technical change implies heterogeneous capital stocks, even in the one-good world. Capital stocks (and their associated labor flows and output flows) therefore appear in the form of separate *vintages* (see Laibman, 1981; 1992a, [ch. 8](#)). These vintages must be tracked carefully, as we will see. Output, according to our highly abstract assumptions, is homogeneous, as is labor; the capital goods, however, are associated with specific levels of productivity and degrees of mechanization, and each vintage of capital goods must therefore be regarded as qualitatively distinct from every other (otherwise, earlier vintages could be instantaneously and costlessly retooled to latest-vintage standards). It is therefore not possible to add together capital stocks of different vintages; an aggregate capital stock can only be determined as a sum of value, and this must be done with great care (as we will see). The one-good model is being worked very hard here; one can only hope to be able to transfer the results obtained to more rigorous heterogeneous settings.

We write b for the *growth factor* of Y (output) and K (capital), following Kliman's notation, where a growth factor of any variable X is its level in one period divided by its level in the period preceding: X_t/X_{t-1} . This is roughly equal to “the growth rate plus one,” provided the “growth rate” (a concept that is inherently ambiguous in discrete time) is thought of as the change in the variable divided by its level at the beginning of the interval of change. The growth factor of labor (L) is c , with $1 < c < b$, as per assumption. The (constant) real wage rate is w .

The rate of profit at time 0 can be defined as:

$$r_0 = \frac{Y_0 - wL_0}{K_0}. \tag{4.1}$$

Now the time path of each variable, both latest vintage and (where appropriate) aggregate, can be traced as in [Table 4.1](#) (using output to illustrate). We therefore have

$$Y_t = b^{t-1} (b-1) Y_0; \quad Y_t^s = b^t Y_0. \quad (4.2)$$

Here and in all similar contexts, the superscript “S” characterizes the variable as the sum or aggregate of all vintages. For the capital stock and for labor, we have:

$$\begin{aligned} K_t &= b^{t-1} (b-1) K_0 \\ L_t &= c^{t-1} (c-1) L_0 \quad L_t^s = c^t L_0 \end{aligned} \quad (4.3)$$

Note that we omit a direct expression for the aggregated physical capital stock, K_t^s , although some such concept lies in the background of the expression for the growth path of the latest-vintage stock, K_t . This is admittedly a stretch; it is, however, the only way to examine rigorously the implications of Kliman's story, which involves a growing *and changing* stock of physical capital goods.

Unit values λ_t are defined for each vintage separately; these are unit values determined by “marginal socially necessary labor time.” The average socially necessary labor time will be based on the output and labor input aggregated over all of the vintages, λ_t^s :

$$\begin{aligned} \lambda_t &\equiv \frac{L_t}{Y_t} = \frac{c^{t-1}(c-1) L_0}{b^{t-1}(b-1) Y_0} = \frac{b(c-1)}{c(b-1)} \left(\frac{c}{b}\right)^t \lambda_0 \\ &= \alpha \left(\frac{c}{b}\right)^t \lambda_0, \text{ where } \alpha \equiv \frac{b(c-1)}{c(b-1)} = \frac{bc-b}{bc-c} < 1 \end{aligned} \quad (4.4)$$

$$\begin{aligned} \lambda_t^s &\equiv \frac{L_t^s}{Y_t^s} = \frac{c^t L_0}{b^t Y_0} = \left(\frac{c}{b}\right)^t \lambda_0 \\ \lambda_t &= \alpha \lambda_t^s \end{aligned} \quad (4.5)$$

It is important to note the proportionality of the latest-vintage unit value and the aggregate unit value, with the former of course less than the latter.

We next form an expression for the rate of profit at time t . In this formulation, the assumption is that a given capital operates with the entire complex of vintages from 0 to t , and that the relevant rate of return is the return to the entire capital stock, whose value – pending careful examination below – is written VK_t^s :

$$\begin{aligned} r_t^s &= \frac{\lambda_t^s Y_t^s - w \lambda_t^s L_t^s}{VK_t^s} \\ &= \frac{\left(\frac{c}{b}\right)^t \lambda_0 b^t Y_0 - w \left(\frac{c}{b}\right)^t \lambda_0 c^t L_0}{VK_t^s} \end{aligned} \quad (4.6)$$

Now VK_t^s must be determined, with close attention to the complexities of the issues

surrounding the valuation of the various vintages of capital goods. Production in each period takes place using the entire complex of vintages, and the average unit value is formed; this presumably is the value that applies to the output of the given period. The average unit value might then also apply to the portion of the output that is assigned as new capital goods, which enter production in the subsequent period. On the other hand, it is also reasonable to assume that capitalists separate out that strategic portion of the output, and value it according to the latest-vintage (marginal) unit value. In effect, as output the good is homogeneous across vintages, whereas as input it becomes a distinct use value that must distinctly acquire its specific unit value. We will examine both possibilities. In the latter case, capitalists value the individual elements (vintages) of the capital stock by the given vintage's unit value, λ_t in the former, they use the unit values determined by the average of all vintages up to the one in question, λ^S_i .

Table 4.1 Deriving time paths of Y, latest vintage, and aggregate

Time	Latest	Aggregate
0	Y_0	$Y_0^s (= Y_0)$
1	$Y_1 = (b - 1) Y_0$	$Y_1^s = Y_0^s + Y_1 = b Y_0$
2	$Y_2 = (b - 1) Y_1 = b(b - 1) Y_0$	$Y_2^s = Y_1^s + Y_2 = b^2 Y_0$
3	$Y_3 = (b - 1) Y_2 = b^2(b - 1) Y_0$	$Y_3^s = Y_2^s + Y_3 = b^3 Y_0$
t	$Y_t = b^{t-1}(b - 1) Y_0$	$Y_t^s = b^t Y_0$

The historical-cost value of the capital stock, VK_t^s , will, as we will soon see, be equal to $\lambda_0 K_0 S_\lambda$, where S_λ depends on which of the two valuation assumptions – λ_t vs. λ_t^S – is used. The expression for the profit rate at time t , following from equation (4.6), therefore becomes

$$r_t^s = \frac{c^t Y_0 - w \left(\frac{c}{b}\right)^t L_0 c^t}{K_0 S_\lambda} = \frac{c^t}{S_\lambda} \frac{Y_0 - w L_0 \left(\frac{c}{b}\right)^t}{K_0} = \frac{c^t}{S_\lambda} r_t^M \quad (4.7)$$

where

$$r_t^M = \left[Y_0 - w L_0 \left(\frac{c}{b}\right)^t \right] / K_0$$

is what Kliman calls the “material rate of profit.” Given the model's assumptions concerning the growth rates of Y , K , and L , a rate of profit calculated on the assumption of a homogeneous capital stock based on the latest vintage alone will rise asymptotically toward a maximum of Y_0/K_0 , the (constant) output-to-capital ratio. The possibility that the “value/price rate of profit,” with historical-cost valuation of the variously dated capital stocks, will fall depends on counteracting behavior of c^t/S_λ , to which we now turn.

We begin with the case in which each new vintage of capital goods is valued by the

specific unit value λ_i appropriate to that period:

$$\begin{aligned}
 VK_t^S &= \lambda_0 K_0 + \lambda_1 K_1 + \lambda_2 K_2 + \dots + \lambda_t K_t \\
 &= \lambda_0 K_0 + \left(\frac{c-1}{b-1}\right) \lambda_0 (b-1) K_0 + \left(\frac{c-1}{b-1}\right) \left(\frac{c}{b}\right) \lambda_0 b(b-1) K_0 + \dots + \\
 &\quad + \left(\frac{c-1}{b-1}\right) \left(\frac{c}{b}\right)^{t-1} \lambda_0 b^{t-1} (b-1) K_0 \\
 &= \lambda_0 K_0 [1 + (c-1) + c(c-1) + \dots + c^{t-1} (c-1)] \\
 &= \lambda_0 K_0 c^t
 \end{aligned} \tag{4.8}$$

In this case, $S_\lambda = c^t$, and

$$r_t^S = \frac{c^t}{S_\lambda} r_t^M = \frac{c^t}{c^t} r_t^M = r_t^M. \tag{4.9}$$

It thus turns out that the rate of profit, calculated meticulously according to the historical-valuation procedure, is *exactly* equal to the material rate of profit, and rises monotonically to the asymptote Y_0/K_0 ! This follows from the fact that, while the unit value is falling, so is the *relative weight* of the early vintage capital stocks in the total capital stock. For the case in which capitalists can purchase latest-vintage capital goods for unit values determined by latest-vintage techniques, the falling “value/price rate of profit,” corresponding to the rising but presumably irrelevant “material rate of profit,” turns out to be entirely illusory.

It may be worthwhile to illustrate this result using a simple numerical example. The real wage rate is 0.5. Start with $Y_0 = 50$, $L_0 = 40$, and $K_0 = 100$; r_0 then = 0.3. If $b = 1.10$ and $c = 1.05$, we can compute the “material rate of profit” for the next two time periods:

$$\begin{aligned}
 r_1 &= \frac{55 - (0.5)42}{110} = \frac{34}{110} = 0.30909 \dots \\
 r_2 &= \frac{60.5 - (0.5)44.1}{121} = \frac{38.45}{121} = 0.317768595 \dots
 \end{aligned}$$

Next, we calculate the “value/price rate of profit.” First, we note that $K_1 = 10$, $K_2 = 11$, $Y_1 = 5$, $Y_2 = 5.5$, $L_1 = 2$, and $L_2 = 2.1$, so that $\lambda_0 = 40/50 = 0.8$, $\lambda_1 = 2/5 = 0.4$, and $\lambda_2 = 2.1/5.5 = 0.38181818\dots$. We also need the aggregate unit values: $\lambda_1^S = 42/55 = 0.76363636\dots$ and $\lambda_2^S = 44.1/60.5 = 0.728925619\dots$. Profit₁ = $\lambda_1^S (34) = 25.963636\dots$, and $VK_1^S = \lambda_0 K_0 + \lambda_1 K_1 = 0.8(100) + 0.4(10) = 84$. $VK_1^S / 0.30909 \dots$, identical to the calculated “material rate of profit” at $t = 1$. A similar calculation yields $r_2 = \text{profit}_2 / VK_2^S = \lambda_2^S (38.45) / 88.1999999\dots = 0.317768595\dots$, again the same as the “material” rate at $t = 2$.

One aspect of the imagery of the TSS falling-profit-rate argument is the notion that the profit rate is hurt by the falling unit value of sales, owing to technical change. While it seems reasonable to use average rather than marginal socially necessary labor time to value output

– this, by the way, *was* Marx's procedure – we may examine the case in which the numerator of the profit rate uses λ_t rather than λ_t^S . This inserts the factor α into the expression previously obtained for the profit rate, which we may now write as r_t , so that $r_t^S = \alpha r_t^M$. In this case, the “value/price” profit rate is less than the material rate by the constant factor α ; it is, of course, still rising steadily, to the asymptote $\alpha Y_0/K_0$. The difference is quantitatively significant: α is dominated by the ratio of the growth *rate* of L to the growth *rate* of Y ; using Kliman's assumption of $b = 1.06$ and $c = 1.02$, $\alpha = 0.35$. However, if the use of λ_t is justified for strategic capitalist acquisition of latest-vintage capital goods, it seems less so for output in general.

The TSS position is supposed to be “temporal,” and one aspect of that stance is the notion of dynamic lags (this does not appear strongly in Kliman, 1996, although it does in other publications). A lag would suggest that inputs in period t are valued at prices (unit values) determined in period $t - 1$. That this lag does not significantly alter the results obtained above can be easily seen. The one-period ratio of unit values $\lambda_t/\lambda_{t-1} = c/b < 1$ (refer to equation (4.4)). Applying this to the expression for VK_t^S (4.8), the same factor follows through; we therefore have

$$r_t^S = \left(\frac{c}{b}\right) r_t^M,$$

and once again the “price/value” rate of profit lies slightly below the “material” rate, but follows it upward over time.

We now turn to the other capital stock valuation assumption. If the unit values used in valuing the individual vintages of capital goods are the global ones determined in the period of production of those goods, rather than those derived from the given vintage itself, the calculation of S_λ changes. We now have

$$\begin{aligned} VK_t^S &= \lambda_0 K_0 + \lambda_1^S K_1 + \lambda_2^S K_2 + \dots + \lambda_t^S K_t \\ &= \lambda_0 K_0 + \left(\frac{c}{b}\right) \lambda_0 (b-1) K_0 + \left(\frac{c}{b}\right)^2 \lambda_0 b(b-1) K_0 + \dots + \\ &\quad + \left(\frac{c}{b}\right)^t \lambda_0 b^{t-1} (b-1) K_0 \\ &= \lambda_0 K_0 \left[1 + \left(\frac{b-1}{b}\right) c + \left(\frac{b-1}{b}\right) c^2 + \dots + \left(\frac{b-1}{b}\right) c^t \right] \end{aligned} \tag{4.10}$$

The term in square brackets is S_λ ; it is a convergent series, whose value is

$$S_\lambda = \frac{\left(\frac{b-1}{b}\right) c^{t+1} - (1-c/b)}{c-1}, \tag{4.11}$$

and c^t/S_λ after some simplification and using α , becomes:

$$\frac{\alpha}{1 - \left(\frac{1}{c'}\right)(1 - \alpha)}. \quad (4.12)$$

This expression clearly falls as $t \rightarrow \infty$, so the resultant impact on the profit rate depends on the relative strength of the two terms, c^t/S_λ and r_t^M (see equation (4.7)). While cyclical fluctuations are possible, the ultimate direction of r_t can be ascertained by comparing r_∞ with r_0 : $r_\infty = \alpha Y_0/K_0$; $r_0 = (Y_0 - wL_0)/K_0 = (Y_0 - \omega_0 Y_0)/K_0$, where $\omega_0 = wL_0/Y_0$, the wage share at $t = 0$. The ultimate trend in r relative to its starting point, r_0 , thus depends on the relation between α , a measure of the pace of mechanization, and the profit share at $t = 0$: the profit rate ultimately rises, remains constant, or falls, depending on whether $\alpha \gtrless 1 - \omega_0$.

In the numerical example used above, the wage share at $t = 0$ is 20/50, or 0.4, so that $1 - \omega_0$ is 0.6. With $c - 1 = 0.05$ and $b - 1 = 0.10$, α is approximately 0.5; this indicates a falling r , and r_1 is indeed 0.2962.

This, in fact, is the basis of the falling “value/price” rate of profit in Kliman (1996). From his definitions of the growth paths of the variables (his eqs. 1–4), the definition of value (eq. 5) and price (eq. 7), it is clear that when he comes to value the increments in the capital stock (his eq. 11) the elements of the capital stock are being priced using the aggregate-over-all-vintages values. Without this procedure, the “value/price” profit rate *coincides with* the “material” profit rate, as we have seen. Even with it, it is by no means clear that the “value/price” rate falls over time, as Kliman himself notes (218–219).

My main result thus far is that – with careful attention to the vintage structure, and assuming the vintages of capital goods are sufficiently distinct (as perceived by capitalists) to warrant pricing them at the individual values determined by their own productivities, rather than by aggregate unit values involving all prior vintages – the distinction between the material and value/price rates of profit disappears completely, and historical-cost valuation produces a monotonically increasing profit rate for the case under examination (in which, after all, wage cost vanishes relatively over time, and capital intensification does not take place). If, however, it is conceivable that the capital goods produced at time t are sufficiently competitive with their predecessors (and successors) so that λ_t^S is used to value them, historical-cost valuation produces an ambiguous result. For $\alpha < 1 - \omega_0$, the value/price profit rate will fall, at least eventually. Does this case finally open up space for a historical-cost valuation argument for a falling rate of profit?

In a word, no.

First, we should recall that, in Kliman's model, capital goods, once produced and installed, never leave the scene. They remain in use, and their value remains on the books, forever. Sophisticated treatments of depreciation are possible. The simplest version, however, is enough to make the point: a given and fixed lifetime of capital goods, linear depreciation, and a simple sinking fund. If the oldest vintages of capital goods are eventually scrapped after the value laid out for their purchase has been recovered, the average

productivity of the remaining set rises, and the historical-cost model gives way to a version of the replacement cost one, in which the *set* of vintages in existence at $t = 1$ replaces the *set* in existence at $t = 0$. In this case, even if we were to use the average valuation assumptions, *and* those assumptions yielded $r_\infty < r_0$ for the case in which capital goods stay in production forever, the calculated profit rate would converge toward r_t^M , and would therefore be rising. This point makes apparent the fact that Kliman's falling rate of profit is subject to correction by the capitalists themselves, who have it in their power to eliminate a certain number of the early vintages of capital goods that are weighing down the profit rate – *provided* they can absorb the losses associated with their original purchase, either by selling them on second-hand markets, or by creative refinancing, or both. (I will discuss the matter of fixed loan obligations further below.)

Even without physical depreciation of capital goods or a rising real wage rate, a case for scrapping early vintages can be made. Capitalists need two weapons in their struggle to survive and accumulate: scale, and productivity. The former is necessary to minimize susceptibility to random fluctuations by invoking the law of large numbers, and to establish economies in marketing and financial power. The latter is the key to rapid growth. A firm can achieve extremely high average productivity simply by scaling way down, scrapping a large part of its early-vintage capital stock (subject to the provisos mentioned above); but this would leave it small, and vulnerable to raiding and takeover. Alternatively, it could maximize the advantages of scale by holding on to all of its capital stocks, at a cost of lower average productivity and growth. Without formalizing the problem at this stage, it is apparent that a tradeoff exists, and that capitalists will seek some optimal point (however loosely defined) along it. This implies *some* degree of scrapping of early vintages, and therefore *some* degree of progressive approximation to r_t^M .

This argument suggests that average socially necessary labor time is determined, in the capitalist context, by the specific exigencies of accumulation. For a given rate of technical progress (which is also determined strategically and endogenously), it will be the labor time socially necessary for capitalists to succeed, and therefore embodies a socially – capitalistically – necessary scale for the individual capital.

2 How fares the Okishio Theorem?

In the contrived example of continuous technical change examined in the last section, in which the “material rate of profit” rises continuously, I conclude that the presumably more relevant “value/price rate of profit” is either identical to the material rate, or is governed by it. The question now is: what does this suggest for the TSS critique of the Okishio Theorem?

2.1 The Okishio Theorem is true

No matter how many times Kliman and other writers in the TSS camp proclaim that “the Okishio Theorem is false” – in fact, in proportion to the number of times they make that proclamation – the truth of the theorem emerges ever more clearly. Kliman himself admits

this: “My claim ... is not that the theorem suffers from a mathematical error. The relevant matrix algebra theorem of Perron and Frobenius, upon which the Okishio Theorem is based, is true” (Kliman, 1997, 1). Kliman notes that the theorem is a comparative equilibrium exercise, and as such is not concerned with dynamics. It involves a comparison between two equilibrium states, following a one-time technical change. That is one of its core assumptions. Kliman is sensitive to the distinction between refuting a theorem on its own ground, on the one hand; and deriving different results by changing one or more of its assumptions, on the other. He applies this distinction when he rejects the work of others, including this writer, who challenge (for example) the relevance of the assumption of a constant real wage rate, lamenting that this leaves the theorem intact. He, however, insists on substituting a continuous process of technical change for the one-time change in Okishio. While this is a laudable effort to examine technical change and its effect on the profit rate in a more dynamic context, it also transgresses one of the key assumptions of the Okishio Theorem; any *valid* results obtained in this context therefore augment the theorem, rather than refute it.

Kliman quite properly objects to verbal extrapolations from the theorem which casually imply that the theorem's key result extends to dynamic situations. Nothing of the kind, of course, can be assumed. The extension of the theorem to dynamics must be done formally, and with care.

If the time period within which technical changes are evaluated and introduced is progressively shortened, one might purport to generalize the theorem by treating dynamics as a sequence of short-period equilibria. Two problems arise in this connection. First, a sequence of arbitrary and exogenous technical changes reveals the poverty of this entire conception, and the need for theorization of the constraints on technical change and the endogenous choice of a technical-change path by capitalists. It should be noted that Kliman's model replaces one-time change with continuous change, but leaves technical change just as exogenous and arbitrary as it is in the Okishio original (see [Chapter 3](#) of this book). Second, if we assume (as I believe we should) that technical change takes some time to complete, then a sequence of infinitesimally small equilibrium steps does not capture key qualities of the process. We will need to study technical change choice by capitalists as determined by out-of-equilibrium positions: a process of *disequilibrium* dynamics. For this, we need at least two sectors, so that unequal profit rates and market prices diverging from production prices can be studied.[‡]

[‡] I have produced a model of this kind (Laibman, 1981; 1992a, [ch. 8](#)). Technical change choices are made separately in a capital goods sector and a consumer goods sector, with stocks of capital consisting of heterogeneous vintages. Under reasonable assumptions the economy approaches a *consistent path* along which the profit rate falls and the profit share rises. Technical change choice is affected by the relative price of the capital good, which is in general a disequilibrium price. Early vintages of capital goods are scrapped as soon as they no longer cover their wage costs. A key result is that, assuming the conditions constraining technical change choice in the two sectors are similar, the endogenous technical change process causes the compositions of capital in the two sectors to converge, and the prices of production therefore approach the labor values of *Capital*, I.

2.2 The TSS critique is irrelevant to the theorem

Kliman's falling-profit-rate model still has not come to terms with the primary motivating question from which the Okishio Theorem springs. This is the question: if the profit rate falls as a result of technical change, why would capitalists – who are surely rational within the bounds of their own production relations – introduce that change? In the section of the paper (Kliman, 1996) entitled “Micro-Enforcement of the Law,” Kliman notes that his “material rate of profit” is greater than his “value/price” rate (this, as we now know, is only true if the λ_i^S are used, *and* if $\alpha < 1 - \omega_0$, *and* if there is no scrapping of early vintages). Assume that these conditions hold, for the moment. The next-period material rate of profit will be higher than this period's, and even higher than this period's value/price rate; this is the rate that will be perceived by capitalists, whatever prices they use; “the board of directors or central planning agency would therefore always ‘give the go ahead’ to the new technique” (Kliman, 1996, 219).

In this formulation, however, the core dynamic of the Okishio process has been lost. That dynamic is the relation between the firm that holds the new technique as the *temporary* monopoly of the innovator, on the one hand, and the remaining firms, on the other. More precisely, every capital (firm) thinks of itself continually as the innovator, and must do so, even if all capitals act from this position and innovate simultaneously. The effort to capture the momentary extra profits from the position of pack-leader – the conjunctural moment – is essential to the survival of the individual capital. This is independent of whether or not the individual capitals can anticipate subsequent developments (including falling profit rates). This intense dialectic of the individual capital and capital in general, which defines the historically specific character of capitalist competition, is present in both Marx and Okishio, and absent in Kliman. The example in his Table 10.3 (220), in which a particular capital is the “innovator” and alone has the ability to innovate over time, while the other capitals never do, is entirely irrelevant to this conception.

As the phrasing of the above quote concerning board of directors/central planning agency indicates, Kliman is wedded to a conception of capital as a disembodied force that can inhabit an unlimited range of property/institutional structures at will, so that the individual-capital/capital-in-general dialectic, and indeed the entire role of *valorization* of social relations, do not exist for him. He quotes the famous passage from Marx – “Capital exists and can only exist as many capitals” – but then argues from the context of the quote that this passage refers only to the fact that competition manifests capitalism's inner laws but does not “invent” them (1996, 209). It is not hard, however, to supply a wider context in Marx for the truly dialectical understanding of value: inner relations *both appear as* outer ones, and *are constituted by* them. The dynamic of technical change, like much else in capitalist production relations, is governed by the contradictory process of interaction among atomistic units of control – the individual capitals – that gives rise to the objective process confronting those capitals as immanent laws. For textual support, we might begin with the first two sentences of Volume I of *Capital*.

2.3 TSS value theory is irrelevant to the TSS critique

Despite all of the posturing about “non-equilibrium” and “temporal” theorizing, the sequence of values (or prices) in Kliman's model is essentially a sequence of equilibrium values. To see this, we will examine the determination of value in the system, following Kliman's assumptions concerning technical change. The basic dynamic equation,[‡] in obvious notation, is:

$$\begin{aligned}
 V_{t+1}Q_{t+1} &= V_t A_t + N_t \\
 V_{t+1} &= V_t a + \left(\frac{n_0}{b}\right) \left(\frac{c}{b}\right)^t \\
 \text{where } a &\equiv \frac{A_t}{Q_{t+1}}, \frac{N_t}{Q_{t+1}} = \frac{N_0 c^t}{Q_0 b^{t+1}} = \frac{n_0}{b} \left(\frac{c}{b}\right)^t
 \end{aligned}
 \tag{4.13}$$

We then get the solution

$$V_t = \left(V_0 - \frac{n_0/b}{c/b-a}\right) a^t + \left(\frac{n_0/b}{c/b-a}\right) \left(\frac{c}{b}\right)^t,
 \tag{4.14}$$

which is virtually identical to Kliman's (5''). Kliman, however, places the two terms of this solution on equal footing, suggesting that $a > c/b$ and $a < c/b$ are equally likely. In fact, a is the material input/output coefficient, presumably significantly less than unity; Kliman uses a value of 0.5. On the other hand, c/b (using the values from one of Kliman's examples) is close to 1, on the order of $1.02/1.06 = 0.96$. The first term of the solution therefore vanishes much more rapidly than the second, and the second therefore dominates the movement of V_t over time. The first term is the complementary function, denoting movement resulting from divergence of V_0 from its equilibrium at time 0 (an unanalyzed initial discrepancy between market price and value). The second term, the particular integral of the solution, traces the decline in the (moving) equilibrium unit value itself over time, due to technical change. It is this term, as noted, that dominates the overall movement. Despite all of the protestation to the contrary, then, Kliman's model is essentially based on moving equilibrium unit values, and does not draw in any significant way on the notion of “non-equilibrium” economics.

[‡] This system involves a small correction to Kliman's eqs. (5), (5'), and (5'') (1996, 214), in which the unit value of period $t + 1$ is multiplied by output of period t . In the formulation proposed here, the material and labor input coefficients are themselves dynamic, relating inputs in period t to output in period $t + 1$.

2.4 The “expulsion of living labor” gambit

Kliman considers the case in which the actual quantity of labor in production falls over time: $c < 1$. Reverting to the pure fixed capital formulation for ease of exposition, and ignoring the niceties of time subscripts and the distinction between aggregate and individual-vintage quantities, we can examine a line of argument that has a long lineage. The profit rate is

$$r = \frac{\lambda Y - w \lambda L}{\lambda K} = \frac{L(1 - \lambda w)}{\lambda K}.
 \tag{4.15}$$

(The second equality follows from $\lambda Y = L$, a feature of the pure fixed capital case; a similar but slightly more involved derivation would apply in a case with material input flows.)

From an expression of this sort (his eq. (12')), Kliman reasons:

If $c < 1$, that is, if mechanization leads to an absolute decline in the extraction of living labor, the profit rate approaches zero over time. The numerator of [(4.15)] – the mass of profit – declines to zero as time proceeds, while the value of the capital stock and thus the denominator of the profit rate remain positive.

(217)

His general conclusion: “Expulsion of living labor through mechanization spells the doom of the system” (218).

Now, if the value of the capital stock is tracking the value of the latest vintage, through the simple weighting process when individual values are used as aggregators, or through scrapping of early vintages, or both, the unit values in the denominator are also falling to zero; in fact, they are falling at a rate $c - b$, which is greater than the rate of decline of labor, $c - 1$. Using $\lambda = L/Y$, the expression for r above is easily processed into $(1 - \lambda w)Y/K$, which (again) rises to a maximum of Y/K . This exercise, in fact, reveals the difficulty with the historical-cost procedure: with current labor declining absolutely, although output continues to rise, we are led to believe that the profit rate is falling toward zero, even though the profit share is rising and the output–capital ratio is constant. Something is clearly wrong, and rhetorical references to the “doom of the system” do not help to clarify matters.

2.5 The ultimate falling- r argument

Kliman, as noted previously, does not claim that the model we have been considering even proves that the rate of profit must fall. He does, however, make this claim on the basis of a model presented in Appendix 2, in Kliman, 1997, which is headed “Refutation of the Okishio Theorem.”

There is, indeed, considerable overkill in the attack leveled against the Okishio Theorem. In places, we are led to believe that it is internally inconsistent, despite the denial of this, quoted above. Elsewhere, its fatal flaw consists in the fact that it is “simultaneist.” Finally, in the argument we are about to consider, the problem with the theorem is that it “does not employ DVL” (DVL: “determination of value by labor time”).

I believe that Okishio is getting in our way here. The argument in Kliman, 1997, is in fact a straightforward theory of the necessity of the falling rate of profit, and should be considered as such.

The argument begins with five assumptions: (1) pure fixed capital; no physical depreciation; (2) no material input flows; (3) the real wage = zero; (4) all profit is reinvested; and (5) the labor input, L , is constant over time. Assumptions (1) through (4) assure that, in value or physical terms, (gross) output = profit = the addition to the capital

stock. The argument proceeds in value terms, for which I will adopt the most traditional notation available. Writing C for the stock of constant capital, we have the simple dynamic relation:

$$C_{t+1} = C_t + L. \quad (4.16)$$

This resolves, almost trivially, to the solution

$$C_t = C_0 + tL. \quad (4.17)$$

Forming the rate of profit at time t , we obtain:

$$r_t = \frac{S_t}{C_t} = \frac{L}{C_0 + tL}. \quad (4.18)$$

From this, Kliman concludes: “Since all terms on the right-hand side except t are constant, r_t falls continuously and approaches zero as t approaches infinity” (1997, 9).

Now at risk of being tagged with employing a “metaphysical materialist primitive” (Kliman, 1996, 211), I will seek to discover the counterpart to the above in terms of physical quantities. By the same method of addition, we can write the time path of the physical capital stock (the “mass” of constant capital, in Marx's terminology) as

$$K_t = K_0 + tY_0. \quad (4.19)$$

This implies a growth rate of the capital stock of

$$\frac{K_t - K_{t-1}}{K_t} = \frac{Y_0}{K_0 + tY_0},$$

which falls to zero as $t \rightarrow \infty$. Now if there is a fixed technical relation between K and Y , given by an output-to-capital ratio $\beta = Y_t/K_t$, then $Y_t = \beta (K_0 + tY_0)$, and

$$r_t = \frac{Y_t}{K_t} = \frac{\beta (K_0 + tY_0)}{K_0 + tY_0} = \beta. \quad (4.20)$$

The profit rate is constant through time and equal to β , as we would expect, almost by definition. Output is growing in the same linear fashion, at the same declining rate, as physical capital. Nevertheless, without technical change impacting in a biased fashion on the output-to-capital ratio, the profit rate does not fall.

To clinch this, put it into value terms. The unit value, λ_t , is $L/Y_t = L/[\beta(K_0 + tY_0)]$, which is, of course, declining over time. The rate of profit is then

$$r_t = \frac{L}{\frac{L}{\beta (K_0 + tY_0)} (K_0 + tY_0)} = \beta. \quad (4.21)$$

Once again, Kliman has lost track of the trend in the value coefficient in the denominator.

The only way to make sense of his falling-profit-rate argument is to make the implicit assumption that Y is constant over time! The profit rate, then, clearly falls to zero over time if anything out of profits is being added to the capital stock, increasing the denominator, while the numerator is not changing. Noting that

$$\lambda_t = \lambda_0 \left(\frac{Y_0}{Y_t} \right),$$

the profit rate can be written

$$r_t = \frac{L}{C_0 \left(\frac{Y_0}{Y_t} \right) + tL \left(\frac{Y_0}{Y_t} \right)}. \quad (4.22)$$

This form is closest to Kliman's actual formulation. But if Y is growing, the rise in t in the denominator is offset by the fall in Y_0/Y_t , and once again the profit rate does not fall. (Of course, the same result would follow from the more elegant assumption of constant proportional growth.)

To get his $r \rightarrow 0$ result in this example, Kliman has given up: (1) value theory in general (the exercise, in one good, does not *require* value in any sense, and the historical-cost formulation has disappeared); (2) TSS value theory in particular (as noted above, “non-equilibrium” processes, whatever these may be, are not invoked); (3) technical change (the example works with accumulation of K and Y with constant technique: just let L grow at the same rate); (4) the Okishio viability criterion (this has gotten lost somewhere); (5) simple logic: capitalists continuously accumulate capital stocks that are apparently never removed from their crates or installed, since they produce no output. Question: has it really been worth the cost?

3 Does any role remain for historical-cost valuation?

What is really at issue in the choice between historical-cost and replacement-cost valuation of capital stocks? Is some sort of synthesis of these two perspectives possible?

What matters in capitalist competition is the dynamic struggle to survive and expand. The capital stock that matters most for the rate of profit that matters most (for future accumulation) is one valued at its *expected replacement cost*.[‡] When productivity increases cheapen the replacement for an existing machine that was purchased earlier for more money, that machine is subject to Marx's “moral depreciation”; in his terms, constant capital is cheapened – something that he saw as a partial offset to the tendency for the composition of capital to rise. The *potential* profit rate has *risen*, and if one capitalist does not get that rate, its competitors will. This is simply an application of the proposition that it is the social, not the individual, situation that determines value.

[‡] This invocation of expectations in no way represents a subjective or arbitrary element. If an individual capitalist is to

survive, its expectation must be borne out by objective developments. The point is that a capital will try to anticipate technical change, and the associated moral depreciation of its capital stock.

Now there is the undeniable fact, mentioned earlier, that the financial aspect of capital may come into conflict with the production aspect, in possibly significant ways. The capitalist that has borrowed to purchase a machine that is now depreciating morally must repay the actual loan that was originally contracted. Its creditors will not be satisfied with a reduced repayment schedule, because they are told that newer machines can now be purchased for less money! In a period of rapid technical change – and especially in one of *unanticipated* change – we may well imagine that a conflict arises between the book, or historical, rate of profit, on the one hand, and the potential, or replacement-value, rate of profit, on the other. This conflict may lead to foreclosure or bankruptcy of the firms most severely affected by it, especially at moments of cyclical crisis. This, I believe, is the core of truth in the historical-cost conception.

The ability to repay loans, however, depends on a capital's success in the competitive struggle to accumulate. *Dynamic collateralization* – the power to roll over debt, and eventually pay it down – is determined in large degree by creditors' perceptions of the ability of a firm to compete in the present for profits. This means having cutting-edge productivity, growth, and market potential – in a word, *keeping up with technical change*. The specter of a firm having to repay old loans out of earnings from production involving rapidly obsolescing capital goods is precisely a vision of the situation facing a capitalist that is not keeping pace; this capitalist of course faces a fall in its profit rate that is peculiar to it.

Successful capitalists do not face *this* fall in the rate of profit, precisely because they are able to use their financial and borrowing power to scrap (or sell off) old vintages and keep the average productivity of their capital stocks rising toward (although always lagging somewhat behind) the productivity of the latest vintage. A model of *instantaneous and total* replacement of early vintages by the latest vintage undoubtedly exaggerates the profit rate, which, as noted earlier, is held down to some extent by the need of the individual capital to maintain scale and therefore keep superseded capital stocks in place. There should be no doubt, however, that replacement value, perhaps conceived as a moving average of the values of some grouping of the most recent time periods, is the key to the real growth that is measured by the profit rate, and that the replacement-cost profit rate is accordingly the most appropriate measure of the profit rate that matters.

To base a theory of the falling rate of profit on capitals that confront the historical cost of their capital stocks as a dead weight is, quite simply, to miss the track of successful accumulation. This is precisely what the historical-cost theorists do: they chart the fall in the rate of profit of the marginal firms that are heading for bankruptcy or takeover. Just as the deepest analysis of capitalist exploitation reveals the production and appropriation of surplus value in the strong case of full effectivity of the law of value – i.e., with all purchases and sales of goods taking place at their benchmark (dare I say “equilibrium?”) labor values – so a truly essential theory of the falling rate of profit must examine the strong case of successful accumulation, and not rely on the obvious nose-diving profit rates of those

capitals destined to be destroyed/absorbed in the accumulation process.

The successful capitals – not the absolute front-runners, or “innovators,” but the main stream of capitals – can replace obsolescing capital stocks with latest-vintage ones, use the power thus afforded them to roll over or repay old loans (at full value), and still compete for market shares and accumulation against all comers. These capitalists have, of course, higher profit rates than the losers. The question is: does the process of technical change and accumulation lead to a fall in *their* profit rates over time? The relevant profit rates for this, truly relevant, analysis will be based on capital stocks valued at replacement cost – at least, the cost of a minimum-scale average of the latest vintages. This cost, incorporating changes in productivity, reveals the true expansion potential, and therefore the real competitive positions, of the capitals in question.

The historical-cost argument, therefore, with its projection of rising-but-illusory “material” rates of profit and falling “value” or “value/price” rates of profit, and its mechanistic projection of profit rates inevitably falling toward zero, is not only illogical at its core. It is also a diversion from the real task of determining the conditions in which a dynamic path of biased technical change will be undertaken by rational, competing capitals, and the implications of that bias for critical processes – including (but not limited to) a tendential fall in the profit rate.[‡] By this standard, models that posit exogenously given increases in mechanization and productivity, with a constant capital–output ratio, that ignore the conjunctural innovation/imitation dialectic, and that fail to grasp the real production relations of successful capital-stock renovation and replacement, do not even step into the starting gate.

[‡] This complex of issues is explored in my book, *Capitalist Macrodynamics: A Systematic Introduction* (1997). There the reader will find a model based on the central importance of replacement cost valuation, in which technical change is endogenous and results in a rising capital–output ratio, and in which – given this bias in technical change and given a dynamic and relational view of the labor market in which unemployment affects the wage *share* of output – the rate of profit falls tendentially. I believe that the Okishio Theorem is therefore consistent with a theory that deduces a falling rate of profit as an immanent aspect of capitalist accumulation, despite Okishio's own view that his result was destructive to Marx's “Law of the Falling Tendency of the Rate of Profit” (see Okishio, 1961, 95).

4 A continuing debate

In a response to the argument of the first section of this chapter, Alan Freeman and Andrew Kliman (hereafter FK) produced a spirited defense of their “TSS” (“temporal single system”) paradigm (Freeman and Kliman, 2000), but in the process have again failed to address the core of my criticism of their work. I will discuss here what I take to be the central issue: their *dualistic* bifurcation of capitalist reality into independent “material” and “value” realms. This section will then offer some comments on ideology, Marx, Marxism, and (once again, unfortunately) the Okishio Theorem.

