WHAT DRIVES CHINA'S GROWTH?

Linda Yueh*

This paper analyses the drivers and components of China's economic growth, showing that the structure of the economy is just as important as standard growth factors in determining its growth. The structural reforms that dismantled state-owned enterprises and shifted factors from agriculture to urban areas are key, as are technology transfers and know-how. Taking these factors into account, the paper shows that total factor productivity (TFP) not derived from those one-off reforms accounted for less than one-eighth of China's GDP growth during the first thirty years of the reform period. There are signs that efficiency is improving in the 2000s and productivity must continue to increase for the country to sustain its development.

Keywords: Economic growth; China; economic reform; productivity

JEL Classifications: O1; P2

1. Introduction

China has accomplished a remarkable feat in transforming itself from one of the poorest countries in the world into the second largest economy in just thirty years. Market-oriented reforms began in 1979, transforming the previously centrally planned economy. Since then it has grown at an impressive 9.6 per cent per annum, on average. China has not only doubled its GDP and income every 7–8 years, it has also lifted 660 million people (or one-tenth of the world's population) out of abject poverty. With its 1.3 billion people accounting for one-fifth of the global population, China's economic growth has begun to shape the world and yet the determinants of its successful development are far from established or well understood.

China, like other large countries, has unique aspects of its economy. It is a transition economy that has dismantled most, but not all, of its state-owned enterprises and banks. But it is also a developing country where half of its population is rural and in large parts agrarian. Although agriculture is declining as a share of GDP, it accounted for 40 per cent of rural employment in 2010. China is also an open economy whose trade-to-GDP ratio was about 70 per cent in the 2000s, making it substantially more globally integrated than other comparably-sized open economies such as the UK (37 per cent). It also does not fit well into the studies of institutions and growth, as China remains a Communist state dominated by the Chinese Communist Party. It is therefore unsurprising that the rule of law and other market-supporting institutions, such as private property protection, are weak, as there is no independent judiciary, giving rise to the so-called 'China paradox' where the country has grown well despite not having a well-developed set of institutions (Yao and Yueh, 2009). China's economic growth is therefore in many respects both impressive and puzzling. It is also, like any other fast growing economy, not assured of sustaining such economic growth.

The paper examines the drivers of China's impressive development. A key theme is that the structure of the economy is as important as the standard growth factors in understanding Chinese development and its sustainability. Thus, this article will review the main models and evidence of China's growth and identify the main drivers of Chinese growth within its particular context. The conclusion is that about half of China's growth has been generated by capital accumulation, about a quarter by labour and human capital, and a quarter by productivity gains. But, within each of these categories, the institutional context is important in order to determine the sustainability of such growth. An example is the productivity gains from one-off movements of labour from state-owned to private enterprises. Moving from a less efficient to a more efficient sector

* St Edmund Hall, University of Oxford. E-mail: linda.yueh@economics.ox.ac.uk.

can inflate the contribution of total factor productivity (TFP) which captures that reallocation, as well as true innovation that increases efficiency permanently.

The next section sets out the standard models of economic growth. It is followed by a review that covers the four main growth theories and their application to China. It starts with a review of neoclassical growth theories before turning to new growth theories. Then, endogenous growth theories are reviewed in terms of the importance of human capital. Technology as a growth driver is analysed both as a result of innovation and from imitation of existing know-how. The final section will draw together the evidence and present the main components of China's GDP growth and how it breaks down among factor accumulation (capital, labour), TFP, human capital, and imitation versus innovation. The breakdown will not only help to increase the understanding of what has explained China's rapid economic growth thus far, but also why innovation and technological progress has become so important in order to sustain the country's growth rate.

2. Economic growth models

In neoclassical models of economic growth, technological change is exogenously determined. In this context, government and market policies cannot increase economic growth in the long run. In empirical models rooted in the neoclassical literature, TFP differences are often attributed to a number of factors, such as those related to institutional differences, and do not comprise technological change alone. Endogenous growth models represent a response to criticism of neoclassical models of economic growth. They are concerned that technological change is a response to economic incentives in the market and can be affected, and created, by government. Technological change can be increased through incentives to innovate and investment in human capital, such as through education and training. Endogenous growth theory also predicts that spillovers from investment in value-added products and knowledge are themselves a form of technological progress and lead to increased growth. In these models, policy and institutions can have an effect on long-term growth.

2.1 Neoclassical growth

Whether it has to do with reforming state-owned enterprises or dismantling the allocated labour market or promoting exports, structural change modifies the traditional drivers of economic growth. When considering the contribution of capital accumulation China should not be viewed as an 'industrialising' country. It was industrialised in the centrally planned period before 1979, and has continued to develop its industrial base since then. So it is the reindustrialisation process that explains much of the continuing capital accumulation in the economy that has accounted for about half of its economic growth. In other words, China's growth can be explained by the standard economic models, but with additional features that are specific to its rather unusual institutional context.

Neoclassical growth models emphasise factor accumulation of labour and capital as determining the steady state, whilst technology and productivity growth increase the rate of growth. In China's case, productivity is not only driven by technology but also by factor reallocation, e.g., the structural change in the economy of labour migrating from state-owned to private industries. The process of factor reallocation exists within the industrial sector, so it is not captured just by the urbanisation and industrialisation processes described by the Lewis model (Lewis, 1954) and others which explain how developing countries grow. It is but one feature of the complex background of China being both a transition and a developing economy. This is also why TFP growth is often difficult to interpret, because it covers both technological as well as one-off productivity improvements, such as those related to privatisation (that involves moving capital from state-owned to private ownership), which are all counted as part of the residual in growth estimations that is counted as TFP.

2.2 Endogenous growth

In terms of endogenous growth models that include human capital, the Chinese experience is more straightforward. The exception is the 'iron rice bowl' – a lifetime employment system that curtailed returns to investment in educational attainment and skills and impeded labour mobility, so that productive workers were not always matched to the most appropriate jobs. Thus, human capital models which consider only the standard measures of educational levels will miss the allocative improvements from other labour market reforms that better matched the human capital of workers to the skills required in jobs, which contributed to China's impressive economic growth.

2.3 'Openness' and growth

China also confounds straightforward interpretations of the theories that link openness to the global economy with growth. These explanations centre on the positive correlation between greater opening and faster development. The mechanisms include how the experience of exporting and accessing global markets can induce competitiveness improvements, as well as

learning from foreign investors with more advanced technology and know-how. It would enable a developing country like China to catch up in its growth rate if it could imitate the existing technology embodied in foreign capital, the classical avenue through which countries achieve convergence in their growth rates according to the Solow model.

Again, the theories require adaptation to China, as they do for many other countries. China is an open economy but exercises elements of control that prevent direct competition in its domestic economy and utilise a policy towards foreign direct investment (FDI) that furthers its own active industrial policies to develop domestic companies. As such, the simple openness measure that underpins the models of openness and growth does not fully capture the nature of China's 'open door' policy, which first introduced market-oriented reforms in the external sector in 1978, accelerating them after 1992.

