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** Appendices are available on request from the author at rod.tyers@anu.edu.au

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Abstract

China's industrial reforms have left many key industries dominated by few, often state owned, firms. Until recently, these firms were not required to pay dividends to the state and the post-2000 surge in growth made them very profitable, with their economic profits adding corporate saving amounting to a fifth of GDP. This bolstered China's overall saving-investment gap and hence its controversial current account surplus. In other countries, oligopolistic industries tend to be taxed more heavily and they are commonly subjected to price regulation. This study offers an economy-wide analysis of approaches to oligopoly rents in China. The results suggest that, while policy changes targeting national saving, including increased corporate taxation, expansionary fiscal policy and SOE privatisation all help to control the external imbalance, they tend also to turn demand inward, inducing higher oligopoly rents and slower growth. Competition policy, embodying both price cap regulation and free entry, proves more effective both in controlling the external imbalance and in fostering continued growth.

1 Introduction

In their analysis of the role of total factor productivity in explaining extraordinary growth rates in East Asia, Fernald and Neiman (2006) find that gaps between primal and dual productivity estimates suggest that significant contributors to the growth have been oligopoly rents accruing to "favoured firms". During the rapid expansion phases of the economies of Singapore, Taiwan, Korea and Hong Kong, these rents are seen as having concentrated income growth, thereby maintaining high saving rates and investment levels. This confluence of growth with oligopoly rents is also recognised by the more generic work of Aghion and Griffith (2005).¹ That such rents have also been present during China's recent growth surge is suggested by the study of profitability of private and state-owned firms by Lu et al. (2008). And with this increased profitability have come very large increases in corporate saving, primarily by state-owned enterprises (SOEs). On the strength primarily of these increases, China's gross national savings rose by 2007 to absorb more than half of its GDP, exceeding investment and providing the underlying cause of its controversial current account surplus.²

The "growing pains" that have been associated with China's high and rising gross saving rate range from its declining consumption share of GDP and hence the unequal sharing

¹ The principal concern of Aghion and Griffiths (2005), however, is the relationship between technical change, or innovation, and imperfect competition. They concede that in the phase of development that China might be thought of as emulating, raw factor accumulation is the core driver of growth. Nonetheless, China's sectoral total factor productivity growth rates appear to have been high (see Tyers et al. 2008).

² See Eichengreen (2006) and, for explicit emphasis on China's imbalance, Kuijs (2006).

of the fruits of its growth³ through protectionist pressures abroad in response to its current account surplus.⁴ Given the perceived need to retain outward capital controls,⁵ the surplus of saving over investment has required the accumulation of massive official foreign reserves. Sterilisation requirements have both created a currency mismatch on the balance sheet of the Peoples Bank of China (PBC) and, given the extraordinary sums involved, made more difficult the sterilisation needed for the control of China's monetary base and hence its price level.⁶

Of course, China's household saving rate is also high by international standards. Permanent income stories include that urban households might have underestimated the post-2000 changes in their permanent incomes and so saved excessively. Alternatively, and prophetically, such high growth might have been considered unlikely in future and so households were smoothing consumption forward. Life-cycle saving stories, on the other hand, rely on China's low fertility rates to precipitate rises in aged dependency and hence suggest a falling household saving rate. The empirical work by Kraay (2000), while it clearly stratifies saving rates by income level, offers no conclusive evidence in support of either hypothesis. Modigliani and Cao (2004), on the other hand, find evidence in support of both. They identify a strong relationship between saving rates and deviations from trend income, lending support to the permanent income hypothesis. Horioka and Wan (2007) use more recent data and account for the influence of real interest rates. Their results offer mixed support for both hypotheses though they give comparative emphasis to dynamic persistence in saving behaviour, suggesting the likelihood that China's household saving rate will remain high and stable for some time. Thus, while further ageing and the evolution of China's health and retirement insurance systems can be expected to influence the household saving rate in the long run, in the meantime it is likely to be impervious to macroeconomic policy. The most tractable component of China's total saving behaviour in the short run is therefore saving from SOE profits, which added as much as 20 per cent of GDP to national savings in 2005.⁷

Even though the total saving rate might temporarily be reduced by the surge in government spending currently under consideration in China, the structural determinants of excess saving there suggest that a lasting solution cannot be found in the macroeconomic

³ From an expanding literature on China's growing inequality and its implications, Xiao (2006) and Lin (2008) are recent examples.