FK assert that temporalism plus determination of value by labor time together determine a law of motion for the *value rate of profit* (r_v) entirely separate and distinct from the movement of the *material rate of profit* (r_m). The latter variable reflects the trajectory of labor productivity and material input per unit of output in the course of technical change; the

former, however, pursues its own completely independent path. While FK are at pains to insist that they do not maintain that r_v *must* inevitably fall, their examples invariably show r_v monotonically falling, while r_m is monotonically increasing. They in fact keep a double set of books: one contingent set in which anything may happen, and in which value, material, and money rates of profit are all present and mutually defining of capitalist reality, on the one hand; and one that offers an apocalyptic vision in which the illusory “material” variables hold sway over capitalists (and their economists, including “Marxists”), while the real working of history – presumably to become effective at some dramatic future moment – is found in the subterranean world of value. Fatefully, the value rate of profit pursues its own course, independent of whatever happens in production: productivity growth, mechanization, etc.

I am probably not wrong in thinking that a typical first reaction to this will be: are they serious? Do they really believe it? Do they really expect anyone else to believe it? The answers are yes, yes, and yes. With reference to what I will call their baseline example (2000, 252), they state: “Since the ... value relations have been determined without reference to any physical quantities or techniques of production, they are compatible with *absolutely every* possible path of technical innovation” (italics in original). This is a wondrous world, indeed. If the path of the value profit rate (the one that presumably matters) is not affected in the slightest by changes in productivity, for example, capitalists can relax, stop trying to intensify production, let the workers take 30-minute coffee breaks every hour, etc. It might even be fun to be a proletarian in a FK capitalist economy.

But before we get carried away, let's examine the baseline example carefully. There is, as before, only one good. All capital is circulating (a strange assumption for anyone interested in temporal dynamics, but I follow FK entirely here). The wage is zero; we are examining, in effect, the maximum rate of profit. These assumptions will be maintained throughout this section. The example, however, makes several additional strong assumptions; I will relax these in turn. They are: (1) the quantity of current labor is constant; (2) all net product (= profit) is invested, i.e., used to expand material input in the next round of production; (3) *net* output grows at a constant rate (in the example, 50% per period); and (4) the *production* cycle or turnover period is exactly equal to the *technical innovation* cycle: i.e., new techniques appear with the same rapidity as rounds of production and sale of goods.

Assumptions (1)–(3) together place a severe constraint on the path of technical change. The *initial* output-to-capital ratio happens to be just the one needed to accommodate the material input deepening resulting from technical change, with a constant labor force and all output invested. The ratio of material input to labor, and the ratio of gross output to labor, must then both grow at just such rates as make possible continuing constancy of the labor force, and growth of net output at exactly 50% per period. In the example, “seed corn” (I will call this M rather than K , which is usually reserved for capital *stocks*) grows by 20% in period 1, and by 25% in period 2. Gross output grows by 25% in period 1, and by 30% in period 2. The sequence continues, with a one-period lag in the growth rate of M ; both rates approach 50% asymptotically. The material rate of profit approaches 50% (as FK indicate),

and the value rate approaches zero (their point).

Now while it is possible to find other material paths that support this value path (FK do just that), it should also be obvious that the value path in question is highly artificial. A particular (M^*, X^*) sequence has been assumed (using asterisks for growth rates). This sequence, and not the (constant) Y^* , is the heart of the path of technical change; it is after all gross output, not net output, that is *produced*. Suppose the capitalists in this story had slightly stronger exploitative animal spirits! They are able to push the workers a bit harder, thereby achieving an additional five percentage points of growth in X in each period: instead of $(0.25, 0.3, \dots)$, X^* follows a path that begins $(0.3, 0.35, \dots)$. (This is not an extreme assumption, given the huge growth rates assumed in the baseline example.) We calculate $r_m(t)$ as $Y(t)/M(t)$, $r_v(t)$ as $L/\lambda(t-1)M(t)$, where $\lambda(t-1) = W(t-1)/X(t-1)$, to be temporally correct. Of course, this means that there will be some extra output in each period after $t = 0$ that cannot be absorbed as inputs in production; we will assume capitalists consume it, thus violating assumption (2). We then find trajectories for the two profit rates (see [Table 4.2](#)).

The material rate rises, of course, since X^* is always ahead of M^* . The value rate first falls, but eventually *rises*. The simulations show r_v rising steadily after $t = 3$, reaching almost 60% of the level of r_m at $t = 50$.[‡] As long as some space opens for consumption out of surplus value, apparently r_v eventually follows the trend of r_m . This is what I call “tracking”: the behavior of the “value” rate of profit *ultimately* follows, or tracks, that of the “material” rate of profit.

[‡] All simulations were run on the CUNY IBM mainframe system, using PL1.

If M^* is increased from the FK baseline example by only one percentage point, the result is the same: r_m rises steadily from 0.2, while r_v first falls to 0.086 in period 12, and rises thereafter. I will only mention here my result for the alternative way of adjusting the model for “extra” X growth: keeping the all-output-invested assumption, but allowing the labor force to vary. In this case, the result is the same: r_v first falls, but then follows r_m upward.

Of course, these examples with variable growth rates of M and X are rather strange; I only use them to conform with the baseline example provided by FK. A more reasonable approach is to assume constant proportional growth over time in both M and X . Using, for example, the growth rates from the FK example for $t = 1 - M^* = 0.2, X^* = 0.25$ – we find r_m rising steadily (of course), and r_v falling from 0.2 to 0.141 at $t = 4$, then rising steadily. *The value rate tracks the material rate.*[‡]

[‡] I should mention here that I am using the FK terminology, in particular their distinction between “material” and “value” rates of profit, only in order to pursue their argument on its own terrain. All rates of profit, whatever the temporal assumptions used to define them, can be calculated either as ratios of physical quantities (what FK mean by “material”) or as ratios of the corresponding value magnitudes. In multi-commodity worlds, of course, the physical-quantity calculation cannot be made, except at strategic standard proportions (see Sraffa, 1960, chs. 5–6). The FK “value” profit rate is distinguished from their “material” rate by the presence of a one-period lag, presumably reflecting the temporal nature of production. More complex

multi-period lags are possible, and the simultaneous case (the FK “material” rate) is, arguably, a useful benchmark revealing the underlying structure of the economy at a moment in time, as indeed suggested by the Tracking Theorem (see below).

Table 4.2 Profit-rate time paths: a particular case

t	r_m	r_v
0	0.200	0.200
1	0.300	0.167
2	0.404	0.149
3	0.507	0.140
4	0.608	0.147
5	0.703	0.160

When the material rate rises to an asymptote, however, the value rate does fall to an asymptote. That is a second “moment” of tracking: long-run constancy of r_m implies long-run constancy of r_v . Moreover, in either the rising r_m case or the constant r_m case, the value rate always stays below the material rate; it never, in any of the simulations I have studied, converges upon the material rate. (I will discuss briefly the special “marginal valuation” case in which $r_v = r_m$ below.) Temporal (time-lagged) value calculation *does* produce a real divergence between the two rates, although *not* one that supports a secularly *falling* rate of profit.

It should be mentioned here that all of these cases fall short of an adequate one-good growth model. Arbitrarily changing M^* and X^* from period to period, to fit a preconceived constant Y^* and maintain “maximum accumulation” and constancy of the labor force, obviously will not do. But the somewhat superior assumption of constant M^* and X^* , together with constant L and constant wage ($= 0$) imposes arbitrary (and arbitrarily varying) consumption out of surplus value. A full treatment, closer to adequacy within the confines of the aggregative model, would have a given capitalist consumption ratio, a given growth rate of the labor supply, labor demand varying with the path of technical change and determining the wage rate, and – most significantly – a mechanism determining capitalists’ optimal choice of a degree of mechanization and path of technical change (see Laibman, 1997, for a detailed exposition of a model of this type). The cases examined here suffice, I think, to refute the FK notion of “two laws of motion” of entirely independent material and value realms.

If, however, we enforce the extreme assumptions of the FK baseline example – all output invested, constant labor force, constant growth rate of net output – then r_v not only falls to an asymptote; it falls to a *zero* asymptote. This is the paradigmatic TSS case. Can it support the claim (made by FK in *some* contexts) that the value rate of profit necessarily falls? Hardly, because of the unreasonable restrictiveness of the extreme assumptions just listed. Moreover, we have not yet examined assumption (4): that the production turnover period is the same as the technical change period. In all of the examples studied thus far, productivity and the material-to-labor ratio both rise in every production cycle.

This is in fact the main basis for the apparent temporal drag: regardless of current productivity, the profit rate must be determined in relation to the value that was paid for the material inputs in the past. Capitalists can never take advantage of the ever-higher levels of productivity, because the year-ago transactions hang over their heads. Even though in this pure circulating capital world every input in production is entirely replaced in each period, the value of constant capital reflects last year's reality, and last year's reality reflects that of two years ago, in a sort of infinite regress weighing down the current value rate of profit.

But suppose capitalists can replace their material inputs *more than once* within the current state of technique. Each replacement, with no technical change occurring, will bring the value of material inputs closer to the unit value calculated simultaneously on the basis of the latest levels of productivity. It is reasonable, I suggest, to assume that the production cycle is shorter than the period in which technical changes can be achieved in the laboratories and brought on line.

To study this possibility, we begin again with the FK baseline example, with L constant, all output invested, and Y growing at 50% with each technical change. We now, however, assume that a production cycle takes four months, while technical changes take one year to implement. The periods t now represent four months, and three periods pass before a growth spurt in M , X , and Y takes place. The first technical change occurs after just one period, which therefore represents the last trimester of a technical change cycle. The results are as shown in [Table 4.3](#).

When a new technique is introduced, r_v immediately drops. In the second and third trimesters of the technique, however, it rises steadily; in the absence of further technical change it would converge to r_m . By $t = 3$, r_v rises back to 0.189, less than the pre-technical-change rate of 0.200. But in the second technical change cycle, r_v finishes at 0.197 (at $t = 6$), higher than the 0.189 at $t = 3$, before the second round of technical change is introduced. At $t = 9$, r_v first surpasses the original rate of 0.200, and by $t = 14$ it has done so permanently. The value rate of profit follows a “scalped” path, whose trend is undeniably upward. This result holds as long as the production period is less than the technical change period (I have results for production periods of one month, two months, and six months), allowing firms to capture some of the benefits of technical change in the form of reduced value of inputs, despite the strict temporal accounting of value.

This case is the core of my critique of the TSS enterprise, and FK have still not responded to it. *Even if* the production and technical change periods were equal in length, the potential of the newest productivity levels would be sufficient collateral to roll over past obligations, which are in fact of vanishing significance in a circulating capital world in any case. The “material” rate of profit is the measure of capital's *potential for expansion*, and is therefore the most significant indicator for crisis of accumulation. Any sensible theory of the falling rate of profit must apply to it, and not to the “value” rate.

Table 4.3 Profit-rate time paths: a short production cycle

t	r_m	r_v	t	r_m	r_v
0	0.200	0.200	13	0.418	0.193
1	0.250	0.167	14	0.418	0.229
2	0.250	0.179	15	0.418	0.264
3	0.250	0.189	16	0.442	0.209
4	0.300	0.159	17	0.442	0.249
5	0.300	0.179	18	0.442	0.288
6	0.300	0.197	19	0.460	0.223
7	0.346	0.165	20	0.460	0.307
8	0.346	0.190	21	0.460	0.307
9	0.346	0.215	22	0.472	0.235
10	0.386	0.177	23	0.472	0.280
11	0.386	0.208	24	0.472	0.322
12	0.386	0.239	25	0.481	0.244

In view of the persistent misrepresentation of my argument (of which more below), I would like to state my results in the form of a theorem.

Temporal-Value Profit-Rate Tracking Theorem. In a one-good world with a constant wage rate, the following hold:

- a If the material rate of profit rises unboundedly, the value rate of profit may first fall but eventually follows the material rate upward, also rising unboundedly, without converging upon the material rate.
- b If the material rate rises to an asymptote, the value rate either falls to an asymptote or first falls and then rises to an asymptote permanently below the material rate.
- c The value rate falls to zero only under extreme and unlikely assumptions: all output invested, constant labor force, material rate rises to an asymptote, and the production turnover period is equal to the technical change period.

Homo Polemicus. FK (2000) is awash with misrepresentations. Duncan Foley and I (here, of course, I speak only for myself) are told we recognize the possibility of a falling r_v as a “new theoretical discovery,” that we have “confirmed [TSS] results [as] valid,” that I “now *accept* the argument made in the TSS literature that prices are determined temporally,” etc., etc. In Laibman, 1999a,b I adopted many TSS assumptions (as I have here), precisely in order to show that they do *not* confirm the programmatic TSS results – a strategy of immanent critique.

FK (2000) also err in supposing that I merely claim to have found a counterexample to a *necessarily* falling value rate of profit, no proof against their position which is only that r_v

can fall. As I have tried to make finally clear, the Tracking Theorem proposes that r_v must eventually follow the trend r_m . FK cannot quite grasp this; they paraphrase me as saying that “if the material rate rises ... the value rate must rise as well,” leaving out an absolutely essential “eventually” between “must” and “rise.”

The TSS authors now assert that their refutation of the Okishio Theorem means only that “viable innovations *can* lead to a falling uniform rate of profit” (italics in original). Despite the existence of some passages to the contrary, the entire weight of their argument, as summarized in the example of the last section, has been in support of the proposition that the *value* rate of profit falls, monotonically, to zero. The new insistence on a much more provisional conclusion is another example of the double set of books being kept.

The issue of the Okishio Theorem looms large in FK's minds. They devote many words to quoting various statements of the Theorem and claiming that their results disprove it. I will address the ideological significance of the Theorem once more (below), but here I simply wish to restate (without repeating) my argument on this, and to note that once again FK have not come to terms with that argument. I “restate without repeating” as follows.

The material rate of profit (as I think we all agree) is the same as the rate of profit calculated simultaneously, with inputs and outputs assigned the same unit values; r_m is equivalent to the equilibrium or benchmark rate of profit resulting from convergence to a common unit value (scalar or vector), in a passage of theoretical time in which the social-technical conditions of production remain constant. *In the TSS lexicon* (no kudos to me, please, for “accepting” this distinction, let alone for “having the courage” to do so), the Okishio Theorem can be stated this way: if a viable technical change is made, and the real wage rate is constant, *the new MATERIAL rate of profit must be higher than the old one*. That is all that Okishio, or Roemer, or Foley, or I, or anyone else has ever claimed! *No* examples of a falling *value* rate of profit – whether realistic or not, generally applicable or not – have any bearing on the Theorem; they most certainly do not “refute” it. Will FK finally address this issue squarely? They enumerate the “premises” of the Theorem as “uniform profitability, viability, and constancy of the real wage rate,” but this leaves out one crucial premise: *simultaneity*, or full convergence. “Counter-examples” to the Theorem that violate that final premise, by focusing on a totally *different* profit rate r_v , simply do not meet the conditions of the Theorem. The Theorem stands.

In Laibman, 1999a (see above, this chapter), I identified one case that is special. That model had vintages of fixed capital, and the (temporal) value of the capital stock was calculated using what I called “marginal” unit values – unit values derived only from the latest-vintage technique. This requires that we imagine that the general output of a period is *purchased-and-sold* at the average unit value – the socially necessary labor time across all vintages – while the portion added to the capital stock is *purchased-and-sold* at a different, lower, unit value. This was an attempt to come to terms with the fact that new techniques of production embody qualitatively new *types* of goods; that all of our efforts to come to grips with technical change must press quite hard against the limitations of a one-good model. Under the stated assumption, the value and material rates of profit *coincide* – a result that FK

find highly distasteful and continue to try to discredit. It is not, however, essential to my argument, which is much more general. FK conclude that “once we prevent profit from arising by selling dear and buying cheap” – their bizarre interpretation of this case – “the actual rate of profit no longer tracks the material rate.” This demolishes a straw notion of “tracking” – *identity* of r_v and r_m – as the entire discussion of this issue above should now make clear.

FK think the Okishio Theorem is an attack against Marx; that if it stands the entire structure of Marx's theory of capitalist crisis comes crashing down. They therefore pose as defenders of “Marx's insights,” and make references to “prejudice against Marx” in a context where it is clear that that “prejudice” is also to be found in the work of Foley and myself. This is both guilt by association and credit by association.

Whatever the merits and faults of particular approaches, I must again make clear that my own work on the theory of accumulation and crisis is intended to be based firmly on the work of Marx. I in fact have proposed a model of accumulation in which the benchmark path, called the “consistent path,” embodies a rising composition of capital (one of *Marx's* concepts that has no place in the TSS literature), a rising rate of exploitation, and a falling (material) rate of profit (see Laibman, 1997; [Chapter 3](#) above). It is for others to judge whether or not my attempt is successful, and whether or not it draws in a meaningful way on the work of Marx, and therefore rests in the Marxist tradition. FK, however, repeatedly imply that in refuting *their* version of a falling rate of profit I (and others) are denying the relevance of the concept as such. That is unwarranted. For their part, since they claim to be defenders of the long-oppressed true Marx, they should cite at least *one* passage from Marx that draws a distinction between a “material” and a “value” rate of profit,[‡] or asserts the superiority of sequential, or temporal, calculation of value over simultaneous calculation. I believe they cannot do so. Let me be clear. I *know* that there are no references in Marx to a “consistent path.” FK, despite indignant denials, appeal repeatedly to textual authority, and make the presumptuous claim that *they* are the guarantors of Marx's “true insights”: I do not.[‡]

[‡] It is strange that the word “material” (in “material rate of profit”) should come to acquire a pejorative sound. “Material” is a profoundly Marxist category, embracing the technical, the social, and the historical; it seems to be an excellent label for a well-defined rate of profit. The fact that monetary rates of profit vary in relation to the material rate for all sorts of contingent reasons is clear, and clearly without implications for the *general* theory of the trend in the profit rate.

[‡] One must also wonder at the paucity of insight in these “insights.” We are treated to a “Marx” in which value, that quintessentially social category, is oblivious to the material social process; in which technical change is irrelevant to accumulation and crisis; in which the composition of capital and relations of production (the class balance of forces) play no role in the trajectory of the rate of profit. One looks in vain for a hint of *capitalism* in the TSS theory of the profit rate. I believe the Marxism of the twentieth century, whatever its faults, is highly preferable to this “Marx” without Marx.

There is something sad about FK's concluding discussion. They deny the charges of scholasticism and orthodoxy leveled against them, but then “plead guilty” to believing that “what happened in the last century was not progress but regress.” They are for Marx, but against everything done by Marxists since Marx. They attribute to “Foley and Laibman” a “highly technical and esoteric reinterpretation of Marx as a dualist equilibrium theorist.”

This, of course, is nonsense. The real, almost Manichean, dualism lies in setting up equilibrium/simultaneous calculation *against* non-equilibrium/temporal calculation as rival and mutually exclusive alternatives, rather than seeing them as complementary methods for grasping a complex reality that exhibits both homeostatic–preservative and critical–transformative tendencies.

FK insist that Marx's project was to identify the immanent barrier to capital within capital. “Falling values impede the self-expansion of value – i.e. lower the rate of profit – and annihilate existing wealth, factors that in turn provoke slumps in material production.” (Notice that here the contingent posture – viable technical changes *can* lower the rate of profit – is gone.) I share this positive sense of Marx's project (although I would formulate it somewhat more broadly). But FK then state that “orthodoxy, buttressed by the Okishio Theorem, says he [Marx] could not be right.” Again, this is nonsense. The Okishio Theorem does not prevent us from theorizing and studying the immanent barriers within capitalist accumulation; it only sets certain guidelines and requires us to establish carefully the relation between macro trends and micro behavior. And *Marxism* would never make progress if the issue were conceived in the narrow terms of whether “Marx is right” or “Marx is wrong.” Please. If Marx were alive today, he would probably be intervening in this discussion with a position different from all of ours! And no one would be deifying him either.

5 Is there a classical theory of supply and demand?

Introductory perspectives

Perhaps the most deeply rooted ideological device in all of economics is the sense that all economic phenomena are composed of, and reducible to, the simple binary of “supply” and “demand” – akin to the almost religious significance attributed by the Italian mathematician Giuseppe Peano to the binary number system, in which everything that exists in the universe can be built up out of 0s and 1s. It is a long way from the world of classical political economy, in which supply and demand were market forces that reflected the deeper anatomies of social class, the property system, law, technology, and psychology, to the voracious abstractions that these concepts became later.

In that later view, supply came to represent the objective side of the paradigm of rational choice, or constrained optimization: the set of circumstances, in the form of given resources (raw materials) and technologies for transformation of those resources into products, that exists independently of consciousness or desire at a moment in time. Demand, in turn, stems from the subjective side – the utility function according to which outputs are transformed into utility, the economists’ abstract index of well-being or welfare. Rational choice is maximization of utility (demand) as constrained by the objective circumstances surrounding production of the goods that are the inputs into utility (supply). This is, quite simply, all there is. It can take varied, and complex, institutional forms, but the problem of rational choice – constrained optimization – precedes and transcends all of those forms, and so constitutes the essence of economics.

Once you get enmeshed in that way of thinking, it becomes difficult to see anything in terms of social relations, especially those involving conflict. If the economic system is a vast mechanism for transmitting signals and prompting actions among agents who are part of a *single*, vast system of optimization, then surely rationality dictates that optimization of each local component of that system is in the interests of the whole. If you are a worker, you *want* employers to maximize profits! Unless they do so, their inefficiency will reduce your own range of choices and force you to sub-optimize. Employers, in turn, *want* workers to succeed at their own game: equating marginal productivity to the wage is efficient from the standpoints of both sides of the labor market. It is a wonderful world, indeed.

In (I think) 1970 (40 years ago!), there was a huge strike of workers in the US electrical

industry. I remember wearing a button that said: “Support the GE Strikers!” My mistake lay in wearing this button in the economics department at a college of the City University of New York. The reaction was palpable. Here was a *professor* who apparently did not know how the *science* of economics was supposed to work! One person confronted me: “Don't you realize what you are saying? If those people [it is always “those people”] win their wage demands, costs will go up. Unemployment will increase, and so will the price level. Surely you understand that?”

Well, *will* they? How *do* supply and demand work?

On the subject of unemployment, I refer the reader to [Chapter 8](#) of this book; even on the austere terrain of orthodox macroeconomics, the effects of changes in the wage in a crucial industry on the overall supply of and demand for labor are far from certain. But what about prices?

[Chapter 1](#), on the theory of value, can also serve as an introduction to classical price theory for readers not already familiar with that subject. Suppose the workers at General Electric win a significant money wage increase (at least for a period before the price level catches up). Here is a question that orthodox supply and demand theory does not make it easy to answer: to what extent will that increase serve a *demonstration role* for workers throughout the economy? To make the argument work, suppose that it does serve that role. Then *one* result of the wage increase achieved by collective bargaining in one industry will be to strengthen workers across the board. If that in turn results in a general wage increase, will prices rise as a consequence? David Ricardo – whose work was perhaps the high point in classical economics – famously showed that relative prices in some industries will actually fall! Industries that have a relatively large proportion of physical means of production (fixed capital) to labor will *benefit* from a general wage increase in comparison with other industries, and will experience competitive pressures resulting in a falling price of their output – the “Ricardo Effect.” So there will be a reshuffling, not a general increase, in relative prices. How will that appear at the level of money prices? That may well depend on monetary policy, and here the GE workers learn that their welfare depends on decisions made by portions of the capitalist class other than the one they are able to confront directly in negotiations.

But if someone thinks that the supply curve is based on the cost curve, and that the rise in wages at GE shifts that company's cost curve (and therefore price) upward, I must remind him/her that, according to Alfred Marshall and the entire tradition in microeconomics following from his work, the cost curve includes the *implicit cost* of the *normal profit* that firms throughout the economy have come to expect from their operations. So if the GE strike outcome affects that expectation throughout the economy, the lowering of expectations of profit would shift that most suspicious of economic functions, the “supply curve of capital,” downward, and the net effect of the wage increase and the profit decrease is indeterminate. Even in these standard microeconomic terms, the outcome on the equilibrium price of the product of GE, or of the electrical industry overall, is uncertain. Once again, I think I was entitled to wear my working-class button, even in such an unlikely place as a department of

economics.

In any case, this makes me want to take another look at the classical economists, to see whether they do indeed have a way of using the concepts of supply and demand that may be superior, from the political economy standpoint, to that of the present-day neoclassical orthodoxy. Can (should) the underlying technical and social forces involved in formation of the benchmark money price based on the price of production – the capitalist form of *value* – be separated from those that shape the reaction of firms to deviations of market price from the benchmark price? If so, the symmetry between “supply” and “demand” will be broken, but that is presumably a good thing, if economics is to work in the service of political economy and not as an obstacle to it, as argued throughout this book.

This chapter first appeared in a *festschrift* for Edward J. Nell, my teacher at the New School Graduate Faculty, PhD Thesis supervisor, and eventual collaborator. I mention this here to explain the reference at the beginning of the chapter, as well as to note, again, the importance of Ed's influence for my intellectual development, even though he and I came at the field from different angles.

For this chapter, you need to understand the core of classical price theory; refer to the discussion of the Ricardo Effect above. Also, my effort to provide a foundation for the classical equation for market price draws on ordinary differential equations, and (as in the case of difference equations in [Chapter 4](#)) I must defer to the textbooks (namely, Chiang and Wainwright, 2005, chapter 14). Marx knew a great deal about the philosophical foundations of calculus, but he didn't use it in his political– economic work, any more than did Ricardo. Thank goodness they left something for *us* to do.

As an undergraduate stripling, visiting at Ruskin College, Oxford, for the 1962–63 academic year, I attended the lectures of Sir Francis Seton on “Supply and Demand.” I remember being fascinated by the logical elegance of intersecting upward- and downward-sloping curves, and especially by the cobweb dynamics (*how* did he make it go inward one time, and outward the next?). I also remember meeting Seton in the vestibule after the first lecture and exchanging courteous nods as we passed. At the time, of course, I had no idea who this was; the Francis Seton of “The Transformation Problem” and “Aggregation in Leontief Matrices and the Labor Theory of Value” would not begin to be accessible to me until several more years had passed.

At the same time, and unbeknownst to me, Ed Nell was doing research at Oxford. Our paths would cross much later at the New School Graduate Faculty, where Ed taught his students (myself included) to cite a favorite maxim of an intellectual forebear of us both: *de omnibus dubitandum*. Even something as prosaic and obvious as a pair of intersecting supply and demand curves, representing the essential properties of a competitive market for a commodity, was worthy of critical reexamination. In fact, the orthodox theory of markets as the locus of confrontation between two opposed counterfactual relations between price and quantity was certain to come under the critical microscope, since the Cambridge Criticism – the organizing concept for the first generation of graduate students who came under Ed's influence – had revealed the immanent logical incoherence of the supply–demand approach

to choice of technique and income distribution in capitalist market economies (see Nell, 1972; Laibman and Nell, 1977). The revival of classical economics in reaction against neoclassical orthodoxy posed the question clearly: is there a *classical* theory of supply and demand in *goods markets* that can be contrasted with the ubiquitous curves of the mainstream textbooks? In other words, are the neoclassical supply and demand schedules acceptable, *apart from* their (mis)use in the context of “factor” markets, or are they inherently invalid or at least inferior to some classical alternative?[‡]

[‡] It is impossible to overestimate the reach of the neoclassical paradigm. When I mentioned to my wife, Marcia – who never studied economics in college – that I was writing a paper with the working title “Supply and Demand,” she immediately quipped: “You *do* tend to focus on novel and obscure topics, don't you?” Then she added: “I suppose there must be something new to say about supply and demand curves.” Where did “*curves*” come from?

Piero Sraffa had of course developed his immanent critique of Marshall using the counterfactual[‡] curves approach (Sraffa, 1926), as Marshall had been one of the originators of that approach. The later Sraffa of *Production of Commodities* (1960), however, leaves one in doubt about this. There is, moreover, some evidence that Sraffa himself, at least from the 1930s on, had serious questions about the Marshallian apparatus. We find Joan Robinson writing to R.F. Kahn in 1933: “Piero has just sent back the proof of book III [of *The Economics of Imperfect Competition*] which I sent him. He can't swallow the modern demand curve, but otherwise makes no big point, some useful minor ones” (cited in Marcuzzo, 1999, 16).

[‡] “Counterfactual” in this context means “composed of a set of hypothetical associations,” of the sort “If the price *were* p_1 , quantity demanded (supplied) *would be* Q_1 ,” etc.

In this short chapter, I will do three things: (1) show that the Marshallian crossing supply and demand curves may be inconsistent with classical price theory in particular cases, and therefore cannot be reconciled with that theory in general; (2) consult key passages from the classical literature that suggest an alternative way of conceptualizing the forces of supply and demand; and (3) outline a formalization of the classical conception – or at least one interpretation of that conception – that resolves some of the obvious problems arising from simple interpretations of those passages. The concluding section sums up, and asks whether one of the casualties of this investigation may be the assumption of *symmetry* in the working of the two forces. In short, if the classical approach has any merit, it may turn out to be in its identification of specific ways in which the forces of supply and demand differ from one another in their modes of operation, reflecting different social processes and structures.

1 Supply and demand curves: the classical interrogation

Despite the elegance of its general equilibrium counterpart, partial equilibrium has been the main carrier of the neoclassical story and the source of its ideological persuasiveness, especially at the undergraduate instruction level and in the popular press. Since Sraffa's famous assault on the Marshallian theory of the firm, however, a significant body of criticism

of the partial equilibrium story has emerged. The upward-sloping supply curve requires assumptions about returns to scale that undermine the independence of the demand and supply curves and the uniqueness of equilibrium (Sraffa, 1926). The rising portion of the long-run average cost curve, and with it the equilibrium of the firm and the conditions for endless perpetuation of “perfect competition,” has no noncircular theoretical justification. Absence of a theory of “normal profit” deprives the long-run equilibrium price concept of theoretical determinacy (see Robinson, 1971).

But let us temporarily clear away at least some of this mess, by assuming constant returns to scale external to the firm and a horizontal long-run supply curve – what the early Sraffa considered to be a necessary revival of the classical theory that rendered price independent of demand. Given what we now know about the eigenvector properties of the classical price system (see Kurz and Salvadori, 1995), can this image of a horizontal supply curve determining price and a downward-sloping demand curve determining equilibrium quantity be sustained?

There is, I think, good reason to believe that it cannot be. The point can be made by means of a simple counterexample – a case in which certain properties of the supply curve–demand curve construction cannot hold. It takes only one example to suggest others and establish the generality of the difficulty revealed.

Imagine a classical equilibrium in Marshallian form, as described above (see [Figure 5.1](#)), but imagine that the output in this market, X , is a wage good – a good that figures prominently in the consumption of wage earners. Next, postulate a general increase in money wages. Various assumptions about the price level are possible, but it is reasonable to suppose that the rise in the *money* wage rate entails a rise in the *real* wage rate, and therefore a shift in position along the wage–profit curve. The utility functions are such that this increase must shift the demand curve outward, as shown in [Figure 5.1](#).

Now as we know, the real relative price of a good, under a regime of competitive profit-rate equalization, is a function of the distribution parameter. This is best defined as the wage *share* of net output, with actual or standard net output used as the measure of value (Sraffa, 1960, chs. 3, 7); a suitable proxy for present purposes, however, is the real wage *rate*. The price will then rise, or fall, or alternate in rising and falling, as the wage rate changes. To get a case that reveals the anomalous character of the supply curve–demand curve construction, assume that the wage good in question is inserted into the economy's production structure in such a way that its real relative price against “all other goods,” P_{xy} , *falls* monotonically as the wage rate rises. The money price of the good, P_x , is related to the real relative price by

$$P_x = P_{xy} P_y \tag{5.1}$$

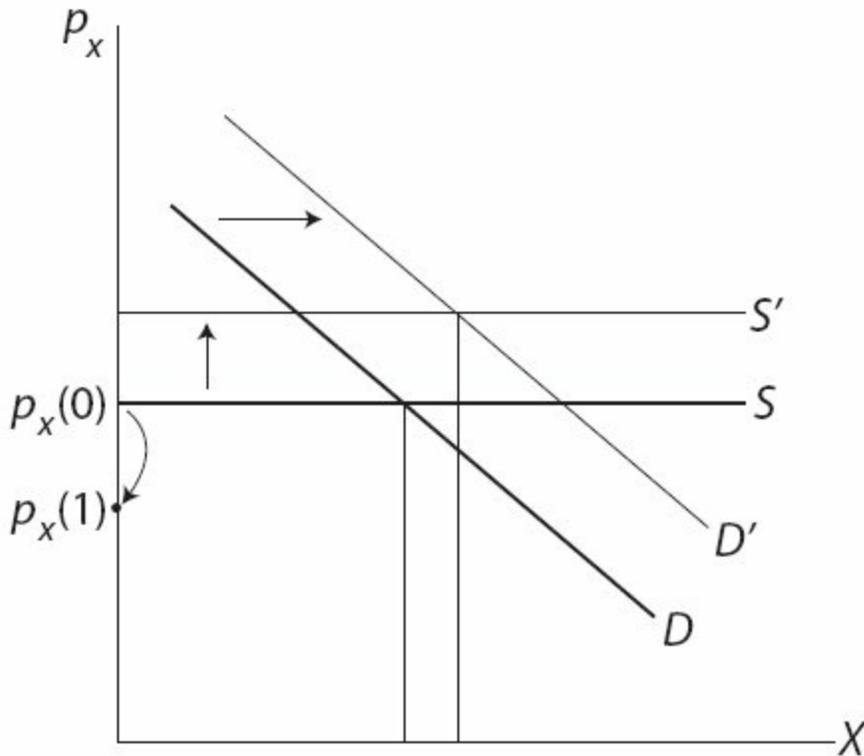


Figure 5.1 Anomalous price adjustment.

where P_y is the money price of “all other goods,” essentially the unit money value of gross output; Y , as “all other goods” basically represents the gross domestic (or national) product. Its value, the price level P_y , will change in some direction, but we may assume – again, in order to construct a *possible* troublesome counterexample – that the change in P_y either works in the same direction as the change in P_{xy} , or works in the opposite direction but does not dominate. In either case, therefore, the money price of X falls.

Now the general rise in wages must either shift the supply curve upward (as shown) or leave it unchanged (if the fall in Marshallian “normal profit” exactly offsets the rise in explicit cost). There appears to be no justification for shifting the supply curve *downward*, so as to be consistent with the fall in the money price of X required for profit-rate equalization.

Examples with even more troublesome rising supply curves can be constructed, with the same general result. If supply curves are upwardly sloped, the increase in demand must raise P_x , unless we imagine a fall in normal profits sufficient to shift the supply curve down massively. The possibility of anomalous movements in prices when explained by intersecting curves, in comparison with the underlying necessity imposed by convergence to the classical price system, suggests that the two conceptions are inconsistent with one another.[‡] One can, of course, simply *assume* that the shift in the supply curve in the above examples corresponds to the price change dictated by the classical equations; in this case, however, the supply curve–demand curve apparatus ceases to play an explanatory role, and certainly does not support the burden of intuition commonly placed on it. If this is the case, then we have a presumption that a role for supply and demand in market price dynamics

within a classical framework will have to be developed on some other basis.

‡ None of this should be taken to imply that the classical theory of convergence of market price to benchmark of “natural” price (see the next section) is unproblematic in itself. Ian Steedman (1984) has attempted to formalize this problem in a general equilibrium framework, noting that cases may exist in which the market price of a product is below the natural level, while profit in the industry is *above* its natural level (owing to the existence of means of production whose market prices are still further below their natural centers). This places the convergence process in doubt, and the matter is not resolved by Steedman's formalization.

To this end, a look at the key verbal formulations in the classical texts concerning the role of supply and demand in driving market prices may be of more than antiquarian interest. The object is to lay foundations for a formal treatment that can be set alongside and compared with the counterfactual demand and supply curves that so dominate current thinking.

2 What do the classics tell us?

The first place to turn is, of course, [chapter 7](#) of the *Wealth of Nations*, “On the Natural and Market Price of Commodities.” There Adam Smith sets out the distinction as follows:

When the price of any commodity is neither more nor less than what is sufficient to pay the rent of the land, the wages of the labour, and the profits of the stock employed in raising, preparing, and bringing it to market, according to their natural rates, the commodity is then sold for what may be called its natural price.

(1985, 56)

The market price of every particular commodity is regulated by the proportion between the quantity which is actually brought to market, and the demand of those who are willing to pay the natural price of the commodity.... Such people may be called the effectual demanders, and their demand the effectual demand.... When the quantity of any commodity which is brought to market falls short of the effectual demand, all those who are willing to pay the whole value ... cannot be supplied with the quantity which they want. Rather than want it altogether, some of them will be willing to give more. A competition will immediately begin among them, and the market price will rise more or less above the natural price.... When the quantity brought to market exceeds the effectual demand, it cannot be all sold to those who are willing to pay the whole value.... The market price will sink more or less below the natural price, according as the greatness of the excess increases more or less the competition of the sellers.... When the quantity brought to market is just sufficient to supply the effectual demand and no more, the market price naturally comes to be either exactly, or as nearly as can be judged of, the same with the natural price. The whole quantity upon hand can be disposed of for this price, and cannot be disposed of for more. The competition of the different dealers obliges them all to accept of this price, but does not oblige them to accept of less.

(1985, 57–58)

David Ricardo, in the *Principles*, seconds Smith's description of this process, and elaborates:

It is then the desire, which every capitalist has, of diverting his funds from a less to a more profitable employment, that prevents the market price of commodities from continuing for any length of time either much above, or much below, their natural price. It is this competition which so adjusts the exchangeable value of commodities, that after paying the wages for the labour necessary to their production, and all other expenses required to put the capital employed in its original state of efficiency, the remaining value of overplus will in each trade be in proportion to the value of the capital employed.

(1951, 91)

These passages convey the following general picture. The various “trades,” or sectors, come to realize for the capitalists in them a common rate of profit on capital advanced. Prices that cover all costs of production and also yield profit at that rate are the “natural prices,” which Ricardo also calls “values.” Market prices, on the other hand, fluctuate around these natural prices as a result of changes in underlying conditions of production and “effectual demand.” The ceaseless pursuit of maximum profits forces capitalists, or “employers of stock,” to shift their resources from low- to high-return trades, thus bringing into existence and reinforcing the tendency for rates to equalize, and driving market prices toward natural prices as their centers of gravitation.

This suggests a simple formalization. With V for value or natural price, P for market price, and S and D for the “forces” of supply and demand, respectively, we can write

$$P = V \left(\frac{D}{S} \right). \quad (5.2)$$

The question immediately arises: how are the “forces” S and D to be measured? Equation (5.2) is clearly unacceptable until and unless these forces are defined precisely and their dimensionality is clarified. That will be done in the next section. Until then, (5.2) may be used provisionally to reveal aspects of the classical intuition concerning supply and demand, especially the way in which their role is crucially limited (as compared to their ubiquitous presence in neoclassical theory).