Restrictions on its exchange rate and capital account while seeking technology transfers from FDI mean that several metrics are needed to calibrate the influence of opening on growth. For instance, FDI supplemented domestic investment, accounting for as much as one-third of all investment at the start of the reform period when China was a poor country with a low rate of household saving at only 10 per cent of GDP. Foreign direct investment was also thought to be a source of productivity improvement, particularly via the Chinese–foreign joint venture policy that required transfers of technology to the Chinese partner as a condition of approval to produce in China. The joint ventures and other foreign-invested enterprises (FIEs) were also explicitly geared toward exports. They were initially located in Special Economic Zones (SEZs), which were created as export-processing zones similar to the export-oriented growth models of China's East Asian neighbours.

China thus became integrated with East Asia, as it joined regional and global production chains, and eventually became the world's largest exporter. The focus on exports, together with the fixed exchange rate and the restrictions on the other side of the balance of payments for a high saving economy, contributed to large current account surpluses by the 2000s at a time when the United States became a large deficit country. By the late 2000s, huge global macroeconomic imbalances had developed, such that China and other surplus countries (in Asia and the Middle East oil exporters) and the main deficit country (the United States) experienced growing and seemingly unsustainable imbalances. Therefore, analysing China using an export-led growth model would explain only part of its success and indeed misrepresent China by applying theories which are geared to small, open economies like those in East Asia. The global imbalances and other aspects of the 'China effect' (the impact on global prices) point to the need to examine China as a large, open economy that affects the global terms of trade, in order to understand the role of openness in its economic growth.

2.4 Innovation and growth

The other aspect of technological progress derives from innovation. Technology in endogenous growth models is generated by a knowledge production function and not treated as an exogenous shock, so that innovation is created by researchers within the model. This also applies to China, particularly since it has increased its focus on patents and investment in R&D since the mid-1990s. Endogenous growth theories, including some variants of the human capital models, attempt to explain why some countries innovate and develop technologies that underpin a sustained rate of economic growth that is not subject to the usual diminishing returns. In other words, knowledge builds upon knowledge (the 'standing on shoulders' effect), generating increasing returns, unlike factor accumulation which is subject to decreasing returns per unit of investment. These models have been applied to the United States in particular, which has been not only the world's largest economy but also the standard setter for the technological frontier. However, there is only limited empirical evidence. Jones (1995), for example, finds that a larger number of US researchers does not increase innovation or growth. Since researchers and scientific personnel are numerous in China, this strand of theories can potentially help explain its sustained rate of growth. Since China is farther from the technology frontier, it is plausible that this phenomenon is only just emerging, whereas the earlier reform period might be characterised as one of catching up by imitating existing know-how.

2.5 Institutions and growth

Applying institutional and growth theories to China is complex. The predominant view is that market-supporting institutions (those which protect property rights and provide contracting security), and an effective rule of law, support and can thus drive strong economic growth (see e.g., La Porta *et al*., 1997, 1998; Acemoglu, Johnson, and Robinson, 2005). This genre of models was proposed to try and explain why some countries grow faster than others, since existing growth theories did not seem able to account fully for the differential growth of countries in the post-World War II period. China is generally not included in those studies – such as

Acemoglu, Johnson and Robinson (2005) – that argue for a causal relationship whereby good institutions lead to growth, as it does not have a colonial past with which to establish the exogeneity of its institutions. Within this methodology, specific instruments related to colonial history are relied upon to address the reverse causality relationship whereby countries that grow well could develop good institutions rather than *vice versa*. Nevertheless, China has been measured against the rule of law and legal origins studies (see e.g., Allen, Qian, and Qian, 2005) and found to be a paradox in having a weak legal system but strong economic growth.

China is therefore deserving of special attention if we are to understand how markets were enabled given the poor formal, legal system. Specifically, the informal institutional reforms of the various dual-track policies, which created a market alongside an administered track, were important when applied to agriculture and the state-owned enterprises (SOEs). These 'institutional innovations' were seemingly sufficient to instil incentives short of formal law-based reforms. But, even in terms of legal protection, China's adoption of laws in some key respects was not dissimilar to that of the United States at a similar stage of economic development. The institutional theories of growth therefore apply to China, but its precepts need modifying to account for the effective role played by incremental legal and institutional improvements. This is particularly important when examining the development of the crucial private sector, which had been stymied by preferential policies towards state-owned enterprises even after the mid-1990s reforms had significantly reduced state ownership.

The role of informal institutions, such as social capital, also cannot be overlooked. Entrepreneurship relied on social networks or *guanxi* to overcome the lack of well-developed legal and financial systems. It is also the case that the cultural proclivity towards interpersonal relationships meant that social capital played a key part in understanding the development of self-employment and the impressive rise of the private sector. Measuring and quantifying social capital requires detailed individual and household level surveys rather than aggregate-level studies.

3. Studies of China's economic growth

3.1 Neoclassical growth model: factor accumulation and TFP

China's rapid economic growth has stimulated a wide-ranging debate as to whether it is driven by productivity growth or by capital and labour factor accumulation. Some find evidence of a clear improvement in total factor productivity in the reform period. Specifically, the increase in TFP contributes about 40 per cent to GDP growth, roughly the same as that of fixed asset investment (Borensztein and Ostry, 1996; Hu and Khan, 1997; Jefferson, Rawski, and Zheng, 1992; Yusuf, 1994). Others conclude that economic growth in China is mostly driven by capital investment (Chow and Lin, 2002; Wu, 2003). For instance, Chow and Lin (2002) show that the increase in TFP contributed 29 per cent to GDP growth between 1978 and 1998, compared to a 62 per cent contribution by capital (see also Chow, 1993; Borensztein and Ostry, 1996; Young, 2003; Wang and Yao, 2003; Islam, Dai, and Sakamoto, 2006). Hu and Khan (1997) found that an average TFP growth of 3.9 per cent explained more than 40 per cent of China's growth during the early reform period. The studies, though, concur that capital accumulation contributes about half of GDP growth. The share of TFP is less clear.

There is one trend that most studies agree on, that is, the slowdown in TFP after the mid-1990s. For instance, the World Bank (1997) estimates that TFP growth accounted for 30 to 58 per cent of China's growth during 1978–95 but slowed after 1995 (see also Zheng, Bigsten, and Hu, 2009). The OECD (2002) considers that part of the reason was that human capital, land, and other resources were misallocated, under-employed, and inefficiently used. Growth thus increasingly relied on capital accumulation, since labour force growth declined from 2.34 per cent per annum from 1978–95 to 1.07 per cent in 1995–2005.

