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Looking Inward for Transformative Growth in China

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Abstract

Export led growth has been very effective in modernising China's economy and establishing a large high-saving middle class. Notwithstanding political opposition from trading partners, this growth strategy has also offered the rest of the world improved terms of trade in both product and financial markets, in the form of cheaper light manufactures and cheaper credit. Yet slowing demand in export destinations has forced a transition to inward-sourced growth. This paper uses a numerical model of the Chinese economy with oligopoly behaviour to examine the available "inward" sources of transformative growth along with the policies needed to exploit them. The potential for considerable further "transformative" growth is shown to be considerable though it will require accelerated skilled labour supply growth and the politically difficult extension of industry policy reform to heavy manufacturing and services.

Keywords

China, growth, fiscal policy, oligopoly, price caps, privatisation

JEL Classification

D43, D58, E62, L13, L43

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Looking Inward for Transformative Growth in China

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Looking Inward for Transformative Growth in China

Highlights

A numerical model of the Chinese economy is constructed with oligopoly behaviour.

“Inward” sources of transformative growth are analysed.

Yet underexploited sources of “transformative” growth have considerable potential.

Professional labour supply and openness of services to FDI are of first importance.

Privatisation, oligopoly pricing surveillance and regulation also offer large gains.

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Abstract

Export led growth has been very effective in modernising China's economy and establishing a large high-saving middle class. Notwithstanding political opposition from trading partners, this growth strategy has also offered the rest of the world improved terms of trade in both product and financial markets, in the form of cheaper light manufactures and cheaper credit. Yet slowing demand in export destinations has forced a transition to inward-sourced growth. This paper uses a numerical model of the Chinese economy with oligopoly behaviour to examine the available "inward" sources of transformative growth along with the policies needed to exploit them. The potential for considerable further "transformative" growth is shown to be considerable though it will require accelerated skilled labour supply growth and the politically difficult extension of industry policy reform to heavy manufacturing and services.

1 Introduction

There is wide agreement outside China, and more recent concurrence inside, that China's growth will, and should, be increasingly underpinned by rising home consumption rather than exports.¹ The foreign viewpoint is notwithstanding the considerable contributions of China's export-led growth to improvements abroad in the product terms of trade, via cheaper light manufactures, and in the financial terms of trade, via cheaper credit. That the resulting income gains and cheaper credit in the US and Europe appear to have been channelled into property booms and, subsequently, government debt, rather than productive long term investment (Chinn et al. 2012), cannot be blamed on the Chinese. Indeed, much of the criticism of China's international impacts seems mercantilist and focussed on the "job stealing" element of Chinese manufacturing growth, disregarding the terms of trade gains conferred.²

Yet the global gains conferred by China's growth are fragile and the Chinese regime that has produced them faces potentially destabilising threats from within and without. The poor performance of trading partner economies clearly weighs on China's performance, as does foreign political hostility to continued export led growth. Internally, there has been a tightening of labour markets, foreshadowing a Lewis "turning point" that would mark a natural

¹ For the foreign, and particularly the American, perspective see Bergsten et al. (2008) and Lardy (2006, 2012). For the Chinese official line on the "rebalancing" of its economy, including its external accounts, see Wen (2007, 2011) and Yi (2011).

² Foreign animus toward China's successful growth regime was inflamed by visible "off-shoring" and manufacturing job losses, along with its large pre-GFC current account surpluses. It is likely, however, that the job-loss effects were more than compensated by aggregate real income gains. See Tyers (2013).

end to export led growth.³ Growth is also slowing because the high environmental costs of China's manufacturing expansion have yet to be fully covered and public investments are required to address increased income inequality, associated with rents in the state-owned sector that will be politically difficult to unwind.⁴ Middle income "slowdowns" in developing countries that have heretofore grown strongly out of poverty are the subject of expanding interest (Easterly 2001; Eichengreen et al. 2011). The concern is over "premature" stagnation due to powerful vested interests that oppose economic policy reforms needed for the final catch-up phase (Haber et al. 2008; Riedel 2011).⁵

So where are the rents and the vested interests that could retard China's future growth and does "turning inward" exacerbate the risk of an associated slowdown? The financial sector is one location. Very high saving challenges this sector to allocate efficiently across investment opportunities. The many weaknesses in this process, stemming in part from the protection of state owned financial institutions, have already received considerable attention (Riedel 2007; Walter and Howie 2011). Yet the potential gains from further industrial reform that reduces rents in protected corners of the economy extend well beyond the financial sector to include comparatively protected and state-owned heavy manufacturing and services. Industrial reforms have penetrated these sectors less because of their political sensitivity. Yet, potentially at least, such reforms offer an effective alternative to the old growth model that is also transformative of China's economic structure and its labour force.

Of course it is important to foster domestic innovation and domestically derived productivity growth. These are the engines of steady state growth. In this paper, however, the focus is on alternatives that offer further transformation of the China's economic structure and which may or may not cause significant one-off expansions. Those alternatives that are popularly discussed include expanded government, accelerated human capital growth and further industrial reforms, amongst which are pure privatisation, the fragmentation of state-owned enterprises, price cap regulation and foreign direct investment in heavy manufacturing and services. In this paper the economic implications of changes of these types are assessed using

³ The timing of China's Lewis turning point is a subject of controversy, as suggested by the contrasts between the views expressed by: Cai (2010), Garnaut (2010) and Golley and Meng (2011), which offer just a sampling of a substantial literature. There is, however, little doubt that the turning point is on its way, even if there is little agreement as to whether recent real wage rises suggest its presence.

⁴ For a discussion of the institutional and industrial reform agenda and its difficulty, see for example Tyers and Lu 2008, Riedel 2011 and Deer and Song 2012

⁵ These issues parallel an established literature in political economy that originated with Mancur Olson (1965) and Gordon Tullock (1967) and from which emerged the term "eurosclerosis" to describe stagnation due to interest group conflict and rent seeking in Europe.

a mathematical model of the Chinese economy that captures the behaviour of state-owned oligopolies and the impacts of further industrial reform.

The greatest potential for inwardly-generated growth is shown to rest with further industrial reform in heavy manufacturing and services. The simulation results suggest the best prospects involve controlling oligopoly rents with tighter surveillance and price cap regulation and to advance heavy manufacturing and services output through human capital accumulation and FDI. Tighter pricing surveillance and price cap regulation, along with freer FDI, in heavy manufacturing and services are shown to offer considerable potential for overall economic expansion, along with growth in real wages as well as in capital income. The next section reviews the relative merits of export led growth, develops the reasoning behind the choice to turn inward in China's case and discusses the sources of internally generated transformative growth. In Section 3, the particular structure of China's economy is reviewed along with the associated sensitivity of its overall performance to its real exchange rate. Section 4 offers a description of the model used and the construction of its database. Section 5 compares inward-sourced growth scenarios and Section 6 concludes.

2. The Turn Away from Export Led Growth

Economic development is primarily about shifting the population from low labour productivity rural activities to urban employment where the availability of physical capital ensures higher income and more efficient access to essential services. This requires rural-urban migration and, at least initially, basic (mainly primary) education and training. These conditions supply a workforce suitable for light manufacturing. If the protection of property rights and the export infrastructure facilities are sufficient, the availability of adequately trained workers then attracts capital that is supplied from both domestic and foreign saving. In the "East Asian model", much of the migration from rural areas goes into manufacturing, though some goes to construction and other services, which also expand.⁶ In a final phase, the transition from middle level to very high real per capita income requires further education and training suited to supplying the professionals needed to support the growth of sophisticated heavy manufacturing and services.

⁶ The Indian model differs from this in that the rural to urban migration goes primarily to services with manufacturing restrained by regulatory and infrastructural constraints. See Bardhan (2010).

The merits of export led growth

The growth in the local supply of light manufactures that occurs in the early stage in the East Asian model is more than can meet local demand. Comparative advantage in light manufacturing is realised via openness to trade and so the home labour force is transformed by exporting. As it turns out, this transformation is also beneficial to developed trading partners. This is because the resulting change in the international terms of trade is positive for them – light manufactured imports are cheaper and skill-intensive durable (consumer and capital) goods, which they export, are in higher demand. Moreover, since the opening of such developing economies in this way supplies additional low-skill labour to the integrated global economy, FDI opportunities are abundant and savers in industrialised countries earn higher returns. Idiosyncratically, the East Asian model has also offered high saving households and firms which have supplied excess saving to the global economy (Horioka and Terada-Hagiwara 2011). This has therefore conferred an improvement in the net-borrowing developed regions' financial terms of trade that is potentially growth-enhancing.⁷

The choice to look inward

Variations on the East Asian model have been the dominant basis for catch-up by poorer countries and regions for more than a century (Dooley et al. 2004). Then why should the Chinese choose to “look inward” now? The most commonly discussed reason is an inevitable slowdown in the rate of rural to urban migration and some associated acceleration in the rate of rise in real wages will force China to cease to depend on labour intensive exports and move its production up the chain of sophistication in the manner of Japan, the Republic of Korea and its regions in Taiwan and Hong Kong before it. This generally coincides with– the “turning point” of Lewis (1955). The ardent debate over the proximity of this turning point notwithstanding, recent evidence suggests it is approaching quickly.⁸ Even though this pattern of labour force tightening is smooth, the associated transition to slower growth can be abrupt and destructive, as in the case of Japan after the late 1980s,⁹ and so an associated rationale is to ensure a smooth transition.