To this end, note first that P is greater than (less than) V insofar as D is greater than (less than) S . One striking result of this formulation is that when $D = S$, $P = V$, as the passages from the classics clearly imply. The forces of demand and supply explain the gyrations of market price around natural price, and the extent of deviations from natural price. Equality of demand and supply results in determination of market price at the level of natural price. However, *demand and supply cannot themselves explain the level of natural price as such*. For this purpose a *theory of value* is required;[‡] or, to put the point in modern classical terms, V is explained not by supply and demand but by the entire social–historical process through which the existing structure of technical coefficients and income distribution

parameters has come into existence, including the evolution of common expectations, the balance of power between property holders and wage earners, the principles governing the choice of the best-practice technique, and perhaps more.

‡ The point is argued in this form in Maurice Dobb's master work, *Political Economy and Capitalism* 1972, [chapter 1](#) – still very much worth reading as an entry point into the classical Marxian interrogation of orthodox economics. The possibility of renewal of the “value” category, in Marxian form, may well rest on the role of that concept in organizing and interrelating the social forces shaping what otherwise appear as “technical” and distribution coefficients; see [Chapter 1](#) of the present work.

The limited role of supply and demand appears most clearly in the formulations of Marx. In *Capital*, Vol. III, we read:

Nothing is easier than to realise the inequalities of demand and supply, and the resulting deviation of market prices from market-values. The real difficulty consists in determining what is meant by balancing supply and demand.... If demand and supply balance, then they cease to have any effect, and for this very reason commodities are sold at their market-values. If two forces exert themselves equally in opposite directions, they balance one another, they have no influence at all on the outside, and any phenomena taking place at the same time must be explained by other causes than the influence of these forces. If demand and supply balance one another, they cease to explain anything, they do not affect market-values, and therefore leave us even more in the dark than before concerning the reasons for the expression of the market-value in just a certain sum of money and no other.

(1982, 223)‡

This statement captures most explicitly the classical conception of demand and supply as *forces*, upward suction and downward pressure, respectively. The image, from elementary physics, is of an object being pulled in opposite directions by opposing forces. If these forces happen to be of equal magnitude, the object will remain stationary with respect to its immediate surrounding environment. The passage is followed by a sentence containing a remarkable parenthesis:

It is evident that the essential fundamental laws of production cannot be explained by the interaction of supply and demand (quite aside from a deeper analysis *of these two motive forces of social production*, which would be out of place here).

(emphasis added)

‡ This passage, which in other translations reads “if supply and demand balance each other they *cease to act*,” was found to be particularly irksome by Marx's illustrious critic Böhm-Bawerk (1966 [1896], 93ff).

Equation (5.2), then, serves as our basic formulation of classical supply and demand theory. While this equation does not appear in any of the classical writings, it does seem to convey the essence of the conception presented in them. As such, however, it raises several

obvious questions that point the way to further analysis.

First, and quite obviously, in this initial classical formulation supply and demand enter with perfect symmetry, a fact that seems to counter the impulse toward a “deeper analysis of these two motive forces of social production.” The mirror-image quality of supply and demand that is central to neoclassical thinking should not, we may assume, be reproduced in a classical approach to the subject. Yet (5.2) clearly allows no apparent role for variation in the *strength* of the forces of supply and demand, either intrinsically or in relation to one another. A coefficient expressing variation in the upward or downward pressure cannot be applied, since when $S = D$, the market price must be equal to value, or natural price.

Second, while we may wish to offset the automatic assumption that price is the governing element in the formation of demand and supply behavior, the classical formulation in (5.2) suggests that the forces of supply and demand are completely independent of the market price of the commodity, and in fact determine its market price in a one-way process leading from V , enhanced by D/S , to P . Is the theory able to allow at all for the fact that the intensity of demand, however conceived, is likely to be affected to at least some degree by the price of the product itself? This line of influence is certainly important, even though there may be goods (medicines? diapers? coffins?) with extremely low or zero price elasticity of demand.

Finally – and this may be the most important difficulty, alluded to above – the initial classical formulation is studiously vague about the dimensions of the two opposing forces, D and S . Equation (5.2) cannot be taken seriously unless and until some account is given of how these forces are to be measured, of exactly what determines them, and how they come to have the requisite impacts on market price. As it stands, equation (5.2) is quantitatively incoherent, and therefore cannot stand on its own as an alternative to the neoclassical apparatus.

3 An outline of a classical model

Our task is to see whether equation (5.2) can be given an explicit foundation in theory, and to ascertain whether this foundation yields any insights into the logic of market adjustment. The partial equilibrium focus enables us to inquire into the differences in the roles of supply and demand in convergence of market prices to their centers of gravitation. It does not replace – let alone resolve – the difficulties in depicting the gravitation process in a general equilibrium framework, especially its stability properties (see Steedman, 1984).

The counterfactual basis for the supply curve is much less clear than that for the demand curve, as indicated by the body of criticism referred to above. In the following exercise, therefore, I will take over the market demand curve from neoclassical orthodoxy, essentially unaltered.[‡] This will enable us to incorporate the main elements of demand theory, especially the role of substitution effects in determining an inverse dependency of quantity demanded on price. In inverse-function form, a linear version of this standard demand curve is written as

$$p = a - bQ \tag{5.3}$$

This demand curve is drawn in [Figure 5.2](#).[‡] Notice that price in this context is written in the standard lower-case notation. This is the market money price – the price that would be relevant to consumers, since it is the one they must actually contemplate paying.

[‡] It should not be necessary to remark that this in no way involves us in the notion of utility functions as preformed entities independent of social experience, class structure, etc. Constrained utility maximization is essentially a formal device that enables a general account of individual choice in markets for consumer goods, however the social determination of the quality of that activity is conceived. As such it does, I believe, play a role in classical theory. For an extensive and colorful elaboration of the contrary view – that rational choice as such must not form the basis of a theory of economic behavior – see Varoufakis, 1998.

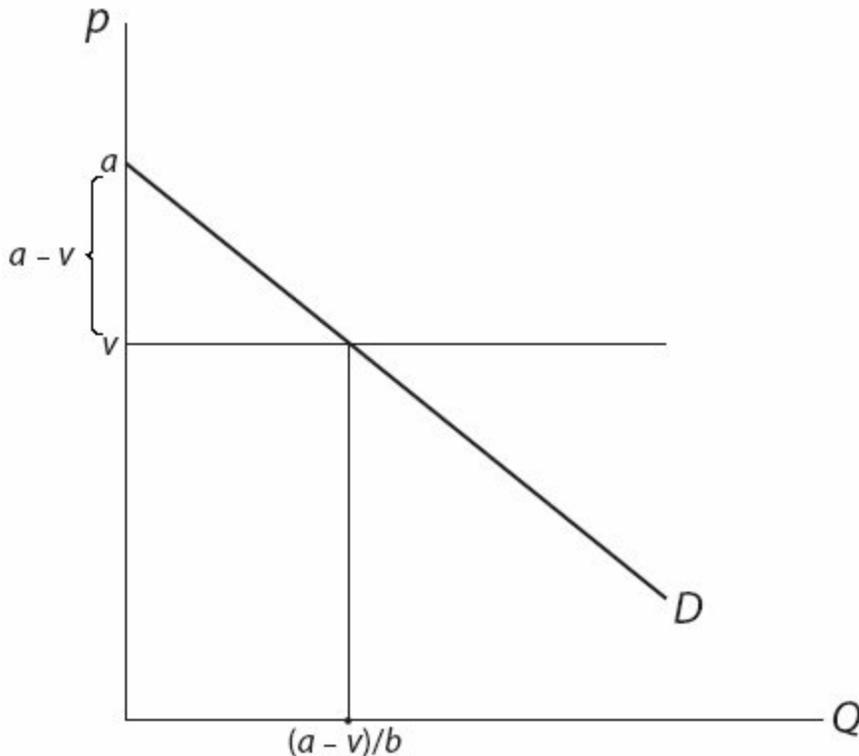


Figure 5.2 Market price adjustment to discrepancy between a and v .

[‡] [Figure 5.2](#) must be interpreted with care. The horizontal line at the level of v is *not* a supply curve in the interpretation represented here. The equilibrium quantity, $(a - v)/b$, results from supply adjustment via a reaction function, described below, not from the intersection of two behavioral curves.

The key to the distinction between classical and neoclassical market adjustment, hinted at above, rests in the treatment of supply. In the interpretation that I am suggesting here, the classical school, unlike present-day mainstream economics, distinguished systematically – if implicitly – between underlying costs of production, on the one hand, and supply behavior, on the other. The former, as noted, refers to the technical coefficients of production for the best-practice (and therefore dominant) technique, combined with a measure of income distribution reflecting the balance of power between labor and ownership. These determine v (again, note the lower-case notation for “market-value,” or simply value), which is essentially all elements in the profit-rate-equalizing eigenvector of money prices (the outward form of Marx's “prices of production”).

Supply behavior, in contrast, is more a matter of the elasticity of producers' responses to surplus profit opportunities and loss conditions. Both Smith and Marx discuss the factors governing this elasticity, including the stage of development of transport and communications, the emergence and characteristics of financial markets and credit systems, the particular aspects of different trades (Smith refers to rigidities of movement in agriculture), and even what might be called the culturally and historically determined level of energy of "animal spirits" that governs the intensity of competitive arbitrage. The movement of capital in search of temporary excess profit rates and away from temporary losses is central to the motion of the modern economy. While this pursuit of maximum gain is presumably the key to supply behavior, there are historical, institutional, and cultural barriers to mobility, as well as those stemming from the structure of production itself. Arbitrage is rapid, but not infinitely so.

All of this suggests that the *supply curve*, in the neoclassical sense of a stable relation between prices and quantities supplied, does not exist in the classical model – even one in which the *demand curve* remains present. To capture the dynamic quality of supply behavior, as based essentially on arbitrage, or maximization *via* shifting, I will replace the supply curve with a *reaction function* of the following type: .

$$\dot{Q}_s = k(p - v). \quad (5.4)$$

Here \dot{Q}_s is the time derivative of the quantity supplied; $k (> 0)$ is the reaction coefficient, which expresses the speed of adjustment of the quantity supplied to the deviation of market price from market value, $p - v$. It will, of course, be different in every sector or trade, and has no counterpart on the demand side, where adjustment is instantaneous. This spot adjustment of demand price to the given quantity supplied is the short-run mechanism governing market price; it suggests that (5.3) can be written as

$$p = a - bQ_s. \quad (5.3')$$

Substituting (5.3') into (5.4), we have a first-order non-homogeneous differential equation in Q_s , the quantity supplied: .

$$\dot{Q}_s + kbQ_s = k(a - v). \quad (5.5)$$

Its solution is

$$Q_s(t) = \left[Q_s(0) - \frac{(a-v)}{b} \right] e^{-kbt} + \frac{(a-v)}{b}. \quad (5.6)$$

Finally, putting (5.6) into the demand curve, rearranging, and simplifying, we get an expression giving the dynamics of price:

$$p = v + (a - v)e^{-kbt} - bQ_s(0)e^{-kbt}. \quad (5.7)$$

The term $(a - v)$ is essentially positive (refer to [Figure 5.2](#)). The second and third terms on the right-hand side of (5.7) disappear over time, and market price therefore converges to market value.

Now close inspection of (5.7) reveals, I think, that this result corresponds in intriguing ways to the classical speculation, given in equation (5.2). The second term on the right-hand side, for example, is governed by the difference between the price intercept of the demand curve and the unit value of the good, $(a - v)$, and is precisely this difference at $t = 0$. This is basically a measure of the strength, or “force,” of demand, including in that force a role for consumer preferences. An outward shift of the demand curve, to illustrate, would raise a and therefore increase the weight of this term.

The third term, in turn, is a measure of “supply” in the classical sense, governed at $t = 0$ by the quantity (arbitrarily) supplied at that moment. (This is, as will be seen, multiplied by b , the slope of the demand curve; I am unable to account for the presence of b in the supply term.) Equation (5.7), therefore, explains market price as determined by a benchmark center of gravitation, v , modified by a term expressing the intensity or force of demand, and one denoting the historically derived scarcity or abundance of the commodity. The reaction coefficient, k , while being a parameter of supply behavior (demand behavior, by contrast, is essentially instantaneous, as noted above), enters into both adjustment terms. The higher k is, the more rapidly market price adjusts to discrepancies between p and v , and the more rapidly these discrepancies disappear.

Where does this leave the original classical formulation? Refer again to (5.2). If the various terms of (5.7) are interpreted as the logarithmic forms of the underlying variables, so that $p = \ln P$, $v = \ln V$, $(a - v)e^{-kbt} = \ln D$ (in an appropriate interpretation), and $bQ_s(0)e^{-kbt} = \ln S$ (likewise), then (5.6) can be written

$$\ln P = \ln V + \ln D - \ln S,$$

which, taking antilogs, appears as our familiar friend

$$P = V \left(\frac{D}{S} \right).$$

4 Summary and conclusion

The classical view sees supply and demand as opposing forces pulling market price away from a center that is not itself explainable in terms of supply and demand. Contrary to the preponderance of belief and the almost absolute hegemony of the contrary view – the neoclassical counterfactual intersecting supply and demand curves – the classical view is potentially important, and certainly nonignorable. At a minimum, I think the exercise presented in this chapter suggests a line of research that supports this contention.

The key insight is that “supply” is really two things: a set of data from technology and social structure that determine a benchmark or central price, and the institutional and cultural

forces shaping the intensity of response to arbitrage opportunities. The classical view carefully separates these two sets of factors; the neoclassical view systematically confounds them.

While it is too early to delineate a complete set of outcomes emerging from this distinction, a few points may be noted. First, if we think of price adjustment in classical terms, certain ideological leaps of faith may be avoided. A general rise in wages, for example, leads to adjustment of v (or V) in an indeterminate direction, but – and this is the ideological point – not necessarily in an upward one. A rise in wages in a single firm, on the other hand, may have the effect predicted by standard theory: a fall in employment, and downward pressure to return the maverick wage to the established level. On the other hand, it may generate a struggle over the wage norm throughout the industry, perhaps even throughout the economy. The story then becomes one of dynamic adjustment along the wage–profit curve, the resultant of forces seeking to alter and maintain, respectively, the established norms for levels of wages and profits. In short, the separation of “supply” into its structural and arbitrage aspects undermines the whole complex of mystifications surrounding the notion of “normal profit” – especially the convenient habit of forgetting to ask what determines the level of the normal rate of profit,[‡] which leads to the implicit assumption that it is constant.

[‡] “[Alfred] Marshall has tacitly abandoned the idea that the rate of profit is equal to the reward of waiting, for, if it were, investment would not be going on. And the influence of the monetary rate of interest on the rate of profit is only an unfortunate aberration. So what does determine the normal rate of profit? Marshall evidently hoped that his readers would not notice that he does not say” (Robinson, 1971, 30).

The classical view of price dynamics can be presented from the standpoint of a single commodity or industry, a presentation that is conformable to the partial equilibrium perspective of orthodox theory. On the other hand, the interweaving of all industries in the economy into a mutually determining web is always implicit in the formation of v , precisely because this value – or production price, or benchmark price – is determined independently of the forces of supply and demand operating on the given industry. For this reason, the classical approach is always implicitly (if not explicitly) on the general equilibrium level, and helps break down the rigid wall between partial and general perspectives (as indeed it does between macro and micro perspectives as well).

Finally, the classical approach helps clarify the sense in which supply and demand are indeed historically and institutionally specific realities, making possible a “deeper analysis of these two motive forces of social production.” This is a healthy corrective to the neoclassical tendency to treat these central concepts of economics as disembodied verities arising from the timeless confrontation of preferences with endowments, and independent of social conditions and structures. A carefully formalized classical approach helps situate arguments on different levels, and establish the conditions in which the counterfactual curves framework may be useful as a way of representing aspects of reality. In fact, the two approaches are not completely disjoint; curves and forces are alternate ways of viewing a single entity, each with its own contribution to make. The proposed formalization of the

forces conception may help us to understand arguments on “Marshallian” grounds, such as that of Sraffa (1926), as not simply forays into enemy territory, but rather as usefully derived from and connected to the deeper perspectives of the general classical model. Thus, Sraffa (1926) is incorporated into the deeper framework established in Sraffa (1960), and need not be seen as merely an immature precursor. The truth is the whole, and the forces of supply and demand are too important to be left to those who would reify them into contentless abstractions.

6 Rationing and price control

Introductory perspectives

One of the ideological functions of orthodox economics is very simple: misdirection.

This short chapter reports on a result that stems from the canonical indifference-curve apparatus of classroom microeconomics. You will find this material (the apparatus; not my application of it) in any introductory textbook in microeconomics, usually in an appendix to the chapter on the theory of the consumer. (By the way, it is amazing how basically *similar* the huge *variety* of commercial economics texts are!) I remember seeing, as a student in the 1960s, a formal “proof” of a “theorem”: rationing – setting an administrative/legal upper limit to the amount of a certain good that can be purchased and acquired for consumption by a single consumption unit (individual, household), in a given period of time – may lower the level of well-being (“utility”) attained by the consumer, or leave that level unaffected, but it can *never* increase it. In short, with reference to the comparison situation of the “free market,” rationing can only hurt; it can never help.

The idea is actually quite simple, and you don't need the geometric analysis of the equilibrium of the consumer to state it. Rationing either does (or does not) make you do something you otherwise would not have done, *i.e.*, spend less on the rationed good and more on everything else. If you otherwise would not have done this, it cannot be preferred to what you would in fact have done. QED.

Where does misdirection come in? Easy. The formal analysis keeps you from asking obvious questions about the way in which the problem is posed. It directs your eye away from the essential.

Years ago, I knew a young fellow, Tommy, a very nice kid who was however extremely awkward in social situations. In a social gathering, he would cringe against a wall, looking miserable. Until, that is, someone put a deck of cards in his hands, or anything else he could use to perform magic tricks (three paper cups and a wad of paper shaped into a ball would do nicely). Then Tommy became the life of the party. His skill at prestidigitation was truly remarkable. I tried to get him to teach me a trick, but he always refused; the community of magicians does not admit new members readily. When I finally prevailed upon him to give me some sort of introduction to the illusionary arts, he said:

Hold a quarter between the thumb and forefinger of your left hand. Insert your right

thumb into the circular space thus created. Transfer the quarter into your right hand, and smoothly bring your right hand down to your side, in such a way that the observer's eye remains fixed to the left hand. When you've got that, come back for the second lesson.

I never came back.

Rationing is the left hand; price control is the right. Think about it. Goods are rationed in wartime, or in periods of social and economic distress (for example, when a developing country with a political direction that is not sanctioned by the “world community” is subject to blockade and sabotage from a large power; can anyone think of an example?), and the goods in question are scarce relative to normal need. The alternative to rationing *with* price control is a “free market” solution, in which allocation is accomplished by allowing the price to rise to its market-clearing level. The unspoken presupposition is that income is unequally distributed; the good will then go to the wealthy, who are in a position to outbid everyone else. So the choice is between rationing together with price control, on the one hand, and the unrationed (“free”) solution with an uncontrolled, and higher, price. It is easy to imagine that there will be a cutoff level of money income (call it \bar{M}); consumers who earn less than this level will benefit from rationing – even in the austere sense of microeconomic theory: a higher level of “utility” – and those who receive more will be made worse off. My object in working out the note that became this chapter was to find that level of income, given a series of other assumptions.

Unfortunately, the math needed to pursue this is a bit more difficult than the norm for this book, but still basically limited to algebra and calculus. It also turns out, however, that the problem does not have an algebraic, or “closed form,” solution. There are equations, such as $x^3 + x^4 = 10$, that cannot be solved for x , *i.e.*, brought into a form with x by itself on the left side and numbers (or letters representing known constants) on the right. The equation for \bar{M} is one of those non-algebraic equations. So this chapter also illustrates what we can do in such cases: produce numerical estimates of the solution under a range of different values for the parameters (the carriers of the “other assumptions” mentioned above).

The few orthodox economists who discuss rationing at all, at a theoretical level, usually focus on inefficiencies: incentives to form illegal (“black”) markets, and so forth. All of that is there. The feasibility and desirability of rationing and price control, then, turn on whether these systems are enforceable, and that in turn depends on whether *there is popular support for the consensus on which the policy is based* (e.g., winning the war, or getting milk to all children in the interest of the society's future); also on whether *popular participatory mechanisms to monitor and carry out the rationing program* can be developed. But this, of course, brings political economy back in! You can take mathematical economics with you across the frontier into the terrain of political economy; that is, in fact, the core message of this book. You cannot, however, go in the other direction, and import political economy into neoclassical economics. Those bottles would surely break from the new wine.

The comparative welfare effects of rationing systems vs. free market pricing have been studied using stochastic methods. Weitzman (1977) presents an elegant formalization of the problem, showing that – contrary to the commonly held view according to which a rationing regime can never prove superior to an unregulated market – when needs for the “deficit” commodity are fairly uniform and when a high degree of income inequality is present, rationing may turn out to be a more effective alternative.

In this chapter, I present a non-stochastic approach to the second problem (that of income equality/inequality), using a standard utility-theoretic toolkit. I compare two regimes: one in which the quantity purchased of a good X is subject to an upper limit per period of time (a rationing constraint), while its price is also subject to control; and the complementary case in which both quantity and price are uncontrolled. The problem may be posed using a simple well-known diagram. In [Figure 6.1](#), the good subject to rationing and price control is X ; Y is “all other goods.” The ration quantity is \bar{x} . The figure shows the situation of two consumers, poor, P, and rich, R, with “R” having approximately twice the spending power of “P.” Budget lines are drawn for each consumer in each of the two regimes, with the uncontrolled price of X shown as twice the controlled price. The budget lines are subscripted for the two consumers R and P in the controlled, C, and uncontrolled, U, situations, in an obvious notation.

As drawn, the indifference curves reveal that quantity-and-price control may turn out to be beneficial to P, whose loss from the quantity constraint is more than replaced by the advantage of purchasing X at the controlled price. Compare the indifference curves attained at the two equilibria for P, E_{PC} , and E_{PU} . By contrast, the controlled regime lowers the welfare of R ($E_{RC} < E_{RU}$). For R, \bar{x} is an onerous burden to bear, whose removal would more than offset the loss from the higher “free market” price in the uncontrolled regime. The minor lesson here is that rationing and price control *may* help the poor and discomfort the rich; at least, a consistent set of indifference curves can be drawn for this case. The major lesson – this is in fact my real interest in presenting this exercise – is that the tools of microeconomic theory are in themselves neutral with respect to analysis and policy conclusions; in particular, they do not necessarily come down against political intervention into the spontaneous workings of the market. The decision to control the market for a good that is, for whatever reason, momentarily scarce must be based on a complex reading of the short- and long-range consequences of so doing, including the all-important issue of public support for the measure (which plays a major part in determining the deadweight costs of administering the controlled regime, the possibility of illegal markets, and so on).[‡]

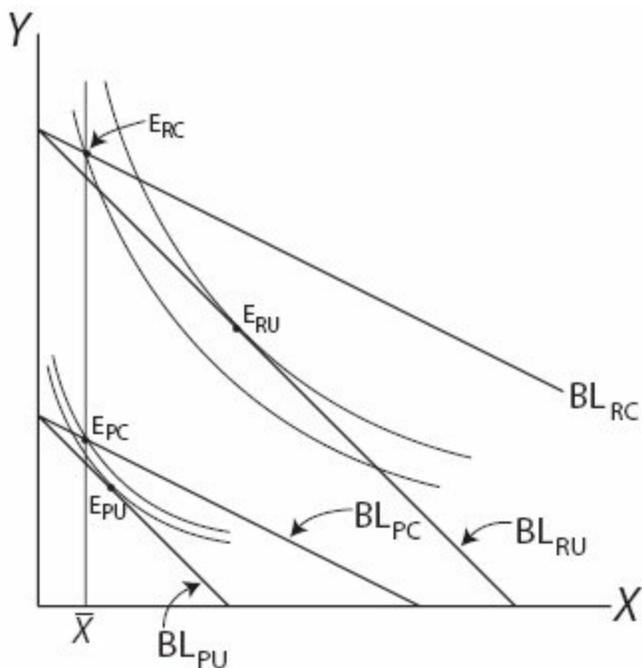


Figure 6.1 Comparison of welfare effects of rationing and price control on two individuals, rich and poor.

‡ Price and quantity controls typically occur during wartime, or during periods of similarly intense social crisis and transformation within a given country. For a detailed study of the political and social context of rationing and price control in the United States during World War II, see Hart-Landsberg, 2003–04.

Figure 6.1, however, recalls the famous aphorism that “paper will tolerate anything that is written on it.” Can the range of possible outcomes of price and quantity control be studied in a more rigorous manner?‡

‡ The exercise that follows does not appear to have any counterparts in the microeconomics literature. Mathematical texts (e.g., Henderson and Quandt, 1980; Silberberg and Wing Suen, 2001; Varian, 1984) do not address market intervention in detail. Among intermediate texts, only Friedman (1986, ch. 17, “Market Interference”) considers these issues in any depth, and there the emphasis is on welfare gains and losses illustrated by shifts in demand and supply curves, with much study of the secondary losses associated with administrative inefficiencies and evasive actions by consumers and producers. In what follows I examine only the welfare effects on consumers; for this purpose, the rationed good may be purchased or requisitioned by the government, or the rationing requirement may be imposed on firms within their existing channels of distribution. I do not look at suppliers’ welfare, producer surpluses, etc. I suspect that administrative costs, evasion, and illegal activities may be less significant in the present than historically, due to modern smart-card technology.

1 Modeling the welfare consequences of market control at different income levels

I borrow only the most commonly used and long-established tools from microeconomic theory. Begin with a Cobb–Douglas utility function

$$U = X^\alpha Y^\beta = X^{1-\beta} Y^\beta \quad (6.1)$$

The restriction $\alpha + \beta = 1$, with $\alpha, \beta \in (0, 1)$, is a standard simplifying normalization which can be shown to have no effect on outcomes, including in the present study. Utility is here treated as a methodological construct with no cardinality, and any function, such as (6.1), that is monotonic-increasing in any other such function can be adopted without loss of generality

(see Henderson and Quandt, 1980, [Ch. 2](#), 16). The restriction to (apparent) linear homogeneity enables us to express the elasticities of utility with respect to X and Y using only one parameter, β .

Including the budget constraint, $M = p_x X + p_y Y$, where p_x and p_y are the prices of X and Y , respectively, and M is “money income” (the amount a consumer is able to allot to consumer goods purchases per period of time), we find the well-known equilibrium (utility-maximizing) levels of consumption, and the associated level of utility. For ease of later exposition, these are written without qualifying subscripts or diacritical marks:

$$X = \frac{(1-\beta)M}{p_x} \quad Y = \frac{\beta M}{p_y} \quad (6.2)$$

$$U = \left(\frac{1-\beta}{p_x}\right)^{1-\beta} \left(\frac{\beta}{p_y}\right)^{\beta} M. \quad (6.3)$$

Equation (6.3) is in fact the indirect utility function for the uncontrolled regime, showing (maximized) utility as a function of prices and money income (Varian, 1984, 116, 121; Henderson and Quandt, 1980, 41–44; Silberberg and Suen, 2001, 360ff.). The corresponding expression for the controlled regime is easily found. Assume, for the moment, that the consumer avails her/himself of the full ration allowance, \bar{X} . The consumption bundle will then be \bar{X} and the quantity of Y that remains available, $(M - \bar{p}_x \bar{X})/p_y$. (Note the notation \bar{p}_x for the *controlled* price of X associated with the rationing constraint.) Controlled utility is then:

$$\bar{U} = \bar{X}^{1-\beta} \left(\frac{M - \bar{p}_x \bar{X}}{p_y}\right)^{\beta} \quad (6.4)$$

Comparing (6.3) and (6.4) is the central task in evaluating the two regimes, so long as the sole basis for this evaluation is individual consumer welfare.

The properties of this comparison can best be revealed by using a diagram in which we plot utility levels against levels of money income ([Figure 6.2](#)).

Equation (6.4) is represented by the curve labeled $\bar{U}(\bar{p}_x)$; it has positive first and negative second derivatives, and rises from an M -intercept of $\bar{p}_x \bar{X}$, the value of the rationed quantity of X . (Clearly, at this level of income attainable Y would be zero, and utility therefore also zero.) At income levels lower than $\bar{p}_x \bar{X}$, (6.4) does not produce real numbers for U ; thankfully, we do not need to venture there.

The indirect utility curve for the uncontrolled regime, (6.3), plots as a linear ray from the origin. We may first find the ray that is tangent to \bar{U} , by setting

$$U = \bar{U}, \quad \frac{\partial U}{\partial M} = \frac{\partial \bar{U}}{\partial M},$$

and solving for M , from which we find

$$M_0 = \left(\frac{1}{1-\beta} \right) \bar{p}_x \bar{X}. \quad (6.5)$$

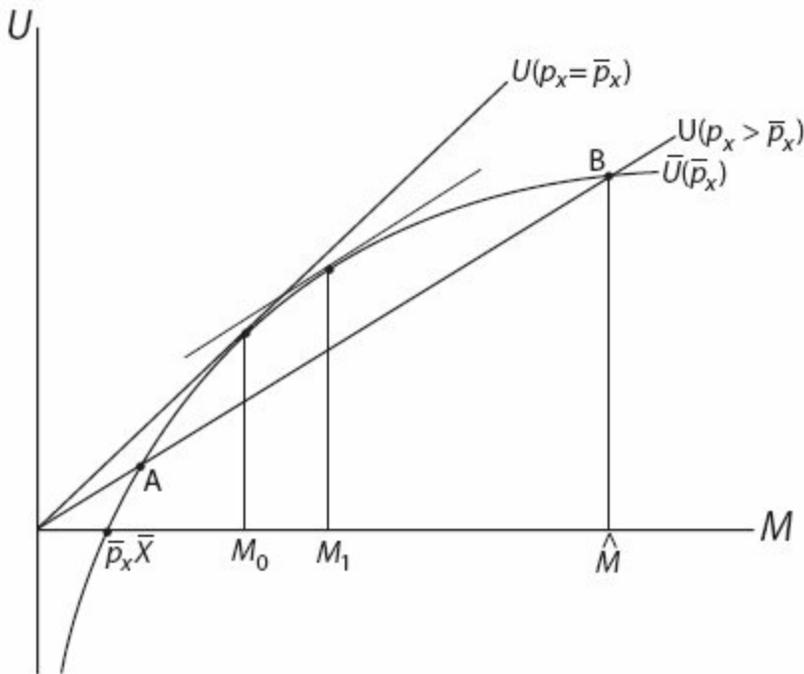


Figure 6.2 Levels of utility in the controlled and uncontrolled regimes, at different income levels.

Putting M_0 in turn into both U and \bar{U} and simplifying, we find that this tangency point occurs when $p_x = \bar{p}_x$. The U curve that is tangent to \bar{U} at M_0 , then represents the limiting case in which the uncontrolled market price is the same as the controlled price: either price control is not applied, or (for some reason) the relative scarcity of X that makes rationing a distinct possibility does not force the price upward from \bar{p}_x in the absence of government intervention. This limiting case, in fact, provides us with the paradigmatic anti-intervention conclusion. With $p_x = \bar{p}_x$, U lies above \bar{U} at every level of income except M_0 . Rationing, therefore, has no effect on consumer welfare at that income level, and is harmful to consumer welfare at every other level.

Looking at (6.3), we can see that a rise in p_x will rotate the U curve downward, into the position represented by $U(p_x > \bar{p}_x)$ in Figure 6.2. We may take this to be the normal case. The U and \bar{U} curves intersect twice, at points A and B. A occurs at a low level of M (not labeled in the figure) and B at \hat{M} . These two values appear to define a range of income levels at which the controlled regime results in a higher level of utility than the uncontrolled regime, with the opposite holding at the extreme ranges of income, above B and below A. This lower level, however, is deceptive. The \bar{U} curve traces utility levels on the assumption that the consumer in fact purchases the entire allowable ration, \bar{X} . The ration, however, is an inequality constraint. Putting \bar{X} and \bar{p}_x into (6.2) and solving for M , we find $M = M_0$, as determined by (6.5). This, then, is the income level at which the consumer would purchase the ration quantity, \bar{X} , in the absence of the ration constraint. At any income level below M_0 , the consumer would select a quantity of X less than \bar{X} , having chosen freely, at the controlled

price, along the ray $U(p_x = \bar{p}_x)$. The complete potential utility frontier, then, follows this ray out to the tangency point, and \bar{u} thereafter, and A is dominated by this frontier. Our attention may therefore turn to B, which defines \hat{M} . This is the critical income level, below which the consumer is helped, and above which s/he is harmed, by quantity and price controls.

Before examining \hat{M} , it will be useful to derive one more property of the model, as shown in [Figure 6.2](#). Given $p_x > \bar{p}_x$, we find M_1 , at which the slopes of U and \bar{u} are equal. Setting

$$\frac{\partial U}{\partial M} = \frac{\partial \bar{U}}{\partial M}$$

and solving, we find

$$M_1 = \left(1 + \frac{\beta}{1-\beta} \frac{p_x}{\bar{p}_x}\right) \bar{p}_x \bar{X} = \left(1 + \frac{a\beta}{1-\beta}\right) \bar{p}_x \bar{X} \quad (6.6)$$

In the second term of this equality, we define

$$a \equiv \frac{p_x}{\bar{p}_x},$$

the ratio of the uncontrolled to the controlled price; this, and β , are the two parameters that will shape our conclusions regarding \hat{M} , which, like M_0 and M_1 , will emerge as a multiple of $\bar{p}_x \bar{X}$, the controlled-price value of the ration quantity. Note, finally, from (6.6), that when $a = 1$ (the limiting case), M_1 reduces to M_0 .

We come now to the heart of the matter: determination of \hat{M} . Equating (6.3) and (6.4), and simplifying, we obtain

$$\psi M^{1/\beta} - M + \bar{p}_x \bar{X} = 0 \quad (6.7)$$

where

$$\psi = \beta \left(\frac{1-\beta}{a \bar{p}_x \bar{X}} \right)^{\frac{1-\beta}{\beta}}.$$

Note that ψ contains the uncontrolled price, p_x , in the form of the ratio a . The expression (6.7) – unfortunately, and obviously – is non-algebraic in M ; we must therefore approach its properties, first, by means of two special cases; second, using a numerical method, which will be developed later in this section.

Case: $\bar{p}_x = 0$. In this situation the government imposes a ration quantity, \bar{X} , but also requisitions or purchases the good from producers and distributes it to the population without charge. Equation (6.7) now has a readily attainable solution:

$$\hat{M}(\bar{p}_x=0) = \left(\frac{1}{\psi}\right)^{\frac{\beta}{1-\beta}} = \left[\frac{1}{\beta^{\frac{\beta}{1-\beta}}(1-\beta)}\right] p_x \bar{X} \quad (6.8)$$

In this case, of course, the multiplier must be applied to $p_x \bar{X}$ the value of the ration at the *un* controlled price. This multiplier contains only one parameter, β (the other parameter, a , is clearly not applicable). I postpone full discussion of possible parameter values until Section 3, but for $\beta = 0.9$, the expression in square brackets ≈ 25.8 . To give a pre-indication of the sort of calculation one can do with this, choose a monetary value for $p_x \bar{X}$ of \$200 per month (a month's worth of the rationed good would cost \$200, at the uncontrolled price). The monthly \hat{M} is then 200×25.8 , or \$5,160/month, which translates, at an income tax rate of 0.3, into an annual pre-tax income of about \$88,500. On this account, people whose $\beta = 0.9$ and who earn less than \$88,500 per year before taxes would benefit from rationing, while those with incomes above that amount would be worse off.

Case: $\beta = 1/2$. For this special value, (6.7) becomes quadratic.

$$\psi = \frac{1}{4a\bar{p}_x\bar{X}}$$

Using the + root (since we are looking for the higher of the two roots), we obtain, after simplification:

$$\hat{M}(\beta=1/2) = 2a \left[1 + \sqrt{\frac{a-1}{a}}\right] \bar{p}_x \bar{X} \quad (6.9)$$

Again, postponing full discussion of parameter values and implications, for $a = 2$ the multiplier in (6.9) is ≈ 6.828 . For $\bar{p}_x \bar{X} = 100$, this gives an \hat{M} of \$682.80/month, or \$11,700/year, suggesting a very low cutoff income level, and a significant majority of the population that would be worse off in the controlled regime than in the uncontrolled regime.

Since we need more general results, for $\bar{p}_x > 0$ and for a variety of values for β and a , we return to (6.7). To explain the numerical estimation strategy, I first analyze the LHS of this expression:

$$\begin{aligned} F(M) &= \psi M^{1/\beta} - M + \bar{p}_x \bar{X} \\ F'(M) &= \frac{\psi}{\beta} M^{\frac{1-\beta}{\beta}} - 1 = 0 \Rightarrow M_2 = a \left(\frac{1-\beta}{\beta}\right) \bar{p}_x \bar{X} = a M_0 \\ F''(M) &= \frac{\psi}{\beta} \left(\frac{1-\beta}{\beta}\right) \left(M^{\frac{1-2\beta}{\beta}}\right) > 0 \end{aligned} \quad (6.10)$$

$F(M)$ has a unique minimum at M_2 ($> M_1$). We can also evaluate $F(\cdot)$ at M_2 ; after simplifying, we find $F(M_2) = (1-a) \bar{p}_x \bar{X}$, which is < 0 for $a > 1$. Similar processing reveals

$$F(M_0) = \left(\frac{\beta}{1-\beta} \right) \left[\frac{1}{a^{\frac{1-\beta}{\beta}}} - 1 \right] \bar{p}_x \bar{X},$$

and

$$F(M_1) = \left(\frac{a\beta}{1-\beta} \right) \left[\left(\frac{1-\beta+a\beta}{a} \right)^{1/\beta} - 1 \right] \bar{p}_x \bar{X},$$

both of which can be shown to be < 0 , for $a > 1$ and $\beta \in (0,1)$. The LHS of (6.7) is therefore negative for all relevant values of M less than \hat{M} , and this provides a simple iteration procedure to find \hat{M} for a variety of values of a and β . Starting at M_2 , with $\bar{p}_x \bar{X} = 100$, M is incremented by 0.01 until $F(M) > 0$. The resulting M is our estimate of \hat{M} for every set of values for (a, β) .

Before presenting the results, I return briefly to the question of the generality of (6.7) with respect to specification of the utility function, a point that is perhaps not completely obvious. The general Cobb–Douglas function is

$$U = X^m Y^n, \text{ where } m+n = \gamma \neq 1 \quad (6.11)$$

In this case, the two indirect (maximized) utility functions, corresponding to (6.3) and (6.4), become

$$U = \left(\frac{m}{\gamma p_x} \right)^m \left(\frac{n}{\gamma p_y} \right)^n M^\gamma \quad \text{and} \quad \bar{U} = \bar{X}^m \left(\frac{M - \bar{p}_x \bar{X}}{p_y} \right)^n \quad (6.12)$$

The normalization to (6.1) uses

$$\alpha \equiv \frac{m}{\gamma} \quad \text{and} \quad \beta \equiv \frac{n}{\gamma},$$

with, of course, $\alpha = 1 - \beta$. Equating the two utility expressions in (6.12) and simplifying, and notably taking the $1/\gamma$ -th power of the resulting expression, yields

$$\beta \left(\frac{1-\beta}{p_x \bar{X}} \right)^{\frac{1-\beta}{\beta}} M^{1/\beta} = M - \bar{p}_x \bar{X}.$$

which is identical to (6.7).