Zheng and Hu (2006) estimate that TFP growth fell dramatically during 1995–2001, accounting for as little as 7.8 per cent of GDP growth. Whereas TFP had risen by 3.2 to 4.5 per cent per year before 1995, it rose by only 0.6 to 2.8 per cent per year afterwards. The OECD (2005) estimated that annual TFP growth averaged 3.7 per cent per annum during 1978–2003, but slowed to 2.8 per cent by the end of that period. However, Young (2003) argues that, though on official figures it is 3 per cent, in reality it should be adjusted downwards to 1.4 per cent from 1978–98.

Explanations for changes in TFP growth are often controversial, but the slowdown during 1995–2005 coincided with sluggish rural income growth and widespread industrial inefficiency as well as the decline of one-off, reallocative effects. From the late 1970s to the early 1990s, China's growth depended more on productivity growth and less on increased capital than

other East Asian countries at a comparable stage of their development. However, since then, growth in capital inputs has often substantially exceeded GDP growth. The issue is whether TFP has slowed down, or whether there were one-off productivity gains associated with reform. This measurement issue may help to explain why there is such wide disagreement as to whether China's growth is based on true productivity improvements. To investigate further, Zheng, Bigsten, and Hu (2009) examined reform measures and found that they often resulted in one-time level effects on TFP, e.g., movement of capital from state-owned to private enterprises.

A similar trend affected labour productivity. Jefferson, Hu, and Su (2006) explore the sources of China's growth covering the period 1995–2004. They conclude that there is evidence of improved allocative efficiency from labour moving out of agriculture and between industrial and ownership sectors resulting in productivity advances. Brandt and Zhu (2010) come to a similar conclusion, but find that the reallocation effect weakens in the 2000s. Yet, labour productivity accelerated in the 2000s. In my estimation, moving labour out of the state sector contributed 8.5 per cent of the total average labour productivity growth of 9.2 per cent in the 2000s (Yueh, 2010). The predominant factor (accounting for around 85–92 per cent) of labour productivity growth in the 2000s is due to improvements in technical efficiency, which are promising as a basis for sustained growth. It does, though, again suggest that the early measures of TFP include the one-off gains from sectoral reform. As that declined, TFP appeared to be slowing down but was mismeasured in the earlier period since prior growth data included allocative gains from reform and not true productivity growth due to increased efficiency and technological progress.

3.2 Endogenous growth: human capital

Although it has long been believed that human capital plays a fundamental role in economic growth, studies based on cross-country data have produced surprisingly mixed results (Barro, 1991; Mankiw, Romer, and Weil, 1992; Benhabib and Spiegel, 1994; Islam, 1995; Pritchett, 2001; Temple, 2001). For instance, Barro (1991, 2001), Benhabib and Spiegel (1994) and Bils and Klenow (2000) find that the initial stock of human capital has a larger impact on the growth rate than the improvement in human capital. The exception is Gemmell (1996), who finds that both the stock and accumulation of human capital were significant determinants of growth. In addition, human capital had both a direct effect on growth and an indirect effect through physical capital investment. One reason for the mixed findings is that the impact of education has varied widely across countries because of very different institutions, labour markets and education quality making it hard to identify an average effect (see Temple, 1999; Pritchett, 2001).

It is widely hypothesised that human capital has a direct role in production through the generation of workers' skills and also an indirect role through the facilitation of technology spillovers. Most studies use different measures of human capital, such as secondary school enrolment, student–teacher ratio, spending on education and science, and the number of science and technology workers. Thus, the incorporation of a measure of human capital 'inside' the production function is based on micro-level evidence that better educated workers are more productive.

In general, labour supply is found to be a less important growth factor for China than capital investment and TFP. The one-child policy slowed down population growth and the high degree of labour force participation limited labour as a source of factor accumulation driving growth. Perhaps also as a result, there are fewer studies of the contribution of human capital to China's growth rate. This set of models internalises human capital as the source of productivity and technology advancement, implying that endogenous growth occurs when there are improvements in human capital. Technological progress is thus explained by the accumulation of education, skills, training, etc. and not left as the unexplained portion of growth as in the neoclassical models.

China's economic growth is largely labour-intensive with high levels of fixed capital investment (Arayama and Miyoshi, 2004; Chow, 1993; Yusuf, 1994). Differentiating the portion from human capital is essential, as growth driven by education and skills improvements has the potential to be sustainable due to the associated increase in productivity, technological innovation and diffusion (Aghion and Howitt, 1998; Lucas, 1988; Romer, 1990). During China's reform period, 10 to 20 per cent of GDP growth may be attributable to the growth of the labour force, a less important source of factor accumulation than capital, which accounts for about half (Chow and Lin, 2002; Hu and Khan, 1997; Wu, 2003).

In terms of separating out human capital, Wang and Yao (2003) find that capital, labour, human capital, and TFP each accounted for 48, 16, 11, and 25 per cent, respectively, of GDP growth in China during the period 1978–1999. Human capital is measured as the average years of schooling per capita for the working age population. In about the same period (1978–98),

using provincial data, Arayama and Miyoshi (2004) similarly find that human capital contributes about 15 per cent to China's growth. This is again confirmed by Qian and Smyth (2006) using provincial data for 1990–2000. They find that the contribution of human capital to GDP growth was 13 per cent, while physical capital contributed 55 per cent and TFP growth accounted for 22 per cent. Comparing across 28 provinces for 1978–2005, Li and Huang (2009) concur that education (quality measured as teacher–pupil ratio and educational attainment) and health both positively contribute to provincial growth rates. Démurger (2001) also finds evidence that education at the secondary or college level helps to explain differences in provincial growth rates. These provincial studies support the national findings, a common research methodology for China.

However, these studies have not differentiated between the stock and accumulation of human capital (Krueger and Lindahl, 2001). Fleisher and Chen (1997) specifically do so, separating out the effect of the stock of human capital on TFP. They measure human capital as the percentage of university graduates in the population, and find that it had a significant effect on total factor productivity. Chen and Feng (2000) use a similar measure and find that human capital is a significant determinant of differential provincial growth rates. Fleisher, Li, and Zhao (2010) also show how regional growth patterns in China depend on regional differences in physical, human, and infrastructure capital as well as on differences in foreign direct investment flows. They find that human capital positively affects output and productivity growth across provinces. Moreover, they find both direct and indirect effects of human capital on TFP growth. The direct effect is hypothesised to come from domestic innovation activities, while the indirect impact is the spillover effect of human capital on TFP growth (Liu, 2009a,b finds an impact of human capital on productivity in both rural and urban China).

Using a less technical approach but one that is highly informative and suggestive, Sonobe, Hu, and Otsuka (2004) show that subtle and important changes in quality control, efficient production organisation and marketing of manufactured goods among emerging private enterprises have been more likely to occur in firms where managers have acquired relatively high levels of education. Fleisher and Wang (2001, 2004) likewise find evidence that highly educated workers have significantly higher marginal product than workers with lower levels of schooling incorporating these qualitative factors.