⁴ See Woo (2006) and Woo and Xiao (2007).

⁵ See Ma and McCauley (2007).

⁶ See Pettis (2008).

⁷ For a review of China's corporate profitability see Lu et al. (2008). The issue of SOE dividends is raised by Kuijs et al (2005) and, in China's policy debates, by the PBC governor (Zhou 2005). See also China Economic Review (2007), Walter and Howie (2006) for insight into China's "unseen" assets.

policy armoury.⁸ The underlying sources of the high savings will need to be addressed eventually via microeconomic policy reforms. While these will include policies to reduce households' incentives to save, further industrial reforms would also help by reducing corporate savings. Such reforms might use taxation or further privatisation to redirect oligopoly rents to household owners and, therefore, to offer households the opportunity to raise consumption. Since large oligopoly rents appear to be the problem, however, price cap regulation and anti-trust policies suggest themselves immediately as first best industrial reforms to redistribute income to households.

The approach adopted in this paper differs from those of previous related studies in that it employs a model that takes explicit account of oligopoly behaviour.⁹ To this model we have added a complete taxation system, household saving and investment behaviour and industry-specific corporate saving, all on an 18 industry database designed to represent China's 2005 economy. This model makes it possible to examine the effects of better taxation of state owned enterprise profits and the implementation of price regulation and anti-trust policies. Not only can we simulate the effects of these policies on overall economic performance but we can also look at their implications for gross saving, the current account surplus, the rate of reserve accumulation and the underlying determinants of China's current inflation. Indeed, our results suggest that while changes to corporate taxation can reduce excess saving, redistribute income and moderate the current account surplus, privatising or regulating pricing in oligopolistic industries would dramatically improve income distribution while at the same time eliminating China's current account surplus and fostering further growth.

The following section offers a brief review of the evidence on China's high total saving rates and their dependence on rates of corporate saving and capital income taxation. Section 3 gives a short description of the economy-wide model used.¹⁰ The estimated effects on economic performance and the current account surplus of policies that primarily affect national saving are discussed in Section 4 and those of policies directed at reducing oligopoly rents are presented in Section 5. Conclusions are offered in Section 6.

2. Excess Saving and its Determinants

Mainland China's extraordinary growth in the mid-1990s and since 2000 is clear from the comparison with Korean and Taiwanese growth in Figure 1. In a country that is so large

⁸ For an application of the approach adopted in this paper to China's fiscal expansion, see Tyers and Huang (2009).

⁹ The model is a distant descendant of that by Harris (1984).

¹⁰ Further analytical details are in appendices available separately from the authors.

and growing so quickly, “growing pains” are only to be expected and should not detract from the success of China’s policy regimes to date. Nonetheless, problems associated with lagging rural incomes and rural services, retirement and other welfare funding and the immaturity of its systems of industrial and financial regulation appeared to become more acute in the years leading up to the global economic slowdown. One clear indicator noted by Azziz and Cui (2007), Lin (2008) and others was the declining trend in the consumption share of GDP, indicated in Figure 2. This and the other growing pains are associated in some way with excess saving. It is therefore possible that they would be redressed, at least to some extent, via a focus on the saving problem.

The scale of China’s excess saving is indicated in Figure 3, which shows that more than half of GDP is saved and that there has been an expanding gap between domestic saving and investment expenditure. Some light is shed on the sources of the excess saving by the consumption survey evidence shown in Figure 4, which shows that China’s households save less than a third of their disposable income. The national accounts “flow of funds” data, illustrated in Figure 5, indicate that corporate saving became more significant than household saving after 2004.¹¹ That the contribution of corporate saving is extraordinary is suggested by a comparison with the contributions to total saving in Taiwan, shown in Figure 6. There, corporate saving has made up a more usual five per cent of the total.

Saving from corporate profits

China’s growth surge after 2000 was extremely profitable for “traditional” industries like mining, petroleum refining and steel manufacture (Lu et al. 2008). Service industries like transport and communications have also proved very profitable in this period. What these industries have in common is that they are all dominated by state owned enterprises. Industries whose expansion has been primarily in the private sector, such as textiles, footwear and processed agricultural products have, by contrast, yielded little more than what for them, given comparatively high costs of credit, are market rates of return.