2 Results and interpretations

We proceed immediately to some calculated values for \hat{M} , presented in [Table 6.1](#). These are, as before, based on an assumed level of 100 for $\bar{p}_x \bar{X}$, interpreted as the monthly cost of the rationed quantity, \bar{X} , at the controlled price \bar{p}_x . The figures in the table are therefore monthly (after-tax) income levels, below which consumers benefit from rationing and price control,

and above which they are made worse off.

The price differential, a , has a fairly straightforward interpretation, although there is undoubtedly no simple way to determine the extent to which p_x would rise in the presence of significant scarcity, if it were left free of political intervention. The positive relation between a and \hat{M} seems consistent with intuition: the greater the price differential, the higher one's income would have to be for the uncontrolled regime to be preferred to rationing and price control. The effect is still not as powerful as one might expect. At the lowest shown β of 0.5, for example, a differential of ten yields an \hat{M} of \$3,897, suggesting an annual pre-tax income of \$66,805, and a significant segment of the income distribution that would prefer the uncontrolled regime.

Increasing β alters the picture, however. The parameter β it will be recalled, is the elasticity of utility with respect to Y , "all other goods," and as it rises, the elasticity of utility with respect to X falls. It is tempting, but would be misleading, to identify the elasticities with the shares of income devoted to X and Y . Gasoline, for example – to take a good for which rationing has been applied in the past, and might be a distinct possibility in the future – may form a small share of total expenditure, but its elasticity coefficient may be much higher, to

Table 6.1 Calculated values of \hat{M} , for selected values of a and β

		β				
		0.5	0.6	0.7	0.8	0.9
α	2	683	902	1,264	1,985	4,143
	3	1,090	1,450	2,045	3,229	6,773
	4	1,493	1,992	2,817	4,459	9,375
	5	1,894	2,532	3,586	5,685	11,967
	6	2,295	3,071	4,354	6,909	14,555
	7	2,696	3,610	5,122	8,132	17,141
	8	3,097	4,149	5,889	9,355	19,726
	9	3,497	4,687	6,656	10,577	22,310
	10	3,897	5,225	7,423	11,798	24,893

the extent that automobile use has become a structural necessity for both work and recreation. This is why I have chosen a range for β that goes as low as 0.5. Now the intuition is much less clear in the case of β than in the case of a . The results suggest that to the extent the rationed good is *less* (marginally) important to total utility, the number and proportion of people for whom rationing is beneficial *rises*. The effect is quite pronounced. At $a = 2$, a β of 0.9 implies a cutoff income of \$4,143 per month, or an annual pre-tax income of \$71,023 (again using an income tax rate of 0.3). At the other extreme of $a = 10$, the corresponding figures are \$24,893 and \$426,737. Here, rationing indeed helps all but the extremely wealthy. I have also run the model for values of β up to 0.99, and can report that at these high levels, the values of \hat{M} soar exponentially.

These results could undoubtedly be subjected to a much more precise analysis, using Gini

coefficients for the income distribution, and sample data or historical evidence to estimate a and β . That will not be attempted in this brief note. I must, however, report my sense of the results in relation to my own preconceptions. I admit to having begun this investigation expecting to find that, for a wide and reasonable range of parameter values, it would turn out that a large majority of the population falls below \bar{M} , with a distinct minority above it. This in turn would provide a basis for widespread political support for the controlled regime. The general shape of the numbers, however, suggests a conclusion that the cutoff income level is more likely to divide the population into significant large groups, and that, in these narrow terms, political support for rationing and price control in situations where these measures might be contemplated is more problematic than my preconception implied.

I will close by suggesting that both popular support and scientific justification for quantity and price control in a specific market must rely on a much broader set of criteria than individual hedonistic calculation alone. Even within the narrow frame of individual utility maximization, however, rigorous modeling points to a range of outcomes, and certainly no automatic presumption that un-(politically)-constrained equilibria must in all cases be deemed superior to political intervention.

7 Non-constant returns, Pareto optimality, and competitive equilibrium

Introductory perspectives

Orthodox (neoclassical) economics has an elegant centerpiece: the welfare theorems of general competitive equilibrium, according to which a system of perfect competition among “firms” and “households” – note that there are no social classes at all in this conception – results in a unique and stable equilibrium outcome. This equilibrium, moreover, is *optimal* in some sense: this is the modern formalization of Adam Smith's famous “invisible hand,” according to which the private, atomistic, self-interested actions of individuals leads to the *best* result from a society-wide standpoint.

The search for a rigorous definition of a social optimum – required as a foundation for a general proof that full competitive equilibrium tends toward that optimum – is one of the great unachieved objectives in this tradition. But a well-known way-station along this journey is the concept of a *Pareto* optimum (named for the early-twentieth-century Italian theorist, Vilfredo Pareto): a situation from which any further change in methods of production, composition, or distribution of output that makes at least one person better off must leave at least one other person worse off. It is, then, an almost universal and religiously held conviction that perfect competition tends to an equilibrium that is Pareto optimal.

Except: no one actually believes it! At least, you can't pin anyone down. From the general equilibrium literature after the middle of the twentieth century you would conclude that nothing about this works: the consumption set (the set of realistic outcomes in which, to be straight about it, no one starves to death) may not include the equilibrium point; information is imperfect, and asymmetric; competition is also not perfect, and subject to strategic manipulation; there may be multiple equilibria; equilibria may or may not be stable (in the sense that positions away from them would lead to movement toward them); there may be external links in production and/or consumption that make individual optima into poor guides to social optima; etc. If one even addresses the Pareto optimality claim or tries to generalize the conditions in which it may not hold, as I do in this chapter, the response is: “The book is closed on that. You are flogging a dead horse. ‘No one’ believes it anymore.”

Well, which is it? No one believes it? Everyone believes it? The philosopher Hilary Putnam issued his critique: economic orthodoxy “keeps a double set of books.” They have

one position for students of Economics 101, for journalists and TV talk show hosts, for the floor rants of US Senators and Representatives, and for Fourth of July speechmaking (and the equivalent in other countries). They have yet another position for themselves, and for anyone who inquires too closely into the premises that underlie the first position. One friend of mine complained: it is like boxing with jello! If you poke holes in the theory, they don't care; in fact, they love it, in a certain way. Then they turn around and teach yet another generation of gullible young minds about the almost eerie virtues of the inevitable, pervasive “free market.”

At bottom, this *jello effect* reflects a deep contradiction at the heart of what is called, in the Marxist tradition, *bourgeois* economics. (The term sounds archaic, but it is in fact rather accurate; more so, indeed, than “orthodox” or “neoclassical” or any other designation that is in the running.) That contradiction occurs between two functions: practical, and ideological. Capitalism needs practical, functional outcomes from its economists, theory that can guide policy; and this is all the more true in the epoch of “late” or advanced capitalism in which the state plays an active role in economic reproduction (at least by comparison with the earlier liberal era). Especially in times of crisis, the executives of capitalist firms and government policy makers need to know “what's what”; they must be provided with tools that can handle the complexity and uncertainty of the economic situation, and that can address the dangers of widespread institutional failure. For this purpose, a microeconomics that is full of rigidities, imperfect information, monopoly or oligopoly power seems to fit the bill. When the TARP bailout money went out to financial institutions in the United States following the great crash of 2007, it would not have done to regard these institutions as “perfectly competitive firms” with “perfect knowledge and foresight.”

On the other hand, capitalists need from the leaders of their Ideological State Apparatuses (Althusser) a well-managed ideology, whose dissemination through the political, media, and educational structures of society is secure, and this ideology has “competitive equilibrium” at its core. That term, to be sure, is not often used, but its popular counterpart, the “free market,” is very much the rage, and this concept is so pervasive that it acquires the status of an unassailable verity, a disembodied “Force” (as in “May the Force be with you!”) to which human intelligence has no access, the existential reality to which “there is no alternative” (TINA). If there is a “secular religion,” this – not Marxism, by the way – is it.

This chapter makes a fairly simple point, although to make that point a certain amount of formal model-mongering becomes necessary! If I didn't *prove* the case using a formal analysis, but merely argued it in literary form, you wouldn't believe me. If I *do* provide the formal analysis, I am told that all this math is a distraction, and that no one wants to read it anyway. Is this yet another instance of a “double set of books”?

The point is this: even if we assume away all of the imperfections, externalities, and so on, that undermine Pareto optimality in the mainstream literature, we still find that competitive equilibrium is not Pareto optimal so long as one condition remains: technical coefficients are *not* independent of the scale at which production of goods takes place – “non-constant returns to scale.” Math aside, the reason (ignored in the literature) is easy to

state: firms make their decisions based on the effect of *their own* actions, not on the effect of movements of entire industries or sectors, and this is simply because, in a competitive environment, firms cannot take account of “macro” adjustments, and would not if they could, since they need to act on their momentary advantages as though their competitors did not also so act.[‡] The rate at which a *firm* can shift production from one good to another is reflected in the current price ratio between the goods, which, from the firm's standpoint, is constant. (That price is entirely independent of the actions of one firm.) The price ratio that would result if *all* firms made the same shift and thereby brought changes in technical coefficients into effect would be different. That crucial difference creates a gap between the (micro)optimal behavior of firms, on the one hand; and the (socially) optimal behavior dictated by conditions of production, on the other. QED. Competitive equilibrium is not Pareto optimal, owing to non-constant returns as such, and independent of any other reasons why this canon of capitalist ideology may be violated.

[‡] The distinction between the momentary, or “conjunctural,” standpoint of the firm and the result of the combined (macro) action of firms as an aggregate is, you may remember, the basis for the theory linking optimal technical change choice (from the standpoint of the firm) to a rising composition of capital and from there (perhaps) to a falling rate of profit; see [Chapter 3](#). The atomistic nature of decision making in spontaneous markets is an important aspect of capitalist reality that cuts across a range of applications, including (not covered in this book) the theory of capitalist finance. It also has important implications for the idea of “market socialism”; see [Chapter 10](#).

As always, the next question is, “So what?” Hey, this is Marxist normal science! Again, specters of double standards, or double sets of books: if “mainstream” economists work on small topics, that is considered mature. If Marxists do it, people get impatient: “What does this have to do with the revolution?” No single bit of insight captures everything we need to know. The result reported in this chapter adds to the undermining of the ideological notion of the social optimality of “competition,” even in the limited Pareto sense. (Some readers may be aware of the indeterminacy and inadequacy of the Pareto approximation to any sort of *social* optimum, but this is yet another story.) Optimality of “competition” has only an indirect relation to any claim to optimality of *capitalist* competition. And so on.

However, if we can claim to have established that something as ubiquitous and central to “free market” ideology as *diminishing returns* results in the destruction of the equally ubiquitous *optimality of competitive equilibrium*, then just maybe we can poke a little hole in the barrier between the ideological and the practical functions of bourgeois ideology, and let a bit of doubt rush into the certainties of TINA.

1 The problem stated

The object of this chapter is to show that, when returns to scale are not constant, competitive equilibrium is not Pareto optimal, except in special and accidental cases.

In today's post-Arrow–Debreu environment of quantity-constrained equilibria, imperfect and asymmetric information, etc., this may not seem to matter much: if an economy is not thought likely to reach equilibrium, the Pareto properties of that equilibrium are of little

interest.[‡] In the textbooks, however, diminishing returns and concave production possibility curves are central to the ideological thrust of mainstream economics. Pareto optimality also serves in an ideological capacity, protecting competitive equilibrium from the ravages of nihilistic realism: in a *hypothetical* world of perfect information, costless mobility of resources, absence of externalities, etc., the invisible hand lives on. For this reason it is important to examine the implications of non-constant (especially decreasing) returns for the Pareto optimality of competitive equilibrium when the usual perturbing conditions are absent.

[‡] Foundation texts for neoclassical general equilibrium theory are Arrow and Hahn, 1971; Debreu, 1959. A recent survey that focuses on the post-Arrow–Debreu developments is Mukherji, 1990.

I will do this using a classical model of production and distribution. Deriving a production possibility curve from a linear production model under decreasing returns is itself novel, and challenges the claim that classical–linear production theory has difficulty handling non-constant returns to scale. This procedure also lets us distinguish the “macro” production possibility curve reflecting the effects on production coefficients of large-scale shifting of resources from the “micro” production possibility curve for the individual producer, whose own perceptible activity shifts have negligible impact on the macro coefficients.

I begin with a subcase of the classical model: one in which all active agents are both producers and traders, performing labor with productive resources which they also own. There is no separation here into labor and capital markets, and the producer–traders maximize, and therefore bring about the competitive equalization of, a single variable – the net income per unit of labor expended, or *net income ratio*, η . I then argue that the result extends readily to the full classical model, with separate labor and capital markets and simultaneous equalization of a wage rate and a profit rate, and by implication to the neoclassical model with fixed endowments and production functions.

2 The model, in n and 2 sectors

Consider a multi-sector economy, without technical change.[‡]

There are no capital stocks (stocks of produced inputs). Non-produced inputs other than labor are assumed to be present; their role in production will be expressed indirectly, however, through their effect on labor and material input flows. The overall scale of production is determined by the aggregate quantity of homogeneous labor, which closes the system. The production technology can then be described in well-known input–output fashion by a row vector of homogeneous per-unit labor inputs, \mathbf{l} , and a square matrix of flow per-unit input coefficients, \mathbf{A} . Net and gross outputs are, respectively, the column vectors \mathbf{Y} and \mathbf{X} ; these are related by $\mathbf{Y} = (\mathbf{I} - \mathbf{A})\mathbf{X}$, where \mathbf{I} is the identity matrix. We will also need, for analytical purposes, the vertically integrated unit labor input vector

$$\boldsymbol{\lambda} = \boldsymbol{\lambda}\mathbf{A} + \mathbf{l} = \mathbf{l}(\mathbf{I} - \mathbf{A})^{-1},$$

from which, with L representing the total labor force,

$$\lambda \mathbf{Y} = \mathbf{I}(\mathbf{I} - \mathbf{A})^{-1} (\mathbf{I} - \mathbf{A})\mathbf{X} = \mathbf{I}\mathbf{X} = L. \quad (7.2)$$

$\lambda \mathbf{Y} = L$ is the equation of the net transformation surface, the simplex expressing the tradeoff among all of the net outputs of the economy, which can also be written as

$$Y_i = \frac{L}{\lambda_i} - \sum_{j=1}^n \frac{\lambda_j}{\lambda_i} Y_j \quad j \neq i \quad (7.2')$$

From (7.2') the maximum net output of any commodity, corresponding to zero net outputs for all other commodities, is seen to be

$$Y_i^{\max} = \frac{L}{\lambda_i}.$$

It should be noticed that (7.2') reveals the *marginal rate of transformation* (mrt) between any two commodities to be

$$\frac{\partial Y_i}{\partial Y_j} = -\frac{\lambda_j}{\lambda_i}. \quad (7.3)$$

‡ A good source for models in this tradition is Kurz and Salvadori, 1995; see also Kurz and Salvadori, 1998. The seminal foundation text is Sraffa, 1960.

This system can be interpreted in two different ways. The first, and most obvious, is to assume constant returns to scale in all sectors of the economy, in which case the elements of \mathbf{A} and \mathbf{I} are invariant to changes in the allocation of the total available labor, L , among sectors. Equations (7.2) and (7.2') then express the literal truth about the range of possible choices of net output combinations available. Alternatively, however, one may regard (7.2) and (7.2') as representing *hypothetical extrapolations* from a particular set of outputs and the associated activity scales in the various sectors; they are a logical deduction from a singular reality, and by no means preclude the possibility that any actual shift of labor and allied resources among sectors will cause some or all of the input coefficients to change.

Such change results from the existence of non-produced and non-homogeneous inputs; these enter the model indirectly by altering the labor input and produced input coefficients, as scale changes. Decreasing returns may then be set in motion by large-scale, aggregative shifting of resources among sectors. Shifting by an individual producer, by contrast, is likely to have an unmeasurable impact on the technical coefficients, which are therefore constant within the range of variation that is relevant for decision making by individual agents.

An example may help illustrate the distinction between the macro and micro perspectives on the effect of scale changes on the technical coefficients. In a hypothetical agricultural economy, economy-wide shifting between crop farming and dairy farming may cause input coefficients to change in the presence of fixed qualities of land that favor one or the other

agricultural activity. The individual farmer, by contrast, may make a decision to move from crops to dairy, perhaps selling crop land and purchasing pasturage of equal value for the purpose, without causing any change in the crop/dairy tradeoff (the marginal rate of transformation). The individual producer's action is so minute that it results in no perceptible change in relative prices (of either land or goods), and no perceptible change in productivities. As in the case of the perfectly competitive firm, whose output decisions move the economy along the market demand curve to such an imperceptible degree that there can be no perceived effect on the price, the farmer's effect on the aggregate balance of resource use is negligible.

In the simple producer–trader subcase, competitive arbitrage results in the formation of a uniform net income ratio, η . The price equation is

$$\mathbf{p} = \mathbf{p}\mathbf{A} + \eta\mathbf{l} = \eta\mathbf{l}(\mathbf{I} - \mathbf{A})^{-1} = \eta\boldsymbol{\lambda}, \quad (7.4)$$

where η is the equalized net income ratio, the outcome of the process $\eta_i \rightarrow \eta$. The equilibrium price vector for this economy is therefore revealed to be proportional to the gross labor input coefficients, $\boldsymbol{\lambda}$.[‡]

[‡] The value of used-up inputs is replaced before net income is calculated, so that differences in ratios of material inputs to labor (however measured) do not “pull” prices away from those that equalize net income ratios across sectors. Differences in startup costs due to divergent material/labor ratios constitute a one-time element that may affect decisions of new producers choosing a sector to enter, but these should have vanishing significance for the price structure in general. In a model with significant fixed capital, however, differing material/labor ratios might well complicate the equilibrium price vector, even in this world of small producers for whom ownership is inseparable from their own labor activity.

We may quickly write down the structure of the better-known “capitalist” subcase, in which an equalized wage rate and an equalized profit rate take shape. Here price adjustment follows the form

$$\boldsymbol{\pi} \rightarrow w\mathbf{l} [\mathbf{I} - (1+r)\mathbf{A}]^{-1}, \quad (7.5)$$

where $\boldsymbol{\pi}$ is the vector of equilibrium prices for this case, from the price equation $\boldsymbol{\pi} = \boldsymbol{\pi}\mathbf{A} (1 + r) + w\mathbf{l}$.

We begin with the producer–trader subcase, as explained above, prior to generalizing the results. As a final preliminary, we will need the property (presented without proof here) that

$$\frac{\partial \lambda_i}{\partial l_j} > 0, \quad \frac{\partial \lambda_i}{\partial a_{jk}} > 0. \quad (7.6)$$

This states simply that the vertically integrated labor coefficients, λ , are monotonic increasing functions of all of the input coefficients.

In a two-good version of this economy, the hypothetical net transformation curve (7.2') reduces to

$$Y_2 = \frac{L}{\lambda_2} - \frac{\lambda_1}{\lambda_2} Y_1. \quad (7.7)$$

In the producer–trader model, we have, in competitive equilibrium, prices proportional to λ_i (as we have seen above). Since the goal is to examine the properties of equilibrium, I assume from here on that convergence is complete, and that the λ_i represent, for this case, the appropriate price concept. Clearly, the agents in this model will evaluate the market price ratio in relation to λ_1/λ_2 , the marginal rate of transformation, which therefore emerges as the long-run equilibrium price ratio.

It may be worthwhile to establish this result as explicitly as possible. For the two-good case we have

$$\lambda = (\lambda_1 \lambda_2) \quad \mathbf{I} = (l_1 \ l_2) \quad \mathbf{A} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$$

from which, using (7.1),

$$\frac{\lambda_1}{\lambda_2} = \frac{l_1(1-a_{22}) + l_2 a_{21}}{l_2(1-a_{11}) + l_1 a_{12}}.$$

Producers move between the two sectors by comparing net income ratios. This amounts to choosing the maximum of

$$(\eta_1, \eta_2) = \left\{ \frac{p_1(1-a_{11}) - p_2 a_{21}}{l_1}, \frac{p_2(1-a_{22}) - p_1 a_{12}}{l_2} \right\}.$$

It is easy to show that

$$\frac{p_1}{p_2} \geq \frac{\lambda_1}{\lambda_2} \Rightarrow \eta_1 \geq \eta_2;$$

producers will therefore migrate in one direction or the other until

$$\frac{p_1}{p_2} = \frac{\lambda_1}{\lambda_2},$$

which is therefore established as the long-run competitive equilibrium condition for this economy. The ratio

$$\frac{\lambda_1}{\lambda_2}$$

is, as we have seen, the marginal rate of transformation *seen by the individual producing agent*, since it is a condensed expression of the production coefficients defined by the

established scale of the sectors of the economy. The individual producer is both powerless to alter, and uninterested in altering, these coefficients, and certainly cannot know or anticipate changes in them.

Our next task is to derive the economy-wide net transformation curve, under the assumption of *decreasing returns to scale* in both sectors: this is the implicit role of the non-produced inputs in the model.‡ All or some of the input coefficients in a sector are thus assumed to vary directly with the scale of activity in that sector, as measured by the proportion of the sector's value added, $\lambda_i Y_i$, in total value added L . Defining

$$\mu = \frac{\lambda_1 Y_1}{L} \quad 1 - \mu = \frac{\lambda_2 Y_2}{L}$$

we can use the monotonic property (7.6) to express decreasing returns as affecting the gross labor coefficients λ_i : an increase (decrease) in scale in sector j , for example, forces some or all of the input flow coefficients in that sector up (down), which in turn alters λ_j in the same direction. For simplicity (and I believe without loss of generality), the relation between the scale parameter μ and the λ_i is assumed to be linear:

$$\lambda_1 = a + b\mu \tag{7.8}$$

$$\lambda_2 = c - d\mu \quad (c > d) \tag{7.9}$$

Relations (7.8) and (7.9) are the central innovation proposed here; they bring non-constancy of returns into the “linear” classical model. The restriction $c > d$ assures that λ_2 is positive at its minimum value, when all labor is allocated to sector 1 ($\mu = 1$). From (7.8) we have

$$Y_1^{\max} = \frac{L}{\lambda_1(\mu=1)} = \frac{L}{a+b},$$

from (7.9),

$$Y_2^{\max} = \frac{L}{\lambda_2(\mu=0)} = \frac{L}{c}.$$

‡ The distinction being drawn here is essentially the same as that between (dis)economies internal to the firm and those external to the firm. These have a long history in twentieth-century discussion, but this has usually been in the context of increasing returns to scale and with regard to the problem of the long-term viability of competitive firm size, a problem that plays no role in my argument (see, *e.g.*, Young, 1928). There is, so far as I am aware, no prior discussion of the relation between non-constant returns and Pareto optimality, despite the large literatures on the two concepts taken separately.

It should be noted that $\lambda_1 Y_1 + \lambda_2 Y_2 = L$, and that $L_1 + L_2 = L$, but that, except at one particular and analytically uninteresting allocation of labor, $\lambda_i Y_i \neq L_i$. The product $\lambda_i Y_i$ goes to 0 as Y_i goes to 0, which occurs when L_i is still positive (sector i must run at a minimum level adequate to ensure replacement of good i used up in both sectors).

Combining the definition of μ with (7.8), we find

$$\mu = \frac{aY_1}{L-bY_1} \quad 1-\mu = \frac{L-(a+b)Y_1}{L-bY_1} \quad (7.10)$$

and from (7.9) and the definition of μ ,

$$\lambda_2 = c - \frac{adY_1}{L-bY_1} = \frac{cL-(ad+bc)Y_1}{L-bY_1}.$$

Putting this into

$$Y_2 = \frac{(1-\mu)L}{\lambda_2},$$

we finally obtain

$$Y_2 = L \frac{L-(a+b)Y_1}{cL-(ad+bc)Y_1}. \quad (7.11)$$

Equation (7.11) is the equation of the *aggregate net transformation curve*, or production possibility curve, incorporating the (decreasing-returns) effect on scale when economy-wide shifts of labor (changes in μ) occur. It should be noticed that $Y_1=0 \Rightarrow Y_2=Y_2^{\max}=L/c$, and $Y_2=0 \Rightarrow Y_1=Y_1^{\max}=L/(a+b)$, as required.

The “macro” aggregate marginal rate of transformation, MRT, is found as

$$\text{MRT} = \frac{\partial Y_2}{\partial Y_1} = - \frac{a(c-d)L^2}{[cL-(ad+bc)Y_1]^2}, \quad (7.12)$$

which is < 0 owing to the restriction $c > d$; this also guarantees that the denominators in (7.11) and (7.12) are positive for all $Y_1 \in (0, Y_1^{\max})$. The second derivative,

$$\frac{\partial^2 Y_2}{\partial Y_1^2},$$

is also < 0 , as expected.

Now the “micro” marginal rate of transformation, mrt, is easily derived:

$$\text{mrt} = - \frac{\lambda_1}{\lambda_2} = - \frac{a+b\mu}{c-d\mu} = - \frac{aL}{cL-(ad+bc)Y_1}. \quad (7.13)$$

From (7.12) and (7.13) the relation between the two marginal rates of transformation is seen to be

$$\text{MRT} = \text{mrt} \left[\frac{(c-d)L}{cL - (ad+bc)Y_1} \right] \quad (7.14)$$

The important point here is that *the two marginal rates of transformation are in general different*. In fact, $\text{MRT} = \text{mrt}$ if and only if the term in square brackets in (7.14) = 1, which implies

$$Y_1 = \frac{dL}{ad+bc},$$

a particular value of Y_1 falling between and Y_1^{\max} .

Comparison of MRT and mrt at different compositions of output is straightforward. In [Table 7.1](#), they are presented in absolute value (i.e., the negative sign is ignored for simplicity).

The information obtained thus far is presented visually in [Figure 7.1](#). The top panel shows the production possibility curve. The straight lines have slopes determined at their points of tangency or intersection with the curve; the labels attached to them are the economic interpretation to be given to their slopes. In the bottom panel, the MRT and mrt curves are again drawn in absolute value, for ease of presentation.

The major implication of this construction should now be clear. Individual producers follow mrt, not MRT: their own resource shifts are infinitesimally small in comparison to the macro scale of the economy, and the decreasing returns that operate at that scale are invisible to them. With the economy at some position along the macro transformation curve, the operational marginal rate of transformation is given simply by

$$-\frac{\lambda_1}{\lambda_2},$$

and is constant for the reasonably small ranges of shifting perceivable by any individual producer. This is nothing but a general equilibrium version of the usual competitive assumption: individual firms confidently (and correctly)

Table 7.1 Marginal rates of transformation at different output compositions

Y_1	0	$dL/[ad+bc]$	Y_1^{\max}
mrt	$\frac{a}{c}$	$\frac{a}{c-d}$	$\frac{a+b}{c-d}$
MRT	$\frac{a}{c} \frac{c-d}{c}$	$\frac{a}{c-d}$	$\frac{a+b}{c-d} \frac{a+b}{a}$

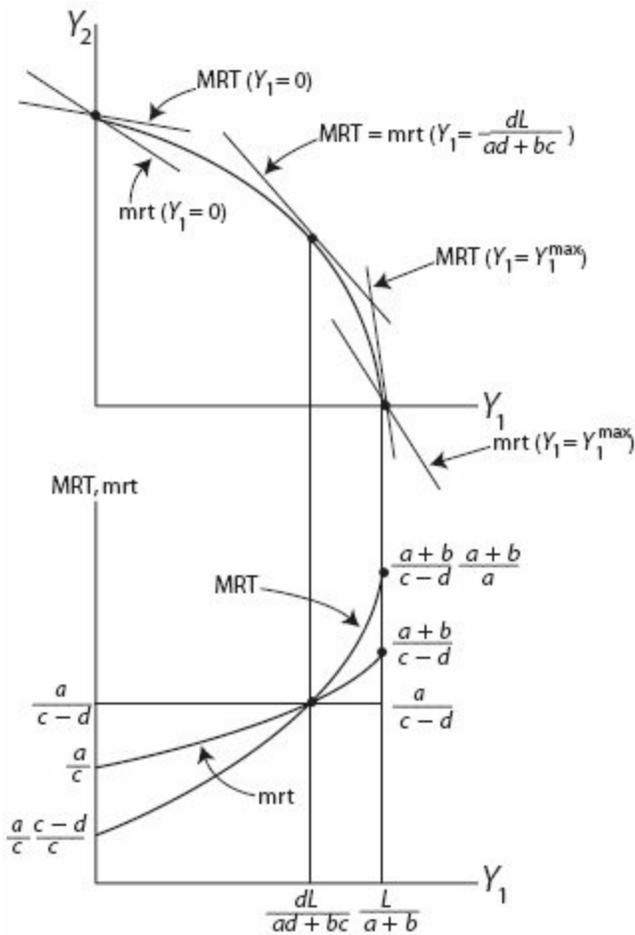


Figure 7.1 The two marginal rates of transformation.

assume that their own actions are too insignificant to affect either prices or scale conditions at a magnitude to alter the technical coefficients. Rational action, then, equates the marginal rate of substitution in consumption, MRS, to mrt, and, by implication, therefore, $MRS \neq MRT$ – unless the parameters underlying the optimal allocation happen by accident to place the economy at $Y_1 = dL/(ad + bc)$.

This outcome can be formalized using a standard Cobb-Douglas utility function:[‡]

$$U = Y_1^\alpha Y_2^\beta \tag{7.15}$$

from which the marginal rate of substitution (once again ignoring the negative sign for convenience) is

$$MRS = \frac{U_1}{U_2} = \frac{\alpha Y_2}{\beta Y_1} = \frac{\alpha}{\beta} \frac{L}{Y_1} \frac{L - (a+b) Y_1}{cL - (ad+bc) Y_1} \tag{7.16}$$

This expression has a vertical asymptote at $Y_1 = 0$, and becomes 0 at $Y_1 = Y_1^{\max}$.

[‡] This of course falls short of a truly rigorous presentation in terms of individual utility functions, and falls prey to all of the well-known paradoxes associated with the notion of a social utility function and community indifference curves. It is sufficient to make the point about the welfare loss from $mrt \neq MRT$.

The relation among all three ratios MRS, mrt, and MRT is shown in [Figure 7.2](#). The competitive equilibrium of the economy is at point E in the top panel. This equilibrium is fully determined by both technical conditions and demand.

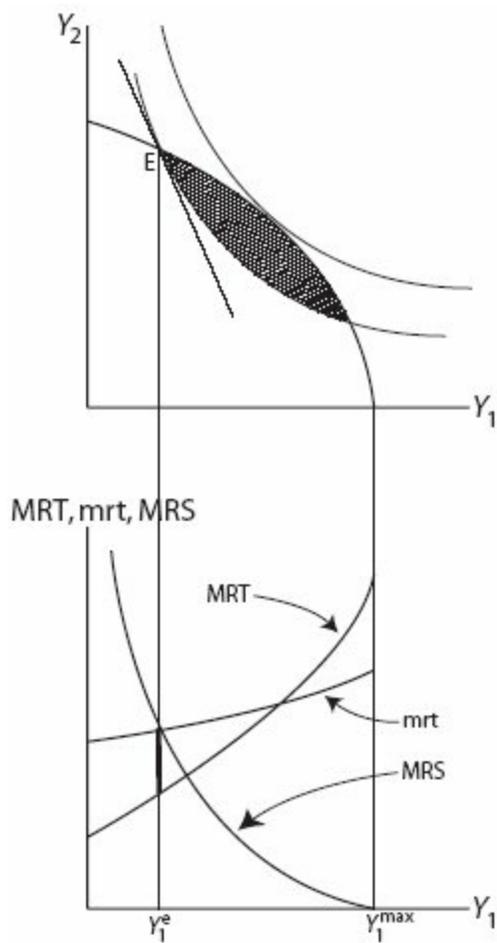


Figure 7.2 The welfare loss in competitive equilibrium.

The important point is that, since $mrt = MRS$ at E, that point represents a stable equilibrium: neither producers nor consumers have an incentive to shift. The MRS and mrt curves clearly have a single intersection, guaranteeing uniqueness of equilibrium, at least in this simple setting. The Pareto inefficiency appears as the heavy line segment in the bottom panel, showing (in this case) $MRT < MRS$ at the equilibrium allocation; and as the shaded area in the top panel, measuring the welfare loss.

3 Concluding and summarizing

The conclusion is unmistakable: non-constant returns *by themselves* imply that *long-run competitive equilibrium is not Pareto optimal*. This conclusion actually follows simply from the observation that individual producers cannot simulate the effects of a combined (macro) shift in resources, and therefore have no way of knowing **MRT** (the vector of marginal rates of transformation for the n -good case). Moreover, even if they had the econometric capability to estimate it, they would not want to do so; their momentary profit

opportunities would impel them to act according to $\mathbf{p} \geq \mathbf{mrt}$ (where \mathbf{mrt} is the vector of micro marginal rates of transformation). \mathbf{MRT} is not a factor in producer optimal calculations.

Does this result survive translation to the capitalist case, in which labor markets and capital markets have been separated and a distinct rate of profit formed? First, it is interesting to observe that in a competitive regime of profit-rate maximization/equalization, the relevant rate of transformation is

$$\frac{\pi_i}{\pi_j} \neq \frac{\lambda_i}{\lambda_j}.$$

Capital owners in this case are oblivious to the actual marginal rates of transformation in the economy – \mathbf{mrt} as well as \mathbf{MRT} . (To see this, remember that with $\mathbf{p} = \mathbf{mrt}$, in general profit rates differ among sectors.) Forces other than the actual technical possibilities of transformation are driving price from the supply side.

With profit-rate equalization defining the special rate of transformation π , there is every reason to expect that $\mathbf{MRS} = \pi \neq \mathbf{MRT}$ in competitive equilibrium. The welfare loss persists. By extension, in a more sophisticated dynamic world, all of the widely recognized problems for the welfare theorems come into play on top of the welfare loss identified in the static case, but there is no reason to believe that that loss is somehow eliminated or superseded. The point remains general.

As a final step toward complete generality, we may briefly consider the world of fixed endowments. Imagine a large number of producers, each with a unique transformation curve and vector \mathbf{mrt}_i , expressing the perceived transformation opportunities in production; imagine also, for the moment, that these vectors are the relevant ones for optimal calculation. Once we recognize that $\mathbf{mrt}_i = f_i(\boldsymbol{\mu})$, – that individual production possibilities depend on aggregate tradeoffs embodying decreasing returns and in principle unknown and unknowable to the individual agents – we still have $\mathbf{mrt}_i \neq \mathbf{MRT}_i$, and a large collection of welfare loss areas such as the one depicted in the top panel of [Figure 7.2](#). This Pareto inefficiency is more visible in the “classical” world, but it exists also in the neoclassical fixed-endowments models.

It should, perhaps, be noted that the deviation of \mathbf{mrt} from \mathbf{MRT} has nothing to do with specific externalities in production, such as the fabled orchardists and bee-keepers or the polluters of rivers with industrial waste. These external effects and other market imperfections constitute further sources of divergence between perceived and actual tradeoffs, and failure to achieve Pareto optimal outcomes. The argument of this chapter is that, even absent all such *specific* external effects and information failures, the very atomistic, “parametric” condition of the individual producer entails failure to perceive and act upon the full social tradeoffs in production.

One may see this failure as yet another externality, in the sense that the effect of an individual producer's actions on technical coefficients is external to his/her calculations and

behavior. Alternatively, it may be considered an information problem: by definition, the individual does not have knowledge of the social **MRT** and would not act on that knowledge if it were available. Semantics should not detain us. If my point is thought to involve externalities and/or imperfect information, it is only in a sense that these qualities are ubiquitous and inherent in *all* competitive production, as long as returns to scale are not constant.

I make no effort to estimate the relative importance of the welfare loss arising from $\mathbf{mrt} \neq \mathbf{MRT}$, and in fact doubt whether any attempt at estimation could be meaningful. The role of the link between Pareto optimality and competitive equilibrium is, as implied at the outset, more ideological than practical. I am quite prepared to agree that the result presented in this chapter has no practical significance – so long as the same conclusion is drawn concerning the invisible-hand thinking that still dominates the textbooks, despite the guarded and nihilistic conclusions of the post-Arrow–Debreu theorists. This doctrine has the advantage of incumbency, with a deep and enduring impact on social thought. Its refutation is therefore a useful project, despite the apparent simplicity and abstractness of the argument. If atomistic competition is *not* socially efficient, even on the austere, static terrain on which it performs best, then speculation about economic possibilities is protected from succumbing to formulaic negativism, and new ways of thinking about institutional arrangements seem both possible and worth pursuing.

8 Broadening the theory of aggregate supply

A “New Critical” proposal

Introductory perspectives

The tension between the ideological and practical functions of economic theory reaches fever pitch when it appears on the terrain of macroeconomic (fiscal and monetary) policy. The core problem is the deeply ambivalent attitude of capitalist ruling classes toward the state, and this ambivalence goes way back into the earliest periods of capitalist development. It acquires its full-blown modern character in the post-liberal era in which self-propelled capital accumulation in the presence of a passive state has become chronically problematic. State economic policy therefore becomes a central requirement for more-or-less smooth reproduction, and a constant bone of contention.

The problem: is the state evil, or is it just inconsequential (ineffective)? It can't be both at the same time. If in the name of spontaneous market-based exploitation and accumulation one wants to declare all state economic activity, or attempts at regulating private activity, to be burdensome, corrupt, and inefficient, one must specify exactly why one feels this way. For example, public-sector provision of jobs is clearly evil, because it is “inefficient”: it creates unwarranted competition with private employment, and so tips the balance of class forces toward the workers, and that (of course) is evil. Anything that threatens to lower the rate of profit is evil. But this throws a spotlight on the class-biased definition of “evil” that is at work. People might just start thinking: “what is evil for you may not be evil for me!”

John Maynard Keynes broke decisively with the “evil”-state view by advocating massive public spending. But he was writing in the context of the Great Depression; with anywhere from one-fifth to one-third of the workforce unemployed, perhaps the ruling class did not then have to worry too much about the effect of public spending on the balance of class forces. Keynes argued, in fact, that too much disciplining of the working class by economic depression might kill the goose that lays the golden eggs. In the postwar decades of the twentieth century, by contrast, fiscal policy – and monetary policy as well, since it came to be widely believed that fiscal expansions had to be monetized in order to be effective – was seen as a threat to management and maintenance of the capitalist class–property system, and the focus shifted, from proving that state intervention in the economy was evil, to proving that state intervention could accomplish nothing whatsoever.