3.3 Catch-up growth: technology

There have been a large number of studies on the role of technology on innovation in China, particularly in terms of spillovers of knowledge from foreign investment. The government during the latter part of the reform period recognised the importance of innovation and enacted a patent law in 1985 and a slew of associated copyright and trademark legislation subsequently. Since the imposition of tougher intellectual property rights' (IPR) requirements with accession to the World Trade Organisation (WTO) in 2001, Chinese firms have gradually devoted more resources to innovative activities and acted aggressively on patent applications (Hu and Jefferson, 2009). But in the early part of the reform period China's policies were geared towards attracting FDI and promoting trade in order to benefit from the positive spillovers of technology and know-how that characterise the catch-up phase of development, whereby a country learns and imitates rather than reinvents or innovates when it is far from the technology frontier.

There are several arguments as to the mechanism through which FDI and trade boost economic growth (Gylfason, 1999). One of the widely recognised views is that FDI and trade are technology spillover channels for absorbing advanced knowledge. One of the benefits from FDI is that new technology is brought in by foreign firms. Technology transfer occurs through two channels – new technologies sold directly through licensing agreements or the transfer of new technology to exporters from their foreign purchasers. Alternatively, international trade also generates technology externalities through learning-by-exporting or imitating technologies embodied in the imported intermediate goods. There is also a productivity effect from facing greater competition at a global level. The argument that FDI and international trade served as major driving forces contributing positively to China's faster growth since the late-1980s through the 2000s is well recognised (Chen, Chang, and Zhang, 1995; Harrold, 1995; Liu, Burridge, and Sinclair, 2002; Pomfret, 1997; Shan 2002).

For China, FDI has facilitated the transformation of the state-owned and the collective sectors (Liu, 2009c). The location of FDI is also encouraged by exogenous geographical and political factors such as proximity to major ports, policy decisions to create special economic zones and free trade areas, local institutional characteristics such as laws and regulations, contract enforcement, local expenditure on infrastructure and labour market conditions. Using city-level data, Wei (1993) arrives at the conclusion that FDI contributes to economic growth through technological and managerial

spillovers between firms as opposed to simply providing new capital. This is supported by studies such as Dees (1998), Sun and Parikh (2001), and Wei (1993) who conclude that inward FDI affects China's economic growth in ways beyond simple capital formation.

Indeed, FDI has played an important role in both China's TFP and its fast growth. The classic catch-up mechanism in neoclassical growth models is for capital to flow from developed to developing countries bringing with it technology and know-how. China has certainly been the recipient of a large amount of FDI since its 'open door' policy took off in the early 1990s. And FDI appears to have had positive effects on its growth. Using econometric methods to regress GDP (or GDP growth) on FDI and other variables, a large number of studies find a positive and significant coefficient on FDI, concluding that foreign investment has played a notable part in China's GDP growth (Tseng and Zebregs, 2002; Lemoine, 2000; Berthelemy and Démurger, 2000; Graham and Wada, 2001; Chen, Chang, and Zhang, 1995; Liu, Burridge and Sinclair, 2002; Wei, 1993; Dees, 1998; Sun and Parikh, 2001; Wei *et al*., 1999; Borensztein, De Gregorio, and Lee, 1998). Whalley and Xin (2010) further examine the role of foreign invested enterprises (FIEs). FIEs are often joint ventures between foreign companies and Chinese enterprises, and account for over 50 per cent of China's exports and 60 per cent of China's imports. Without FDI inflows in 2004, they estimate China's overall GDP growth rate would be lower by around 3.4 percentage points. Excluding FIEs whose FDI are from Hong Kong, Macao and Taiwan, FIEs still account for around 30 per cent of China's GDP growth.

Fleisher, Li, and Zhao (2010) find that FDI had a much larger effect on TFP growth before 1994 than after, and they attribute this to the encouragement of and increasing success of private firms. After 1994, they find a much smaller, even insignificant, economic impact of FDI. They conjecture that the drop in the impact of FDI after 1994 can be attributed in part to the encouragement of the non-state sector. Since then, private and 'red cap' enterprises (nominally rural collectives, but in fact privately owned) and the evolution of township and village enterprises (TVEs) from collectives to *de facto* private firms have become relatively more important sources of growth, while the relative importance of FDI-led growth has declined. Consistent with this conjecture, Wen (2007) reports that, at least since the mid-1990s, FDI has tended to crowd out domestic investment, more so in the non-coastal regions. A similar finding is reported for the early 2000s by Ran, Voon, and Li (2007).

But there is likely to be a degree of endogeneity in these relationships between FDI and TFP growth if TFP growth encourages FDI (Li and Liu, 2005). A number of studies conclude that technology transfers and the spillover effects are limited, and much if not most of the correlation between FDI and superior economic performance reflects reverse causality (Young and Lan, 1997; Woo, 1995; Lemoine, 2000). Woo (1995) argues that the role of FDI in spillover effects is overstated because foreign investment is located in liberalised regions. Rodrik (1999) also expresses doubts over spillover effects, arguing that greater productivity in domestic firms in producing for exports does not necessarily suggest efficiency spillovers from foreign firms, since more productive firms, domestic or foreign, tend to locate in export sectors.

Turning to R&D, studies of the roles of research and development, spillovers and absorptive capacity on growth are limited in China. Using provincial data covering the period 1996–2002, Lai, Peng, and Bao (2006) find that domestic R&D has a positive and statistically significant impact on economic growth, though that study does not include the external effects of technology imports. Their estimates also indicate that international technology spillovers depend on the host province's absorptive ability as measured by human capital investment and degree of openness. Brun, Combes, and Renard (2002) attempt to test for the existence of provincial spillover effects, though their concept of regional spillover is of 'regional growth spillover effects' rather than 'regional technology spillovers'. Utilising a panel dataset of 28 provinces covering the period 1981–98, they find that spillover effects have not been sufficient to reduce disparities across Chinese provinces in the short run. Kuo and Yang (2008) also assess how and to what extent knowledge capital and technology spillover contribute to regional economic growth in China. Moreover, a region's absorptive ability is considered as they measure the critical capability to absorb external knowledge sources embodied in FDI and imports, which then contribute to regional economic growth, e.g., the absorptive capacity of human capital on using acquired advanced foreign technologies. They find that knowledge capital, both in terms of R&D capital and technology imports, contributes significantly, with similar magnitude, to regional economic growth. There are also suggestions of the existence of R&D spillovers as well as international knowledge spillovers. R&D has a positive impact on regional growth with an estimated magnitude of R&D elasticity of 0.043, indicating that a 1 per cent increase in R&D capital would raise regional GDP about 0.043 per cent, controlling for other variables.