Yet the most important reason for China's turn inward is that it has become a practical necessity, since growth has slowed in the regions to which China's exports are directed while,

⁷ That cheaper credit has not always led to growth enhancing expenditures in these countries is noted and discussed by Chinn and Ito (2007), Choi (2008) and Chinn et al. (2012).

⁸ Key contributions to the debate include Feng (2010) and Golley and Meng (2011). More recent indications show an accelerated rise in the wages of rural-urban migrants (Huang et al. 2013 and Feng and Yang 2013).

⁹ The literature on Japan's stagnation since the late 1980s is vast and the reasons hotly debated (Hayashi and Prescott 2002, Tyers 2012) but there is wide agreement that a negative demographic shock has contributed.

at the same time, China has come to dominate global trade in light manufactures. As of 2013, export values began to decline, a consequence both of reduced volumes and a shift against China in its terms of trade.

While it might have been of less practical importance thus far, threats of protection in the developed regions continue, based on China's continued current account surpluses, the perceived unfairness of Chinese macroeconomic policy and the loss of trading partner employment in manufacturing.¹⁰ The perception in the US that countries like China use "exchange rate protection", stems from the role of the US dollar as the reserve currency and the difficulty the US faces when a lack of competitiveness would justify a depreciation against others. In the 1980s, this ire had been directed against Japan, leading to the Plaza Accord, an associated large and destructive appreciation of the Yen (Goval and McKinnon 2003; Hamada and Okada 2009), and ultimately to the US *Exchange Rates and International Economic Policy Coordination Act of 1988*, which formalised the US "defence" against "currency manipulators". Ironically, the underlying real exchange rate of China against the US has appreciated substantially since 2004, a consequence in part of the relative rise in China's labour costs (Huang et al. 2013, Feng and Yang 2013, Tyers and Zhang 2011).

Potential inward sources of growth

Alternative inward growth stimuli are numerous. Most conventionally, they include policy implementation in the areas of innovation, technology acquisition and human capital growth (Robertson 2011). These are at the core of China's future long run steady state growth path. Yet they are not the focus here. Instead, emphasis is given to particular sources of growth that are natural successors to the export-led paradigm in that they could further transform the structure of China's economy and support, at least temporarily, further very high rates of expansion.

The scale of government:

All the sources to be considered require action from the central government. The first concerns the mere scale of its revenue and expenditure. Given the apparent success of China's surge in public investment during the global recession in 2008-9 the temptation remains to think of expanded government activity as an inward source of future growth. And there is certainly room to redress the undersupply of key public goods (basic and higher education, transport and

¹⁰ Associated criticism has been common amongst high-profile economists (Bernanke 2006; Krugman 2010, Bergsten et al. 2008, Lardy 2012).

telecommunications infrastructure, retirement insurance, health insurance and environmental protection). Since implementing its tax law in 1994, the extension of China's formal sector has seen the share of central government revenue in GDP expand from 11 per cent to 23 per cent in 2012 (Chinese Statistical Yearbook, 2012). The overall fiscal deficit has also been rising, however, because of growth in provincial government debt.¹¹ Yet, while growth via fiscal expansion may offer short term benefits, it is not sustainable. In the long run expanded government activity must be financed by taxes.

Industrial reform:

An important and yet only partially tapped source of further growth is in the extension of industrial reforms to heavy manufacturing and services. State owned firms in these sectors have been relatively protected and significant foreign ownership shares have been prevented. One consequence of this is that these firms, supplying as they do essential materials and services to an economy that is expanding rapidly, courtesy of the more competitive light manufacturing export sector, have been extremely profitable (Lu et al. 2008). At the same time they have returned little in the way of dividends to the central government and so their profits have not been distributed to their public owners. Instead, these profits have been reinvested. Consequently, the decision to save or consume from this component of national income has been denied households, contributing to China's saving a fifth of GDP.¹²

Substantial potential future growth lies in the redistribution of these rents, which would make Chinese intermediate products cheaper and foster overall output growth while at the same time raising private consumption. A number of approaches are possible, some of which are already being tried. Amongst these are pure privatisation, which would return the profits of SOEs to private households and foster consumption, raising domestic demand for China's goods and services, SOE fragmentation, which would force more competition between firms and thus reduce mark-ups, and tighter regulation of SOE pricing, which would force firms to price nearer their average costs, cutting rents and reducing the price level.

Labour market reform and human capital growth:

The rate of human capital accumulation in China is constrained by the *hukou* system, since urban residents with rural registration have comparatively poor quality education and have

¹¹ See Jia and Liu (2009). In effect, high private saving in China has allowed commercial banks to lend to provincial governments at an expanding rate, fostered after the GFC by the need for stimulus.

¹² The contribution of corporate saving to China's overall saving rate and to the current account surpluses of the past decade is examined by Kuijs (2006), Kuijs and He (2007) and Tyers and Lu (2008).

access to generally poorer schools for their children.¹³ This forms a weak educational foundation for the professional education required to support growing heavy manufacturing and services sectors (Zhang et al. 2012). A relaxation of the *hukou* system would open the superior urban school system to all urban residents and, at least temporarily, cause a surge in the supply of skill.¹⁴

These alternatives are examined in the analysis to be discussed in subsequent sections.

3. China's Economic Structure, Performance and its Real Exchange Rate

The structure of the Chinese economy, as of 2005, is summarised in Table 1. Four distinct patterns are evident. First, the great majority of non-agricultural employment is in the export-oriented light manufacturing sector – indeed, employment in this sector exceeds that in agriculture. Second, the light manufacturing sector dominates China's exports. Third, light manufacturing is relatively competitive – price mark-ups are low and so pure or economic profits make up only a small share of total revenue, and fourth, the SOE-dominated energy, metals and services sectors are less labour-intensive and at the same time they are oligopolistic, generating substantial rents. Since exporting firms are highly competitive, generate little pure profit and carry most of the new or “modern sector” employment, future employment performance is very sensitive to the relativities between home wages and export prices, and hence to China's real exchange rate. Yet the inward-looking policy changes that could contribute most to enlarging China's economy all have implications for the real exchange rate. Consider each in turn.

Government expansion

There are two long run mechanisms by which expanded government expenditure tends to appreciate the real exchange rate. One is the Froot-Rogoff effect (Froot and Rogoff 1995) whereby governments concentrate their spending on non-traded services and so their expansion changes the composition of aggregate demand toward more inelastically supplied home

¹³ There remain immense disparities between education quality in rural and urban areas (Fang et al. 2012, de Brauw and Rozelle 2013) and, under China's *hukou* system, most urban households with rural registration must seek education in their rural districts of origin (Chen et al. 2007).

¹⁴ The relaxation of the *hukou* system is also touted as a means of raising consumption demand directly. See Song et al. (2010).

products, driving up their relative price and hence the real exchange rate.¹⁵ This effect is illustrated in Figure 1, which is based on the abstraction that goods and services are starkly divided according to their tradability. If the share of government spending in aggregate demand rises, then the pattern of implied preferences shifts favouring non-traded goods, appreciating the real exchange rate.

A second appreciating effect is due to oligopoly rents. Increased government spending raises home demand for home products, reducing the exported share of the average firm's output. Because foreign demand is the most elastic, this reduces the elasticity of demand faced by oligopoly firms, which then raise their mark-ups. And since oligopoly firms reside mainly in the protected heavy manufacturing and largely non-traded services sectors, such price rises appreciate the real exchange rate by raising the relative prices of non-traded services and by increasing costs faced by the competitive export sector (Tyers and Lu 2008). A way of thinking of this is that the excess profits are achieved by supplying less output and so the oligopoly firms reduce productivity in the largely non-traded sectors of the economy. Again employing the abstraction that goods and services are either tradable or not, the effect of this productivity contraction on relative prices is illustrated in Figure 2. It raises the prices of non-traded goods relative to traded goods and hence China's real exchange rate.¹⁶

Further industrial and education reforms

Returning to the oligopoly pricing effect on the real exchange rate, because industrial reform will reduce oligopoly mark-ups, particularly in the non-traded sector, it will also tend to depreciate the real exchange rate and thereby preserve the competitiveness of China's export manufacturing sector. The further alternative of accelerating the rate at which human capital is accumulated would reduce the growth in China's skilled wage premium and hence reduce costs in those sectors that are intensive in skill, namely heavy manufacturing and services. More access to FDI in Chinese services is a further means by which services costs could be controlled. Both these reforms would depreciate China's real exchange rate by reducing the relative cost of supplying the home product bundle and, particularly, the cost of non-traded services, via the reverse of the Balassa-Samuelson effect. To quantify the effects of these

¹⁵ De Gregorio et al. (1994) and Froot and Rogoff (1995), and more recently Galstyan and Land (2009), recognise that boosting government expenditure appreciates the real exchange rate by this mechanism, even in the case of public investment, at least in the short run.