Thus, by around 1980, macroeconomics came to be dominated by the “policy ineffectiveness proposition.” Any fiscal–monetary policy will be anticipated, and thereby

nullified, by the rational expectations assumed to be deployed by actors in the private sector. If, for example, we anticipate that government will want to create full employment by increasing the money supply M , and if we also “know” that that increase will lead to a corresponding rise in the price level P (because we all share the “one true model” of the way the economy works), then we come to expect that the *real* money supply, M/P , will not increase; any attempt to influence the level of activity by increasing real money balances is therefore offset. Policy is ineffective. The free market macroeconomists have other strings to their bows, such as “Ricardian equivalence,” learning theory, and other modern devices, but the rational expectations argument is a good summation of the general attitude.

However, if the problem with the government-is-evil position is the relativity of “evil,” the problem with the government-is-ineffective position is the manifest failure of the resulting theory to explain the turbulence of recent economic history, and the impotence it imposes on economic policy makers. Remember, capitalist ideology must mystify, but it must also provide tools to ruling political centers for dealing with real-world concerns.

What orthodox macroeconomic theory *cannot* do is grasp in its entirety the problem revealed by the eternal cycling between the two poles. There is a similar polarity between conservatives (who blame crisis on government spending and insufficient “incentives” to business) and liberals (who blame crisis on insufficient demand and excessive profits): crisis is due either to low profit rates or high ones! Each side sees a solution to chronic turbulence within the framework of capitalist social relations, but their solutions work in opposite directions, and the proposals of each exacerbate the problems identified by the other. In the same way, the evil-government/ineffective-government poles exclude each other. Neither “side” within the mainstream policy discussion can see the whole picture: capitalist accumulation is inherently autonomous and cannot be tamed or “regulated”; policy *does* affect outcomes, but in partially unanticipated and unanticipatable ways; policy can therefore ultimately only be “effective” – from a progressive standpoint that prioritizes the developmental needs of the working class – if it makes increasing inroads upon the prerogatives of capitalist private property as such. But that, as they say, is a declaration of war.

The internal critique of mainstream theory that looms as an important element in this book often takes the form of revealing hidden assumptions, or assumptions that are not so much hidden as simply unanalyzed. This chapter examines what has come to be called the “New Classical macroeconomics.” Suppose an economy is running at a level significantly, but not precipitously, below full employment of its labor and material resources. Keynesian policy makers will then want to deploy a fiscal–monetary expansion of demand, to close the gap. Suppose, further, that this temporarily raises the level of output and lowers the unemployment rate. Fine. But, the New Classical macroeconomists tell us, the price level will also go up. The balance of class forces – a concept they cannot entertain as such – is unchanged, so when workers perceive the price increase they demand equivalent money wage increases. This decreases the supply of output, raising prices still further. The outcome of this process is a return, at whatever higher price level, to a standard level of unemployment at which workers are no longer in a position to demand money wage

increases. The new macroeconomic equilibrium that emerges is one with exactly the same level of output, and a higher price level. Policy is ineffective in altering the position of the “real” economy (output, employment).

But now reverse the (hidden) assumptions! Suppose the money wage rate is fixed (absolutely or relatively), but the price increase affects the (unthinkable) balance of class forces, by lowering the real wage, weakening labor, and so increasing the quantities of labor supplied at each level of the wage (needed for workers to achieve the customary standard of living). Now output and employment rise and the price level falls back to its standard level! Policy is fully effective. Keynes is vindicated.

But of course he isn't, really. Triumphant visions of “fine tuning” cannot rest on policy expansions that increase the rate of exploitation of labor. What this healthy antidote to policy-ineffectiveness thinking shows is that the capitalist macroeconomic process itself is inherently unstable, and that *macroeconomic* policy, while important in the short run, must give way to *social-transformation* policy – perhaps a genuine new New Deal – if it is to be ultimately effective. This, however, as noted, takes us beyond the narrow confines of mainstream macroeconomic thinking – as well it should.

No space for any math lessons this time around! I must, however, record, as I do within the chapter itself, my indebtedness to the nonmathematical work of the twentieth-century Cambridge University economist Maurice Dobb, whose wise and careful scholarship in economic theory and history has served as a model and guide, which I could never hope to emulate.

1 Setting the table

Recent decades have witnessed widespread rejection of discretionary government stabilization policy, and of the underlying Keynesian model. While monetary policy in practice seems to have survived the ascendancy of libertarian thought to the highest councils of the Federal Reserve system, fiscal policy, especially in the form of government spending, is in rather total disrepute. At the level of the textbooks, the theoretical foundation is now almost entirely provided by the “New Classical” macroeconomics, which teaches that competitive labor markets and a flexible, endogenous price level combine to generate a dynamic short-run aggregate supply curve, and a vertical long-run aggregate supply curve. The positive government-spending multiplier of the Keynesian model rests upon an unacceptable neglect of the labor market and the price level. At best, it points to rigidities in prices and money wages and elements of less-than-perfect competition that create a temporary space for discretionary policy to affect real output and employment. Even this effect, however, is largely nullified to the extent that people form rational expectations of government stabilization efforts. Fiscal and monetary policy thus have no significant impact on output, but instead determine only the level of money prices.[‡]

[‡] A useful survey of the New Classical–New Keynesian debate and the search for micro-foundations for the New Keynesian models will be found in Dixon and Rankin, 1995.

While many texts appear to be settling at a point in between the New Classical and Keynesian extremes, it is common to award victory in logic to the New Classical view, while insisting, often with some puzzlement, that the facts still seem to support the Keynesian position. Thus, output fluctuations are significant, and cannot be explained by non-policy exogenous shocks alone; monetary policy is demonstrably effective.[‡] In any dispute between theory and facts, however, theory ultimately wins. It is therefore of some interest to inquire whether the New Classical challenge can be met at the level of theory. The labor market is indeed decisive for overall macroeconomic behavior, but a fuller representation of what takes place in the all-important exchange of labor services for wages may result in a richer view of stabilization policy – one that does not rest solely upon myopia, imperfections, and rigidities.

[‡] For example, a leading textbook (Dornbusch *et al.*, 2001) states, with particular regard to the rational expectations position: “the intellectual appeal of rational expectations is completely irresistible. The only really good argument against the notion that monetary policy is ineffective lies in the data” (110–111). I will use this text in what follows to represent the mainstream consensus; it would be tedious and arbitrary, given the limited purposes of this chapter, to refer to multiple texts containing essentially the same material. On the effectiveness of monetary policy, see Romer and Romer, 1989.

In this chapter, the Aggregate Demand concept, as it has evolved in the literature, is retained, with attention directed toward reconceptualizing Aggregate Supply. I will develop a “New Critical” alternative to the standard New Classical view, at the intermediate textbook level. If the intuition underlying my proposal seems reasonable and the results obtained fruitful, others may wish to help explore and develop the complete foundations of the theory.

As the above implies, the New Critical proposal offers a user-friendly supplement to the usual teaching materials. I have experimented with the new ideas in both introductory economics and intermediate macroeconomics classes, with generally good results. Finally, I note, in a clear attempt to dampen expectations, that nothing approaching a comprehensive survey of the literature is attempted in this chapter; the “canonical” New Classical model presented below could be drawn from any number of standard texts (in Dornbusch *et al.*, 2001, refer to [chapter 6](#)), and is part of the general *corpus* of economic theory. I will, of course, provide references for the ideas underlying the New Critical position as the argument proceeds.

The next section sets forth the New Classical model – a composite focusing on only those features that are essential for critique, comparison, and, eventually, synthesis. Section 3 discusses the conceptual foundations, and sources, of the New Critical view. Section 4 presents the “canonical” New Critical model, at the same level of formalism as its New Classical counterpart. In Section 5, I address the possibility of synthesizing the two models; synthesis would presumably capture far more of the richness of what actually occurs in the world than either of the two models separately. This reference, incidentally, suggests that the “orthodox” position in macroeconomics is not, in some absolute sense, wrong; it is, rather, incomplete. In anticipation of a complete synthesis of the two perspectives, I offer an interim suggestion in which the two adjustment mechanisms alternate. A final section concludes and

summarizes. I will anticipate here only to this extent: the New Critical proposal, and the Critical/Classical synthesis, by no means vindicate an old-fashioned “hydraulic” Keynesian multiplier view of stabilization policy,[‡] but rather raise questions about the wider social conditions for, and effects of, policy interventions. Rather than attempting to counter “policy ineffectiveness” (McCallum, 1980) with “policy effectiveness,” the New Critical model and synthesis offer us, I propose, an opportunity to think more fully about the question: what *kind* of effectiveness, and with what longer-range impacts?

[‡] For the distinction between “hydraulic” and “fundamentalist” Keynesianism, see Coddington, 1976.

2 A canonical New Classical model

We begin on familiar terrain. Combine a Phillips Curve – an inverse relation between the growth rate of the money wage rate and the unemployment rate – with a stable markup, and a simple linear production function – the relation between output and quantity of labor employed, with a given capital stock and in conditions of constant productivity – to find a relation between the change in the price level and the level of output Y relative to a strategic pivot level, Y^* . In discrete time, with the subscript $_{-1}$ indicating the previous time period, we have:

$$P = P_{-1} + \delta(Y - Y^*) \quad (8.1)$$

This is the canonical Aggregate Supply (AS) curve for the New Classical case.[‡] The pivotal Y , Y^* , is the level of output corresponding to a level of employment consistent, given the size of the labor force, with the “natural rate of unemployment” or NAIRU (“non-accelerating inflation rate of unemployment”), U^* . The idea is simple, and corresponds to a strong intuition running through many schools of thought: U^* is the unemployment rate at which the balance of power in the labor market is at the precise level required to keep the money wage rate from either rising or falling. $Y = Y^*$ ($U = U^*$) implies a constant money wage rate, and therefore price level ($P = P_{-1}$). $Y > Y^*$ suggests a tight labor market and rising price level, and conversely. The coefficient δ measures the strength of this transmission mechanism: the intensity with which tightness or slackness in the labor market results in rising or falling money wages, respectively, and in turn money wage changes result in corresponding movements in the price level (the degree of price flexibility). The slope of the AS curve is, of course, δ (> 0). We will also need (8.1) written in inverse form:

$$Y = Y^* + \mu(P - P_{-1}), \quad \text{where } \mu \equiv \frac{1}{\delta}. \quad (8.1')$$

[‡] In their eighth edition [117], Dornbusch *et al.* use an expectations-augmented Phillips curve and derive a relation like (8.1) between the current price level P and the expected value of the current price level P^e . The earlier editions use a more adaptive-expectations-oriented formulation relating P to P_{-1} . The change does not alter the central New Classical point about the shifting of short-run AS until $Y = Y^*$. Their derivation of AS also has P^e (or P_{-1}) in both intercept and slope; in adjustment to a given level of aggregate demand, the curve should thus rotate around a constant point on the Y -axis, rather

than shifting parallel to itself, as in their graphical illustrations. In my canonical (8.1) I have removed this complication and written AS in a simple version with a given slope, δ . Nothing in what follows depends on these simplifying assumptions.

Without unpacking it, I will represent the Aggregate Demand (AD) curve as the linear relation

$$P = a - bY \quad (8.2)$$

This can be thought of either as a linearization of the IS–LM equation for equilibrium output (Dornbusch *et al.*, 2001, 85, 234), or of the quantity equation $P = MV/Y$ (e.g., Farmer, 1999, [ch. 5](#)). Combining (8.1') with (8.2), we find a relation between today's and yesterday's price level:

$$P = \left(\frac{a - bY^*}{b\mu + 1} \right) + \left(\frac{b\mu}{b\mu + 1} \right) P_{-1} \quad (8.3)$$

This is an ordinary difference equation, with solution

$$P_t = (a - bY^*) \left[1 - \left(\frac{b\mu}{b\mu + 1} \right)^t \right] + \left(\frac{b\mu}{b\mu + 1} \right)^t P_0 \quad (8.4)$$

It is clearly convergent, with

$$\lim_{t \rightarrow \infty} P_t = P_\infty = a - bY^* \quad \text{and, using (8.2), } Y_\infty = Y^*.$$

The convergent (long-run equilibrium) price level is determined by aggregate demand, and the convergent level of output is the pivotal output Y^* .

The logic is expressed in the familiar [Figure 8.1](#). Degree of flexibility and adjustment time aside, an economy in which $Y < Y^*$ will adjust spontaneously via a falling P , while an attempt to increase output above Y^* will lead to rising P and $Y \rightarrow Y^*$, with at best a temporary impact on output and employment. [Figure 8.1](#) captures the determination of the position of the short-run AS curve in each time period: $P = P_{-1}$ where $Y = Y^*$ (from (8.1)). The sequence of points ABCDEF represents, first, spontaneous adjustment to AD_0 via falling P from A to C (B is the first-period position); then, following an increase in aggregate demand to AD_1 adjustment via rising P from D to E (first period), and finally to F. Note that the intercept of the AS curve, (8.1), is $P_{-1} - \delta Y^*$, and that $P > P_{-1}$ implies rising P_{-1} – the AS curve shifts backward and to the left – and conversely for $P < P_{-1}$.

The New Classical adjustment mechanism thus captures one aspect of labor-market behavior: the effect of excess demand for labor on the money wage rate and the pass-through to the price level. The leftward shift of AS as the price level rises mirrors a similar leftward shift in the supply curve of labor – the money wage rate drawn against the quantity of labor supplied – which in turn rests on the assumption that underlying conditions of labor supply

have not changed. Once workers discover the impact of the rising price level on the real wage rate, they demand a higher money wage rate, w_m , for each given quantity of labor supplied; the supply curve of labor in terms of the real wage rate, w , is unaltered.

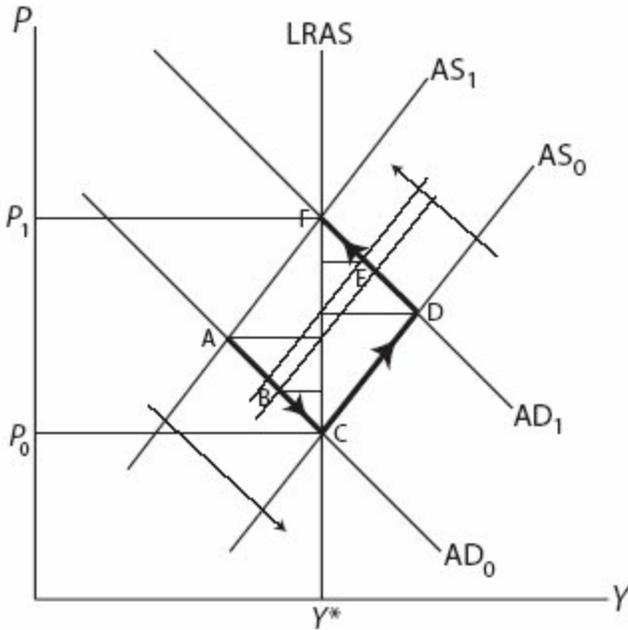


Figure 8.1 New classical dynamics.

3 A full-blooded labor market: the Dobb Effect

The reference above to an unchanging supply curve of labor in real terms provides the key to an expanded view of the aggregate supply of output. To reveal the underlying issues, it will be useful first to derive labor supply from an explicit microfoundation: utility maximization over income, Y , and leisure, LE . The utility function must have multiplicative separability; the familiar Cobb-Douglas form is, as always, the easiest to work with:

$$U = Y^\alpha LE^\beta = (wL + \pi)^\alpha (\bar{L} - L)^\beta, \quad \text{with } \alpha, \beta \in (0,1) \quad (8.5)$$

where w is the real wage rate, π is non-labor income, L is labor employed, and \bar{L} is the total time available for allocation to labor and leisure. Equation (8.5) is a well-defined unconstrained optimization;

$$\frac{\partial U}{\partial L} = 0$$

has the solution

$$L_s = \varphi \bar{L} - (1 - \varphi) \frac{\pi}{w}, \quad \text{where } \varphi \equiv \frac{\alpha}{\alpha + \beta}. \quad (8.6)$$

This is the supply curve we are seeking. It has the required upward slope, rising to an

asymptote at $L_s = \varphi \bar{L}$. Most interesting is what it reveals for what might be called the “pure” working-class case, in which there is no non-labor income: $\pi = 0$. This strong case, in effect, posits *two* representative agents: one that owns property and one that does not (cf. the conventional bias in favor of a *single* representative agent; e.g., Farmer, 1999, [ch. 4](#)). If we assume that workers have no ownership of land or other natural or productive resources, and no significant accumulated savings providing them with interest income above some nominal amount, then $L_s = \varphi \bar{L}$; the labor supply curve is vertical and independent of the wage rate. I will use this strong case in what follows, pending generalization to situations in which π is significantly > 0 .

The question now is, what determines φ , the relative elasticity of utility (well-being) with respect to L ? If social and economic events (such as stabilization policy moves) affect the supply of labor, this will appear as a change in φ ; the preference parameter φ is therefore intrinsically endogenous.

This point was made in a seminal and unduly neglected paper by the British economist and economic historian Maurice Dobb, “A Sceptical View of the Theory of Wages,” which appeared in the *Economic Journal* of December 1929. Dobb sought to establish the basis for a determinate outcome, such as an equilibrium of the wage rate. A necessary condition for this, in his view, is the substantial independence of the determining forces – the supply of and demand for labor – from that which is being determined. In a microeconomic setting, labor supply to a particular firm or sector may be thought to be reasonably independent of the wage offered by that firm or sector. Since the economic position of the supplier rests in significant measure on the opportunity to seek employment elsewhere, the wage offered by the individual firm or sector is not the sole, or even a major, determinant of the income-earning possibilities of the supplier. In this sense, the microeconomic wage bargain resembles determination of equilibrium prices and quantities in individual goods markets. Here, again, the price resulting from supply and demand does not enter, in any important way, into the shaping of those underlying forces. As Dobb expresses the point, “the marginal utility of income both to buyers and sellers can be regarded as unaffected by the price at which exchange takes place and by the volume of such transactions” (Dobb, 1955a, 25). This, however, ceases to be true in the case of the macroeconomic labor market. Dobb continues:

When labor ... is being sold, the marginal utility of income, at any rate to the seller, cannot be treated as constant. Since the labourer is propertyless, the sale of his labour will constitute his only source of income, and the terms of the sale will virtually affect his whole position, and will be the principal determinant of the labourer's subjective valuation of his own labour in terms of the income which he secures in return. In other words, a change in the price of labour in either direction is likely to produce a change in the supply-price of labour of a similar kind, thereby creating a tendency for any fall in wages to become cumulative, as in the classic case of sweated trades. If we have here an equilibrium at all, it is unstable rather than stable.

The point can be expressed graphically. In [Figure 8.2](#), panel *a* represents the usual view of labor market equilibrium, borrowed from microeconomics. The supply curve is vertical, reflecting the strong assumption $\pi = 0$ (relaxing this assumption does not change the results obtained below in any essential way). The demand curve is drawn in the conventional manner – downward sloping – although I must express serious doubts about basing this on choice of technique in a short-run context in which technical change and choice are presumably absent. Independence of the curves from their arguments determines the most crucial feature of competitive equilibrium: competition on each side of the market protects those on the other side, and \bar{w} is a genuine, and unique, equilibrium wage rate.

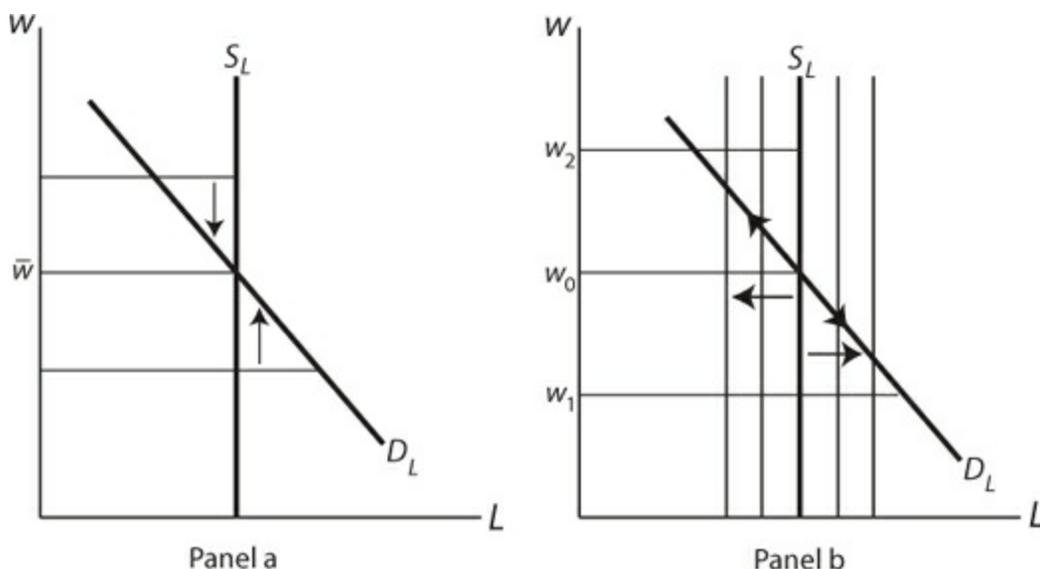


Figure 8.2 Two views of the labor market.

Panel *b*, by contrast, represents the macro view, and shows the impact of changes in w on the supply curve. A sustained decrease in the wage rate below its accustomed level causes ϕ , and therefore L_s , to increase, and conversely for an increase in the wage rate. The outcome is essentially indeterminate; it depends on the strength of conflicting forces. In the case of a wage rate below the accustomed level w_0 , there is upward pressure from excess demand – the conventional emphasis – but also downward pressure as the lowered wage results in drying up of personal savings, borrowing against insurance plans and pension funds, weakening of the financial position of trade unions and consequent deterioration of strike and social support funds, using up of government benefits (food stamps, for example), and increase in personal indebtedness – in a word, increase in the marginal utility of income and consequently in the supply of labor. I propose, with what I believe is due academic justice, to call this the *Dobb Effect*.

The key to the Dobb Effect is to grasp the impact of wage changes dynamically: they initiate a *process of change* in the conditions underlying the relative strength of labor and in the *customary standard of living* – the social-cultural construction of what is required to live in normal circumstances. It is important, in view of Dobb's formulation of the point in terms of utility theory, to note that the Dobb Effect is much more than merely the

incorporation of the income effect into the labor supply curve, a factor that was only beginning to be understood (at least in the English-speaking world!) at the beginning of the 1930s. The elements of conflict and indeterminacy are at the heart of the concept. In [Figure 8.2](#), panel *b*, the wage bargain shapes the evolution of φ and the position of the supply curve, incorporating both the relative social strength of labor and the set of socially shared customary expectations regarding the workers' standard of living. (Dobb also discusses its impact on the demand curve; I am focusing, for present purposes, on the supply side.)

To avoid the fallacy of composition in the construction of a core macroeconomic model, the microfoundation for macroeconomic reasoning must indeed be developed, but on the terrain of the labor market, rather than (as hitherto) solely at the level of the goods market. Writing in 1929, Dobb could not have foreseen the application of his insight to the macro policy problem, and for some reason did not return to this in later years. I believe the implications may be significant.

4 The canonical New Critical alternative

In the New *Classical* view of the labor market, money wage and price dynamics are initiated by departure of real income Y from a critical, or pivotal, level, Y^* . The New *Critical* alternative has an opposite starting point, and is in fact in some sense a “dual” to the New Classical model. Dynamics in the supply of labor and therefore in real income emerge from departure of the real wage rate w from a critical, or pivotal, level, w^* . This is the real wage rate corresponding to the *customary standard of living*: the standard that, for cultural and historical reasons more than biological or physiological ones, is required if sellers of labor are to successfully reproduce their conditions of existence; literally, re-create; or, more colloquially, “make it,” or “get by” (see Ehrenreich, 2001). In the macroeconomic short run – i.e., outside of the context of growth and development – the level of w^* can be taken as given.

The dynamics of labor supply can then be represented, at the same intermediate formal level as price dynamics in the canonical New Classical model, as follows:

$$L_s = L_{s,t-1} + \eta(w^* - w) \quad (8.7)$$

This is the Dobb Effect on the terrain of the New Critical model: deviation of the real wage rate from its customary, or pivotal, level causes the supply of labor to change from period to period. The demand curve for labor then determines w .

The production function is $Y = yL$, where y = the (constant) productivity of labor. Translation to the space of aggregate supply is then straightforward. Since the labor supply curve is vertical, output supplied is simply

$$Y = yL_s = yL_{s,t-1} + y\eta(w^* - w) = Y_{t-1} - \kappa(w^* - w) \quad (8.8)$$

The final step in the derivation of the New Critical AS curve involves the simple identity relating the real wage rate to the money wage rate and the price level:

$$w = \frac{w_m}{P} \quad w^* = \frac{w_m}{P^*} \quad (8.9)$$

Note that the pivotal wage rate, w^* , provided w_m is given, defines a pivotal price level, P^* .

In this presentation of the New Critical model, I will invoke a strong version of new-Keynesian coordination, or information asymmetries, or efficiency-wage theory, or long-term labor contracts (Dornbusch *et al.* 2001, 111–116), and simply hold the money wage rate constant. This provides a sharp contrast with New Classical theory, in which the money wage rate is of course highly flexible but the underlying determinants of labor supply are (explicitly or implicitly) held constant.

Using (8.9), (8.8) can be further processed into

$$Y = Y_{-1} + \kappa w^* \left(\frac{P - P^*}{P} \right) \quad (8.10)$$

Since $\frac{\partial}{\partial P} \left(\frac{P - P^*}{P} \right) = \frac{P^*}{P^2} > 0$, this expression can be re-linearized, to keep our tools manageable (as is so often done to create textbook versions of New Classical reasoning):

$$Y = Y_{-1} + \varepsilon(P - P^*) \quad (8.11)$$

and in inverse form, to conform to the usual graphical representation:

$$P = P^* + \lambda(Y - Y_{-1}), \quad \text{where } \lambda = \frac{1}{\varepsilon} \quad (8.11')$$

Equations (8.11) and (8.11') are the New Critical AS curve we have been seeking, the counterparts to (8.1) and (8.1') for the New Classical case.

We proceed in exactly the same way as previously. Combine (8.11) with the AD curve (8.2) to find the relation between this period's and last period's output:

$$Y = \frac{a - P^*}{\lambda + b} + \left(\frac{\lambda}{\lambda + b} \right) Y_{-1}, \quad (8.12)$$

an ordinary difference equation with solution

$$Y_t = \left(\frac{a}{b} - \frac{1}{b} P^* \right) \left[1 - \left(\frac{\lambda}{\lambda + b} \right)^t \right] + \left(\frac{\lambda}{\lambda + b} \right)^t Y_0 \quad (8.13)$$

As $t \rightarrow \infty$, Y approaches $Y_\infty = (a - P^*)/b$; output is determined by aggregate demand. The convergent price level, P_∞ , is of course $a - bY_\infty = P^*$.

The diagrammatic version is a straightforward dual to the New Classical adjustment story. Refer to [Figure 8.3](#). We begin in equilibrium at A, where $P = P^*$ ensures that Y is stable (8.11), and then impose an expansionary rightward shift in aggregate demand, to AD_1 . The movement is from A to B. The increase in price, with a given money wage rate, pulls w

down below w^* , and the Dobb Effect kicks in. The supply of labor increases, and output rises; the falling price level ensures that the higher output level is consistent with the now-given level of monetary aggregate demand. The intercept of the AS curve is $P^* - \lambda Y_{-1}$, and as Y (and consequently Y_{-1}) rises, this intercept falls; the AS curve shifts outward and to the right. In each period its position is established at the stable point where $P = P^*$, as shown. The adjustment process therefore proceeds, until the price level has fallen back to P^* , and w has risen back to w^* . At this point, E, output has risen, from Y_0 to Y_1 . In this view of the labor market, then, it appears as though the Keynesian fiscal and monetary policy multipliers are vindicated! The long-run AS curve is horizontal, as in what is presumed to be the “naive” Keynesian model.[‡]

[‡] I note in passing that the New Critical model is robust with respect to the spectral qualities of the goods and assets markets, i.e., whether either or both of these is Pure Classical, Pure Keynesian, or intermediate. In particular, no problems arise if the interest-sensitivity of investment is zero, or asset demand for money is infinitely elastic (the liquidity trap), and the AD curve is vertical. By contrast, of course, a vertical AD curve in the New Classical case renders the price level indeterminate, or suggests perpetual inflation/deflation.

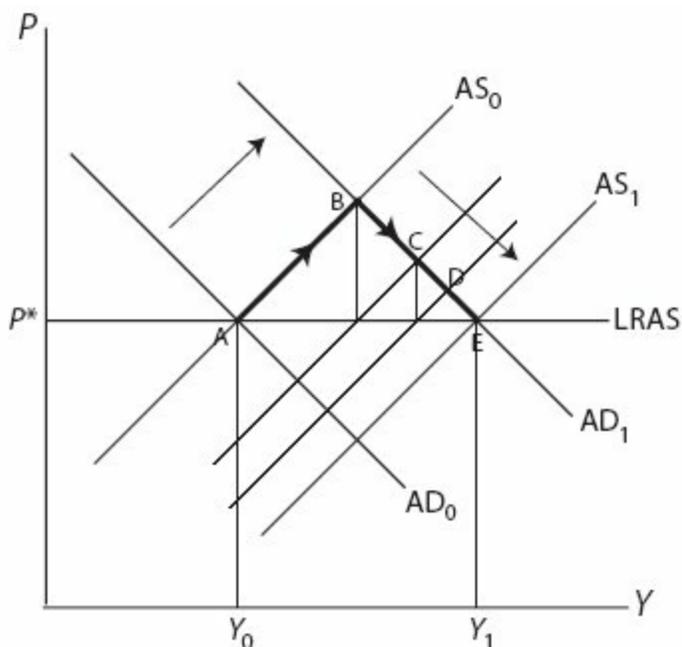


Figure 8.3 New critical adjustment to a demand expansion.

The new equilibrium at E is stable; the balance of power in the labor market is consistent with equilibrium in the goods and assets markets, given the level of autonomous demand. It might seem at first that since the real wage rate is once again at its pivotal level, w^* , savings would once again rise, debt levels fall, and so on, until both φ and L_s fall back toward their original levels. However, any leftward shift of AS from AS_1 would immediately drive the price level back up and w back down. AS_1 is thus a stable position of the AS curve. The heart of the matter, I think, is that the Dobb Effect does not posit a stable and reversible functional relationship between levels of the real wage rate and positions of the AS curve; it

is, as noted above, a dynamic process and much depends upon the embodiment of recent experience in assumptions about the normal, conventional requirements of life. Once a cycle of wage depression, following the chain $AD\uparrow \Rightarrow P\uparrow \Rightarrow w\downarrow \& (w < w^*)$, has been established, it would require a powerful social movement to reverse the fait accompli of “sweated trades,” high employment, etc. Referring to both the demand curve for and the supply curve of labor, Dobb summarizes:

Neither the “will to work” nor the “will to save” are independent of subjective valuations of income by the parties concerned and of conventional standards; and these in turn are not independent of the way in which income has been distributed by the wage bargains of the immediate past.

(1955a, 29.)

5 Toward a synthesis

The assumption of a constant money wage rate is clearly untenable, and the simple New Critical story described in the last section rests upon it. Can we do better? In a “Sophisticated New Critical” model of a demand expansion, the money wage rate rises as unemployment falls and output increases ([Figure 8.4](#)). With a higher money wage rate, the pivotal price level P^* will also be higher; this results in a new equilibrium at C, and (by inference) a rising long-run aggregate supply curve instead of a horizontal one, and a reduced multiplier. The problem with this, of course, is that the degree of increase in w_m is completely arbitrary, and the question arises, is there any way to derive it? Put another way, the $Y^* - Y$ dynamics are presumably as valid and important as the $P^* - P$ dynamics, and vice versa. Can a model be constructed that incorporates both the New Classical and the New Critical properties? This is essential if we are to know whether the Dobb Effect persists in a model where the money wage rate is flexible, to *any* degree; whether, in other words, either adjustment mechanism dominates the other.

In anticipation of a model that rigorously combines the Dobb Effect and the Phillips Curve, I propose the following. The two AS curves coexist; following a demand expansion, the economy behaves New Classically in the first period, New Critically in the second, and so on, with the two behaviors alternating.

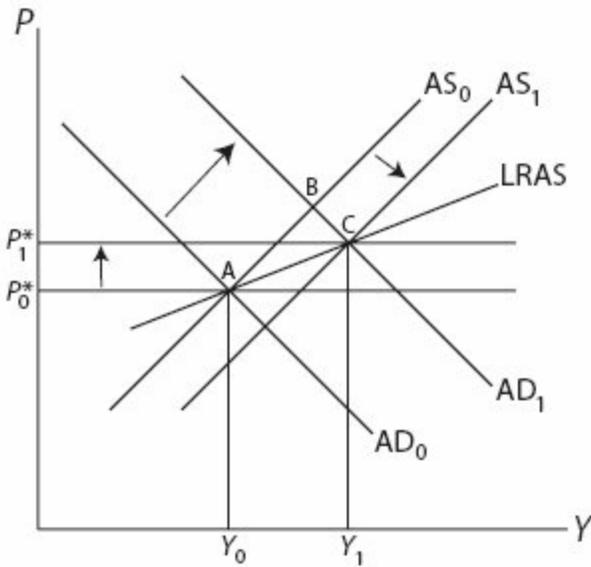


Figure 8.4 “Sophisticated” New Critical expansion.

While this seems arbitrary, it may not be a bad first approximation to a story in which both New Classical and New Critical adjustment mechanisms are in effect simultaneously: as the length of the time period approaches zero, the separation of the two behaviors progressively disappears.

Bringing together the difference equations (8.3) and (8.12), for the New Classical and New Critical cases respectively, we have (using P_t and P_{t-1} instead of P and P_{-1}):

$$P_t = (\alpha b) P^* + (\alpha \lambda) P_{t-1} \quad \alpha \equiv \frac{1}{\lambda + b} \quad \text{New Critical} \quad (8.14)$$

$$P_t = (\beta) \bar{P} + (\beta b \mu) P_{t-1} \quad \beta \equiv \frac{1}{b \mu + 1} \quad \text{New Classical} \quad (8.15)$$

where $\bar{P} = a - bY^*$, the demand-determined price level corresponding to Y^* in the New Classical case. All coefficients (in parentheses) are in the unit interval. I will trace the dynamics of the price level, rather than output; since P and Y are always related by the AD curve, determining either determines the other. Equation (8.15), the New Classical adjustment mechanism, determines the price in odd years (t is odd), while equation (8.14), the New Critical mechanism, governs in even years (t is even). Iterating from $t = 0$, the sequence begins as follows:

$$\begin{aligned} P_0 \\ P_1 &= \beta \bar{P} + \beta b \mu P_0 \\ P_2 &= \alpha b P^* + \alpha \beta \lambda \bar{P} + \alpha \beta b \lambda \mu P_0 \\ &\dots \end{aligned}$$

Continuing, simplifying, and taking limits as $t \rightarrow \infty$, we obtain this result:

$$P_{t \rightarrow \infty}^{EVEN} = \left(\frac{\alpha\beta\lambda}{1 - \alpha\beta b\lambda\mu} \right) \bar{P} + \left(\frac{\alpha b}{1 - \alpha\beta b\lambda\mu} \right) P^* \quad (8.16)$$

$$P_{t \rightarrow \infty}^{ODD} = \left(\frac{\beta}{1 - \alpha\beta b\lambda\mu} \right) \bar{P} + \left(\frac{\alpha\beta b^2\mu}{1 - \alpha\beta b\lambda\mu} \right) P^* \quad (8.17)$$

The coefficients of \bar{P} and P^* in (8.16) and (8.17) can be simplified, removing the temporary constructs α and β .

$$P_{t \rightarrow \infty}^{EVEN} = \left(\frac{\lambda}{\lambda + b + b^2\mu} \right) \bar{P} + \left(\frac{b + b^2\mu}{\lambda + b + b^2\mu} \right) P^* \quad (8.16')$$

$$P_{t \rightarrow \infty}^{ODD} = \left(\frac{\lambda + b}{\lambda + b + b^2\mu} \right) \bar{P} + \left(\frac{b^2\mu}{\lambda + b + b^2\mu} \right) P^* \quad (8.17')$$

The convergent values of the price level in odd (New Classical) and even (New Critical) years are revealed to be weighted averages of \bar{P} and P^* . Comparison of the coefficients will show that in odd years, when the New Classical mechanism is operating, P_∞ is closer \bar{P} , and that in even years, when the New Critical mechanism is in effect, P_∞ is closer to P^* (as we would expect). The economy thus approaches a constant oscillation, with P alternating between high and low values – both of which are greater than P_0 , assuming the AD curve is to the right of AD_0 , which passes through the point (Y^*, P^*) – and Y alternating in corresponding fashion between low and high values – both of which are greater than Y_0 .

The alternating process is illustrated in [Figure 8.5](#), which is accessible to undergraduates (even, I think, somewhat fun to draw!). In this illustration, I have used the simplifying assumption that the slopes of the New Critical and New Classical AS curves are the same ($\lambda = 1/\mu$); the more general case in which they differ, aside from its greater visual complexity, does not present any additional problems. Begin, as always, at A. The aggregate demand curve shifts from AD_0 to AD_1 , and the economy moves to B. In this first (odd) period, the increase in the price level is immediately followed by a money wage increase; aggregate supply shifts, New Classically, to AS' and the economy moves to C. But now the money wage is sticky; the fall in the real wage weakens the position of labor, and aggregate supply increases, New Critically, to AS'' , with corresponding equilibrium at D. Graph paper, a fine-pointed pencil, and some patience will confirm that in each subsequent iteration the equilibrium points E, F, etc., cluster ever more closely around two centers close to E and F along AD_1 , as suggested by (8.16') and (8.17').

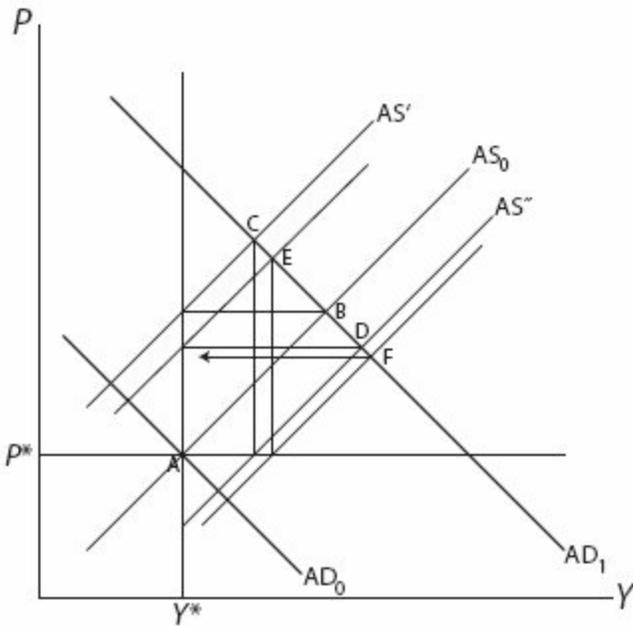


Figure 8.5 New Critical/New Classical synthesis.