Along these lines, Dobson and Safarian (2008), using the evolutionary approach to growth in which institutions support technical advance and enterprises develop capabilities to learn and innovate, examine China's transition from an economy in which growth is based on labour-intensive production and imported ideas and technology to one in which growth is driven by domestic innovation. They find the increasing competitive pressure on firms encourages learning. Their survey of privately owned small and medium enterprises in five high-tech industries in Zhejiang province found a market-based innovation system and evidence of much process and some product innovations. These enterprises respond to growing product competition and demanding customers with intensive internal learning, investment in R&D and a variety of international and research linkages. Zheng, Liu, and Bigsten (2003) find that TFP growth in China has been achieved more through technical progress than through efficiency improvement.

Without question, the role of international knowledge spillovers in generating endogenous economic growth has been long emphasised in theory, e.g., Grossman and Helpman (1991). And a growing trend in empirical studies finds that international technology spillover is one of the major sources of productivity growth (see Coe and Helpman, 1995; Eaton and Kortum, 1996; Keller, 2000). This crucial and still under-explored issue could provide evidence for the possibility of more sustainable growth for China in the coming decades. In Van Reenen and Yueh (2012), we investigated the impact using a specially designed data set with measures of technology spillovers at the Chinese firm-level. Working on the premise that capital accumulation has accounted for about half of China's real GDP growth of 9.6 per cent per annum since 1979, we find that the contributions of Chinese–foreign joint ventures (JVs) of 9 per cent and FDI as a whole, accounting for 15 per cent of investment, translate into between 0.42 to 0.71 percentage point additions to growth. In other words, without having attracted FDI, China's growth rate would have been up to three-quarters of a per cent slower, bringing the average growth rate down to 8.9–9.2 per cent. Adding in the productivity boost of JVs, they are 23 per cent more productive as compared with other firms and JVs with technology transfer agreements hold a 73 per cent productivity advantage. As JVs are 15 per cent of all firms in the 2000s, China's GDP has been increased by between 3.45 per cent and 10.95 per cent, respectively. Translating this into growth terms (and assuming a cumulative process starting in 1979 for the increase in GDP by 2009) means that average growth would have been lower by 0.43 per cent per annum by 2009 without JVs.

Putting all this together, we calculate that had China not attracted FDI and JVs in particular, with their potential to allow for catching up via technology transfers and other indirect avenues of learning, then China's annual GDP growth could have been between one-half to over a percentage point lower (i.e. as low as 8.5 per cent) over the past 30 years. As JVs were more important as a share of investment during the 1990s, accounting for around one-quarter of total investment, this is a conservative estimate. The contribution of joint ventures is therefore sizeable, as 1 percentage point in compound growth terms translates into large differences in income levels, as countries like India, which has grown at 7–8 per cent instead of China's 9–10 per cent over the past few decades, can attest. China surpassed its Asian neighbour even though it was poorer in 1980.

3.4 New growth theories: institutions

The link between institutional development and economic growth has risen in prominence as a factor explaining the unexplained portions of growth (Acemoglu, Johnson, and Robinson, 2005), though economists have long been interested in the role of institutions in explaining economic transition and growth (North, 1990). The inability to explain long-run differences in growth has motivated a return to this subject, which was also revived by the instability of transition economies in the former Soviet Union when it underwent market-oriented reforms. China's underdeveloped institutions but relatively stable transition and remarkable growth rate make it an outlier in much of this literature, suggesting that analysis of China's growth has much to add to the understanding of how institutions interact with economic growth.

The late twentieth century witnessed the transformation of numerous centrally planned economies around the world into market-based systems. Many of these transitions were characterised by a 'Big Bang' (Hoff and Stiglitz, 2004) that combined economic liberalisation with rapid privatisation and democratisation. The theory is that growth will accelerate with the removal of the inefficient and distortionary state and the introduction of market forces (Persson and Tabellini, 2006). The result was a transformational recession whereby these nations underwent a decade-long period of contraction and stagnation in the immediate aftermath of shedding central planning.

By contrast, China followed a rather different path, where economic reform and transition towards a market economy occurred without democratisation. Liberalisation proceeded only incrementally and

privatisation was delayed by almost two decades after the initiation of market-oriented reforms. Without clearly defined property rights, such as those vested in private firms, China managed to grow by fostering a different sort of competition – among provinces. Regional decentralisation helped to introduce market-oriented reforms into the economy through experimentation at the provincial level, where policies that worked could propel growth locally and serve as a template for others, such as Special Economic Zones which were first established on the coast (see e.g., Xu, 2011).

Indeed, China's gradual approach to reform has resulted in high and relatively stable growth rates for over three decades (Prasad and Rajan, 2006). This remarkable growth performance was accompanied by a relatively undeveloped legal and financial system, which makes China a puzzle or paradox given the focus of economists on the importance of well-defined legal and formal institutions. La Porta *et al*. (1997, 1998, 2000) study the relationship between law and finance, and consequently economic development, and highlight the importance of legal institutions. According to Allen, Qian, and Qian (2005), China seems like "a counterexample to the findings in law, institutions, finance and economic growth literature". They document the poor legal protection of minority shareholder interests and outside investors as well as the dominant role of the state public sectors and yet China managed to outperform other economies which score well on those measures.

Hasan, Wachtel, and Zhou (2009) examine the roles of legal institutions, financial deepening and political pluralism on growth rates. The most important institutional developments for a transition economy are the emergence and legalisation of the market economy, the establishment of secure property rights, the growth of a private sector, the development of financial sector institutions and markets, and the liberalisation of political institutions. They develop measures of these phenomena, which are used as explanatory variables in regression models to explain provincial GDP growth rates. Their evidence suggests that the development of financial markets, legal environment, awareness of property rights and political pluralism are associated with stronger growth. Based on a sample of 31 Chinese provinces for the period 1986–2003, their results indicate that those regions with a better rule of law, more property rights awareness and more political pluralism also have stronger growth. After controlling for the province-specific effects, endogeneity and potential problems associated with weak instruments, the data suggest a strong, positive link between institutional development and economic growth in China, and that a one standard deviation increase in relative pluralism is associated with a 0.6 percentage point increase in the growth rate.

There are a large number of other studies that examine the disparities among provinces as a way of identifying the determinants of growth in China (see e.g., Liu and Li, 2001), but few include the role of institutions. However, there are a few studies that look at province-level data on financial sector development and the private sector. Chen and Feng (2000) find that growth of private and semi-private enterprises leads to an increase in economic growth, while the presence of SOEs reduces growth rates among the provinces based on their sample 29 Chinese provinces from 1978 to 1989. Aziz and Duenwald (2002) and Boyreau-Debray (2003) find little influence of financial sector depth (development of capital markets in addition to the banking system) at the provincial level on growth primarily because little credit growth in the 1990s went to the private sector. In the latter part of the reform period, Liang (2005) and Hao (2006) find evidence that financial depth and the reduced role of government both positively influence provincial growth rates. In addition, Biggeri (2003), using provincial-level data for the period 1986 to 2001, finds that the level of aggregate output in each province is negatively influenced by the presence of state-owned enterprises, a proxy for the extent of marketisation of the economy. These studies of inter-provincial differences in growth indicate that the effort to measure institutional development is warranted. Allen, Qian, and Qian (2005) compare growth in the formal (state-owned and publicly traded firms) and the informal sector and find that the latter is the source of most economic growth even though it is associated with much poorer legal and financial mechanisms. They argue that there exist effective informal financing channels and governance mechanisms, such as those based on reputation and relationships (social networks), to support this growth.