¹⁶ Government expansions are most commonly viewed as being temporary (short run) and debt financed. Fiscal expansion shocks also tend to appreciate the real exchange rate by raising home bond yields and drawing in expenditure associated with financial inflows (Mundell 1963, Fleming 1962). The analysis presented here is restricted to shocks that do not raise sovereign debt in the long run.

changes on the real exchange rate and on China's overall economic performance, a complete model of the Chinese economy is required.

4. An Oligopoly Model of the Chinese Economy

To capture the behaviour of the oligopolistic SOEs, a comparative static macroeconomic model of the Chinese economy is used that embodies a multi-industry structure in which all industries are treated as oligopolies, with firms in each industry supplying differentiated products and interacting on prices.¹⁷ Government expenditure creates demands for goods and services via nested constant elasticity of substitution (CES) preferences and government revenue stems from a tax system that includes both direct (income) taxes levied separately on labour and capital income and indirect taxes including those on consumption, imports and exports.¹⁸ A capital goods sector is included which translates investment expenditure into product and service demands, again using a nested CES preference structure. The level of total investment expenditure has Q-like behaviour, being influenced positively by home rates of return on installed capital and negatively by a financing rate obtainable from an open "bond market" in which home and foreign bonds are differentiated to represent China's capital controls. Savings are sourced from the collective household at a constant rate and from corporations at industry-specific rates applying to the magnitudes of pure (economic) profits earned. Foreign direct investment and official foreign reserve accumulation are both represented, to complete China's external financial accounts.¹⁹

Model structure

The scope of the model is detailed in Table 2. Firms in all industries are oligopolistic in their product pricing behaviour with the degree of price-setting collusion between them represented by conjectural variations parameters that are set to account for the degree of regulatory surveillance. Each firm bears fixed capital and labour costs, enabling the representation of unrealised economies of scale. Home products in each industry are differentiated by variety via CES nests and output is Cobb-Douglas in variable factors and intermediate inputs. While firms are oligopolists in their product markets they have no oligopsony power as purchasers of

¹⁷ It is a distant descendant of that by Harris (1984), Gunasekera and Tyers (1990), though it is considerably generalised to include elemental macroeconomic behaviour following Tyers and Lu (2008).

¹⁸ Income taxes are approximated by flat rates deduced as the quotient of revenue and the tax base in each case. Capital income tax rates vary by industry in which the income is earned.

¹⁹ Hereafter the capital, financial and official sub-accounts of China's balance of payments will be referred to as the "capital account".

primary factors or intermediate inputs.²⁰ The economy modelled is “almost small”, implying that it has no power to influence border prices of its imports but its exports are differentiated from competing products abroad and hence face finite-elastic demand.²¹ The consumer price index is constructed as a composite Cobb-Douglas-CES index of post-consumption-tax home product and post-tariff import prices, derived from the aggregate household’s expenditure function. This formulation of the CPI aids in the analysis of welfare impacts. Because collective utility is also defined as a Cobb-Douglas combination of the volumes of consumption by generic product, proportional changes in overall economic welfare correspond with those in CPI-deflated GNP.²²

In the experiments to be presented a long run closure is used throughout and so the foreign owned stock of domestic capital can vary in size, retaining a market rate of return equivalent to that demanded abroad. Considering that the transformative growth shocks to be implemented have large effects on domestic income and saving, it is inappropriate to assume that the home-owned capital stock is constant. So it is raised in proportion to real GNP.²³ Thus, as growth shocks raise capital demand in long run experiments, some of this is met domestically and a residual comes from foreign investors. In this long run, capital is assumed homogeneous and fully mobile between industries and foreign-owned shares are not industry-specific. A fixed oligopoly structure is retained, assuming SOEs are protected from competitive entry and are prevented from exiting if losses are incurred. Finally, the standard fiscal closure in the long run is consistent with China’s heretofore fiscal conservatism, the base fiscal deficit is held

²⁰ Imports in each industrial category are seen as homogeneous, differentiated from home products as a group, so that import varietal diversity never changes. Since all home varieties are exported there is no movement on the “extensive margin” of the type that is evident in the models of non-homogeneous export industries by Melitz(2003) and Balistreri et al. (2007).

²¹ The effective numeraire is the import product bundle. Consumer and GDP price indices are constructed for real aggregations, following the practice in national modelling since Dixon et al. (1982) and Harris (1984).

²² When the utility function is Cobb-Douglas in consumption volumes, the expenditure function is Cobb-Douglas in prices. If the consumer price level, P^C , is defined as a Cobb-Douglas index of prices, the equivalent variation in income can be expressed in terms of the proportional change in this index. Thus, following any shock, the income equivalent of the resulting changes to income and prices is:

$$\Delta W = Y_1 - Y_0 + EV(P_0^C, P_1^C, Y_1) = Y_1 - Y_0 - Y_1 \frac{\Delta P^C}{P_1^C},$$

which can be expressed in proportional change form as:

$$\frac{\Delta W}{W} = \frac{Y_1 \left(1 - \frac{\Delta P^C}{P_1^C}\right) - Y_0}{Y_0} \cong \frac{\Delta Y}{Y_0} - \frac{\Delta P^C}{P_1^C}.$$

This is, approximately, the proportional change in real GNP.

²³ This assumption is needed to avoid growth shocks generating capital expansion with unrealistic shares of foreign ownership and hence a balance of payments distorted by excessive profit repatriation.

constant with expenditure dictated by endogenous revenues at fixed tax rates, or shocks to government spending being financed by changes in tax rates.

Macroeconomic behaviour

Central is the open economy financial capital market which is built around the market clearing identity:

$$(10) \quad I^{EXP}(r^c, r) = S_D(Y_{DH}, \pi, G) + S_{NF}(r, r^*) - \Delta R(r, r^*),$$

where r is the home real financing rate (bond yield) for which this equation solves, r^* is the real yield on bonds abroad (the two being differentiated and so offering different yields). Total domestic saving is $S_D = S_H(Y_{DH}) + S_C(\pi) + (T - G)$, where S_H is saving from home household disposable income. The household saving rate is assumed fixed, so that $S_H = s_H Y_{DH}$.

Following Tyers and Lu (2008), China's extraordinarily high level of corporate saving, S_C , is assumed to stem from pure profits, π , with a distinct but fixed saving rate assumed for each industry:

$$(11) \quad S_C = \sum_i S_{Ci} = \sum_i s_{Ci} \pi_i.$$

The last two terms of (10) represent net private and public flows on the capital account. S_{NF} is the inflow of private foreign saving to finance investment in China net of Chinese private saving going abroad and ΔR is the annual addition to official foreign reserves. r^c is the average net rate of return on installed capital, which takes the following form at the industry level:

$$(12) \quad r_i^c = \frac{P_i^Y MP_i^K}{P^K} - \delta_i,$$

where P^K is the price of capital goods, P^Y is the product price and δ is the rate of depreciation. An average of these rates is taken that is weighted by value added in each industry to obtain r^c . Economy-wide investment expenditure then:

$$(13) \quad I^{EXP} = P^K I_0 \left(\frac{r^c}{r} \right)^{\varepsilon_V}.$$

Because in China's case capital controls have been tight and "private" inflows and outflows have mainly taken the form of state-approved FDI, this comparative static analysis assumes net

foreign saving, S_{NF} , is motivated by the difference between the home and foreign bond yield. A linear relationship is used to allow for reversals of the direction of net flow in response to shocks.

$$(14) \quad S_{NF} = a_{SF} + b_{SF} (r - r^*) .$$

The tight capital controls necessitate a low level of responsiveness and so b_{SF} is small (the supply of net foreign private saving is inelastic). Correspondingly, the combination of China's high saving rate with outward capital controls necessitates that the surplus of saving over investment, which has amounted to a tenth of GDP in some years, be directed abroad by the PBC as official foreign reserves. This behaviour depends on a reduced form relationship that is linear, for the same reason as in (14):

$$(15) \quad \Delta R = a_{DR} - b_{DR} (r - r^*) ,$$

where the movement of reserves is much more elastic to the home real interest rate than that of private financial capital, so that $b_{DR} \gg b_{SF}$. The effect of this is to stabilise the home real rate in response to shocks, which cause, instead, elastic movements in the rate of reserve accumulation.

The capital market clearing identity (10) then determines the home real interest rate and the magnitude of the capital account deficit ($\Delta R - S_{NF} = S_D - I$). This is then equal in magnitude to the current account surplus [$X - M + N(r, r^*)$, where N is net factor income from abroad²⁴]. Shocks originating in the determinants of domestic saving and investment, and hence in external flows, cause home (relative to foreign) product prices (and hence the *real* exchange rate) to adjust sufficiently to clear home markets and preserve the balance of payments.