That China’s corporate saving comprises primarily the pure profits of successful state-owned firms is evident, first, from the dominance of those firms in total profits and, second, from the omission of those firms, through 2007, from the requirement to pay dividends to their

¹¹ As noted by by Kuijs and He (2007), the upturn in corporate saving in 2004 emerged from data published following the 2005 census. This suggests the trend indicated in the figure may be suspect but the 2004 and 2005 shares are relatively robust.

state owners (Kuijs et al. 2005).¹² The latter omission was corrected in 2008 when dividend requirements were added to corporate taxes. From gross profits, SOEs are now expected to pay to the government 10% (petrochemicals, coal, electricity and telecommunications) or 5% (steel, transport, electronics and retail trade). Defence and R&D industries will continue to be forgiven for at least another several years.¹³ Because SOE corporate savings bypass most of the Chinese households that are their ultimate owners, they add to the national saving rate. If more of this corporate income was paid to households, as it tends to be in the industrialised West, the national saving rate would fall from around 50 per cent toward that of households, at around 30 per cent. Superficially, this suggests a possible reversal of China's controversial current account surplus.

Corporate Saving, Corporate Taxation and the Current Account

That the current account surplus is the same, by definition, as the surplus of domestic saving over investment is clear from the standard identities.¹⁴ From these it follows that

$$(1) \quad X - M + N = S_H + S_C + (T - G) - I = S_H + S_C + S_G - I = S_D - I ,$$

where N is net factor income from abroad, S_H and S_C are the savings of households and corporations, S_G is government saving and S_D is total domestic saving. The LHS of (1) is the current account surplus and the RHS is the capital account deficit.¹⁵

For a preliminary sense of the dependence of the current account on saving and tax rates, we begin with the assumption (to be relaxed later) that investment and the household private saving rate are exogenous to these levels.¹⁶ Then, from (1), there is a unique and positive interdependence between total domestic saving, S_D , and the current account surplus.¹⁷ Important questions, then, are the effects on S_D of reduced corporate profits, a reduced corporate saving rate (the distribution of a larger share of profits to household owners), or of a rise in the corporate or capital income taxation rate.

¹² This is notwithstanding the payment of dividends to private holders of that proportion of these firms' equity listed on Chinese exchanges (about a third, on average).

¹³ See Chinastakes.com, (December, 2007).

¹⁴ Crudely, expenditure on GDP is $Y=C+I+G+X-M$, GNP is $Y+N$, where N is net factor income from abroad and the disposal of GNP is $Y+N=C+T+S$.

¹⁵ Here net outflows associated with asset acquisition are referred to as "capital account" net outflows. This is intended to encompass the capital, financial and official components of the balance of payments.

¹⁶ Investment depends on expected future rates of return and current financing costs in China compared with other regions and so its exogeneity to saving rates is credible, though exogeneity to capital income tax rates is a greater stretch. The exogeneity of saving rates implies durable structural determinants associated with financial immaturity – costly corporate debt and retirement and health insurance.

¹⁷ Flexible prices are implied, so that changes to S_D bring about adjustments in the trade surplus because they alter domestic aggregate demand and the underlying real exchange rate.

Assume further that the economy has two primary factors, where labour and capital incomes carry flat rates of income tax, τ_L and τ_K , that the before-tax factor rewards, W and R are negligibly affected by saving or tax changes, that indirect taxes and subsidies net out at zero so that GDP is merely factor cost, that government expenditure, G , is net of transfers and that the government maintains fiscal balance ($G=T$).¹⁸ Then the level of GDP is:

$Y = WL + RK$ and corporate and household disposable incomes are $Y_{DC} = RK(1 - \tau_K)$ and $Y_{DH} = WL(1 - \tau_L) + Y_{DC}(1 - s_C)$, where s_C is the corporate saving rate. Total domestic saving is then the sum of saving by households and corporations, $S_C = s_C RK(1 - \tau_K)$ and $S_H = s_H Y_{DH}$.