An additional channel of financial sector influence on growth is through the capital markets which also rely on institutions such as corporate governance and regulatory structures. Stock markets accelerate growth by facilitating the ability to trade ownership and by allowing owners to diversify portfolios easily. Rajan and Zingales (1998) argue that financial development facilitates economic growth by reducing the costs of external finance to firms; their empirical evidence from a cross-country study supports this rationale. Further, in terms of private sector development, Guiso, Sapienza, and Zingales (2004) find that differences in local financial development can explain the spread of entrepreneurship and economic

growth. Zhang, Wan, and Jin (2007) provide evidence of financial depth effects on productivity growth at the provincial level in China. Rousseau and Xiao (2007) find that stock market liquidity and banking development are positively associated with growth for China (see also Rousseau and Wachtel, 2000).

4. China's growth determinants

Summarising these findings, capital accumulation accounted for 3.2 percentage points of the 7.3 per cent growth in output per worker from 1979–2004, with TFP accounting for 3.6 percentage points. From 1993–2004, since the take-off of the open door policy, capital accumulation has accounted for 4.2 percentage points of the higher 8.5 per cent growth in China, and interestingly outweighs the contribution of TFP (3.9 percentage points). These estimates suggest that capital accumulation has contributed around half of China's economic growth, which is in line with other estimates that find that most of China's growth is accounted for by capital accumulation rather than TFP growth during the reform period thus far.

From the evidence, labour accumulation accounts for much less; 10–20 per cent of GDP growth may be attributable to the growth of the labour force. Human capital accounts for a slightly lower proportion of between 11 and 15 per cent of China's growth. Factor accumulation (capital and labour) thus accounts for about 60–70 per cent of GDP growth. Once human capital is accounted for in the residual, the contribution of TFP to economic growth declines.

Within TFP, there is a further need to separate the one-off productivity gains due to factor reallocation from efficiency-driven improvements. By the 2000s, labour reallocation accounted for 8–15 per cent of TFP gains but with higher contributions in the previous decades. It is similar for capital and could explain the decline in TFP after the mid-1990s. These calculations imply that around 8 per cent of China's GDP growth is driven by factor reallocation, leaving about 7–21 per cent that is explained by efficiency gains driven by sustained productivity improvements and not one-off structural change.

Of those efficiency improvements, Van Reenen and Yueh (2012) show that GDP growth would be lower by between 0.43 to 1 per cent per annum if not for joint ventures that allowed for transfers of knowledge and technology, the catch-up mechanism as opposed to domestic innovation. Positive spillovers and imitation of existing know-how thus could account for between one-third to two-thirds of TFP. It implies that TFP driven by innovation and technological progress not directly traced to FDI accounts for about 5–14 per cent of GDP growth. Given the poverty of China when market-oriented reforms began in 1978, and the apparent catch-up potential, this is not surprising.

To achieve its ambition of sustaining growth for another 30 years China will require not only technological and human capital improvements, but also reform of its rule of law, the role of the state, and the rebalancing of its economy. Rebalancing the economy will involve boosting domestic demand (consumption, investment, government spending) to grow more quickly than exports, shifting toward services (including non-tradable areas) and away from agriculture, increasing urbanisation to increase incomes, and permit greater external sector liberalisation, including the internationalisation of the RMB. To achieve these aims will also require examining the role of the state in China and the legal system. The retention of large SOEs and the increasingly perceived un-level playing field for both foreign and domestic private firms raises doubts as to the efficiency of China's markets and thus its ability to overcome the middle income country trap, whereby countries start to slow after reaching upper middle income levels. For China to realise its potential as an economic superpower requires reforms of both the microeconomic drivers of productivity as well as significant transformation of the structure of its economy.

REFERENCES

Acemoglu, D., Johnson, S. and Robinson, J. (2005), 'Institutions as the fundamental cause of long-run economic growth', in Aghion, P. and Durlauf, S. (eds), *Handbook of Economic Growth* Amsterdam, Elsevier, pp. 385–472.

Aghion, P. and Howitt, P. (1998), *Endogenous Growth Theory*, Cambridge, Cambridge University Press.

Allen, F., Qian, J. and Qian, M. (2005), 'Law, finance and economic growth in China', *Journal of Financial Economics*, 77(1), pp. 57–116.

Arayama, Y. and Miyoshi, K. (2004), 'Regional diversity and sources of economic growth in China', *World Economy*, 27(10), pp. 1583–607.

Aziz, J. and Duenwald, C. K. (2002), 'Growth-financial intermediation nexus in China', IMF Working Paper, 02/194.

Barro, R.J. (1991), 'Economic growth in a cross section of countries', *Quarterly Journal of Economics*, 106/2, pp. 407–43.

—(2001), 'Human capital and growth', *American Economic Review*, 91/2, pp. 12–17.

Benhabib, J. and Spiegel, M.M. (1994), 'The role of human capital in economic development: evidence from aggregate cross-country data', *Journal of Monetary Economics*, 34/2, pp. 143–73.

Berthelemy, J.C. and Demurger, S. (2000), 'Foreign direct investment and economic growth: theory and applications to China', *Review of Development Economics*, 4/2, pp. 140–55.