Oligopoly in supply

Firms in each industry supply differentiated products. They carry product-variety-specific fixed costs and interact on prices. Cobb-Douglas production drives variable costs so that average variable costs are constant if factor and intermediate product prices do not change but average total cost declines with output. Firms charge a mark-up over average variable cost

²⁴ As modelled, N comprises a private inflow of income from assets abroad combined with fixed aid to the government, less endogenous repatriated earnings from foreign-owned physical capital in China. In long run closures, the private income inflow from assets abroad is endogenous and assumed to stem from a foreign asset stock based on 10 years of reserve accumulation at the endogenous rate, ΔR (15).

which they choose strategically. Their capacity to push their price beyond their average variable costs without being undercut by existing competitors then determines the level of any pure profits and, in the long run, the potential for entry by new firms.

Thus, each firm in industry i is regarded as producing a unique variety of its product and it faces a downward-sloping demand curve with elasticity $\varepsilon_i (< 0)$. The optimal mark-up is then:

$$(16) \quad m_i = \frac{p_i}{v_i} = \frac{1}{1 + \frac{1}{\varepsilon_i}} \quad \forall i ,$$

where p_i is the firm's product price, v_i is its average variable cost and ε_i is the elasticity of demand it faces. Firms choose their optimal price by taking account of the price-setting behaviour of other firms. A conjectural variations parameter in industry i is then defined as the influence of any individual firm k within that industry, on the price of firm j within the same industry:

$$(17) \quad \mu_i = \frac{\partial p_{ij}}{\partial p_{ik}}, \quad \forall j, k, j \neq k .$$

These parameters are exogenous, reflecting industry-specific collusion and free-rider behaviour along with the power of price surveillance by regulatory agencies. The Nash equilibrium case is a non-collusive differentiated Bertrand oligopoly in which each firm chooses its price, taking the prices of all other firms as given. In this case the conjectural variations parameter (17) is zero. When firms behave as a perfect cartel, it has the value unity. This parameter enters the analysis through the varietal demand elasticity.

Critical to the implications of imperfect competition in the model is that the product of each industry has exposure to five different sources of demand. The elasticity of demand faced by firms in industry i , ε_i , is therefore dependent on the elasticities of demand in these five markets, as well as the shares of the home product in each. They are final demand (F), investment demand (V), intermediate demand (I), export demand (X) and government demand (G). For industry i , the elasticity that applies to (19), above, is a composite of the elasticities of all five sources of demand.²⁵

$$(18) \quad \varepsilon_i = s_i^F \varepsilon_i^F + s_i^V \varepsilon_i^V + s_i^I \varepsilon_i^I + s_i^X \varepsilon_i^X + s_i^G \varepsilon_i^G \quad \forall i$$

²⁵ The expressions for these elasticities are messy and voluminous. They are derived in appendices to Tyers and Lu (2008).

where s_i^j denotes the volume share of the home product in market i for each source of demand j . These share parameters are fully endogenous in the model and the elasticities of demand are calculated from CES demand nests and the conjectural variations parameters, as per (Tyers and Lu 2008). Mark-ups then follow from (16).

Thus, the strategic behaviour of firms, and hence the economic cost of oligopolies, is affected by collusive behaviour on the one hand and the composition of the demands faced by firms on the other, both of which act through the average elasticity of varietal demand. The collusive behaviour enters through conjectural variations parameters and composition through the demand shares s_i^j . Of course, the capacity firms have to reduce their prices also depends on their productivity performance and on the fixed cost burden carried by each industry (and hence on firm numbers).

To study the effects of price-cap regulation a Ramsey mark-up, m_i^R is formulated as:

$$(19) \quad m_i^R = \frac{afc_i + v_i}{v_i} .$$

Compromise mark-ups can be simulated by altering the parameter φ_i in an equation for the “chosen” mark-up:

$$(20) \quad m_i^C = (\varphi_i - 1)m_i^R + (2 - \varphi_i)m_i \quad \forall i .$$

Thus, when $\varphi_i = 1$, $m_i^C = m_i$, and when $\varphi_i = 2$, $m_i^C = m_i^R$.

The database and its representation of broad economic structure

The flow data for the current model originates from the GTAP Version 6 global database for 2001.²⁶ It combines detailed bilateral trade, transport and protection data characterizing economic linkages among regions, together with individual country national accounts, government accounts, balance of payments data and input-output tables which enable the quantification of inter-sectoral flows within and between regions. Factor shares and input output coefficients from these 2001 data are combined with Chinese national accounts and balance of payments data for 2005, inflating the database to that year and readjusting it for balance. Key structural elements are evident from Table 1, already discussed in the previous section and the scope of the model is clear from Table 2. Factor proportions in each industry

²⁶ Documentation on the GTAP 6 Data Package may be viewed at: <http://www.gtap.agecon.purdue.edu/databases/>.

are given in Table 3, which confirms that traded industries in general, and the exporting light manufacturing industries in particular, are intensive in production labour. This is most notably true of processed agricultural products and textiles.

Calibration of pure profits and oligopoly parameters

The flows represented in the database do not reveal details of intra-sectoral industrial structure. To represent oligopolistic behaviour, additional information is required on effective firm numbers, pure profits, fixed costs and minimum efficient scale for each industry. With the support of China's official statistics these variables are calibrated in the following manner. First, pure profits are required as a share of total revenue in each industry. This is needed to finalise the flow database by splitting capital payments between market and over-market returns.²⁷ It is also a starting point for calibrating industry competitive structure. Second, rough estimates are required of strategically interacting firm numbers in each industry and their corresponding conjectural variations parameters. Again, official statistics provide firm numbers and sizes and the proportion that are private and state-owned.²⁸

Third, to complete the formulation of industry demand elasticities, values of elasticities of substitution between home product varieties on the one hand, and between generic home and foreign products on the other, are required for each industry. These are initially drawn from the estimation literature.²⁹ Preliminary industry demand elasticities are then calculated for each source of demand (final, intermediate, investment, government and export). Initial shares of the demand facing each industry are then drawn from the database to enable the calculation of weighted average demand elasticities for each industry. Preliminary mark-up ratios are deduced from these, via (16). The base year equilibrium industry shares, elasticities and mark-up ratios for each industry are given in Table 4.³⁰ This completes the initial demand side calibration. Work on the supply side begins with the application of mark-up ratios to deduce the initial level of average variable cost in each industry. Then the proportion of pure profits in

²⁷ Pure profit shares of total revenue in 2005 were high in "metals and minerals", "petroleum and energy", "telecommunications", "insurance and finance" and "transport". Data on accounting profits in the latter three sectors is comparatively weak and the estimates are partly judgemental, accounting for such determinants as low borrowing rates for these SOE dominated sectors and hence low capital service costs. See the appendices to Tyers and Lu (2008).

²⁸ *Effective* firm numbers are smaller than totals since pricing is frequently dominated by a few large firms in each sector. For oligopolistic sectors in China, these tend to be state owned enterprises. See Tyers and Lu (2008).

²⁹ Summaries of this literature are offered by Dimaranan and McDougall (2002) and at <http://www.gtap.purdue.edu/databases/>.

³⁰ Note that the reason the elasticities appear large in magnitude at first glance is that they do not represent the slopes of industry demand curves for generic goods. Rather, they are the elasticities faced by suppliers of individual varieties and are made larger by inter-varietal substitution.

total revenue is deducted from the mark-up to arrive at fixed cost revenue shares.³¹ Total recurrent fixed cost in each industry then follows. At this point these results are reviewed and, where conflicting information is available on fixed cost shares of total turnover, the calibration is recommenced with new initial elasticities.³²

Importantly for the interpretation of later results, Table 4 also makes clear that the five sources of demand facing firms in each industry are not equally elastic. Export and final demand are the most elastic and intermediate demand the least.³³ Also from Table 4 it is evident that, where exports dominate demand firms face larger elasticities and charge smaller mark-ups. Consistent with these observations, pure profit shares of total revenue tend to be small or even negative for export-oriented industries and very large for the SOE dominated industries: petroleum, metals and minerals, telecommunications, finance and transport.

5. Comparing the Growth Effects of Alternative Policy Regimes

This section offers results from several applications of the model. While the model is based on data on the 2005 Chinese economy the shocks applied to it are stylised with a view to illustrating the general magnitudes of the expansions that could stem from each of the reforms considered in Section 3. Long run closures are employed to allow for an endogenous capital stock which is mobile internationally and between industries. Labour market closures are case specific, commencing with an exogenous real production wage and endogenous employment under the export led growth paradigm and moving to exogenous labour supply and endogenous real wages for all post-transition shocks. Industrial competition closures hold the numbers of firms exogenous and the level of pure profits endogenous throughout. This is to capture changes in competitive behaviour in response to each policy shock and to reflect the continuing importance of state-owned firms and oligopoly rents.

The first application is to depict the effects of continued export-led growth and the implications for it of rising labour costs and contracting global demand. This is followed by an investigation of the effects of tax-financed government expansion and of additional investment

³¹ Fixed costs take the form of both physical and human capital costs using the rule of thumb (based on estimates by Harris and Cox, 1983) that physical capital has a fixed cost share of 5/6.

³² The actual calibration process is yet more complex than this because the elasticities of intermediate demand depend on intermediate cost shares, which depend on the variable cost share. It is therefore necessary to calibrate iteratively for consistency of elasticities and shares.