The alternation experiment thus provides us with a very preliminary presumption that, when both New Classical and New Critical adjustment mechanisms are operating, a one-time demand expansion results in a permanently higher level of output and a higher price level. The long-run aggregate supply curve slopes upward after all, and the multiplier is greater than zero. It is even possible to give this multiplier an algebraic form. First, find the arithmetic mean of the two convergent values of the price level:

$$P_{\infty} = \frac{1}{2}(P_{\infty}^{EVEN} + P_{\infty}^{ODD}) = \left(\frac{\lambda + b/2}{\lambda + b + b^2\mu} \right) \bar{P} + \left(\frac{b/2 + b^2\mu}{\lambda + b + b^2\mu} \right) P^* \quad (8.18)$$

Next, combine (8.18) with (8.2) to find the average level of output following the demand expansion, Y_{∞} , also replacing \bar{P} with $a - bY^*$ so that constant terms are separated from variable ones (those dependent on the position of the AD curve, represented by a). This gives us

$$Y_{\infty} = \frac{a}{b} - \frac{1}{b} P_{\infty} = a \left(\frac{b\mu + 1/2}{\lambda + b + b^2\mu} \right) + B \quad (8.19)$$

where

$$B \equiv - \left(\frac{\lambda + b/2}{\lambda + b + b^2\mu} \right) Y^* + \left(\frac{1/2 + b\mu}{\lambda + b + b^2\mu} \right) P^*.$$

We can express the horizontal shift in AD, for a fiscal expansion, in the standard fashion, as $\gamma \Delta G$, where γ is the “fiscal policy multiplier” (Dornbusch *et al.*, 2001, 236). This horizontal shift is also $(1/b)\Delta a$, from which $\Delta a = b\gamma \Delta G$. Finally, take the difference of (8.19) to find

$$\Delta Y = \left[\frac{b\mu + 1/2}{\lambda + b + b^2\mu} \right] b\gamma \Delta G \quad (8.20)$$

The term in square brackets is the multiplier we are seeking. It has intuitive properties, varying directly with b (a steeper, more “Keynesian” AD curve), and inversely with both λ and $1/\mu$, the slopes of the New Critical and New Classical AS curves, respectively.

I conclude this section by noting that the existence of two models with contrary tendencies casts a rather large pall over rational expectations theorizing. No matter how smart people are, once they are deprived of the “one true model” their theoretical anticipations of government policy must depend crucially on the model chosen, and on assumptions regarding which model prevails in policy makers’ thinking, and so on. Even if everyone miraculously came to agree on the multiplier represented by (8.20), the relative magnitudes of the coefficients comprising it would be open to dispute, and anticipated outcomes accordingly. The only consensual multiplier value about which no controversy is possible is zero.

6 Conclusion

The New Critical proposal is little more than a call to bring into focus the relation between macroeconomic policy and the real supply curve of labor. The Dobb Effect is an assertion: relative flexibility of prices over money wages means that demand expansion is likely to erode the real wage rate, and this erosion increases labor supply and therefore output.

How does this square with the stylized facts of macroeconomic life? While empirical issues are beyond the scope of this study, something might be said about the widely observed procyclical behavior of the real wage rate, and its implications. Rising real wages in expansions may be problematic for both the New Critical and the New Classical stories, in which the money wage rate initially lags behind the price level. However, policy-induced expansions are always superimposed upon a real cycle, and it is difficult to disentangle spontaneous effects from policy effects. Similarly, the Dobb Effect may appear to contradict evidence for an upward sloping supply curve of labor. This evidence, however, is drawn – as it must be – from a large enough number of time periods for us to imagine that w^* is itself shifting, and very likely, in normal times, in an upward direction. Without downplaying the importance of empirical investigation, one may doubt whether any single test can adjudicate between the New Classical and New Critical models, or unambiguously separate the effects of macro policy from underlying forces at work in the economy.

The multiplier in (8.20) appears to represent a return of Keynesian full-employment stabilization policy. Despite the wide range of theoretical developments that question this policy framework – crowding out, price flexibility, competitive labor markets, rational expectations, Ricardian equivalence, learning theory (Evans and Honkapohja, 2001), etc. – it seems to re-emerge, once a fuller view of the labor market is embraced. It is not my intention, however, to reinvent fine-tuning, or to suggest that “hydraulic” Keynesianism has been somehow vindicated. It is enough to point out that even though the real wage rate and the wage share of income return to their previous levels in the New Critical adjustment to an

increase in AD, this is accomplished by a weakening of the savings and debt positions of workers, with, one must assume, a corresponding increase in social tension and potential for instability. My sole objective has been to provide a corrective to simplistic policy-ineffectiveness thinking, not to revert to an equally unconvincing fine-tuning triumphalism.[‡]

[‡] Rational expectations can be enlisted in the service of a temporary but huge multiplier effect. An anticipated increase in government spending – perhaps military spending might serve as an example – may occasion a surge in investment as firms rush to acquire the capacity to bid for government orders. It goes without saying that this anticipation refers to political events as well as the “true” outcomes of macroeconomic processes. No one has yet proposed the single “true” *political-economic* model.

It remains to be seen whether the Dobb Effect has significant empirical plausibility, and whether better methods of combining it with the money wage dynamics of the New Classical story can be found.

9 Revisioning socialism

The Cherry Esplanade Conjecture

Introductory perspectives

With these final two chapters, we arrive at the culmination of the project of this book. Readers may have noticed a certain progression: from Marxist concerns with the nature ([Chapters 1–2](#)) and logic ([Chapters 3–4](#)) of capitalism; to wider foundations for microeconomics ([Chapters 5–7](#)) and macroeconomics ([Chapter 8](#)). Now, in opposition to TINA, [Chapters 9](#) and [10](#) use the analytical tools of economics to explore the foundations of a social alternative, usually called “socialism” or “communism,” although sometimes “participatory” economics, communitarianism, and other labels are deployed. If the message of these chapters had to be captured in a single slogan, that slogan might be: “There *is* a revolutionary alternative!” (TIARA).

One of the great ideological constructs of conservative (capitalist) ideology is the idea of ineluctable tradeoffs: the impossibility of having more of two good things at once. Free-market enthusiasts are fond of telling us that “there is no such thing as a free lunch” – although one wonders why this message is not directed toward, e.g., the wizards of the financial community who first grind the economy to a halt in piles of dubious paper, then get bailed out to the tune of \$750 billion, after which they pay themselves “bonuses” averaging half a million dollars per person. The tradeoff notion is one of the first things students of economics learn: “guns vs. butter,” the “production possibility curve” (see [Chapter 7](#)). There are all sorts of little tradeoffs, and the idea that optimal choice is constrained is certainly valid in general.

But then we observe a huge ideological leap of faith: the *grand* tradeoff between equality and efficiency. From the rather obvious notion that, on the efficient frontier of possibilities, a little more of good X means a little less of good Y , we arrive at a mighty theorem, which comes to be taken as almost axiomatic in social science, and yet is very little analyzed, let alone derived rigorously from underlying axioms or lemmas. We simply can't have *both* Q and X , where Q stands for a composite of q qualities of the good life – e.g., equality, democracy, security, participation, job satisfaction – and X stands for a composite measure of efficiency or productivity, the general effectiveness with which we transact with the natural environment. Or, more precisely, we can't have *more* of Q and X at the same time.

This grand constraint, or tradeoff, appears to be at work whenever socialists or their opponents think of “socialism” as public provisioning of social values such as education, guaranteed employment, health care, and pensions, and “markets” or “capitalism” as private,

gain-seeking activity. Early socialist regimes, from China to Cuba, seem to be faced with a problematic of compromise; they must walk a fine line between professed socialist values, often deeply rooted in the country's revolutionary history, on the one hand; and efficiency/productivity/dynamism, which apparently can be found only by diluting or reducing the weight of the socialist sector, on the other. In these circumstances, keeping the socialist component working and significant requires huge efforts at moral persuasion and political mobilization. Abstract – and, it must be said, at times intrusive – appeals to people to transcend or moderate their self-interest in the wider interest must be made. This, unfortunately, lends credence to the view that “capitalism” – or, at a minimum, private property and unrestricted markets that have a strong potential to foster the re-emergence of capitalism – is in fact merely an expression of some insurmountable human nature. Capitalism is just what you get from the full play of spontaneous human striving.

Socialism, by contrast, and even if you think it has desirable qualities overall, runs against the grain of that striving. The idea of an essential and unchangeable “human nature” in fact works hand-in-glove with the ineluctable tradeoff between, well, Q and X to paint a bleak picture of socialist possibilities. In fact, working populations in early post-capitalist countries are tempted by the siren song of the capitalists: return control to us, and we will give you the good life in return! Give up your aspirations for a high Q in exchange for X . At the peak of the crisis of the socialist polity in the Soviet Union, around 1988, *Moscow News*, in a state of utter political disorientation, cried out: “Where are the men of property?” Capitalist ruling classes, of course, have always cultivated and fomented the myth of their own absolute necessity, from the standpoints of management, education, culture, the nation, science, and history.

This chapter is about a simple “What if?” What if the curve connecting X and Q is indeed downward sloping over the region that we have actually experienced; but then, as Q increases, it flattens out and eventually turns upward? This is the “Cherry Esplanade” Conjecture, so named for no good reason whatsoever! Before we go any further, you will ask: On what rigorous model do you base this? Answer: *none at all* ! Its foundation is just about as murky as in the case of the opposite assumption, that the curve inexorably falls forever.

The eventual upturn in the X – Q curve, however, does have the following imprecise justification: at some point in human development, the dominant causal direction between X and Q changes, and increasing quality of life becomes more a *precondition* and *necessity* for rising productivity than a result of it.

The argument is made more fully in the chapter, but its significance is, I think, potentially profound. Beyond the turning point, spontaneous human activity, instead of working against socialist institutions and seeming to undermine them, becomes a force that leads naturally to their further development. Imagine that we can let loose the spontaneous striving for betterment under conditions in which that striving leads to solidarity, sharing, principled cooperation and deepening of the pathways of democratic consensus formation, instead of to polarization, corruption, and destructive competition. A very different foundation for “human

nature,” indeed!

Since the “Cherry Esplanade” paper was written, in fact, I have come to believe that its implications run deeper than the formulations there suggest. Do socialism, and its higher stage, communism, mean an inevitable preference for collective forms of organization and culture, as opposed to individual ones? And how would such a preference be reconciled with democracy? The automatic assumption that “socialism” means collectivity concedes too much ground to the pro-capitalist ideology tying the idea of “capitalism” to the prerogatives of the “individual.”

Perhaps the idea of socialism has been linked too closely to early forms of communal organization (“primitive communism”), which do not partake of the profound *individuation* that accompanied the capitalist transition. That individuation is, of course, incomplete and alienated in its capitalist form; it requires dialectical coupling with the “solidarian” aspect of human growth for its full flowering. Nevertheless, the range of individual potentials, variations, and actions must certainly grow as part of a successful socialist takeoff – say, beyond the $X-Q$ turning point. Socialism, if this is correct, offers the possibility of more complete fulfillment of libertarian objectives, for those who pursue that path, than does capitalism – which, after all, is thoroughly unprincipled in its drive to cannibalize both social and individual space in the interest of accumulation and power.

As we use both radical imagination and analytic tools to deepen our sense of the existence of an alternative (TIARA), the actual content of that alternative emerges in ever fuller, and unanticipated, ways.

The monumental transition of 1989–91, in which authoritarian regimes based in revolutionary working-class movements lost state power in large parts of the world, has given rise to a new interest in reexamining the idea of socialism itself. It has given us the opportunity to pose fundamental questions in a fresh manner, and to rework the challenge to capitalism based in the Marxist tradition (which remains, I think, the only coherent alternative to free market conservatism and neoliberalism).

With few exceptions, however, this renaissance has not drawn upon the actual experiences of socialist construction in the twentieth century. These experiences – especially that of the Soviet Union from the mid-1930s to its demise – gave rise to an enormous body of theory and evidence concerning different forms of state property, the relation of socialist structures to markets and money, concepts and methods of planning, the organization of popular participation in management, the special characteristics of incentives and prices in socialist conditions, and much more. Much of the left in the Western capitalist countries knows little of all this, having bought into the wholesale rejection of the Soviet “model” (and having unconsciously absorbed not a small dose of anti-communist ideology in the process).

The post-Soviet literature on socialism partakes of two broad conceptions: (1) a revived “market socialism,” in which the instrumentality of “the market” is associated with public ownership of enterprises (for example, Roemer, 1994; Roosevelt and Belkin, 1994; Schweickart, 1996; Wright, 1996); (2) communitarian and/or neo-anarchist positions, which

stress cooperation among production and consumption sites, non-authoritarian (and non-hierarchical) planning, and (in some cases) a return to the imagery of the original pithy formulations found in Marx's works (Devine, 1988; Albert and Hahnel, 1991; Ollman, 1998).

In recent publications, I have attempted to chart a different course, one that acknowledges and builds on the positive as well as the negative elements in the Soviet and East European experience (Laibman, 1992b; 1995). The model emerging from these studies projects a system of “comprehensive planning,” with a critical core of central planning; an iterative procedure linking central plans to continuous planning at the micro, or decentral, level; systematic democratic controls at *both* levels; and complementary but subsidiary forms of market relations, whose social content is progressively transformed as the democratically planned core of the society matures and develops.

I have also tried to pose some basic questions concerning the foundation conceptions and goals of socialism. In particular, I suggest that the *problem of democracy* in the socialist context is the need to coordinate and effectuate the diverse wills of highly educated and individuated citizens, in the performance of labor and allocation of goods. This requires what (for want of a better term) I call “consensualization”: coordination of conscious activities based on a shared, mutually created, and accepted understanding of the main lines of social and economic activity. Consensualization is brought about in socialism through the planning process, which involves constant and systematic participation of the members of society – in a word, economic democracy. Consensualization, in fact, emerges as the *primary* role of planning; the physical coordination of production and distribution, commonly regarded as its main objective, occupies a secondary position.[‡] Democratic planning, then, is the practical embodiment of the mastery of people over things, of the de-alienating control by workers over the means of production, of the conscious and cooperative social existence posited, but not operationalized, in the classical formulations of Marxism (for example, Marx, 1933b; Engels, 1966). I now think that this conception, while suggestive, is still too closely linked to older ways of thinking – especially to the “plan vs. market” dichotomy. In this chapter, I want to offer some tentative approaches toward reconceptualization.

[‡] The relevant contrast is with *valorization* in capitalism. The primary function of spontaneous market relations in capitalist societies is thus to establish and reproduce alienation, reification, and, therefore, exploitation. Coordination of production and distribution, the centerpiece of mainstream conceptions of the role of “the market,” is again secondary in importance.

The initiating premise is to reconsider the relation between the “utopian” and the “scientific” dimensions in socialist thought, by allowing – in the present context of disarray and revisioning on the left – full play for creative speculation and bold conjecture. This sort of activity, far from lapsing into *idealist* utopianism, has a material base in all of the experiences of the past century; if according to the materialist premise ideas derive ultimately from social experience, conjecture necessarily draws upon that reality for its raw material. What may appear as arbitrary speculation must emerge from real history and can, if fruitful, be integrated into a truly imaginative science of human emancipation. In this

interpretation, the advance from utopia to science in socialism (see Engels, 1966; Maler, 1998) does not replace the utopian dimension; rather, it incorporates it. What we need now, above all, is bold thinking about the core elements in the socialist vision.

The main current in the market socialism discussion has come from the camp of “Analytical Marxism,” where there is a pronounced tendency to confuse rigor with precision in thought. Thus, Roemer (1994) asks: “what do socialists want?” The answers, in the collection edited by Wright (1996), range from “equality” to “democracy.” The underlying paradigm is thoroughly instrumental. It is a matter of constrained optimization: we determine what we “want” (our objective function), and then seek means, in the form of ingenious institutional arrangements, to achieve our goals (to the extent possible). There is something of the same instrumental constriction of vision also in the common way of posing the problem of socialism in broader circles: “Is it feasible?” “Is it desirable?”

Suppose we say, instead, that socialism is the embodiment in theory and practice of the most fundamental and non-arbitrary moral commitment possible: affirmation of the overriding value of human life and potential. Socialism, then, is about creating the best possible conditions for human development, along two dimensions: the *effective* (quality of action upon the external environment), and the *experiential* (the way life impacts upon consciousness). The two dimensions, in fact, define the space of human growth: the objective advance in mastery and understanding of the world, embodied in what is usually narrowly called “productivity”; and subjective progress in the way people experience their life activity. This latter may involve (an incomplete list): creativity; fulfillment in work and personal relations; “rational understanding” of social and technological processes (in Karl Mannheim's sense of grasping the inner forces at work; cf. “functional understanding”); connectedness to other people, and sharing with others (including the exquisite satisfaction of teaching and guiding the young); personal growth. Against this canvas – which I think is absolutely central to a thoroughgoing socialist revisioning – the problematic of “desires” for and “feasibility” of equality and/or democracy seems narrow indeed.

Before using this perspective to frame a quest for ingredients in a renewed socialist vision, I make one observation about the quality of the first-wave socialist societies of recent experience. The notorious H.L. Mencken uttered his famous wisecrack: “The trouble with socialism is: not enough free evenings.” This hurt – just as did the comment by (far less notorious) Nancy Folbre (in *Z* magazine) on the Albert–Hahnel horizontal planning conception: “Like one long University of Massachusetts student government meeting.” Socialists know this from experience. In 1994, in Havana, I heard a paper delivered by a Cuban economist, entitled “The Objective Insufficiency of Cuban Economic Relations.” This was in part a retelling of the several rectification campaigns that have been launched in Cuba in recent decades. There is nothing wrong with rectification, of course, but one must eventually wonder why such massive political effort must be devoted to getting socialism (back) on track: why some sort of *self-rectification* – an internal corrective mechanism – does not emerge. Cuban socialism appears to be like a *guagua* – a small bus, in Cuban Spanish) without a steering wheel. It goes forward, but inevitably veers to the side of the road into a ditch; the passengers must then get off the bus and physically heave it back on to

the road, so that the next stretch of the journey can commence. The general question is: what is there in the nature of socialism that appears to require both continuing and periodically massive political interventions for its functioning? After all, it is all of that political work that eats into poor Mencken's free evenings.[‡]

[‡] It is also fraught with danger: intense politicization brings cadres of activists to the fore, and these cadres can consolidate into an elite with interests opposed to the majority – especially in the early socialist atmosphere struggling to escape from the authoritarian, unprincipled, and “power-hungry” political culture inherited from capitalism.

1 Ingredients

To frame the inquiry, I start with some concepts from the theory of capitalist crisis, focusing on one site within capitalism: the workplace.

In attempting to theorize one aspect of crisis at this site (Laibman, 1997, ch. 11; 2007, [ch. 3](#)), I distinguish between incentive and control as two problems faced by capitalists at the point of production. These are the positive and negative aspects, respectively, of the need to reproduce and maintain capitalist domination. They are both affected by the degree to which creative and managerial functions are devolved to lower and broader layers of the workforce. I propose to measure this quality (imprecisely, but possibly rigorously) by a variable called the *devolution ratio*.

The devolution ratio has an upper limit, above or at which capitalist control over the work process as such is threatened; this is the *control ceiling*. There is, correspondingly, a lower limit, at or below which incentive is compromised (here is a link to the efficiency wage theory of present-day labor economics); this is the *incentive floor*. The ceiling and floor together define the space within which the strategic choice of a position of the devolution ratio can be made by capitalists.

I further hypothesize that the ceiling falls as the real wage rate rises, and that the floor rises as the real wage rate rises. Upward pressure on the real wage rate, then, pushes the capitalist workplace in the direction of an increasingly severe contradiction: the space for the choice of a devolution ratio progressively narrows, until a (theoretical) point is reached at which a unique position of that ratio forces an encounter with ceiling and floor simultaneously. This defines a critical, historically high, level of the real wage rate that calls the antagonistic relations of the capitalist workplace into question. The historical materialist insight at work here is the link between levels of productive development, on the one hand; and possible and necessary forms of social organization, on the other. Within one broad range of levels, the capitalist forms of incentive and control – involving the social irresponsibility of markets for labor, fear of unemployment and destitution, and the reification and mystification of the power accruing to property ownership – are efficacious for productive development. At the upper end of that range, however, we discover, in the form of a critical high level of the real wage, a secular crisis of those forms, suggesting a need for their transcendence.

Now let us presuppose that transcendence. We have an inherited general level of

productivity, or efficiency, X , achieved by means of antagonistic capitalist incentive and control systems, now requiring replacement. The “devolution” concept is now no longer appropriate. Indeed, the distinction between incentive and control itself withers away, as control is vested in workers and their organizations themselves: this is the world-historic reversal of the subsumption of labor to means of production that defines the onset of the socialist era.[‡] The twin features of incentive and control merge into the single concept of *motivation*. Motivation is governed by the power of workers over their own lives, their rational understanding, the effectiveness and democracy of their forms of organization, and their autonomy – in the crucial double sense of absence of determination from outside *and* presence of inner capacity to act. It therefore appears as the central feature of the labor process reflecting the subjective dimension defined above. We may give this dimension the label Q , from q uality of socialist work–life experience.[‡] The objective dimension is captured by X , which must be a *broad* measure of productivity, including effects on living communities, the environment, and so on.

[‡] It will be apparent that I am using “socialism” as the general term for the form(s) of society transcending and replacing capitalism. In this use it should be distinguished both from a transitional phase, in which the question of class power is not yet settled, and from the higher stage of communism. Some features of the latter will emerge in the discussion of the Cherry Esplanade Conjecture, below.

[‡] There should, of course, be no association between this usage and the limited (and occasionally cynical) concept of “quality of work life” circles (QWLs) promoted in some capitalist countries – at least during the time when the Soviet Union was still in existence.

2 The π curve

This is the $Q \Rightarrow X$ link. Reflecting the motivation qualities of the capitalist precursor period, represented by the vertical intercept of the π curve in [Figure 9.1](#), increasing levels of Q are associated with *decreasing* levels of X ; hence, the inverse shape of the curve. At this stage, this is to say, we posit, with hard-headed realism, the existence of an inverse tradeoff between two broad socialist goals: increasing productivity (X) and increasing workers’ fulfillment–democracy–equality–autonomy (in short, and hereafter, Q). “Productivist” goals and strategies therefore involve some sacrifice of social objectives, and we are deep into the Leninist problematic: one can hear strains of “catching up” and “overtaking,” the need for “one-man management,” and so on, in the background of this conception.[‡]

[‡] The assumption of a protracted period of *conflict* between the twin goals of raising X and raising Q is quite deliberate, and represents a rejection of the idea that the solidarizing conditions of revolutionary struggle against capitalist power and the elemental cooperation formed within modern productive forces are by themselves sufficient to generate sustainable advanced levels of worker motivation and consciousness. While some might wish to posit a π curve that rises immediately from its X intercept, I believe it is better, from the standpoint of a long-term viable socialist strategy, to err on the side of prudence and caution.

The fact that the curve slopes downward from its X intercept suggests a socialism taking over from *developed* capitalism; no consideration is given here to the motivation effects of

productivity levels that are low in comparison not only to the same country's recent past but also to the even higher levels of advanced capitalist countries elsewhere.

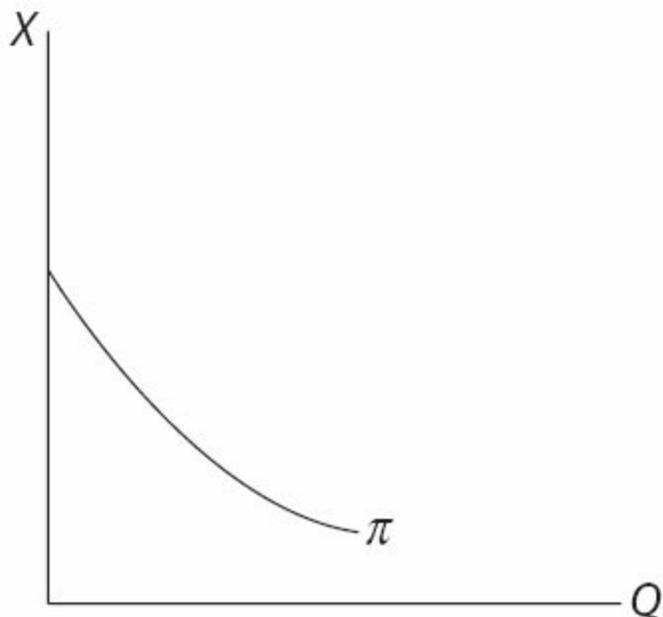


Figure 9.1 The π curve.

The classic issue of material and moral incentives, and the cross-cutting distinction between individual and collective incentives, is embedded here (see also Laibman, 2007, [ch. 4](#)). A materialist approach to this problem begins by acknowledging that material and individual incentives *exist* objectively; it is then not a matter of a policy choice between the two terms – material vs. moral, individual vs. collective – but of finding ways to combine and unite these pairs that open up the widest possibilities for advance in socialist consciousness. The π curve slopes downward, not necessarily only because an increase in Q leads to deterioration of discipline and effort; it may slope downward also because of the difficulty of finding a structure of incentives, rewards, and evaluations that is simultaneously Q - and X -increasing.

3 The δ curve

To capture the opposite relation, with X in the position of independent variable, $X \Rightarrow Q$, we observe that, in socialist conditions, the level of productivity is the essential basis of the working-class standard of living. (The wage share represents a subsidiary division of that standard between individual and collective forms of consumption, and between present and future.) A higher X , therefore, means a greater amount of resources available to enhance the quality of life in the broadest sense, including education, job enrichment, cultural opportunities, and so forth. Within any given period, the relation is positive, as drawn in [Figure 9.2](#). This determination from X to Q is not (to put it mildly!) automatic: the use of higher levels of productivity to improve the quality of work–life is a major area of struggle and political concern. Improvement is certainly not *guaranteed* by a simple rise in the

material standard of living.

To the extent that the possible higher levels of Q afforded by higher levels of X are actually brought into existence, the δ curve determines a set of possible combinations of X and Q within a given, fairly short, period. To capture the fact that the use of higher levels of productivity to increase Q is a matter of intense and problematic social development, and presumably limited in any given short period, the curve is drawn rising at an increasing rate – that is, showing rapidly diminishing returns to increases in X .

The two curves, π and δ , are brought together in [Figure 9.3](#). The point a represents a combination of levels of productivity and work–life quality satisfying both relations at once, and therefore consistent both with the achieved degree of motivation (as defined above), and the available resources that can be devoted to sustaining a given quality of working-class life. The causal links between Q and X associated with each curve are shown. Given these links, we can trace a path of development, invoking the classic “cobweb” theorem, showing progressive convergence to a over time. Convergence is assured by the sharp diminishing returns determining the steepness of δ .[‡]

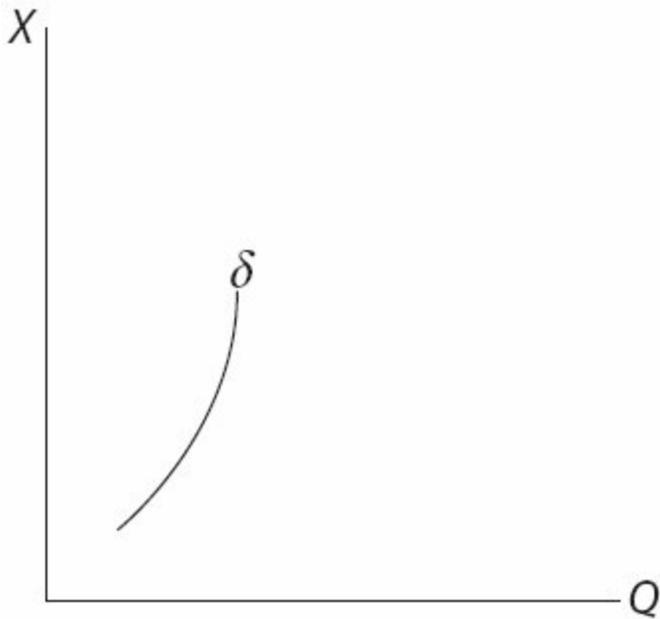


Figure 9.2 The δ curve.

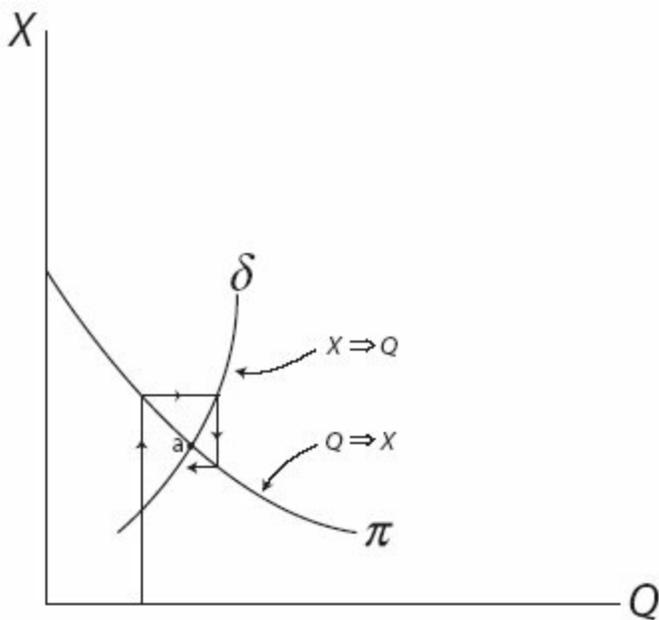


Figure 9.3 Early socialist equilibrium.

‡ It is important to understand the logic behind this movement. Since determination runs from Q to X along the π curve, movement from any point is toward that curve in a vertical direction. Once there, the achieved level of X then determines Q , along the δ curve; movement toward δ takes place in a horizontal direction. Vertical to π and horizontal to δ : this formula will generate the dynamics of all of the various situations examined below. Of course, if the two movements take place simultaneously, the convergence is much more rapid and less “angular.” For full discussion of the mathematics of cobweb-type adjustment in economic models, see Allen, 1966.

The point a thus represents a given level of productivity for a socialist society. The productivity level is below the intercept level inherited from the capitalist precursor. The static position at a thus serves as the basis for the endless litany of allegations in pro-capitalist journalism and scholarship – which undoubtedly has a strong anecdotal basis – concerning the “inefficiency” of socialism. The π curve, in fact, is a version of the famed efficiency–equity tradeoff, which is a staple of the neoclassical (and neoliberal) ideological diet, but which has, in fact, a very slim basis in theory (however one reads the empirical evidence). It shows clearly that to achieve specifically socialist goals (that is, to increase Q), a price will have to be paid in terms of falling productivity, which may indeed endanger the entire enterprise.

One further hypothesis rounds out our list of ingredients. The π curve may be thought of as essentially stable over time (barring an assumption of increasing ecological pressure, according to which it could shift downward!). By contrast, the δ curve is subject to advances in consciousness, which make it possible to achieve higher levels of Q at *given* levels of X . In fact, successful socialist education and political work should make it possible to develop higher qualities of job enrichment, participation, continuing education, and so on, at any established degree of productive development. This would amount to shifting the δ curve to the right, and presumably would require high levels of political mobilization. The result, in the environment framed by the curves as currently drawn, would be a higher quality of work life (and social life in general), at a cost of *lower* levels of productivity and, consequently,

lower material living standards. And, as indicated, this would require political mobilization of a high order. Indeed, the pull of those higher levels of productivity originally inherited from capitalism may be such that political mobilization and appeals to moral incentives are required just to hold Q at the achieved level. [Figure 9.3](#) therefore illustrates the characterization of socialism as (relatively) inefficient, and excessively political (the “no-free-evenings” syndrome).

4 The conjecture

In one of those prescient passages for which they are justly famous, Marx and Engels wrote:

In the beginning this [“increas(ing) the total of productive forces” after raising “the proletariat to the position of ruling class”] cannot be effected except by means of despotic inroads on the rights of property and on the conditions of bourgeois production; by means of measures, therefore, *which appear economically insufficient and untenable* but which, in the course of the movement, *outstrip themselves*, necessitate further inroads upon the old social order, and are unavoidable as a means of entirely revolutionizing the mode of production.

(Marx and Engels, 1971, 111, emphasis added)

This passage anticipates, I think, the further explorations of the shape of the π curve, to which I give the name the “Cherry Esplanade Conjecture.”[‡]

[‡] So named because it was conceived by the author while sitting on a bench at the Cherry Esplanade, a particularly beautiful setting of cherry trees within the Brooklyn Botanic Garden in New York City.

The “economically insufficient and untenable” measures are, of course, the massive political efforts required to shift the δ curve to the right, and thus to move *down* along the π curve (see [Figure 9.4](#)). The conjecture is that production eventually comes to depend on a motivation structure of a new type, so that productivity gains increasingly *depend upon* higher levels of Q . *The curve therefore becomes flatter, eventually bottoms out* (at point b), *and then rises*, reflecting the new dependence of productivity increase on an advanced quality of work and social life.

The point of inflexion, i , reflects the eventual onset of diminishing returns to the new relation between Q and X , as does the flattening out of the curve at the right end. Notice how productivity increases eventually “outstrip themselves”: having fallen below inherited levels originally, productivity now can rise far above those levels (the dashed horizontal line in [Figure 9.4](#)).

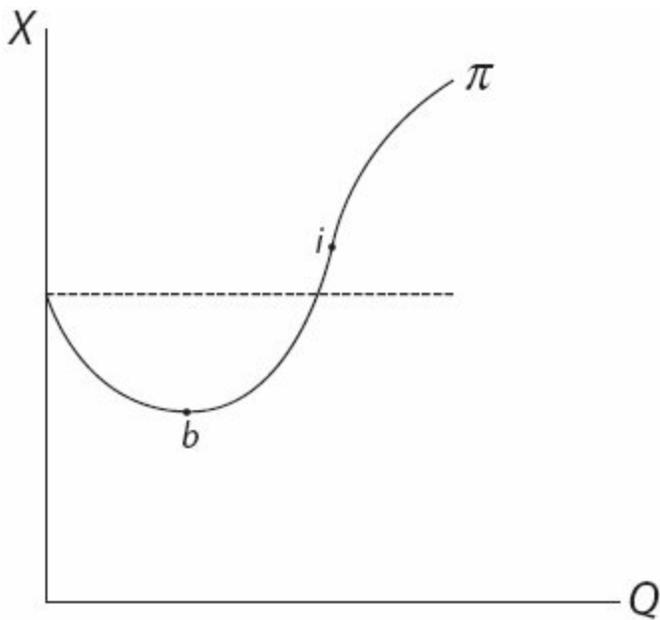


Figure 9.4 The Cherry Esplanade Conjecture.

The conjectured shape of π represents, of course, a central historical materialist postulate. There is a moment at which all prior growth in the productive forces has brought humanity to a crucial position: further growth is not possible under the pre-existing antagonistic systems of incentive, control, coercion, and domination (or is possible only in a cramped and distorted form, and associated with ever-present crisis). The rise in Q beyond existing historical levels signals a shift to new, more principled forms of motivation and consciousness, which – and this is the crucial postulate – are indispensable for the *further* development of the productive forces. Production has come to require levels of democracy, equality, autonomy, intellectual functioning, and moral and social responsibility such that new qualities of creativity and principle must necessarily be vested in each individual worker, and in the various collective structures in which she participates, if production is to be both efficient and dynamic. (It need hardly be mentioned that even to pose this transition the private accumulation and exploitation characteristic of capitalism, as well as the authoritarian and bureaucratic distortions of many recent socialist experiences, must have been long transcended.)

To grasp the implications of this new, fully formed π curve, refer to [Figure 9.5](#). A series of δ curves is drawn; these are linearized, for simplicity.

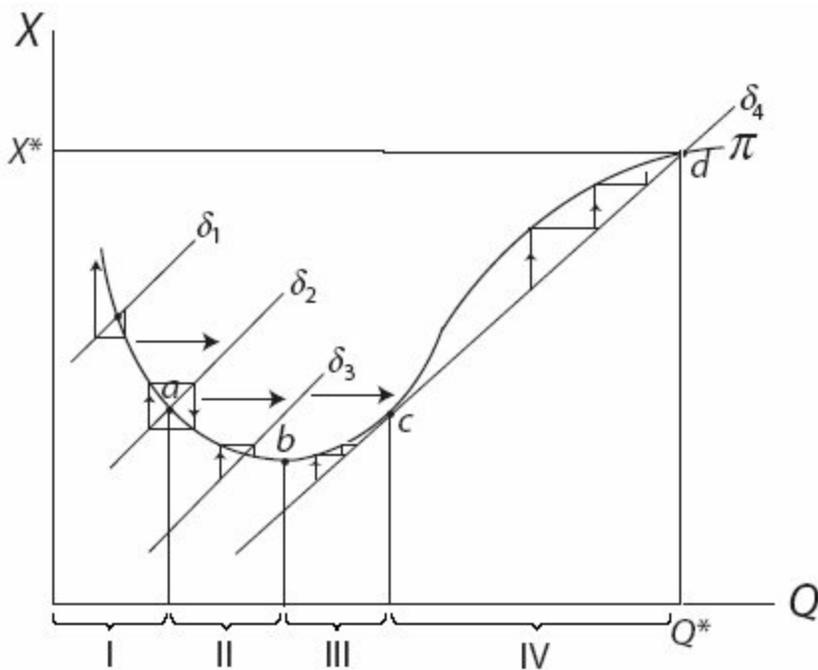


Figure 9.5 Stages of socialist development.