Biggeri, M. (2003), 'Key factors of recent Chinese provincial economic growth', *Journal of Chinese Economic and Business Studies*, 1/2, pp. 159–83.
Bils, M. and Klenow, P.J. (2000), 'Does schooling cause growth', *American Economic Review*, 90/5, pp. 1160–83.
Borensztein, E., De Gregorio, J. and Lee, J.W. (1998), 'How does foreign direct investment affect economic growth', *Journal of International Economics*, 45/1, pp. 115–35.
Borensztein, E. and Ostry, J.D. (1996), 'Accounting for China's growth performance', *The American Economic Review*, 86(2), pp. 225–8.
Boyreau-Debray, G. (2003), 'Financial intermediation and growth: Chinese style', World Bank Policy Research Working Paper, 3027.
Brandt, L. and Zhu, X. (2010), 'Accounting for China's growth', IZA Discussion Papers 4764, Institute for the Study of Labor (IZA), Bonn, Germany, pp. 1–59.
Brun, J.F., Combes, J.L. and Renard, M.F. (2002), 'Are there spillover effects between coastal and noncoastal regions in China', *China Economic Review*, 13/2-3, pp. 161–9.
Chen, C., Chang, L. and Zhang, Y.M. (1995), 'The role of foreign direct investment in China post-1978 economic development', *World Development*, 23/4, pp. 691–703.
Chen, B. and Feng, Y. (2000), 'Determinants of economic growth in China: private enterprises, education, and openness', *China Economic Review*, 11/1, pp. 1–15.
Chi, W. (2007), 'The role of human capital in China's economic development: review and new evidence', *China Economic Review*, 19/3, pp. 421–36.
Chow, G.C. (1993), 'Capital formation and economic growth in China', *Quarterly Journal of Economics*, 108/3, pp. 809–42.
Chow, G.C. and Lin, A. (2002), 'Accounting for economic growth in Taiwan and mainland China: a comparative analysis', *Journal of Comparative Economics*, 30/3, pp. 507–30.
Coe, D. and Helpman, E. (1995), 'International R&D spillovers', *European Economic Review*, 39, pp. 859–87.
Dees, S. (1998), 'Foreign direct investment in China: determinants and effects', *Economics Planning*, 31/2–3, pp. 175–94.
Démurger, S. (2001), 'Infrastructure development and economic growth: an explanation for regional disparities in China', *Journal of Comparative Economics*, 29/1, pp. 95–117.
Dobson, W. and Safarian, A.E. (2008), 'The transition from imitation to innovation: an enquiry into China's evolving institutions and firm capabilities', *Journal of Asian Economics*, 19/3, pp. 301–11.
Eaton, J. and Kortum, S. (1996), 'Trade in ideas: patenting and productivity in the OECD', *Journal of International Economics*, 40/3-4, pp. 251–78.
Fleisher, B. and Chen, J. (1997), 'The coast–noncoast income gap, productivity, and regional economic policy in China', *Journal of Comparative Economics*, 25/2, pp. 220–36.
Fleisher, B., Li, H. and Zhao, M.Q. (2010), 'Human capital, economic growth, and regional inequality in China', *Journal of Development Economics*, 92/2, pp. 215–31.
Fleisher, B. and Wang, X.J. (2001), 'Efficiency wages and work incentives in urban and rural China', *Journal of Comparative Economics*, 29/4, pp. 645–62.
—(2004), 'Skill differentials, return to schooling, and market segmentation in a transition economy: the case of mainland China', *Journal of Development Economics*, 73/1,pp. 315–28.
Gemmell, N. (1996), 'Evaluating the impacts of human capital stocks and accumulation on economic growth: some new evidence', *Oxford Bulletin of Economics and Statistics*, 58/1, pp. 9–28.
Graham, E.M. and Wada, E. (2001), 'Foreign direct investment in China: effects on growth and economic performance', Institute for International Economics Working Paper, 01–03.
Grossman, G.M., and Helpman, E. (1991), *Innovation and Growth in the Global Economy*, Cambridge, Mass., The MIT Press.
Guiso, L., Sapienza, P. and Zingales, L. (2004), 'Does local financial development matter', *Quarterly Journal of Economics*, 119/3, pp. 929–69.
Gylfason, T. (1999), 'Exports, inflation and growth', *World Development*, 27/6, pp. 1031–57.
Hao, C. (2006), 'Development of financial intermediation and economic growth: the Chinese experience', *China Economic Review*, 17/4, pp. 347–62.
Harrold, P. (1995), 'China: foreign trade reform: now for the hard part', *Oxford Review of Economic Policy*, 11/4, pp. 133–46.
Hasan, I., Wachtel, P. and Zhou, M. (2009), 'Institutional development, financial deepening and economic growth: evidence from China', *Journal of Banking and Finance*, 33/1, pp. 157–70.
Hoff, K. and Stiglitz, J.E. (2004), 'After the Big Bang? Obstacles to the emergence of the rule of law in post-Communist societies', *American Economic Review*, 94/3, pp. 753–63.
Hu, A.G. and Jefferson, G. (2009), 'A great wall of patents: what is behind China's recent patent explosion?', *Journal of Development Economics*, 90(1), pp. 57–68.
Hu, Z.L. and Khan, M.S. (1997), 'Why is China growing so fast', *IMF Staff papers*, 44/1, pp. 103–31.
Islam, N., Dai, E. and Sakamoto, H. (2006), 'Role of TFP in China's growth', *Asian Economic Journal*, 20/2, pp. 127–59.
Jefferson, G.H., Hu, A.G.Z. and Su, J. (2006), 'The sources and sustainability of China's economic growth', *Brookings Papers on Economic Activity*, 2, pp. 1–60.
Jefferson, G., Rawski, T.G. and Zheng, Y. (1992), 'Growth, efficiency, and convergence in China's state and collective industry', *Journal of Comparative Economics*, 40/2, pp. 239–66.
Jones, C. (1995), 'R&D based models of economic growth', *The Journal of Political Economy*, 103(4), pp. 759–84.
Keller, W. (2000), 'Do trade patterns and technology flows affect productivity growth', *World Bank Economic Review*, 14/1, pp. 17–47.
Krueger, A.B. and Lindahl, M. (2001), 'Education for growth: why and for whom', *Journal of Economic Literature*, 39/4,pp. 1101–36.
Kuo, C.C. and Yang, C.H. (2008), 'Knowledge capital and spillover on regional economic growth: evidence from China', *China Economic Review*, 19/4, pp. 594–604.
La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R. (1997), 'Legal determinants of external finance', *Journal of Finance*, 54/20, pp. 1131–50.
—(1998), 'Law and finance', *Journal of Political Economy*, 106(6), pp. 1113–55.
—(2000), 'Investor protection and corporate governance', *Journal of Financial Economics*, 58, pp. 3–28.
Lai, M., Peng, S. and Bao, Q. (2006), 'Technology spillovers, absorptive capacity and economic growth', *China Economic Review*, 17/3, pp. 300–20.
Lemoine, F. (2000), 'FDI and the opening up of China's economy', CEPII Working Paper, 2000–11.
Lewis, W.A. (1954), 'Economic development with unlimited supplies of labour', *Manchester School*, 22, pp. 139–91.
Li, H. and Huang, L. (2009), 'Health, education, and economic growth in China: empirical findings and implications', *China Economic Review*, 20/3, pp. 374–87.
Li, X. and Liu, X. (2005), 'Foreign direct investment and economic growth: an increasingly endogenous relationship', *World Development*, 33/3, pp. 393–407.