³³ Export demand is found to be more elastic because of the larger number of substitutable product varieties available abroad while intermediate demand is relatively inelastic because of firms' reluctance to alter arrangements for intermediate input supply which may depend on location or "just in time" relationships.

in professional education with a view to the relaxation of the skill demand bottleneck, simulated by “twisting” labour supply away from low skilled production workers to professional workers. Five types of industrial reform are then considered. First, a pure privatisation is simulated by allowing most profits of SOEs to accrue as income to the collective private household, causing a substantial cut to corporate and overall saving. Second, a tightening of oligopoly pricing surveillance is represented by reduced collusion (smaller conjectural variations parameters). Third, a threefold fragmentation of SOEs is tried in order to elicit more competitive pricing, and fourth, price cap regulation is imposed to force mark-ups a fifth of the way to the level sufficient to barely cover average costs. Finally, the option of opening the services sector to additional FDI is represented via accelerated productivity growth in that sector. It is worth noting that, except for the last, all these scenarios ignore natural innovation and productivity improvements that would continue irrespective of the fiscal or industrial policy regime. As such, these simulations consider policy changes that would be “transformative” in their effects on China’s economic performance.

Further export led growth

Continued export led growth is illustrated in this simulation by some representative shocks to productivity and a closure that allows rising labour supply. There is a rise in total factor productivity in agriculture, to represent its capacity to continue shedding workers, and productivity improvements in manufacturing that are strongest in the light manufacturing (export) sector, to represent the effects of continued FDI into that sector. There is also an arbitrary increase in the exogenous real production wage to represent the observed pattern of real wage growth. The results, indicated in the first column of Table 5, show that employment continues to expand and foreign capital flows in, contributing to growth in the home capital stock. Because the household and corporate saving rates are high, however, the current account surplus widens, reflecting the dominance of financial outflows. The net effect of all these shocks on the real exchange rate is to appreciate it.³⁴ The levels of both GDP and GNP continue to expand substantially.

When the market for production labour is tightened via a stronger increase in the real production wage, overall growth slows. This case is illustrated in the second column of Table 5. The higher labour costs further appreciate the real exchange rate and the value of exports

³⁴ High domestic saving and the financial outflow that stems from it is depreciating because it switches home income toward expenditure abroad, but this effect is here more than offset by the exogenous increase in production labour costs and the endogenous rise in the skilled wage

grows more slowly when measured in foreign prices and contracts when measured in domestic prices (which are higher, consistent with the real appreciation). The current account surplus contracts, as does the capital stock. The final column shows the effects of the addition of a modest contraction in foreign export demand (achieved by shifting foreign demand curves while leaving export flows endogenous). It causes the growth in real GDP to be choked off altogether.³⁵ These results serve to illustrate the vulnerability of the export led paradigm to home labour costs and foreign demand.

Tax financed government expansion

In the long run any expansion in government activity must be tax financed. Here this is accomplished, alternately, by taxes on consumption, capital income and labour income. The experiment is an arbitrary increase in government spending by 30 per cent, or roughly six per cent of GDP (about double the spending expansion that took place in 2008-9). All three cases shown in Table 6 offer the expected result that the expansion of government activity comes at the expense of the remainder of the economy and there is no significant overall economic expansion relative to the 2005 base. Raising government activity is, however, a classic turn inward, since government expenditure is intensive in home non-traded services. For the reasons discussed in Section 3, mark-ups increase, the real exchange rate appreciates and exports decline. Capital returns rise with mark-ups and wage rates fall. Since the government absorbs income that would otherwise be divided between saving and consumption and then commits it to its own consumption, total domestic saving falls. The current account surplus therefore contracts substantially.

In the case of the consumption tax, an increase in revenue is required to the tune of 16 per cent of the tax base. It differs from the other two financing modes in that it creates a wedge between the level of the GDP price index and the CPI. Since GDP is deflated by the former and GNP (and other incomes) by the latter, there is divergence in the pattern of effects on *real* GDP and GNP. In this case the real appreciation is comparatively small and the turn inward, combined with the shifting of the tax burden toward consumption offers a small rise in real activity. When financing is via taxes on capital income, the extra take must be 8.2 per cent of the base while a labour income tax requires 15 per cent of its base. All have negative effects

³⁵ Real GNP continues to expand, first, because of income from assets accumulated abroad and, second, because the real appreciation causes a divergence between the consumer and GDP price indices used to separately deflate the two measures.

on the production wage and capital growth and all close the economy by contracting trade relative to GDP.

Accelerated skilling

The idea here is to consider an acceleration in the rate at which production workers are transformed into professional workers, such as might be achieved if the *hukou* system were relaxed to the extent of allowing urban residents with rural *hukou* the opportunity to seek higher quality education and training in cities. Again, a stylised shock is offered, upgrading 3.2 per cent of production workers to achieve a 30 per cent increase in the supply of professional workers. The results are summarised in the final column of Table 6. As expected the shock is positive, adding to aggregate output and income. It is inward looking in that, by reducing the professional to production wage premium from 72 to 25 per cent, it reduces costs in industries intensive in skill, namely heavy manufacturing and services industries. Because services employs the greater labour force the effect is a comparative reduction in the cost of non-traded goods and hence a real depreciation, which yields an expansion in exports, a rise in capital returns and an expansion in the capital stock. Overall this shock would be a significant contributor to continued growth.

Pure privatisation

The simplest industrial reform to simulate is a pure privatisation of the remaining SOEs. Here it is assumed that after tax corporate income would then be paid out in dividends and so households could divide it between consumption and saving. It is represented here by a reduction in corporate saving from a fifth to a 20th of GDP (the Taiwanese proportion) by shocking the corporate saving rate. The capital income tax rate is unchanged and is the same for households and firms. The principal effect of this change is to raise private consumption and reduce the overall saving rate, thus reducing exports and virtually eliminating the current account surplus. While the reform is growth-enhancing overall, by itself its boosting effect is modest.³⁶

Tighter price surveillance

In most countries some oligopolistic industries are tolerated but regulation is used to constrain collusion in pricing. In the China of 2005 SOE profitability had soared without significant regulatory response (Lu et al 2008). Here, increased pricing surveillance is represented by a 20

³⁶ Had it been assumed that privatization might eliminate x-inefficiency and hence raise productivity by making poor performing firms take-over targets, a more substantial one-off growth surge might be expected from this change.

per cent cut to the conjectural variations parameter (17) in all industries. Of course, this has most effect in industries where conjectural variations (and the mark-ups they influence) are large. From Table 4 it is clear that these industries include metals, petroleum, chemicals, telecommunications, finance, transport and construction. This reform would have reduced the prices of intermediate inputs substantially, cutting overall costs, depreciating the real exchange rate and substantially expanding economic activity. As is clear from the second column of Table 7, the result is benefits to both workers and capital owners with the greater gains accruing to the workforce. Despite the “inward-focus” of a reform that addresses efficiency in sectors that tend not to trade, the reduced costs and depreciated real exchange rate cause so great an improvement in China’s competitiveness that it becomes more export-oriented than before.

Fragmentation of SOEs

There has already been some fragmentation of SOEs within sectors, occurring in some cases because of inter-provincial competition and in others to force competition on output prices. While such a change is pro-competitive so long as pricing collusion is controlled, the new oligopoly firms must then each carry recurrent fixed costs. As modelled at least, this represents a substantial overall cost increase at the industry level. The results indicate that the cost increasing effect greatly outweighs the price competition effect and that the results are not attractive. Because fixed capital is required, the capital stock increases substantially but capital returns are slashed. While production workers gain due to the labour component of recurrent fixed costs, domestic capital owners lose. So costs rise considerably, the real exchange rate appreciates and the levels of GDP and GNP collapse.

Price cap regulation

This form of regulation is common in developed countries, particularly in oligopoly service industries. If applied more widely in China the simulation results suggest the associated benefits could be both considerable and widespread across the economy. It requires tighter regularly limits on the price-to-average-cost margin as per (19) and (20). In oligopoly industries with fixed costs, often quite large mark-ups over average variable cost are required just to break even. As simulated, price caps are imposed that would force firms to reduce their mark-ups just 20 per cent of the way toward the level that would cover average costs. This is akin to pricing surveillance and the economy-wide outcome is indicated in the fourth column of Table 7. Output prices fall in industries whose products are used as intermediate inputs throughout the economy, costs fall and the real exchange rate depreciates. As for price

surveillance, beyond the overall expansion it offers, there is an unwinding of the income inequality of recent decades since industrial rents are redistributed and real wages raised. Again, notwithstanding the focus of the reform on inward-looking sectors, the effects improve China's competitiveness so much that exports rise, along with general openness.

FDI-associated productivity rises in services

Service institutions have heretofore been protected from foreign ownership and, partly as a consequence, their productivity performance relative to manufacturing and agriculture has been poor. With rapid growth this sector has assumed greater importance and the comparatively high cost of its mainly non-traded output has tended to appreciate the real exchange rate and constrain overall performance. Opening this sector to FDI would relax this constraint on growth. To illustrate its potential to do so the simulation conducted here raises total factor productivity in only services by five per cent. The results, summarised in the final column of Table 7, show that the associated economy-wide gains are proportionally larger than the productivity shock notwithstanding its restriction to services only. Clearly, services productivity is an important source of further transformative growth. Its positive effects on the economy as a whole arise, as for the cases of pricing surveillance and price cap regulation, from the widespread use of services as intermediates in all production processes. More services productivity yields reduced costs in all sectors, a depreciated real exchange rate and substantial gains to both capital and labour, though again the benefits to labour are the greater.