The dependency of S_D on the saving and taxation rates is then:

$$(2) \quad \frac{\partial S_D}{\partial s_H} = Y_{DH}, \quad \frac{\partial S_D}{\partial s_C} = RK(1 - \tau_K)(1 - s_H), \quad \frac{\partial S_D}{\partial \tau_L} = -s_H WL, \quad \frac{\partial S_D}{\partial \tau_K} = -s_H(1 - s_C)RK.$$

The partial to the corporate saving rate is intuitive as follows. If it rises, say by enough to increase corporate saving by one Yuan, this is the sum by which household disposable income is reduced. The associated reduction in household saving is $s_H < 1$ Yuan, hence the net positive effect of corporate saving on total saving. Turned around, this partial indicates that overall domestic saving is reduced unambiguously by either a decline in corporate profits or in the corporate saving rate.

The partials to the tax rates are negative because tax rises are transfers to a non-saving government. Now consider the effect of a rise in corporate taxation as providing the opportunity to redistribute income to (principally labour income dependent) households. The government fixes its revenue and expenditure ($\bar{G} = \bar{T}$) by reducing (endogenising) the labour income tax rate. In this case the partial derivative of domestic saving with respect to the capital income tax rate is:

$$(3) \quad \frac{\partial S_D}{\partial \tau_K} = -s_C(1 - s_H)RK.$$

The net reduction in saving occurs despite a one-for-one transfer from corporate disposable income to household disposable income, because unsaved corporate disposable income accrues to households. Again, imagine that the change in τ_K redistributes one Yuan from corporate disposable income to household disposable income. The corporate contribution to domestic saving is then reduced by s_C . The residual income after corporate saving that accrues to

¹⁸ These restrictive assumptions, too, are relaxed in applications of the model introduced in the next section.

households is reduced by $(1 - s_C)$, so that the net gain in household disposable income is $1 - (1 - s_C) = s_C$. The rise in household saving is then $s_H s_C$ and so the net change in S_D is $-s_C(1 - s_H)$. If the corporate saving rate were zero the tax transfer effect on domestic saving would also be zero. Thus, if the government is fiscally conservative, if it raises the capital income tax rate, caps revenue and redistributes, there is an unambiguous reduction in total domestic saving.¹⁹

In what follows we use a more complete model in which several of the crude assumptions of this illustration are relaxed. It allows, moreover, consideration not only of policies that change corporate saving and taxation but also that regulate the level of over-market profits and hence the capacity of corporations to save.

4. An Oligopoly Model of the Chinese Economy

We use a comparative static macroeconomic model of the Chinese economy 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.²⁰ 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.²¹ 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 at levels representing 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.²²

¹⁹ The redistribution need not take the form of reduced labour income taxation. It could, for example, be government funding for retirement and health insurance schemes.

²⁰ It is a distant descendant of that by Harris (1984), Gunasekera and Tyers (1990) and Tyers (2005), though it is generalised to include macroeconomic behaviour, as in Tyers and Huang (2009).

²¹ Income taxes are approximated by flat rates deduced as the quotient of revenue and the tax base in each case.

²² Hereafter the capital, financial and official sub-accounts of China’s balance of payments will be referred to as the “capital account”.

Model structure

The scope of the model is detailed in Table 1. 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 might be seen as indicating 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 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 primary factors or intermediate inputs.²³ 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.²⁴ 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 single household’s expenditure function. This formulation of the “ideal” 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 real GNP.²⁵

The quantity of domestically-owned physical capital is fixed, so that changes in the total capital stock affect the foreign ownership share and hence the level of income repatriated abroad. Several closures are used in the experiments to be presented. The first represents the short run: physical capital is fixed in supply and immobile between industries. Production

²³ 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).

²⁴ 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).

²⁵ 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.

labour is mobile between industries but at a fixed real (CPI-deflated) wage, so that employment is endogenous, and the remaining factors, while also mobile between industries, are fixed in endowment and flexibly priced. There is no entry or exit of firms but the magnitudes of pure profits earned are endogenous. A medium run closure is also defined which differs from this only in that the production real wage is flexible and production employment is fixed. Finally, a long run closure is employed in which physical capital is homogeneous and fully mobile between industries and internationally at a fixed external rate of return. All real unit factor rewards are flexible, with total supplies fixed, and there is free entry and exit of firms with exogenous rates of pure profit in each industry. Fiscal policy closures vary according to application. In most applications, consistent with China's heretofore fiscal conservatism, the base fiscal surplus is held constant so that changes in endogenous revenue lead to corresponding changes in government expenditure.