Liang, Z. (2005), 'Financial development, market deregulation and growth: evidence from China', *Journal of Chinese Economic and Business Studies*, 3/3, pp. 247–62.
Liu, T. and Li, K. (2001), 'Impact of liberalization of financial resources in China's economic growth: evidence from the provinces', *Journal of Asian Economics*, 12/2, pp. 245–62.
Liu, X., Burridge, P. and Sinclair, P.J.N. (2002), 'Relationships between economic growth, foreign direct investment and trade: evidence from China', *Applied Economics*, 34/11, pp. 1433–40.
Liu, Z. (2009a), 'The external returns to education: evidence from Chinese cities', *Journal of Urban Economics*, 61/3, pp. 542–64.
—(2009b), 'Human capital externalities and rural–urban migration: evidence from rural China', *China Economic Review*, 19/3, pp. 521–35.
—(2009c), 'Foreign direct investment and technology spillovers: theory and evidence', *Journal of Development Economics*, 85/1–2, pp. 176–93.
Lucas, R.E, (1988), 'On the mechanics of economic development', *Journal of Monetary Economics*, 22(1), pp. 3–42.
Mankiw, N.G., Romer, D. and Weil, D. (1992), 'A contribution to the empirics of economic growth', *Quarterly Journal of Economics*, 107/2, pp. 407–37.
North, D. (1990), *Institutions, Institutional Change and Economic Performance*, Cambridge, Cambridge University Press.
OECD (2002), *China in the World Economy: The Domestic Policy Challenges*, Paris, OECD.
—(2005), *OECD Economic Surveys of China*, Paris, France.
Persson, T. and Tabellini, G. (2006), 'Democracy and development', *American Economic Review*, 96/2, pp. 319–24.
Pomfret, R. (1997), 'Growth and transition: why has China's performance been so different', *Journal of Comparative Economics*, 25/3, pp. 422–40.
Prasad, E.S. and Rajan, R.G. (2006), 'Modernizing China's growth Program', *American Economic Review*, 92/2, pp. 331–6.
Pritchett, L. (2001), 'Where has all the education gone', *World Bank Economic Review*, 15/3, pp. 367–91.
Qian, X. and Smyth, R. (2006), 'Growth accounting for the Chinese provinces 1990–2000: incorporating human capital accumulation', *Journal of Chinese Economic and Business Studies*, 4/1, pp. 21–37.
Rajan, R.G. and Zingales, l. (1998), 'Financial dependence and growth', *American Economic Review*, 88/3, pp. 559–86.
Ran, J., Voon, J.P., and Li, G. (2007), 'How does FDI affect China? Evidence from industries and provinces', *Journal of Comparative Economics*, 35/4, pp. 744–99.
Rodrik, D. (1999), 'The new global economy and developing countries: making openness work', Overseas Development Council (Baltimore, MD) Policy Essay No. 24.
Romer, P.M. (1990), 'Endogenous technological change', *Journal of Political Economy*, 98(5), S71–102.
Rousseau, P.L. and Wachtel, P. (2000), 'Equity markets and growth: cross country evidence on timing and outcomes, 1980–95', *Journal of Banking and Finance*, 24/12, pp. 1933–57.
Rousseau, P.L. and Xiao, S. (2007), 'Banks, stock markets and China's great leap forward', *Emerging Markets Review*, 8/3, pp. 206–11.
Shan, J. (2002), 'A VAR approach to the economics of FDI in China', *Applied Economics*, 7(34), pp. 885–93.
Sonobe, T., Hu, D. and Otsuka, K. (2004), 'From inferior to superior products: an inquiry into the Wenzhou Model of Industrial Development in China', *Journal of Comparative Economics*, 32/3, pp. 542–63.
Sun, H.S. and Parikh, A. (2001), 'Exports, inward foreign direct investment and regional economic growth in China', *Regional Studies*, 35/3, pp. 187–96.
Temple, J.R.W. (1999), 'The new growth evidence', *Journal of Economic Literature*, 37(1), pp. 112–56.
— (2001), 'Generalizations that aren't? Evidence on education and growth', *European Economic Review*, 45/4–6, pp. 905–18.
Tseng, W. and Zebregs, H. (2002), 'Foreign direct investment in China: some lessons for other countries', IMF Policy Discussion Paper, 02/3.
Van Reenen, J. and Yueh, L. (2012), 'Why has China grown so fast? The role of international technology transfers', University of Oxford Department of Economics Working Paper 592 and London School of Economics and Political Science Centre for Economic Performance CEP Discussion Paper DP1121, pp. 1–24.
Wang, Y. and Yao, Y. (2003), 'Sources of China's economic growth: 1952–99: incorporating human capital accumulation', *China Economic Review*, 14(1), pp. 32–52.
Wei, S. J. (1993), 'The open door policy and China's rapid growth: evidence from city-level data', NBER Working Paper, 4602.
Wei, Y.Q., Liu, X.M., Parker, D. and Vaidya, K. (1999), 'The regional distribution of foreign direct investment in China', *Regional Studies*, 33/9, pp. 857–67.
Wen, M. (2007), 'A panel study on China – foreign direct investment, regional market conditions, and regional development: a panel study on China', *Economics of Transition*, 15/1, pp. 125–51.
Whalley, J. and Xin, X. (2010), 'China's FDI and non-FDI economies and the sustainability of future high Chinese growth', *China Economic Review*, 21/1, pp. 123–35.
Woo, W.T. (1995), 'Comment', in Terutomo Ito and Krueger, A.O. (eds), *Financial Deregulation and Integration in East Asia*, Chicago, University of Chicago Press, pp. 102–5.
World Bank (1997), *China 2020*, Washington, DC, World Bank.
Wu, Y. (2003), 'Has productivity contributed to China's growth', *Pacific Economic Review*, 8/1, pp. 15–30.
Xu, C. (2011), 'The fundamental institutions of China's reforms and development', *Journal of Economic Literature*, 49/4, pp. 1076–151.
Yao, Y. and Yueh, L. (2009), 'Law, finance and economic growth in China: an introduction', *World Development* (Special Issue on Law, Finance and Economic Growth in China), 37(4), pp. 753–62.
Young, A. (2003), 'Gold into base metals: productivity growth in the People's Republic of China during the reform period', *Journal of Political Economy*, 111/6, pp. 1220–61.
Young, S. and Lan, P. (1997), 'Technology transfer to China through foreign direct investment', *Regional Studies*, 31/7, pp. 669–79.
Yueh, L. (2010), 'Accounting for labour productivity growth in China in the 2000s', China Growth Centre (CGC) Discussion Paper No. 1, St Edmund Hall, University of Oxford, pp. 1–65.
Yusuf, S. (1994), 'China's macroeconomic performance and management during transition', *Journal of Economic Perspective*, 8/2, pp. 71–92.
Zhang, J., Wan, G. and Jin, Y. (2007), 'The financial deepening-productivity nexus in China: 1987–2001', *Journal of Chinese Economic and Business Studies*, 5/1, pp. 37–49.
Zheng, J., Bigsten, A. and Hu, A. (2009), 'Can China's growth be sustained? A productivity perspective', *World Development*, 37/4, pp. 874–88.
Zheng, J. and Hu, A. (2006), 'An empirical analysis of provincial productivity in China 1979–2001', *Journal of Chinese Economic and Business Studies*, 4/3, pp. 221–39.
Zheng, J., Liu, X. and Bigsten, A. (2003), 'Efficiency, technical progress, and best practice in Chinese state enterprises (1980–1994)', *Journal of Comparative Economics*, 31(1), pp. 134–52.