Combined positive reforms

When all the positive reforms are combined a very substantial expansion is achieved, as indicated in the Table 8. Importantly, the gains to labour, both unskilled and skilled, are larger than those to capital-owners and it is production workers who gain most. There is, however, a substantial real depreciation and, thus, an increase in export dependence. Quite reasonably, investment assumes a smaller proportion of GDP than before and consumption a larger one, but the balance of the two still yields an expansion in the current account surplus. It is reasonable to expect, however, that these reforms would occur over a period during which the incentives for households to save will wane, due to dissaving by an enlarged retired population and to improvements in access to education, health and retirement services. When a decline in the household saving rate is added to the mix, the results retain their widespread benefits while at the same time greatly enlarging the consumption share of GDP and avoiding any substantial further increase in the current account surplus.

In Table 9, major measures of economic structure are compared in their levels as between the 2005 base data and the post-reform economy. The pattern of disposal of GDP becomes more typical of developed economies as do the household and corporate saving rates. Openness to foreign ownership and the repatriation of income is roughly the same, though the economy is more open to trade in that both exports and imports are larger relative to domestic income. Comparisons in the levels of the industrial structure of GDP and of exports are offered in Table 10. These show a substantial economic shift toward services relative to tradable products and, within the tradable products, shifts away from agriculture and light manufacturing toward heavy manufacturing. Changes in tradable composition show up in the pattern of exports with shifts away from labour-intensive processed agriculture and textiles toward vehicles and chemicals. The share of transport services in exports also rises. Thus, even in the pattern of exports, these transformative reforms foster convergence on patterns typical of modern developed economies.

The difficult politics of internally generated growth

While the results obtained here are illustrative, they are clear in suggesting that, for substantial further growth to be found from looking inward, China will need to implement a broad-based program of industrial reform that includes a more ardent regulatory attack on oligopoly rents. This will be difficult politically, as will the other key element of further growth, namely allowing more FDI in services to encourage advances in productivity there. This risks adverse reactions to foreign ownership. As the results suggest, however, all this can be achieved with no significant increase in the foreign –owned share of China’s overall capital stock.

6. Conclusion

With the apparent end to China’s export led growth era and conflicts due on the one hand to rising domestic inequality and, on the other, to global imbalances and poor economic performance abroad, China is in need of a further stage of transformative growth that will address these conflicts and thereby maintain the pace of its catch-up. Much depends on the pathway to an orderly transition along the lines previously achieved by the Republic of Korea and the province of Taiwan. Of course, both Korea and Taiwan were helped in this by the stimulus associated with mainland China’s own growth surge. Japan’s initial transition was orderly, surviving the oil and commodity crises of the 1970s, but it was subsequently disrupted by policy errors during the 1980s and early 1990s. Japan’s comparatively liberal democracy

could not chart those waters effectively even with the growth of China on its doorstep. Now China must do so, but without the external stimulus associated with a growth surge in a large near neighbour.

The search for alternative strategies to sustain transformative growth in China is here addressed via simulations of a 17 sector model of the Chinese economy that takes explicit account of oligopoly behaviour of SOEs and a database that captures essential economic structure, namely a largely competitive light manufacturing export sector combined with oligopolistic heavy manufacturing and services sectors dominated by SOEs. The results suggest that further transformative sources of growth do exist but, to exploit them, China's government must initiate industrial reforms that reduce the rents that currently concentrate economic gains while at the same time welcoming FDI into its hitherto protected service industries. The benefits available are considerable. Not only do they include final steps toward real per capita income convergence with the West but they also reduce domestic inequality and they yield stronger more externally engaged heavy industry and services that would be on a par with those from the developed economies.

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Figure 1: Expenditure Composition and the Real Exchange Rate