We begin toward the left, in the downward-sloping region of π , with δ curves δ_1 , δ_2 , and δ_3 . This of course is “primitive” or “early” socialism: the falling π curve is the familiar inverse tradeoff between socially progressive measures and productivity, akin to the inevitable constraint portrayed by the neoliberal naysayers as a fundamental Law of Nature. The three situations depicted differ, however, in their stability properties. The curve δ_2 is drawn for a case in which deviations of Q and X from a result in a stable limit cycle, as shown. In the even “earlier” situation represented by δ_1 , at which the motivation structure is very preliminary and any attempt to improve the autonomy and power of the workforce results in a drastic fall in productivity, the cycle around the consistent point is unstable; political effort is therefore needed to stabilize the central process, as well as to shift the δ curve to the right. By contrast, the cyclical process around π and δ_3 , representing a more developed stage of early socialism, is stable and damped. Point a , therefore, qualifies as a strategic marker between stages I and II, identified along the horizontal axis: having progressed beyond a , the socialist structure is stable, and attention can be focused on the further shift in δ .[‡]

[‡] A caution may be in order concerning the use made of stability analysis in this exercise. Cobweb stability depends on the relative slopes of the π and δ curves, and bears no relation to either the “Walrasian” or the “Marshallian” formulations, according to which, respectively, changes in X are inversely related to $Q(\delta) - Q(\pi)$, and changes in Q are directly related to $X(\pi) - X(\delta)$. When π is negatively sloped and δ is (as always) positively sloped, both the Walrasian and the Marshallian measures suggest stability; in other cases (see below, main text), they yield opposite conclusions, and a choice must be made based on the presumed realism of one or the other behavioral assumption. I find the “Marshallian” view, according to which Q responds to a divergence between possible and necessary X , to be superior to the alternative, especially since Q is much more the outcome of policy than is X . But the cobweb movement is decisive for dynamic stability, in any case.

Point b is clearly highly significant; it signals the end of the inverse tradeoff, so

inexorable and eternal in the minds of the paleoliberals, and the beginning of a crucial new historical stage, in which further advances in Q are not only consistent with productivity increase, but necessary for such increase. Point b therefore marks the terminus of stage II and the onset of stage III. Between b and c , however, the dynamic stability property holds at any point. Convergence to c from below is illustrated in [Figure 9.5](#). In the interval between b and c , each point is similarly stable, with convergence from above or below (not drawn in the figure) instead of the cobweb pattern associated with the falling region of π . But, crucially, in stage III experience gradually establishes consciousness of a positive relation between work–life quality and productivity, greatly easing the task of shifting δ to the right.

The final turning point, defining the upper limit of stage III and the onset of stage IV, is reached when $\delta = \delta_4$, at point c . As the support lines indicate, that point is stable from below, but *unstable from above*, and this is a momentous instability! The *spontaneous* movement – after one final political push, to displace Q upward – is *away* from c in the direction of d , a point of singularly high (and outstripping) levels of both work–life quality and productivity, Q^* and X^* . Point c is therefore a crucial watershed in socialist evolution: it signals the onset of the possibility of self-sustaining development in both the objective and the subjective dimensions of human welfare, *without the massive political mobilization effort that was required before*. At point c , we may say, the *guagua* acquires its steering wheel; the spontaneously emerging micro-activity of workers now serves as its own guarantee of stability and progress, without continuous political intervention (which, as noted, is a limitation of early socialism, even when the intervention in question is highly democratic). A foundation is laid in working-class experience that validates principled behavior as also self-interested behavior; put another way, space is opened for autonomous, even spontaneous, activity of individuals (and, of course, of teams and collectives as well) that is not atomizing, alienating, or polarizing.[‡]

[‡] The movement up to the onset of stage IV has been described in this chapter in terms of the political effort to shift the δ curve to the right. Is it possible, instead, that the π curve shifts upward, reflecting the gradual rise in productivity (at every hypothetical level of Q)? The answer is “yes,” and a little experimentation will show that an upward-shifting π curve against a given δ curve will eventually produce the same “explosion”: a point like c in [Figure 9.5](#). While the stages of socialist development can therefore be depicted with either form of movement (or both), I continue to think that most emphasis should be placed on the political project of shifting δ , again erring on the side of prudence and caution.

It might be noted that even if one adopts the “optimistic” standpoint of a π curve rising monotonically from its X intercept, a period of political effort to shift δ to the right toward point c will still be necessary.

Point d represents a high and self-sustaining level of both productivity and work–life quality.[‡] It also marks levels of these social goods that are clearly unattainable by capitalism. With measured political activity, either or both curves (π and δ_4) might be shifted so as to move d further upward and/or to the right. This is not necessary, however, and the construction suggests that socialist evolution may arrive at a high but stable terminus. Progress, of course, continues in a qualitative sense; it is not a matter of stasis, only of an end to *systematic* expansion in productivity; perhaps even in absolute levels of output, if population stabilizes. The implications for ecological constraints are clear: the entire

construction could well come to grief if a horizontal barrier representing an upper limit to productivity expansion were drawn in. Prospects for solar communism, however, seem eminently reasonable in a conception that does not require unending advance in productivity applied in production (as distinct from continuously expanding knowledge and widening of the range of human possibilities) (see Lovejoy, 1996; Schwartzman, 1996).

‡ This is clear in terms of dynamic (cobweb) stability. It is also supported by the “Marshallian” view (see sidenote, p. 185 above), in which Q adjusts to divergences of necessary and possible X , but not by the “Walrasian” view, with X adjusting to divergences of Q . As I have indicated, the Marshallian story seems superior to the Walrasian one for this model.

The Cherry Esplanade Conjecture is, at this stage, just that: an unproved hypothesis. Future work might well focus on research both in theory and with regard to data from all known experiences of socialist construction – and, indeed, of struggle for transforming social relations within capitalism. The crucial issue, of course, is the existence and location of the turning point b . It is quite likely that the curve is path-dependent – that is, that the position of b may depend, at least in part, on the course of the struggle to attain it. But *if* b exists – or if some such point can be created through socialist mobilization and development – then there also exist powerful forces in today's world that do *not* want us to find it!

This section may be concluded with a final comment on the stadial (stage-theoretic) properties of the Conjecture. The model discovers four stages in post-capitalist evolution (not the usual two, or three). The stages are defined analytically: that is, their beginning and end points (a , b , c , and d) are not mere postulates of convenience, or arbitrary readings of clusters of empirical events. (This is quite a different matter from the question whether we know, or even can know, precisely where they are located.) Point a is defined by the stable limit cycle; b by the bottoming-out of the π curve; c by the tangency of π and δ ; and d by the intersection of the *same* δ curve (δ) and π , representing the high-level equilibrium of mature socialism evolving toward full communism. Theories that posit stages of development (regimes of accumulation/modes of regulation; social structures of accumulation) without a basis in theory usually lose the insight afforded by periodization: the nature of the immanent tendency for transition from one stage to another and consequently the directionality of the process as a whole.

5 Wider perspectives

What, if anything, does the Cherry Esplanade Conjecture tell us about the wider issues in the contemporary socialism debate?

Its central implication is that there is no reason why mature socialism should not provide us with *more* free evenings than capitalism does! In their (implicit) preoccupation with stages I and II, socialists have tacitly accepted an insidious premise of neoliberal thinking: the idea that “capitalism” promotes the private, non-political existence of individuals in civil society, whereas socialism entails constant public–political interference, bureaucratism, and so on. We often say, or imply, that the political life is a *good* and rewarding life; we speak of “politics in command,” and so forth.‡ The Cherry Esplanade

Conjecture, however, suggests that the highly political character of socialism may be a characteristic of its early stages of development, more so than its later ones.

‡ This writer lived a very political life in the 1960s, as part of the US student, antiwar and civil rights movements. Like many others, I burned out of this intense activity after a few years. In (formerly) existing socialist societies, those who did not burn out became the core of Party activists; what often emerged was not a meritocracy, but rather an “activocracy,” much more benign than the bureaucracies beholden to a capitalist ruling class in capitalist societies, but a seriously alienating presence nevertheless. I believe the left has to rethink the way it advocates democracy (not, of course, its commitment to democracy as such). People resist “participating in all aspects of managing their lives”; they often would rather leave at least some of that to others, as anyone who has tried to recruit volunteers to serve on a housing cooperative board or community school board can attest.

One of the great silences in the Soviet economic reforms, beginning in the 1960s, concerned the question of horizontal ties among enterprises. Through all of the metamorphoses of the system of planning and management, this possibility was never seriously investigated – a sign of the dead weight of the authoritarian legacy. Enterprises were legally entitled to initiate most plan details, including desired contracts with suppliers and customers; these, however, had to be approved through a vertical process of communication, never directly with the principals concerned.

I have suggested (Laibman, 1992b) that horizontal ties among state enterprises, taking place in conditions of overall price and financial planning, with full disclosure and visibility and subject to qualitative evaluation for the purpose of assigning bonuses for plan fulfillment, would represent a new, higher form of a socialist market or commodity relation. I now wonder whether this process can be better characterized as a *convergence* of market and plan, in the context of the high levels of socialist consciousness and functioning represented by stages III and IV in the Conjecture model. In a sense, *both market and plan* are transcended, in a regime with a large amount of individual autonomy and creativity. Along with the communitarian or traditional critics of “market socialism,” one must, I think, reject the “market socialist” notion of socialism as equality in private property ownership (enforced by means of vouchers, or a related gimmick) plus regulation by means of *atomistic* markets, *given the levels of social consciousness and motivation inherited from capitalism*. But in the advanced stages under consideration here, the centrifugal and polarizing aspects of such market relations are absent; autonomous horizontal activity cannot generate unprincipled self-interest, manipulation, accumulation, and so on. Socialist autonomy is not “market” behavior in any sense consistent with capitalist horizons. It is also not “planned” activity, in the sense that prior confirmation from higher bodies is necessary. ‡ I envision, as an inherent component of a modern socialism, a system of ongoing cybernetic macrocoordination (see Cockshott and Cottrell, 1997), perhaps better called “programming” than “planning.” High levels of participation, visibility at all levels, and a critical political culture are vital in this programming–planning system, if it is to serve as a means of consensualization – especially concerning the price and income constraints (income differentials) within which individuals make production and consumption decisions. But whatever it is called, in stages III and IV it embodies autonomous but principled activity, and it transcends the conventional plan–market dichotomy; this dichotomy, even when

stripped of its binary oppositional simplicity, appears increasingly inadequate to convey the complexity of the process of social interaction and growth being described.

‡ A major advantage of modern computer-assisted production (design, manufacture) is the ability to combine detailed specification and creativity at the microlevel with overall coordination and balance, without necessarily pre-envisioning and sanctioning each particular set of micro-activities.

This chapter, as its title makes clear, is a Conjecture; “for purposes of discussion,” as a footnote on the first page of non-sanctioned articles in Soviet journals used to say. It does not try to address many monumental problems for socialism, especially those involving bureaucratic organization and power. My hope is that it will help steer the global conversation about alternatives to neoliberal capitalism into more fruitful channels – at least concerning some aspects of this massive and vital subject. I believe the tools are available now to begin to envision a socialism that is both technically sophisticated and “inspirational”; that transcends narrow conceptions of “plan” and “market” as economic institutions; and that goes beyond both the nihilism and eclecticism of the “market socialist” schemes, and the naiveté of cooperativistic conceptions that rely on semantic imagery and slogans of democracy and participation, but do not wrestle with the hard questions of individuation, autonomy, and the motivational and organizational complexities of modern social life.

10 Incentive design, iterative planning, and local knowledge in a maturing socialist economy

Introductory perspectives

Everyone has heard about the impossibility of socialism! Millions and millions of equations. An authoritarian Central Planning Board trying to make all of the What?, How?, and For whom? decisions for everyone in the economy, when no central agency could possibly have the detailed *local knowledge* of preferences and production possibilities that it would need even in order to populate those equations with data, let alone solve them. No choice, no freedom, no incentives, no basis for rational decision making. Truly the Road to Serfdom!

Except for the fact that it ain't so! With modern information technology, a system can be constructed of iterative (multi-period) communication and data flows between production units and planning centers. Each unit creates its own plan, with an economic objective – producing the socially desirable assortment of output with maximum efficiency – and a social objective – doing so in a way that optimizes the effects of its activity on its members and on the wider community. The iterative process combines the individual enterprise plans into larger aggregates, and the central bodies process those aggregates into a consistent whole, assuring that macro balances are achieved and that social goals visible at the macro level are respected. The center then asks the local units for modifications, in a progressive sequence that converges to a fit between the overall plan and the local ones. The enterprises thus acquire real information – not the random noise of the spontaneous market – and a stable framework for their own planning activity. Every level is visible to all; ever greater numbers of people are drawn into a meaningful planning process that embodies democratically determined social goals. How far can we go in overcoming the alienation and cynicism and disempowerment to which we are accustomed? The alternative is capitulation to the vagaries of “the market,” which in fact is nothing but a concentrated enforcement of the antagonistic force of exploitation by an unprincipled minority.

This chapter is about responding to an “Impossibility Theorem.” The Theorem claims that individuals, and local production units, cannot be given the power to create plans for themselves within a larger planning system of the type described, without incentives arising for those units to distort the information at their disposal and to manipulate the system in their own interest, with effects that are (obviously) destructive of efficiency.

My answer, as in the case of the $X - Q$ curve of the last chapter, has as its premise the existence and further development of modern technology. Marxist thinking about the ordering forces in human history has always pointed to the relation between the level of development of the productive forces and the social forms that that level (a) makes possible; (b) requires for its own continued elaboration. Technology does not “determine” anything; it only comes into existence when human agents make that happen, but it also shapes the relations among those agents as they succeed in increasing people's efficacy in their continual interaction with nature. In the present instance, I posit that post-electronic-revolution technology requires a high degree of creativity, responsibility, discretion, and rational understanding on the part of its users—developers. It is unthinkable without extensive democratic devolution of decision making, and cultivation of a culture of the workplace in which people are meaningfully connected to both planning and execution of the work process, and to each other.

If any of this is not, or not yet, true, then the Collective Morale Function of this chapter is not, or not yet, relevant. The Function, however, constitutes at least a potential answer to the Impossibility Theorem: it states that deviation of a production unit's plan from its own true level of possibility will result in consequent downward deviation of the unit's actual results from its plans. Enterprises, then, work under an incentive to find and report their own realistic possibilities. Plans (both local and aggregate) come increasingly to rest on accurate information, and the world-historic overcoming of people's alienation from their own work activity – due either to the rigors of extreme scarcity or to the exigencies of class domination – can, in principle, be accomplished.

Of course, advocates of socialism have long argued that socialism is possible because people have the capacity to be far-sighted and other-regarding, either on the basis of a particularly generous (some might say “naive”) view of human nature, or because collective spirit is formed among workers in their struggle to survive and prevail against the predations of capital. Some might say that my answer to the Impossibility Theorem rests on a subtle reintroduction of this facile view. I insist, however, that the objective requirements of technology – coupled with the need to resolve pressing problems of achieving ecological and sustainable balance in our transactions with the external world – go a long way toward making the Collective Morale Function effective in promoting an increasingly principled culture, within workplaces and in a socialist community at large. At the very least we can say that this sort of path is possible. All that stands in the way of a serious and consensus-seeking worldwide conversation about this, and about the human prospect generally, is the continued existence of a predatory, rapacious, power-hungry, increasingly international capitalist ruling class bent on preserving its privilege and power at any cost.

The central result of this chapter – the socialist enterprise's optimal levels of plan and achievement, and their evolution toward a position of full correspondence with locally known best practice – is clearly in the category of a precise result running far ahead of meaningful estimation. As noted in the Introduction to this book, however, I recommend results of this sort as a way of keeping our eyes on the prize. The model is a tool for holding our vision fast to the *qualitative* presence of an answer to TINA-thinking, and that thinking is

so pervasive that we need every handle we can find to disrupt it.

As throughout this book, this “Introductory perspectives” piece is intended to give the reader a sense of the chapter's main message, and if anyone gets that message without becoming involved with the much more demanding material in the chapter itself, that is at least better than not reading the book at all! I strongly recommend, however, that you tackle the real thing. That way, you don't have to take my word for a result; you actually come to own it (in an appropriately socialist sense of “own,” of course!).

I expect critics of this book to argue that it suffers from a sort of bipolar disorder: revolutionary–socialist perspectives coexist with quantitative model building, but the two elements do not interact; radical imagination and scientific method, to invoke the terms of the book's subtitle, are like ships that pass in the night. Well, even having them both between the covers of a single book might represent progress of some sort – a potential, to be realized later, and by others. Nevertheless, I do hope that the models, such as that of this chapter describing enterprise planning and plan-execution within a comprehensive plan framework, derive from the quest for an alternative to the neoliberal capitalist present, and contribute something to the advancement of that alternative. If some readers at least find here material along these lines on which they can build, that will be more than sufficient justification for the effort.

1 The problem stated

At mid-twentieth century, the great libertarian economist and philosopher Friedrich Hayek issued his famous challenge (1944; 1945): *any* attempt to circumvent the spontaneous, unregulated competitive market would lead to serfdom. And, from a much more eclectic perspective, in 1983 the doyen of comparative economists, Alec Nove, essentially concurred, insisting that there are, at bottom, only two possible economic coordinating principles: the market, and top-down command. It would not be unfair to say that this rigid bipolarity has been the axis on which thinking about socialism has turned, even up to the present. Even at the more socialism-friendly end of the spectrum – as in the discussion in Cuba today, and among proponents of “market socialism with Chinese characteristics” (Yang, 2009) – the bipolarity as such is not questioned; reforms are sought which somehow balance and combine the positive and negative features of markets and “planning,” but the essential dichotomy itself remains in place.

The experience of the Soviet Union, however, suggests the *possibility* of a third alternative: a system of *multi-level iterative coordination*. In this conception, economic activity is always undertaken within the framework of a plan, which serves both as guide and as the normative foundation for evaluation and reward. The plan, however, is not imposed from a “top” or “center,” but instead emerges from the *planning* activity that takes place at each local site of production (and, perhaps also, consumption). The local units – I will call these units “enterprises” in what follows – create their own plans, which are then transmitted to a central site or authority, aggregated, adjusted for overall consistency and to address any macro imbalances that could not have been known or foreseen at the enterprise

level, and returned to the enterprises. The enterprises then readjust (“fine-tune”) their local plans accordingly, and send them back “up” (or “in”) to the center. The iterations – in theory! – lead to sufficiently rapid convergence to a consistent overall grid for the plan to become effective. In the Soviet system, which was a very early precursor of what becomes possible after the electronic revolution, there was a rigid separation between the planning phase and the execution phase, and the planning phase tended to hyperextend into the period for which the plan was intended. In a modern IT conception, we may imagine planning (coordination) and execution to be continuous and simultaneous. The result, however (again, in theory!) is quite different from whatever might emerge from unplanned, atomistic market interaction. (It should go without saying that markets in their specifically *capitalist* form are not at issue here.) First, enterprises are able to situate their own activity within the larger macro process of which they are a part, which thus becomes a stable foundation on which rational calculation may be projected. (Contrast this to the random noise and uncertainty of markets, especially financialized markets.) Second – and herein lies an essential socialist response to the Hayek critique – the plan, as envisaged in the iterative conception, incorporates local (and even tacit or non-propositional) knowledge that by definition exists only at the enterprise level and cannot be transmitted to or held by the center.‡

‡ The literature on the Soviet economy is enormous, and cannot even be summarized here. Some high points, from various perspectives: Dobb, 1948; Nove, 1961; Khudokormov, 1967; Ellman, 1973; 1979; Spulber, 1991; Gregory, 2001.

Now if enterprises are to be given the responsibility to create their own plans, the question arises: since local knowledge is truly local, how can the center provide incentives to enterprises to plan *both* ambitiously *and* realistically? The enterprise's reward should be maximized when it achieves its full actual potential – for level, quality, and assortment of output; for output and productivity growth, technical change, social, educational, and technical development of the work-force; and perhaps other goals. There are really two questions here. First, given the desire of the center – which acts as the representative of society as a whole in this – to reward the enterprise *both* for planning ambitiously, *and* for planning realistically (i.e., for fulfilling the plan once announced), can this in fact be achieved? Second, can an incentive structure be created that encourages the enterprise to reveal its true possibilities? Put negatively, can the enterprise be prevented from manipulating its announced plan and/or its subsequent behavior, and distorting its true position, in order to maximize its reward?

These questions were addressed in the Soviet economic reform literature of the 1960s and beyond (for a summary, see Ellman, 1979). They are also at the heart of the incentive design literature in Western economics (Hurwicz, 1972; Campbell, 1995), which addresses the question of incentives for non-distorting behavior on the part of agents, in cases in which principals cannot have good knowledge of agents' preferences or possibilities.

The incentive design models suggest that there are indeed mechanisms that may induce agents, in their own interest, to reveal their true positions and act accordingly. An example of such a mechanism is the proposal for a second-price, sealed-bid auction (Vickrey, 1961; cf. Campbell, 1995, 140ff.) which induces participants to state (in their bids) the true

reservation value they attach to the object being auctioned, and then forces the winner of the auction to pay the true social cost of her victory (namely, the reservation value of the *second-highest* bidder). The upshot of this literature, however, is that – apart from special instances – it is not possible *in general* to find a mechanism that (a) induces truthfulness; and (b) produces Pareto-optimal outcomes. This result, the Impossibility Theorem (Hurwicz, 1972; Roberts, 1979; cf. Campbell, 1995, 294ff.), suggests, in our context, that there is no way for a socialist society (as represented by its center, or Central Planning Authority) to provide a motivational structure for enterprises that would preclude strategic behavior on their part: concealing reserves, falsifying achievement possibilities, and so on. If this is correct, it would essentially vindicate the Nove binary of market vs. command: Hayek's draconian vision and “free market” fundamentalism aside, we would have to settle for some “compromise” between spontaneous, horizontal markets with their propensity toward cyclical instability, polarization, and promotion of egoistic and short-sighted behavior, on the one hand; and central, top-down command, with its propensity toward authoritarianism and inefficiency, on the other. I will note, for the present, that the Impossibility Theorem of the incentive design literature assumes implicitly (but crucially) that there is no link between an enterprise's planning behavior (manipulative or otherwise), the actual outcomes of its activity, and its true possibilities.

In the sections that follow, I will present a canonical model of a typical reward function for an enterprise in a decentralized, iterative planning system of the sort under consideration (Section 2). I will then study two preliminary simple models of reward maximization (Section 3), leading to the heart of my proposal to form an answer to the Impossibility Theorem: a Collective Morale Function linking an enterprise's plan, its actual locally known possibility, and the outcome of its efforts (Section 4). The final section concludes, with some wider implications.

2 The reward function

2.1 *Material incentives*

A prominent strain of socialist thought resists any attempt to use income incentives as a stimulus to exertion, diligence, productivity, and self- or collective improvement; it sees all such attempts as catering to “defects” or otherwise contrary to Marx's conception of communist society (see, e.g., Lebowitz, 2010; Ollman, 1998). In contradistinction to this way of thinking, I see the determination of rewards by some measure of an enterprise's or individual's performance as essential for successful development of *both* production *and* consciousness in a socialist context (see also Laibman, 2007, [ch. 6](#)). Marx's *Critique of the Gotha Programme* (1966) makes clear his commitment to the need for material reward in relation to work performed, in the lower stage of communism as defined by him. I would, however, affirm this even if Marx could be read to the contrary, on the basis of the entire experience of the twentieth century up to the present and of a materialist philosophical platform for thinking about the dialectic of changing conditions and consciousness. It is a

matter of greatest principle that every working collective in a socialist society consider itself responsible to the entire society for its guardianship over a particular set of productive resources, and for the efficiency with which that guardianship is exercised. Differential rewards, both to collectives and to individuals, follow from this, throughout a long period in which consumption is still constrained by labor income. The system of rewards must be “gotten right,” precisely so that it can eventually be transcended. The ideas that material incentives can simply be denied, or that people's consciousness and behavior can be transformed through a simple act of revolutionary political will, are what give socialism a sense of unreality, and drive people toward advocates of “the market”; concern for the hard reality of motivation and incentives makes it seem as though it is only the anti-socialists who have their feet on the ground. From this point of view, artificially accelerating equalization of incomes among different classes of labor (so long as such classes exist), and among different individuals within each class (so long as levels of consciousness, effort, skill, and educational attainment vary), may have the opposite of the intended effect, causing resentment, demoralization, and cynicism and obstructing, rather than promoting, socialist consciousness (cf. Laibman, 2007, [ch. 6](#)).

In the present context, this means that the reward function for enterprise performance is of crucial importance. It must provide a clear message concerning how the society, through a democratic mandate embodied in the reward structure, values different aspects of group and individual activity – including (as we will see) both plan development and plan execution. If that mandate dictates that a given group or individual receive a differential for their valued contribution, it is important for that differential to be accepted by the group or individual in question, as that validates the standards that apply to all. (If any individual feels strongly that she does not need the differential, she can always donate it to solidarity funds set up to eliminate still-existing social inequalities.)

The reward function, of course, does not replace a certain basic support wage, and associated social consumption systems in areas such as health, education, and retirement. The generalized access to security and dignity afforded by this basic level of equality is a fundamental value of socialist society, and the viability of socialism as such rests on the premise that technical and social levels have been reached at which this basic platform is a requirement for, not a hindrance to, further development. The reward is distributed, on top of the basic wage, as individual and collective bonuses, within each tier of the enterprise's structure (again, assuming such tiers – managerial, creative, skilled, unskilled – still exist, at an early stage in which the stratifications inherited from the capitalist past have not yet been overcome). It may also be used to support various investment and collective consumption funds that are at an enterprise's disposal. I therefore prefer the more general term “reward” to the (perhaps more common) “bonus” to designate this concept.

2.2 The performance measure

Before a canonical reward function can be formulated, care must be taken in establishing the nature of the performance criterion to be used in determining the reward. Central to the superiority of socialist over capitalist (or any spontaneous market) coordination is the

proposition that the achievement of the enterprise is in fact a vector of outcomes in different dimensions. There are, first, various measures of enterprise performance in the narrow sense of “production,” and many of these appeared in the twentieth-century socialist experiments: level, assortment, and quality of output; output sold (as distinct from merely produced); productivity; productivity growth; “profit” (net income generated for the public sector); targets for control over costs; etc. Note, first, that here there is a unique problem for socialist economic theory: does the enterprise count as its “value added” all of the net income, including wage income, or just the surplus over costs that accountants in a capitalist context will recognize as “profit”? Definition of the surplus from enterprise activity clearly embodies a tension, in which workers-as-owners must treat themselves as a means to their own ends! What is the appropriate measure of the rate of return to the resources (capital stocks) entrusted to the enterprise: is it realized net income divided by capital value, or just the portion of net income not paid out as wages? Capitalists (or state enterprise managers who act as an alien presence in relation to the work-force and treat that workforce as a means to their own ends) would have no problem with this issue. By contrast, a socialist enterprise director and her staff, in consultation with committees and representatives of the production, creative, and engineering workforce, must wrestle with it.

But even if we assume that some scalar measure of operational efficiency in this narrow sense can be identified, that still does not exhaust the content of the performance criterion. In a socialist context, society “tasks” the enterprise with various social goals, including (but perhaps not limited to): establishing and promoting relations with the geographic community in which the enterprise is sited; meeting targets for ecologically sound and sustainable activity; developing educational and other programs for children and young people in the community; pursuing goals of eliminating inherited discriminatory distinctions among workers, on the basis of color, gender, nationality, or culture, by means of affirmative action programs; and implementing projects to disseminate its knowledge and capacities to other regions and enterprises, to overcome developmental lags.

In what follows I will leap over this huge area for socialist theoretical study, by simply assuming that the standard “economic” measures of performance can be combined with some way of rating the enterprise in all of these other areas. The vector of “scores” achieved (or planned) must be weighted, in order to reduce the multidimensional complexity of social evaluation to a single scalar measure, x . I ask the reader to remember that this x is not a simple measure of “output” in some natural units (as it indeed often was in early Soviet planning), but can be as multidimensional and complex as necessary, given the task of evaluating enterprise performance in increasingly sophisticated technical and cultural environments.

Some may question whether reducing performance to a single scalar is possible at all; I will only justify this on the grounds that it makes possible the following analysis. Certainly, at a minimum I must be assuming that the weights used to determine the scalar x are independent of the resulting behavior.[‡]

[‡] The idea of x as a linear weighted sum of performance indicators,

$$x = \sum_i k_i q_i,$$

suggests that the enterprise can choose among different ways of achieving a given value of x , in which case the center might wish to impose some side constraints establishing minimum requirements in all areas. The linear scheme could be replaced by a more interactive (multiplicative) formulation. All this awaits further study.

The final step in this sequence will be to distinguish between the planned level of the performance indicator, x_p , and the actual achieved level, x_a . The planned level, x_p , is announced by the enterprise, and is therefore generally known. The achieved level, x_a , depends on accurate reporting of observable information, and also, crucially, on the political process whereby the enterprise's work in the various qualitative dimensions of performance enumerated above is rated. It should go without saying that this rating process could be subject to unprincipled manipulation and conflict! That is to say nothing more than that we are here dealing with a very human situation, and that there are no simple fixes.

2.3 The reward function

The reward, R , can now be specified, in a way that encourages the enterprise both to plan ambitiously and to fulfill the plan, once announced. There are various ways in which this can be done, but one specification seems to have canonical status, in that it treats upward and downward deviations of result from plan in a symmetrical manner, and is a continuous function and therefore amenable to optimization analysis (Pickersgill and Pickersgill, 1973; cf. Ellman, 1973).

The reward, R , is related to both plan and achievement, as follows:

$$x_a = x_p \pm \sqrt{\frac{ax_p - \bar{R}}{b}} \quad (10.2)$$

R has two terms, and the coefficients a and b determine the relative weights assigned to each. The first term on the right has the level of the plan, x_p , contributing positively to the reward, in a simple linear manner; this is a straightforward incentive for ambitious planning. The second term, however, reduces R to the extent that the actual result, x_a , deviates from x_p , in either direction. It places a value on plan fulfillment, treating overfulfillment as just as disruptive as under-fulfillment (due to unplanned burdens on storage and transportation capacities, but perhaps more to the distortions imposed upon knowledge for aggregation and macro planning by significant deviations of x_a from x_p).

The reward function (10.1) will be used in later sections. It may, however, be seen as a development arising from several simpler reward models. First, we may imagine a managerial incentive in which planning is not valued or rewarded explicitly at all; the reward depends only on the achieved level. In this case, $R = ax_a$. Second, we posit a simple model of *central* planning, in which the plan is given to the enterprise by the center:

$$R = \bar{R} - b(\bar{x}_p - x_a) = (\bar{R} - b\bar{x}_p) + bx_a$$

Here \bar{R} is a constant, the reward “base” that does not depend on the enter-prise's activity. In this case, deviation from plan is formally penalized, but since the plan \bar{x}_p is not under the control of the enterprise, it amounts (as the last expression on the right side shows) to a “more is better” incentive, to get x_a to the highest possible level. This becomes a variant of the first, managerial, case. A further development of central planning is to place a value on plan fulfillment and penalize deviations in either direction, in which case the formula becomes

$$R = \bar{R} - b(\bar{x}_p - x_a)^2$$

When, crucially, the planning function itself is devolved to the enterprise, central planning evolves into multi-level coordination, and the reward function becomes (10.1).

3 Preliminary models

3.1 Properties of the reward function

To see how the reward function works, treat R as constant, for the moment – $R = \bar{R}$ – and solve (10.1) for x_a in terms of x_p . We have, in effect, all of the possible combinations, for a given reward, of actual achievement with the announced plan:

$$x_a = x_p \pm \sqrt{\frac{ax_p - \bar{R}}{b}} \quad (10.2)$$

This is shown in [Figure 10.1](#). Real values of x_a require $x_p \geq \bar{R}/a$. We have

$$\frac{\partial x_a}{\partial x_p} = 1 \pm \frac{a/2}{\sqrt{b(ax_p - \bar{R})}} \quad (10.3)$$

This derivative approaches 1 as x_p approaches infinity. On the lower branch, it becomes 0 (the function is minimized) at $\tilde{x}_p = \bar{R}/a + a/4b$. In practice, the lower branch, associated with the minus sign, will be effective, since all reasonable constraints will place the upper branch out of the feasible range.

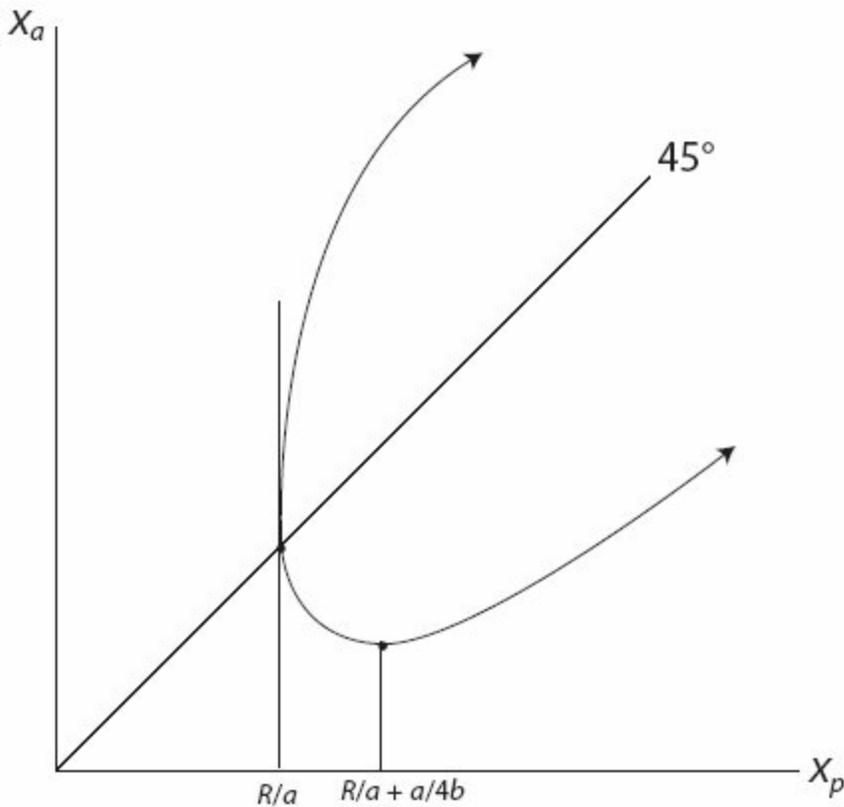


Figure 10.1 Combinations of plan and achievement for a given level of reward.

3.2 Constant achievement level

Suppose the workforce is impervious to incentives, and completely insensitive to the plan: $x_a = \bar{x}_a$. The reward function then becomes a straightforward maximization problem:

$$\frac{\partial R}{\partial x_p} = a - 2b(x_p - \bar{x}_a) = 0 \Rightarrow x_p^* = \bar{x}_a + \frac{a}{2b} \quad (10.4)$$

and putting this result back into (10.1),

$$R^* = a\bar{x}_a + \frac{a^2}{4b} \quad (10.5)$$

This simple result is graphed in [Figure 10.2](#). The $x_a - x_p$ curve (10.2) begins at a point on the 45° line; increasing R means increasing R/a , equivalent to moving up along that line. For R/a less than R^*/a , the curve will cross \bar{x}_a , identifying two (x_p, x_a) strategies that will produce that value of R . For R/a greater than R^*/a , no plan x_p is consistent with the given \bar{x}_a . R^* is therefore shown to be the maximum achievable reward.

Note that, in this case, R -maximization requires the enterprise to set a plan, x_p^* , that is greater than the (constant) achievable level, \bar{x}_a . While in this ultra-simple case we may imagine that \bar{x}_a is known by the center, so that the local-knowledge problem does not arise, we still find a deviation between what the enterprise can do and what it declares to be “the

truth” about what it can do.

3.3 Material incentives

The constant achievement level can be replaced by one that responds to the reward received by the enterprise. The amount of effort and diligence that the enterprise can draw out of itself may reasonably be thought to depend on the size of the bonus and other funds achieved, or at least anticipated.[‡] We imagine a base level of x_a , α , that would result when $R = 0$, and enterprise income is restricted to the maintenance described in Section 2.1. The product x_a then rises with R , but with diminishing returns, to an asymptote at $\alpha + \beta$. This is captured by the hyperbola

$$x_a = \alpha + \frac{\beta R}{\gamma + R} \tag{10.6}$$

[‡] This proposition of the socialist economic literature bears a major resemblance to the efficiency wage literature in Western labor economics and macroeconomics; see Akerlof and Yellen, 1986; Mankiw and Romer, 1991.

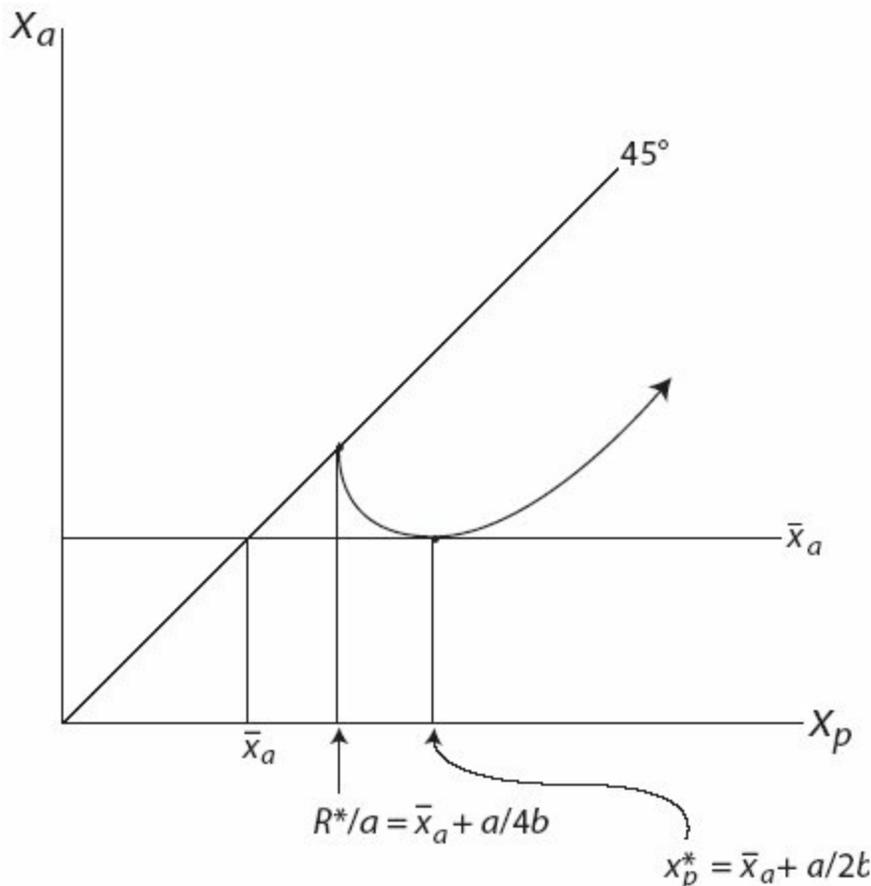


Figure 10.2 Reward maximization with a constant achievement level.