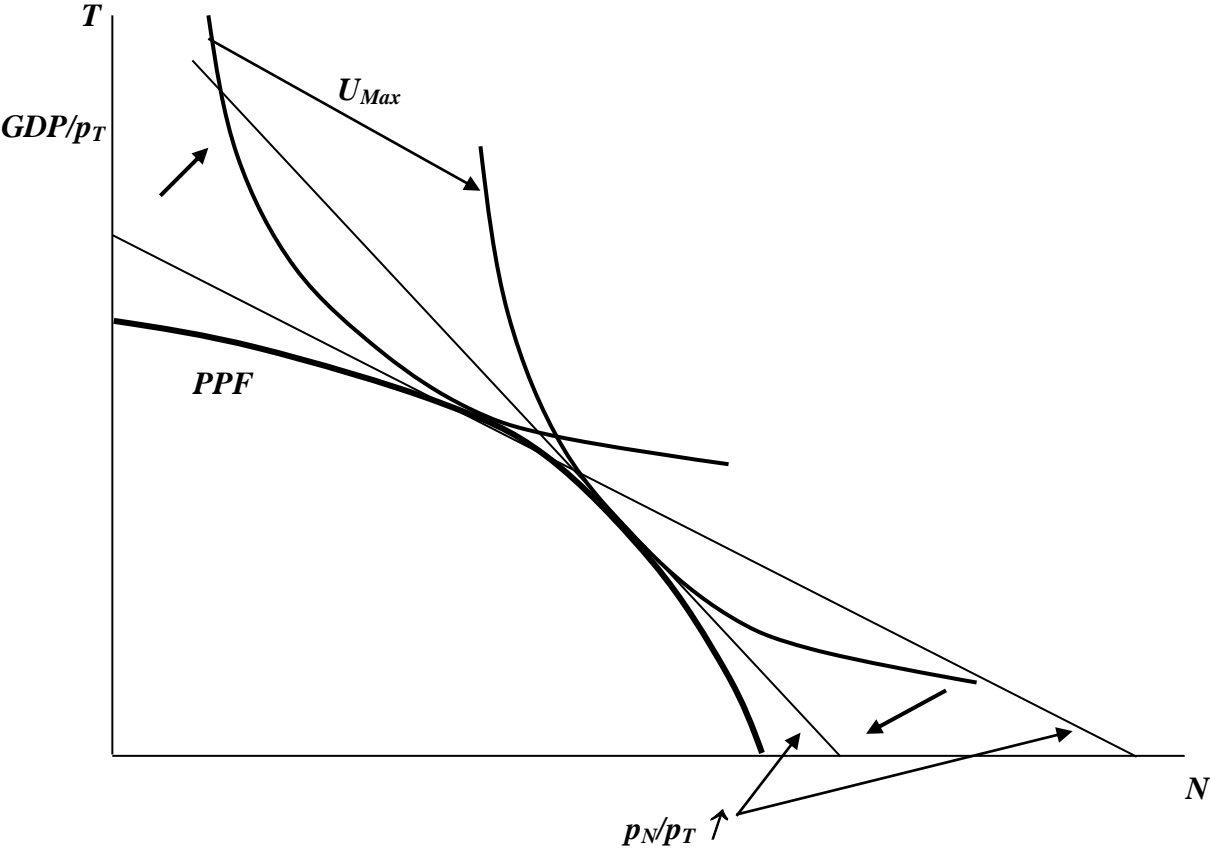


Figure 2: Service Oligopoly Rents and the Real Exchange Rate

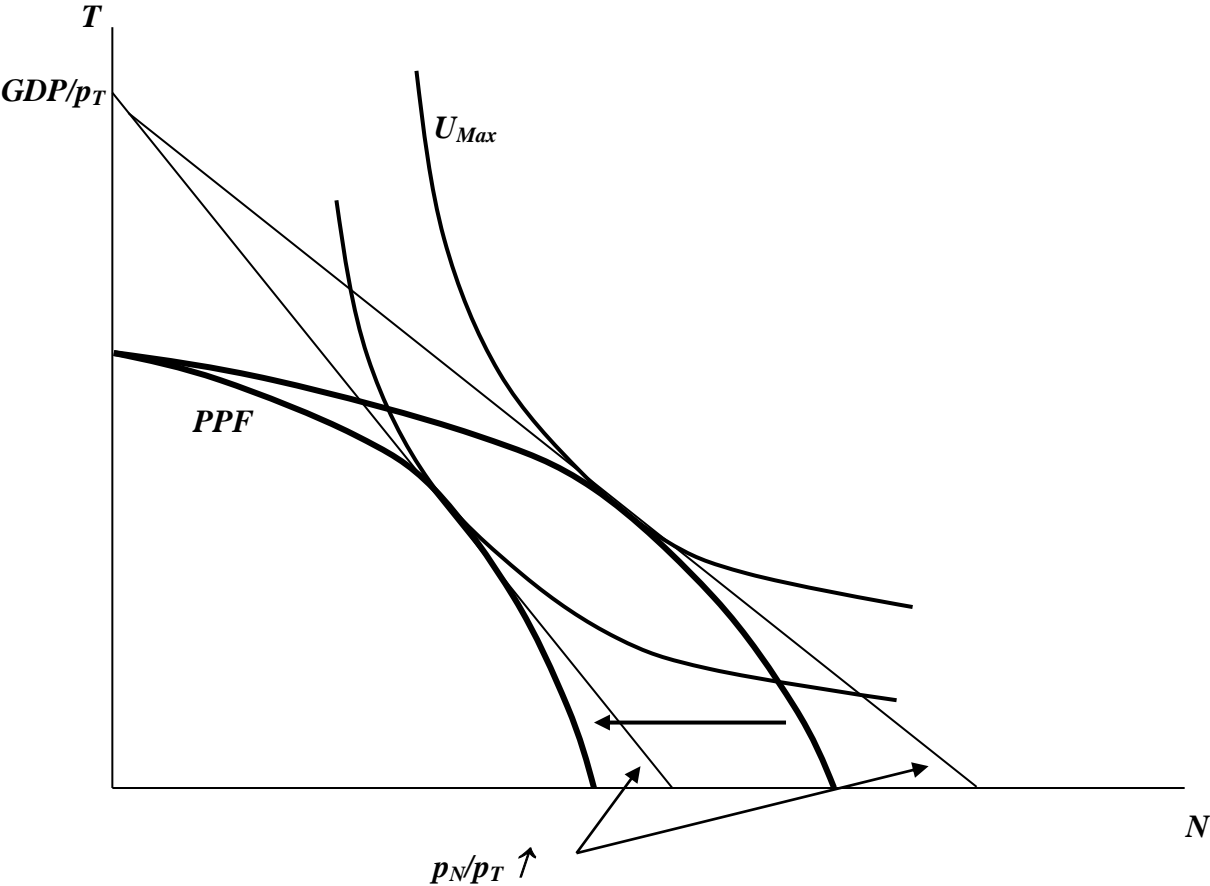


Table 1: Structure of the Chinese Economy, ca 2005^a

Per cent	Value added share of GDP	Share of total production employment	Share of total exports	Pure profit share of gross revenue
Agriculture	13	24	2	0
Petroleum, coal, metals	16	11	10	20
Light manufacturing	29	33	82	5
Services	42	32	6	20
Total	100	100	100	12

^a Pure profits are calculated from national statistics estimates of accounting profits, deducting required returns to service industry specific prime rates. Here they are presented gross of tax and corporate saving and as shares of total revenue.

Source: Model database, derived from Dimaranan and McDougall (2002), and an updating of the national data to 2005.

Table 2: Model Scope

Regions	China Rest of world
Primary factors	Land Natural resources (mineral, energy deposits) Skilled (professional) labour Unskilled (production) labour Physical capital
Industries	Agriculture Metals, including steel, minerals and (non-coal) mining Coal mining and production Petroleum production and refining Processed agricultural products Electronic equipment Motor vehicles Chemical, rubber, plastic products Textiles Other manufactures Electricity supply and distribution Gas supply and distribution Telecommunications Insurance and finance Transport Construction Other Services

Source: Aggregates of the 57 industry GTAP Version 6 database from Dimaranan and McDougall (2002).

Table 3: Factor Intensities by Industry^a

	Capital	Production labour	Skilled labour	Land and nat resources
Agriculture	11	59	0	30
Metals & minerals	66	27	5	2
Coal	28	30	3	39
Petroleum	86	5	1	7
Processed agriculture	38	54	7	0
Electronic equipment	66	26	8	0
Motor vehicles	59	35	6	0
Chemical products	62	32	6	0
Textiles	40	52	7	0
Other manufactures	68	27	5	0
Electricity	69	21	11	0
Gas mfg & distribution	49	37	14	0
Communications	92	5	3	0
Insurance and finance	80	12	8	0
Transport	78	18	4	0
Construction	56	37	7	0
Other Services	54	27	19	0

a These are factor shares of total value added in each industry, calculated from the database. Capital shares include pure profits. Shares sum to 100 per cent horizontally.

Source: Model database (social accounting matrix), derived from Dimaranan and McDougall (2002).

Table 4: Initial Demand Shares, Elasticities and Mark-ups^a

	Demand shares, %					Demand elasticities					Average demand elasticity	Industry mark-up ^b
	Inter mediate	Final	Export	Invest ment	Govt	Inter mediate	Final	Export	Invest ment	Govt		
Agriculture	53	40	4	3	0	-10.2	-28.6	-40.1	-15.6	-16.0	-18.8	1.06
Metals, Minerals	84	3	10	2	1	-2.9	-4.4	-8.9	-2.8	-2.8	-3.5	1.39
Coal	61	4	33	0	2	-3.6	-6.1	-11.2	-2.4	-2.5	-6.2	1.19
Petroleum	58	12	5	14	12	-2.1	-2.8	-6.2	-2.3	-2.1	-2.4	1.69
Proc agriculture	50	34	15	0	1	-12.0	-30.8	-26.8	-16.4	-17.0	-20.7	1.05
Electronics	24	4	65	6	0	-2.7	-6.4	-9.8	-2.9	-2.9	-7.5	1.15
Motor vehicles	46	8	15	29	1	-4.8	-10.0	-16.9	-3.4	-3.7	-6.6	1.18
Chemicals	77	6	17	0	0	-3.6	-6.3	-10.4	-2.5	-2.5	-4.9	1.26
Textiles	45	11	44	0	0	-6.5	-16.9	-25.7	-10.4	-10.2	-16.1	1.07
Other mfg	43	5	35	16	0	-2.6	-7.1	-9.5	-4.0	-4.0	-5.5	1.22
Electricity	84	13	1	1	1	-6.4	-12.3	-21.0	-7.5	-7.7	-7.3	1.16
Gas mfg & distn	50	10	0	8	32	-4.9	-7.7	-13.4	-4.8	-4.9	-5.2	1.24
Telecommunications	42	24	1	5	27	-1.7	-1.4	-5.1	-1.5	-1.7	-1.7	2.45
Finance	57	29	2	3	8	-1.8	-2.6	-6.6	-2.2	-2.2	-2.2	1.86
Transport	53	18	8	7	14	-1.3	-1.6	-5.9	-1.6	-1.5	-1.8	2.26
Construction	4	2	0	86	8	-2.5	-5.1	-12.3	-4.4	-4.0	-4.3	1.30
Other Services	46	21	4	4	25	-3.4	-8.6	-11.7	-3.1	-2.8	-4.7	1.27

a All these variables are endogenous in the model. Initial (base) values are provided here.

b Industry mark-ups are the ratio of producer prices and average variable costs.

Source: Model database, derived from Dimaranan and McDougall (2002) and 2005 national statistics.

Table 5: Illustrative Effects on Export-Led Growth of Rising Labour Costs and Contracting Export Demand^a

Per cent changes	Export (X) led growth: 5% manufacturing productivity, 5% real production wage gain ^b	X-led growth + 10% real production wage increase ^c	X-led growth + 10% real production wage increase + 3% foreign demand contraction ^d
Real GDP ^f	9.5	2.2	0.0
Real GNP ^g	14.9	6.8	5.4
Real exchange rate ^h	5.6	6.3	6.7
Exports / GDP	-1.5	-4.6	-7.9
Consumption / GDP	2.3	2.3	3.5
Current account surplus / GDP	24.4	-7.5	-15.7
Government spending / GDP	-1.7	-1.2	-0.9
Tax revenue / GDP	-0.7	-0.6	-0.4
Production employment	4.9	-4.7	-6.3
Real production wage	5.0	10.0	10.0
Real skilled wage	6.2	-1.1	-3.4
Physical capital stock	4.3	-0.4	-2.0
Average real rate of return on capital ⁱ	3.9	0.1	-0.9

a These simulations are all made in long run mode – endogenous capital stock with exogenous external rate of return and perfect mobility of physical capital internationally and of workers between agriculture and the other sectors. The number of oligopoly firms is fixed in each sector, so that pure profits are endogenous.

b This simulation illustrates the export-led policy regime. It applies 10% labour productivity in agriculture, to continue to release workers, 5% productivity in light and 4% productivity in heavy manufacturing due to continued FDI. The nominal production wage is exogenous and shocked up by 5 % and production employment is endogenous.

c Here export led regime is retained but the real production wage rises by a larger 10%, reflecting increased shortage of production workers.

d This simulation is as for the central column except that global demand for Chinese exports contracts by 3% (export demand curves faced by China are shifted while the actual level of exports remains endogenous). This is just sufficient to eliminate real GDP growth.

e As modelled, GDP is measured against (fixed price) imports. Its value is here deflated by a GDP price index.

f GNP is here deflated by a consumer price index, which rises substantially relative to the GDP price with the introduction of a consumption tax rise.

g The real exchange rate is here defined as the ratio of the cost of the home relative to the foreign production bundle. With foreign prices fixed it changes with the home GDP price.

h This is the national average rate of return on capital, inclusive of pure profits retained domestically.

Source: Simulations of the model described in the text.

Table 6: Simulated Effects of Tax-Financed Government Enlargement and Expanded Skill Investment^a

Per cent changes	Government expansion by 30%, consumption tax financed ^b	Government expansion by 30%, capital income tax financed ^c	Government expansion by 30% labour income tax financed ^d	Conversion of 3.2% of production workers into professionals ^e
Real GDP ^f	3.8	-1.7	-1.5	6.3
Real GNP ^g	-13.1	-1.9	-3.4	6.6
Real exchange rate ^h	0.1	1.5	0.8	-2.1
Exports / GDP	-0.5	-5.9	-1.1	3.2
Consumption / GDP	-10.2	-6.2	-11.3	1.5
Current account surplus / GDP	-19.3	-39.2	-32.9	33.4
Government spending / GDP	25.1	30.3	30.9	0.4
Tax revenue / GDP	27.5	33.5	33.4	0.8
Production employment	0.0	0.0	0.0	-3.2
Professional employment	0.0	0.0	0.0	30.0
Real production wage	-2.3	-3.1	-2.6	10.5
Real professional wage	-0.5	-0.7	-0.4	-19.3
Physical capital stock	-0.6	-1.3	-0.9	4.3
Average real rate of return on capital ⁱ	1.6	1.4	1.5	2.0

a These simulations are all made in long run mode – endogenous capital stock with exogenous external rate of return and perfect mobility of physical capital internationally and of workers between agriculture and the other sectors. The number of oligopoly firms is fixed in each sector, so that pure profits are endogenous. Fiscal deficits are held constant in value terms in each case. The supplies of production and professional labour and natural resources are exogenous and factor rewards are endogenous.

b Here government expenditure is expanded while holding the fiscal deficit exogenous and the consumption tax rate endogenous. Consumption tax must increase by 16% of its base.

c As for b, above, government expenditure is expanded with a fixed fiscal deficit. This time all company tax rates (which vary by industry) are raised by a common 8.2 % of base.

d As for b and c, above, government expenditure is expanded with a fixed fiscal deficit. This time labour income tax is raised by 15 % of base.

e Here 3.2 % of production worker years are converted to professional worker years, causing a rise in the stock of the latter by 30% . The starting point is an aggregate labour force that is 12% professional.

f As modelled, GDP is measured against (fixed price) imports. Its value is here deflated by a GDP price index.

g GNP is here deflated by a consumer price index, which rises substantially relative to the GDP price with the introduction of a consumption tax rise.

h The real exchange rate is here defined as the ratio of the cost of the home relative to the foreign production bundle. With foreign prices fixed it changes with the home GDP price.

i This is the national average rate of return on capital, inclusive of pure profits retained domestically.

Source: Simulations of the model described in the text.

Table 7: Simulated Effects of Further Industrial Policy Reforms^a

Per cent changes	Privatisation: corporate saving reduced from 65%, to 5.5% of GDP ^b	Pricing surveillance: conjectural variations reduced by 20% ^c	SOE fragmentation: heavy manufacturing and service firm numbers up three- fold ^d	Price cap regulation: 20% reduction in mark-up over AC ^e	FDI-associated services productivity rises ^f
Real GDP ^g	1.4	19.5	-19.8	28.9	17.9
Real GNP ^h	-2.6	19.6	-29.3	27.1	20.0
Real exchange rate ⁱ	0.2	-5.6	2.5	-7.6	-5.4
Exports / GDP	-5.1	13.0	-14.2	22.3	6.3
Consumption / GDP	10.3	4.6	21.8	5.0	5.4
Current account surplus / GDP	-83.0	99.8	-297.3	132.4	94.3
Real production wage	1.3	19.7	37.2	30.5	17.6
Real skilled wage	2.2	26.7	-0.7	42.8	22.7
Physical capital stock	1.1	15.7	45.2	26.1	13.3
Average real rate of return on capital ^j	-0.4	3.1	-71.1	2.7	5.4

a These simulations are all made in long run mode – endogenous capital stock with exogenous external rate of return and perfect mobility of physical capital internationally and of workers between agriculture and the other sectors. The number of oligopoly firms is fixed in each sector, so that pure profits are endogenous. The labour market closure fixes employment and allows wages to vary throughout.

b Privatisation returns corporate income after tax to households who save from it at the household rate. Corporate saving falls to a more “normal” level.

c Pricing collusion by oligopoly firms is reduced by surveillance, the effect of which is here simulated by a fall in conjectural variations.

d Sub-dividing state owned firms is represented by increased firm numbers, applied to the heavy manufacturing and service industries. This triples the overall burden of firm-specific fixed costs in these industries.

e The allowable mark-up over average cost is reduced by a fifth in all sectors as a consequence of tighter regulation.

f Here FDI in all service industries is assumed to yield a rise in total factor productivity of 5% in those industries.

g As modelled, GDP is measured against (fixed price) imports. Its value is here deflated by a GDP price index.

h GNP is here deflated by a consumer price index, which rises substantially relative to the GDP price with the tax increase.

i The real exchange rate is here defined as the ratio of the cost of the home relative to the foreign production bundle. With foreign prices fixed it changes with the home GDP price.

j This is capital income gross of pure profits, taxes and depreciation.

Source: Simulations of the model described in the text.

Table 8: Simulated Changes Due to Combined Positive Reforms^a

Per cent changes	Combined positive reforms ^b	Combined positive reforms with 30% lower household saving rate ^c
Real GDP ^d	62.2	63.4
Real GNP ^e	52.5	47.9
Real exchange rate ^f	-12.1	-11.4
Exports / GDP	33.0	25.0
Investment / GDP	-42.1	-48.1
Consumption / GDP	16.4	29.9
Current account surplus / GDP	117.8	10.3
Production employment	-3.2	-3.2
Professional employment	30.0	30.0
Real production wage	70.1	71.0
Real skilled wage	44.2	46.2
Physical capital stock	56.9	58.1
Average real rate of return on capital ^g	5.2	4.0

a These simulations are all made in long run mode – endogenous capital stock with exogenous external rate of return and perfect mobility of physical capital internationally and of workers between agriculture and the other sectors. The number of oligopoly firms is fixed in each sector, so that pure profits are endogenous. The labour market closure maintains employment as exogenous and allows wages to vary throughout.

b This simulation combines all the growth shocks from the skill twist of Table 6 through the industrial reforms of Table 7. The shocks excluded are those to government size in Table 6 and contractionary fragmentation in Table 7.

c Here the combined growth generating reforms are combined with a decline in the household saving rate by 30%, reflecting the likelihood that this will be a response by households to ageing, combined with increased wealth and institutional reforms.

d As modelled, GDP is measured against (fixed price) imports. Its value is here deflated by a GDP price index.

e GNP is here deflated by a consumer price index, which rises substantially relative to the GDP price with the introduction of a consumption tax rise.

f The real exchange rate is here defined as the ratio of the cost of the home relative to the foreign production bundle. With foreign prices fixed it changes with the home GDP price.

g This is capital income gross of pure profits, taxes and depreciation.

Source: Simulations of the model described in the text.

Table 9: Combined Growth and Low-Saving Structure Compared with the 2005 Baseline^a

Per cent shares	2005 base data	2005 base + combined positive reforms with 30% lower household saving rate
Consumption / GDP	41.3	53.7
Household saving / GDP	24.9	19.1
Corporate saving / GDP	16.6	5.6
Total domestic saving / GDP	40.3	23.9
Investment / GDP	35.1	18.2
Current account surplus / GDP	7.2	7.9
Exports / GDP	39.1	48.9
Imports / consumption expenditure	30.4	36.2
Imports / domestic absorption ^b	33.3	41.5
Share of profits repatriated abroad	26.1	24.2
Share of foreign owned capital	29.3	32.9

a The first column draws on the database for 2005 while the second indicates the structure of the economy following the combined positive growth shocks along with reduced household saving.

b Domestic absorption, or gross national expenditure, is expenditure on all goods and services irrespective of the country of origin ($C+I+G$).

Source: 2005 database and simulations of the model described in the text.

Table 10: Changes in Industry Structure following Growth Shocks^a

	Value added share		Export value share	
	2005 base	After growth shocks	2005 base	After growth shocks
Agriculture	17.1	12.4	2.0	0.0
Metals, Minerals	10.2	11.7	7.6	14.4
Coal	0.6	0.6	0.8	0.2
Petroleum	2.7	4.4	1.1	2.1
Processed agriculture	5.0	4.4	6.7	1.8
Electronics	2.9	2.9	18.3	14.5
Motor vehicles	1.5	2.7	2.3	17.4
Chemicals	4.0	4.5	6.5	9.5
Textiles	8.3	4.8	23.8	6.4
Other manufacturing	9.3	10.0	24.8	22.5
Electricity	1.9	2.1	0.1	0.4
Gas manufacturing & distn	0.1	0.1	0.0	0.0
Telecommunications	2.1	3.1	0.1	0.4
Finance	2.4	3.6	0.3	0.5
Transport	4.6	6.5	1.6	5.7
Construction	8.1	5.1	0.2	0.4
Other Services	19.1	21.2	3.7	3.9

a In each case, the first column draws on the database for 2005 while the second indicates the structure of the economy following the combined positive growth shocks along with reduced household saving.

Source: Simulations of the model described in the text.