This can be rewritten to make it compatible with the space of [Figures 10.1](#) and [10.2](#), by dividing the numerator and denominator of the second term on the right side by a :

$$x_a = \alpha + \frac{\beta \frac{R}{a}}{\frac{\gamma}{a} + \frac{R}{a}} \quad (10.6')$$

Since the objective R is now also an argument determining one of the choice variables, we have, instead of a straightforward maximization problem, a simultaneous solution, and this is shown in [Figure 10.3](#). Since the object is to maximize R/a , and since R/a is the “starting point” of the $x_a - x_p$ curve (10.2), which lies on the 45° line, that point must be consistent with the material incentive function (10.6'). The solution is therefore at the intersection of the 45° line and (10.6'), at point A in the figure. The solution is found from

$$\frac{R}{a} = \alpha + \frac{\beta(R/a)}{\gamma/a + R/a},$$

which results in

$$R^* = -\frac{\gamma - a\alpha - a\beta}{2} + \frac{1}{2} \sqrt{(\gamma - a\alpha - a\beta)^2 + 4a\alpha\gamma} \quad (10.7)$$

Both roots are real, but the plus sign corresponds to the only positive (and therefore relevant) root. The optimal plan and achievement levels, equal in this case, are

$$x_p^* = x_a^* = \alpha + \frac{\beta R^*}{\gamma + R^*} \quad (10.8)$$

Notice that the coefficient b , which measures the center's relative distaste for discrepancies between the enterprise's plan and its result, plays no role in this solution, as we would expect: since x_a coincides with x_p in the solution, no discrepancy arises, and it doesn't matter at what rate discrepancies are penalized.

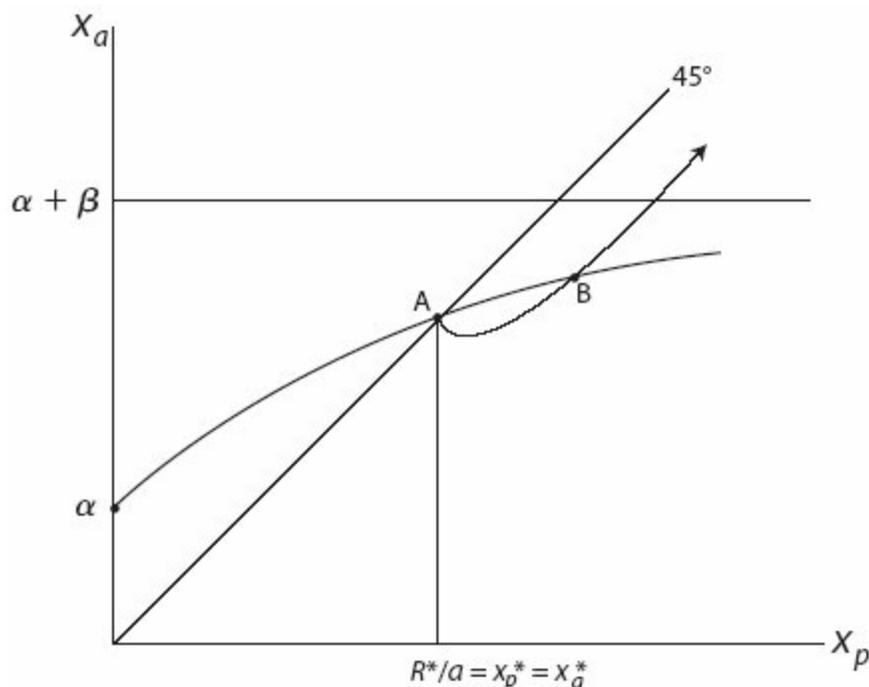


Figure 10.3 Reward maximization in the presence of a material incentive function.

It should be noted that point B in [Figure 10.3](#), which looks like a solution of some sort, is not: at B, the x_p-x_a combination indeed produces R^* , but this value of x_a is higher than x_a^* , which is the only value that is consistent with R^* along the material incentive function. Point B, despite appearances, is not feasible.

4 The collective morale function

The preceding analysis of the constant achievement and material incentive cases lays the groundwork for the core proposal of this chapter: a model in which both the enterprise's plan and the result of its activity are closely related to its actual level of possibility – something that is in principle known only to the collectives of the enterprise and in fact only discoverable via the process of plan formation at the enterprise level. This section discusses and describes this proposal in detail.

4.1 Logic and properties

The Collective Morale Function (CMF) will only become operational when social and technical conditions have developed to a point at which production – not to speak of production development – cannot take place without significant discretionary involvement and rational understanding among the members of the enterprise. In socialist conditions, there is a strong culturally reinforced political commitment to full employment and social security; moreover, production requires high and rising educational levels, analytical and communicative skills, and creative responsibility on the part of individual workers. In this context, the only managerial strategy consistent with broadly successful results is a highly devolved strategy: one that relies on dissemination and cultivation of management and

creative responsibilities throughout the workforce, and on sophisticated incentives. We are envisioning here a world in which *morale matters*; in which all essential contracts are highly and increasingly implicit and incomplete; and in which instrumental levers alone are not sufficiently motivating. Jobs in this sort of environment are not “just jobs”; they are “worth doing well.” Job satisfaction, broadly defined to include satisfying interpersonal relations in all phases of work (planning, creating, executing), is not just a valued side-product, but rather an essential prerequisite for collective success and growth.

This raises the question whether the technical, material, and cultural prerequisites for positing this sort of advanced enterprise environment existed to a significant degree in the experiments in early socialism of the twentieth century; indeed, whether they can reasonably be expected to be present, except in limited circumstances, in the foreseeable future. My sense is that they can, and must, be present, but this may be regarded as an open question. The purpose of this chapter is to explore the implications of the assumption that they are present, for a model of decentralized, iterative planning under conditions of significant locality of knowledge.

The key assumption, then, is as follows: there is a level of the achievement variable x – we will call this level z – which is *actually attainable* by an enterprise, given its best (not greatest) effort. As noted above, we may assume that z is known only to the enterprise; the center cannot have information on it. We may further assume, in fact, that this knowledge of z does not exist even at the enterprise level “ready to hand,” so to speak; rather, it is the outcome of the enterprise's concerted deliberations, study, debate, and consensus formation. In a word: the enterprise – and this means not just the people holding central management posts but all members, with (perhaps) varying levels of detail and sophistication – comes to know what it can accomplish, if it sets out to do that. Moreover, the enterprise – again, all of it – experiences the morale effects of divergence between z and x_p .

More precisely, we are looking for a specification of the CMF with these properties: if, and to the extent that, $x_p < z$, so that enterprise leadership has failed to incorporate what everyone knows is possible into the official plans of the enterprise, morale will suffer, and x_a will fall short of x_p . And, conversely, if, and to the extent that, $x_p > z$ – the plan is unrealistically ambitious – again morale will suffer, and x_a will again turn out to be $< x_p$. If the plan, as announced by the enterprise, coincides with (locally known) reality, then it will turn out that $x_a = x_p = z$.

In constructing some representation of this, I began with the geometry. The result was [Figure 10.4](#). It should be easy to verify, visually, that the CMF drawn has the stated properties, and that tangency with the 45° line at z is necessary for that to be the case. Assuming, reasonably, that the CMF has the form of a parabola, its specification emerges straightforwardly:

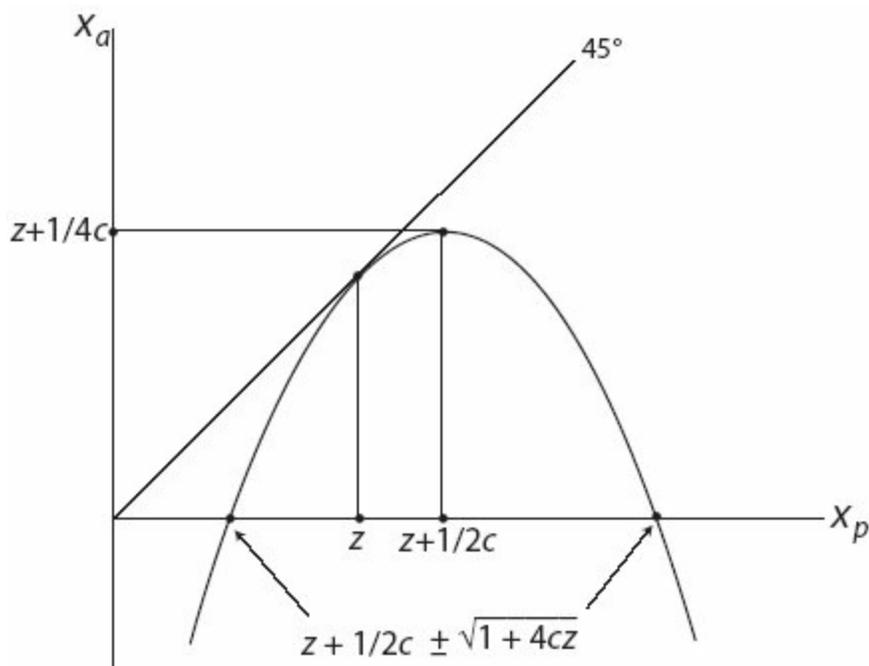


Figure 10.4 The Collective Morale Function.

$$x_a = -cz^2 + (1 + 2cz)x_p - cx_p^2 \quad (10.9)$$

The requisite properties can be easily verified: writing the right side of (10.9) as $f(x_p)$, we have $f(z) = z$, $f'(x_p) = 0$ at $x_p = z + 1/2c$, $f'(z) = 1$, and so on. The parameter c regulates the “tightness” of the parabola; when $c = 0$, $f(x_p)$ coincides with the 45° line ($x_a = x_p$); the morale factor disappears, and the enterprise planners have complete, unconstrained control over the achievement level. As c increases, the parabola becomes narrower; its maximum approaches z , as do its “zeroes” (crossings of the horizontal axis). This represents the maturing of the enterprise, as expressed in increasing effectiveness and importance of the morale factor: deviations of x_p from z have immediate and drastic effects on achievement levels.

4.2 Maximizing reward subject to the CMF

We can now proceed directly to the formal optimization result. The enterprise maximizes the reward function, subject to the CMF as constraint:

$$\begin{aligned} \text{MAX! } R &= ax_p - b(x_p - x_a)^2 \\ \text{S.T. } x_a &= -cz^2 + (1 + 2cz)x_p - cx_p^2 \end{aligned} \quad (10.10)$$

The Lagrangian, and first-order conditions, are:

$$Z = ax_p - b(x_p - x_a)^2 + \lambda[cz^2 - (1 + 2cz)x_p + cx_p^2 + x_a] \quad (10.11)$$

$$\frac{\partial Z}{\partial x_p} = a - 2b(x_p - x_a) - (1 + 2cz)\lambda + 2c\lambda x_p = 0 \quad (i)$$

$$\frac{\partial Z}{\partial x_a} = 2b(x_p - x_a) + \lambda = 0 \quad (ii)$$

$$\frac{\partial Z}{\partial \lambda} = cz^2 - (1 + 2cz)x_p + cx_p^2 + x_a = 0 \quad (iii)$$

A closed-form solution can be teased out of the system (i)–(iii), as follows. First, (iii) can be used to form

$$x_p - x_a = c(z^2 - 2zx_p + x_p^2) = c(z - x_p)^2$$

and inserting this into (ii),

$$\lambda = -2bc(z - x_p)^2 \quad (A)$$

Next, use (ii) and (i) to find

$$a - 2c(z - x_p)\lambda = 0, \quad \text{or} \quad \lambda = \frac{a}{2c(z - x_p)} \quad (B)$$

Combining (A) and (B),

$$\frac{a}{2c(z - x_p)} = -2bc(z - x_p)^2, \quad \text{or} \quad (z - x_p)^3 = -\frac{a}{4bc^2}$$

This cubic equation in x_p has only one real root, easily found from

$$z - x_p = \left(-\frac{a}{4bc^2}\right)^{1/3} = -\left(\frac{a}{4bc^2}\right)^{1/3}$$

so that the optimal plan is revealed as

$$x_p^* = z + \left(\frac{a}{4bc^2}\right)^{1/3} \quad (10.12)$$

Substituting x_p^* into the constraint – (10.9), or (iii) – we find the achievement level predicted from reward maximization:

$$x_a^* = z + \left(\frac{a}{4bc^2}\right)^{1/3} - c\left(\frac{a}{4bc^2}\right)^{2/3} = x_p^* - c\left(\frac{a}{4bc^2}\right)^{2/3} \quad (10.13)$$

The most striking observation one can make about this result is twofold. First, the reward-maximizing enterprise will systematically find the *best-effort outcome*, z , and then *announce*

a plan that exceeds it, by some amount equivalent to the right-most term in (10.12)! To this extent, then, the incentive embodied in this model leads only to *approximate* “truth-telling,” since the underlying “truth,” known only to the enterprise, is associated with z . Second, however, reasonable hypotheses about the dynamic evolution of the enterprise suggest that x_p^* may converge toward z over time, so that the model has efficient properties from the standpoint of society as a whole over the long run. First, the ratio a/b measures the relative importance attached by the center to ambition over precision in planning, and we may well imagine that this ratio will fall over time, as the inherent drive to realize its full potential increasingly kicks in for the enterprise, making additional reward less necessary, and as increasing complexity in inter-enterprise relations places an ever-greater premium on exactitude in plan fulfillment. Second, maturation of the enterprise means that the morale factor acquires greater importance over time, causing c to increase. Both of these evolutionary tendencies push the plan ever closer to the underlying true best-effort position, z , and, from (10.13), push the optimal achievement level, x_a^* , ever closer to x_p^* .

The impact of the parameters z , a , b , and c on the maximized reward, R^* , can be studied by substituting x_p^* and x_a^* into the reward function, and simplifying, to obtain:

$$R^* = az + (4^{-1/3} - 4^{-4/3})a^{4/3}b^{-1/3}c^{-2/3} = az + (0.47247 \dots)a^{4/3}b^{-1/3}c^{-2/3} \quad (10.14)$$

from which we observe the qualitative results:

$$\frac{\partial R^*}{\partial z, \partial a} > 0, \frac{\partial R^*}{\partial b, \partial c} < 0 \quad (10.15)$$

An increase in the objective (“true”) possibilities of the enterprise increases the maximized reward (this is hardly surprising), as does an increase in the value assigned to ambitious planning. But increases either in the value assigned to precise plan fulfillment or in the morale factor c *decreases* the maximized reward; the last result is interesting, because it is slightly counter-intuitive. On reflection, however, we can see that a rising morale factor pushes the announced plan closer to z and therefore lessens the extent to which the enterprise can “play” the reward function by taking advantage of the ax_p term.

The second-order conditions confirm the stationary value R^* as a maximum. Writing the reward function as $f(x_p, x_a)$ and the CMF as $g(x_p, x_a)$, the single relevant bordered Hessian is

$$|\bar{H}| = \begin{vmatrix} 0 & g_p & g_a \\ g_p & f_{aa} & f_{ap} \\ g_a & f_{pa} & f_{pp} \end{vmatrix}, \quad (10.16)$$

which, after considerable simplification, can be shown to be

$$|\bar{H}| = 12bc^2 (z - x_p)^2 > 0,$$

confirming the stationary position of (10.12)–(10.14) as maximizing Z , and R .

4.3 The geometry

The model developed in this section, in which the reward function is maximized subject to the CMF as constraint, can be visualized easily using the geometry of earlier sections of this chapter. Refer to [Figure 10.5](#).

The maximand is represented by R/a , the initial point of each $x_a - x_p$ curve for a given value of R , on the 45° line. The curve beginning at R_0/a represents all levels of reward less than the maximum, R^* , for which there are two feasible combinations of x_p and x_a that generate the given R , shown as points A and B in the figure. The curve beginning at R^*/a is optimal, as can be seen from the unique point of tangency to the CMF at x_p^* . For any higher levels of R the reward curve does not touch the CMF at all, and those levels are not feasible.

4.4 The model as guide to policy

In addition to affirming dynamic convergence of enterprise behavior to its true potential (truth-telling in plan formation), the model of this section can be used to formulate an approach to systematic thinking about the policy choice controlled by the center: setting the proportions between parameters a and b . Recall that this amounts to setting the importance of precision in plan fulfillment, in relation to that of ambitious (“taut”) planning. We will see that a degree of freedom remains in setting the *scale* of the two parameters; the relative size of R as such in relation to the base income of the enterprise affects both the share of the income generated by enterprise activity that goes to the center for general (society-wide) investment and social expenditure, and the degree of income security of the enterprises’ members, as measured by the share of income that does not depend on enterprise planning or results in any way. These are, of course, complex social decisions, and we will not pursue them in detail in this chapter. The a/b ratio, however, is of interest in relation to our overall concern with incentives for planning and execution, and their result.

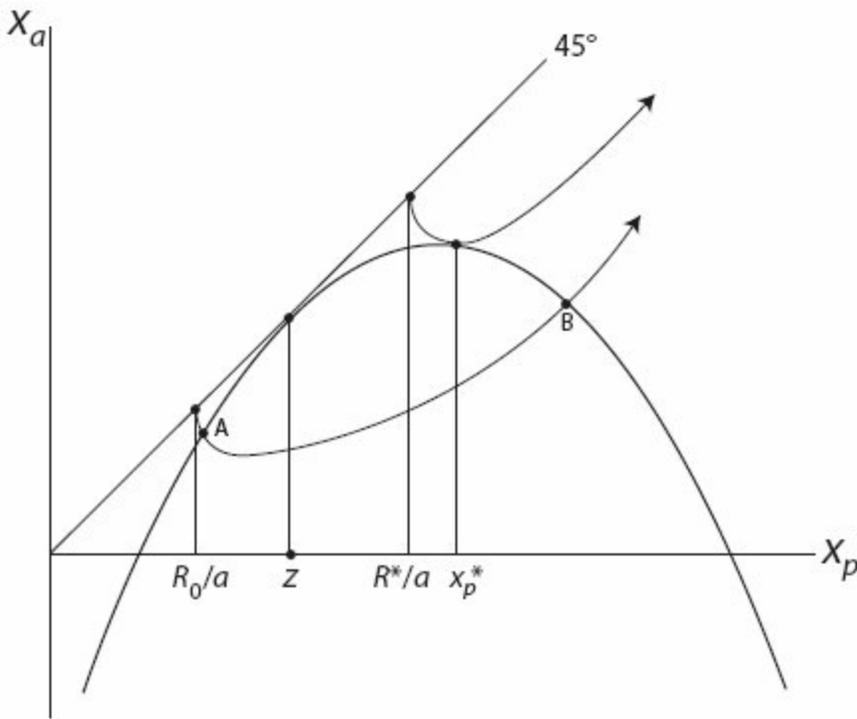


Figure 10.5 Reward maximization subject to the Collective Morale Function.

There are, apparently, two possible goals of policy: achieving an outcome of enterprise activity, x_a^* , that is exactly equal to z , the enterprise's own estimate of its actual potential; and maximizing x_a^* . We begin with the former.

From (10.13), it becomes apparent that $x_a^* = z$ is equivalent to

$$\left(\frac{a}{4bc^2}\right)^{1/3} = c \left[\left(\frac{a}{4bc^2}\right)^{1/3}\right]^2 \quad (10.17)$$

and this reduces to

$$k = \frac{4}{c}, \quad \text{where } k \equiv a/b. \quad (10.18)$$

We can get the enterprise to “produce” z , by setting this value for k . Note that if, as previously hypothesized, c rises over time, this would mean a steadily falling a/b ratio: greater relative emphasis on precision over ambition. Everything, however, depends on the size of c .

To get a sense of how c might be estimated, we can interpret x_p , x_a , and z dynamically, as growth factors: ratios of levels in the present period to those in the immediately prior period. A z of 1.04, for example, means that the locally known best-practice outcome is an improvement in the achievement index of 4 percent over the preceding period (year, or quarter, or some other unit of time). We will need one other benchmark value to determine c , and that can be the maximum value of x_a . Suppose this is 1.08. Consulting [Figure 10.4](#), we see that this implies

$$z + \frac{1}{2c} = 1.04 + \frac{1}{2c} = 1.08,$$

from which we find $c = 12.5$. Using (10.18), we have $k = a/b = 0.32$. The $x_a^* = z$ outcome, under the conditions assumed, suggests a value for a that is approximately one-third of the value of b (caution is needed here: the dimensionality of a differs from that of b , and we cannot say whether any given ratio is inherently “large” or “small”).

In the case under consideration, the enterprise's plan can be found by plugging (10.18) into (10.12), which, after simplification, results in

$$x_p^* = z + \frac{1}{c} \tag{10.19}$$

Rising c over time causes x_p^* to converge to z . At any moment in time, of course, the tension remains: the reward structure induces the enterprise to set a plan that is greater than its own internally known best-practice position. Under the present assumptions, from (10.19) the plan would be $1.04 + 0.08 = 1.12$, a rather draconian eight percentage points above the best-practice z .

The $x_a^* = z$ outcome, therefore, cannot be regarded as socially optimal. A look at [Figure 10.6](#) reveals that x_a^* is equated to z on the *far side* of the CMF, not at the tangency point (which, in the given story, is not attainable). We get the enter-prise's own best result, therefore, by pushing it far beyond any range consistent with a high-morale regime.

The alternative policy option, to maximize the enterprise's actually achieved level, is straightforward. In this case, we must have (10.12) and $x_p = z + 1/2c$ simultaneously, which suggests

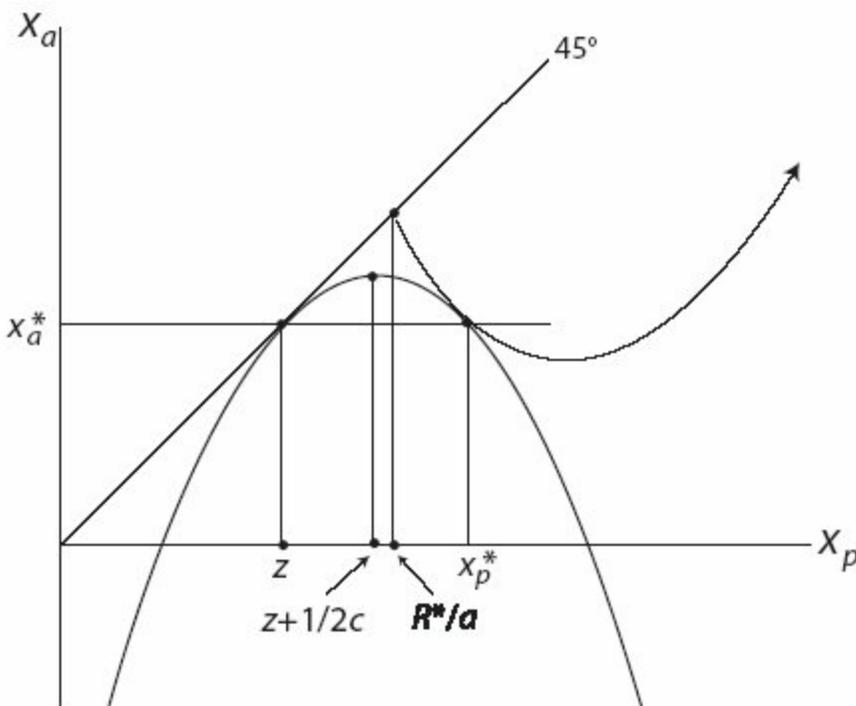


Figure 10.6 Forcing the enterprise to overachieve its local optimum.

$$\left(\frac{k}{4c^2}\right)^{1/3} = \frac{1}{2c}, \quad \text{or} \quad k = \frac{1}{2c} \quad (10.20)$$

Using the same assumptions as before – $z = 1.04$ and $x_p(x_a = \max) = 1.08$, and therefore $c = 12.5 - k$ turns out to be $1/25 = 0.04$, a seemingly much more extreme emphasis on exact plan fulfillment over plan ambitiousness. In this case, x_p^* (of course) = 1.08, and $x_a^* = -12.5(1.04)^2 + [1 + 2(12.5)(1.04)](1.08) - 12.5(1.08)^2 = 1.06$. [Figure 10.7](#) illustrates.

4.5 A synthesis of the collective morale and material incentive cases

During the long period of Marx's lower phase of communism – which I have called “maturing socialism” – it seems reasonable to suppose that the CMF is operative (c has attained a significant positive value), but that material incentives are also at work. In Section 3.3 the effect of the reward R on the enterprise's activity result was studied. Can this effect be combined with the analysis of the CMF in this section?

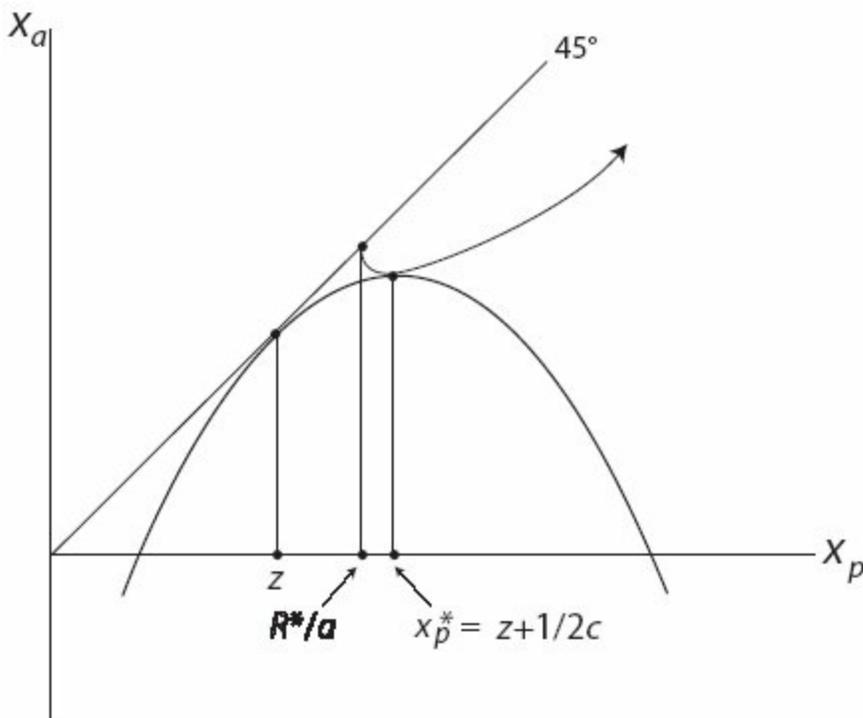


Figure 10.7 Forcing the enterprise to maximize the achievement level.

In the context of the CMF, the obvious approach will be to transfer the effect of R from the result, x_a , to the locally known best-practice outcome, z . Adapting (10.6), therefore, we have

$$z = \alpha + \frac{\beta R^*}{\gamma + R^*}, \quad (10.21)$$

using R^* instead of R since we assume the enterprise is maximizing the reward under the CMF constraint, as in earlier subsections. From that analysis, we also have the additional relation between R^* and z (equation (10.14) above):

$$R^* = az + (0.47247)a^{4/3}b^{-1/3}c^{-2/3} = az + \varphi \quad (10.22)$$

The two R^*-z relations (10.21) and (10.22) are graphed in [Figure 10.8](#). The solution is simultaneous, determining z^* and R^{**} at point C, where the double-starring of R suggests equilibrium in two senses: maximizing in relation to the CMF, and consistency with the material-incentive effect (10.21). The causal directions associated with each curve are indicated in the figure. Paths from arbitrary points A and B are therefore stable, converging on C.

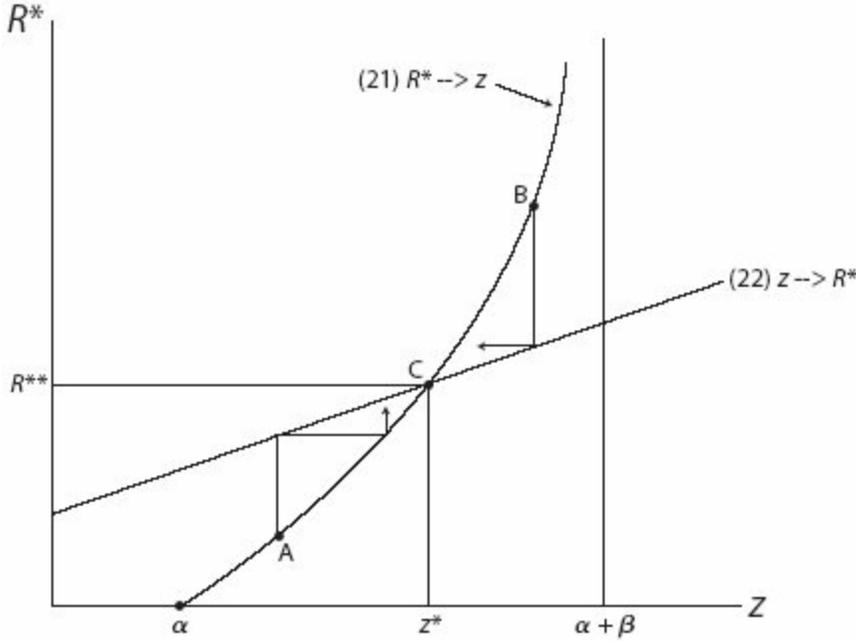


Figure 10.8 Combining the material incentive function with the Collective Morale Function.

Substituting (10.21) into (10.22) and solving for R^* yields

$$R^{**} = -\frac{1}{2}(\gamma - \varphi - a\alpha - a\beta) + \frac{1}{2}\sqrt{(\gamma - \varphi - a\alpha - a\beta)^2 + 4(a\alpha + \varphi)}$$

Both roots are real; the positive sign alone yields a positive value for R^{**} . The full equilibrium can be characterized as follows:

$$\begin{aligned} z^* &= \alpha + \frac{\beta R^{**}}{\gamma + R^{**}} \\ x_p^* &= z^* + \left(\frac{a}{4bc^2}\right)^{1/3} \\ x_a^* &= x_p^* - c\left(\frac{a}{4bc^2}\right)^{2/3} \end{aligned} \quad (10.24)$$

The parameter b does not play a role in determining R^{**} and z^* , but it does enter into the enterprise's optimal plan and the eventual result. All of the qualitative conclusions concerning the equilibrium continue to hold in this final case in which there is a material-

incentive feedback from the optimal reward R^{**} to the best-practice position z^* .

5 Some wider implications

5.1 Five great fears

Following the fall of the Soviet Union at the end of the last century, and the financial–structural crisis gripping the capitalist world economy at the beginning of the new one, there are (re)awakenings of socialist thought, and interest in the possibility of significant alternatives to capitalist polarization and crisis. Along the road to a vibrant new socialism, however, we encounter road-blocks, in the form of specific preoccupations, or fears, which prevent or problematize the required synthesis. I identify five such fears, enumerated below.

In speaking of “fears,” I do not mean to ridicule or belittle these perceptions; they point to legitimate and important concerns. I will suggest, however, that raised to a position of dominance over socialist thinking, each of them becomes a barrier, to be transcended.

5.1.1 Fear of planning as such: market socialism

In periods of transition from relative technological and social underdevelopment, many countries may experience a more-or-less stable standoff between a core state sector under socialist leadership, on the one hand, and a surrounding environment of spontaneous market relations and private property, on the other. This is Lenin's New Economic Policy, projected forward to conditions in which the preparatory phase may last for quite a long time. It is entirely understandable that this experience should give rise to a theoretical perspective combining social ownership with “markets,” conceived as simple instruments for accomplishing production and consumption coordination “automatically,” without a need for planning (for which the human and material prerequisites are still scarce) (Roemer, 1994; Schweickart, 1996; Weisskopf, 1992; Yang, 2009).

Those prerequisites, however, can only emerge if planning institutions and procedures are themselves increasing in relative and absolute importance. The fear of planning results, first, in a situation in which the society must succumb to the “inevitability” of polarization, new or re-emergent capitalist forms of property ownership, cyclical instability, helplessness in the face of external capitalist market pressures, and so on. Perhaps even more serious, this would amount to renunciation of the movement to build the environment of democratic planning, with its need to foster communication, principled behavior, awareness of social interconnections, consciousness leading to a consensus in favor of greater equality – in short, all of the foundations for an intentional, participatory, and non-alienating social and economic system. These foundations are necessarily undermined by uncontrolled marketization.

5.1.2 Fear of authority: horizontal iterations

Understandably, given the perversion and hyperextension of authority within recent post-

capitalist experience, and the degeneration of legitimate lines of authority into bureaucracy and despotism, some recent authors (Albert and Hahnel, 1991; 2002; Hahnel, 2002) have envisioned a non-market system of “horizontal” iterations between producer collectives and consumer collectives, aided by an “Iteration Facilitation Board” which, however, has no power to shape or alter the process. Collectives on both sides make proposals, and other collectives either accept or reject these, until a fit is achieved. In the process, something like a consistent set of outputs, exchanges, prices, and consumptions emerges; the authors of this model indeed draw heavily upon Walrasian *tâtonnement* for their formalizations.

Without a center, however, the model projects an economy running very much as an automatic mechanism, independent of human will and democracy, which operate only at the microlevel of the collectives. It thus bears an uneasy resemblance to the very competitive market equilibrium that it proposes to replace. The center in a socialist planning system enables people society-wide to grasp the unity and consistency of the whole, and of their place within that whole. It is the site of decisive interventions concerning the overall direction of investment and growth, and the shaping of the built environment, and these cannot be the simple *post facto* sum of individual and ground-level collective choices, but rather must evolve out of a process of discussion and debate establishing the mandate and controlling the activity of the center itself. In short, democracy is vitally important, both for the micro-units and for the center.

5.1.3 *Fear of calculation: negotiated coordination*

In a model of “participatory planning through negotiated coordination,” Pat Devine (1988; 2002) envisions a system in which collectives, made up of “stakeholders” (workers, community members, consumers), engage in a continuous process of discussion and bargaining leading to economic outcomes. Market “relations,” although not market “forces,” are included in this scheme. The division of labor into separate managerial, creative, skilled, unskilled, and caring categories is to be rapidly transcended, with all workers participating in all of these categories. Very little is said about prices, or about quantitative issues in income formation.

While “voice” relationships and discussions among collectives and representative bodies undoubtedly play a role in socialist coordination, it is hard to see how the complex problems of assigning activities and positions in networks and production chains could be left to a process of open-ended negotiation. This would appear to lead to endless talk, raising concern over hyperextension of meetings and over-politicization of coordination. Socialists have traditionally placed a high value on participation, and indeed the opportunity to participate in economic management is an expression of economic democracy, certainly important for overcoming the alienation from the work–life experience so common in capitalist societies. Participatory democracy, however, should be optimized, not maximized, and this seems impossible without use of *parametric forms*, such as planned prices and reward formulae (the latter being the object of study in this chapter).

5.1.4 *Fear of delegation: the new central planning*

In their contribution to a 2002 symposium on socialist theory (*Science & Society*, 2002), Paul Cockshott and Allin Cottrell noted (Cockshott and Cottrell, 2002, 55n.): “In systems of the Soviet type the implementation of material balances was only partial. The information processing techniques needed to fully implement material balances did not exist. They do now” (see also Cockshott and Cottrell, 1993; cf. Jablonowski, 2011). These authors refer to modern computer technology – an instance of the development of the forces of production – to “reinvent” *central* planning: determination of enterprise plans through inversion of huge matrices containing all the necessary coefficients. This approach tackles the “millions of equations” critique head on.

The point is certainly important. The unending growth of firms in capitalist economies relies on electronic networks (intranets) to manage entities that are in some cases the size of small countries. There is every reason to believe that these information technologies can be transferred to and further developed within a socialist context, in which the obstacles to their full potential application created by the anarchy and antagonism of capitalism would be left behind.

Modern IT, however, also contains huge potentials for *delegation* – for coordinating and aggregating local plan formation and execution activities in ways that both provide those activities with a stable and comprehensible macro frame, and enable localities (enterprises) to act creatively, autonomously, and meaningfully in terms of local possibilities. The new central planning model simply fails to address the valid core of the Hayek critique: the existence of local (and, especially given dynamics of change, tacit) knowledge that defies all attempts at quantitative standardization and transmission.

5.1.5 *Fear of the Soviet experience*

This final fear runs through almost the entire Western left. Even many Communist parties have concluded that 1989–91 signifies rejection, by the peoples of the former Soviet Union and Eastern Europe, of the “Soviet model” of socialism. I have argued (Laibman, 2001, 2002b, 2005, 2007) that the entire Soviet project, from the late 1920s until the demise, contains unique and vital contributions to the theoretical and empirical basis for socialist renewal. This applies especially to the experience with *system-wide* material balances; the reforms of the 1960s; and the much more profound transformations initiated in 1979 and known to the world as Mikhail Gorbachev's “perestroika.” These developments, by and large, had no counterpart in Eastern Europe, or Asia, or Cuba. Their potential was thwarted due to the political instability arising from the authoritarian distortion of political, scientific, and cultural life associated with the cult of Stalin from the 1930s forward. The peoples of the Soviet Union rejected, not socialism as it existed there, but the profound authoritarianism and repressiveness that took root in the early decades, and was not adequately confronted in the immediate postwar decades.

5.2 *A possibility theorem*

The fears must be transcended. As indicated, none of them is unfounded: Soviet planning *was* associated with serious – ultimately fatal – degeneration into misuse of bureaucratic power and authoritarian violations of the norms of human conduct. Delegation carries dangers of loss of overall coordination and stability; hierarchical structures, on the other hand, entail risks of abuse of power. Prices and incentives must be used in ways that transcend the alienating quality they had in the past, when “the market” enforced an *invisible fist* of coercion and domination. Finally, the continuing ignorance and wholesale rejection of the Soviet experiment, so widespread due to the cumulative weight of cold-war ideology, deprives the world left of vital resources for overcoming one-sidedness in thinking about socialist forms – incorporating the best of previous experience while learning from defects and weaknesses. The slogan “Socialism for the Twenty-first Century” embodies, implicitly or explicitly, this “rejectionism.” It must be said: *there is only one road leading from the nineteenth century to the twenty-first, and that one passes through the twentieth.*

Multi-level, iterative, democratic coordination seems to offer a perspective that combines the positive features of central plan formation, local autonomy, and sophisticated evaluation. In particular, the model developed in this chapter suggests that overall central coordination can be combined with local autonomy and initiative, and that it is *possible* for incentives to be structured in a way that encourages enterprises to report and act upon their own true possibilities – at least, as the outcome of a dynamic maturation process in which the morale factor becomes ever-increasing in importance. If further development of the productive forces of an advanced socialist society requires autonomy and principled behavior on the part of its ground-level collectives, this provides the objective foundation for a rising c , and therefore for tendential convergence of plans to locally known possibilities, and of results to plans. Plans become ever-better indicators of reality, enhancing the efficacy of central coordination. They also become less and less subject to possible manipulation in an unprincipled direction, since plan fulfillment requires the knowledgeable participation of all individuals making up the collective. Rational understanding on the part of all agents in this process means that the very separation between principal and agents is progressively overcome: *we incentivize ourselves*, and in so doing we lay the foundations for full internalization of incentives, transcending the need for their existence in the explicit form of the labor–income connection.

This is the *socialist possibility theorem*. Unlike impossibility theorems, possibility theorems are just that: they only point to agendas for further research, and for action.

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