Macroeconomic behaviour

As befits a comparative static analysis, the macroeconomics embodied is elemental. The short run closure fixes productive capital use in all industries but allows investment that affects current aggregate demand and future output. Central is the open economy capital market which is built around the market clearing identity for domestic investment expenditure:

$$(4) \quad I^{EXP}(r^c, r) = S_D(Y_{DH}, \pi, G) + S_{NF}(r, r^*) - \Delta R(r, r^*),$$

where r is the home real financing rate (bond yield), 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 $S_H = s_H Y_{DH}$. China's extraordinarily high level of corporate saving, S_C , is assumed to stem only from pure profits, π , with a fixed saving rate applying to each industry:

$$(5) \quad S_C = \sum_i S_{Ci} = \sum_i s_{Ci} \pi_i.$$

The last two terms of (4) 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:

$$(6) \quad r_i^c = \frac{P_i^Y MP_i^K}{P^K} - \delta_i ,$$

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 . Investment expenditure then is determined by:

$$(7) \quad I^{EXP} = P^K I_0 \left(\frac{r^c}{r} \right)^{\varepsilon_V} .$$

This relationship constrains the investment response to a change in either the rate of return or the financing rate, offering a reduced form representation of either gestation costs or expectations over short run consequences of installation for the rate of return.

The home household saving rate from disposable income is fixed, in keeping with the comparative static nature of the analysis. Corporations are assumed to save a proportion of their economic profits that differs across industries but is exogenous in model experiments. Rates are calibrated to yield corporate savings volumes consistent with Chinese statistics. These savings are modelled as arising after corporate tax from economic profits and they go directly to the capital market and not to household or government owners.

In most modern macro models of open economies private financial flows are driven by exchange rate expectations. In China's case capital controls are tight and inflows mainly take the form of state-approved FDI. In our comparative static analysis 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.

$$(8) \quad S_{NF} = a_{SF} + b_{SF} (r - r^*) .$$

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 amounts to a tenth of GDP, be directed abroad by the PBC as official foreign reserves. This behaviour depends on a relationship that is linear, for the same reason as in (8):

$$(9) \quad \Delta R = a_{DR} - b_{DR} (r - r^*) ,$$

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.²⁶

The capital market clearing identity (4) then determines the home real interest rate and the magnitude of the capital account deficit ($\Delta R - S_{NF} = S_D - I$). This is equal in magnitude to the current account surplus $[X - M + N(r, r^*)]$ ²⁷. 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. Output is Cobb-Douglas in variable factors 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 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:

$$(10) \quad m_i = \frac{p_i}{v_i} = \frac{1}{1 + \frac{1}{\varepsilon_i}} \quad \forall i ,$$

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 , on the price of firm j :

²⁶ It is argued elsewhere (Tyers and Bain 2007, for example) that, given the commitment to outward capital controls and the high saving rate, the PBC has little residual discretion over annual increments to reserves. This is because there is no incentive for China's commercial banks to do other than relinquish unused foreign currency to the PBC. The scale of reserve accumulations are therefore not an instrument in the PBC's monetary policy. Yet, by soaking up domestic saving through the issue of "sterilisation bonds" the PBC's reserve accumulation has the effect of preventing downward pressure on that rate. Equation (9) is intended merely as a reduced form description of this process.

²⁷ As modelled, N comprises a fixed net private inflow of income from assets abroad and fixed aid to the government, less endogenous repatriated earnings from foreign-owned physical capital in China.

$$(11) \quad \mu_i = \frac{\partial p_{ij}}{\partial p_{ik}} .$$

These parameters are exogenous, reflecting industry-specific free-rider behaviour and 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 (11) is zero. When firms behave as a perfect cartel, it has the value unity. This parameter enters the analysis through the formulation of the varietal demand elasticity, ε_i

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. The five sources of demand for home produced products 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 (10), above, is a composite of the elasticities of all five sources of demand.²⁸

$$(12) \quad \varepsilon_i = s_i^F \varepsilon_i^F + s_i^V \varepsilon_i^V + s_i^I \varepsilon_i^I + s_i^X \varepsilon_i^X + s_i^G \varepsilon_i^G \quad \forall i$$

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.

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 the fixed cost burden carried by each industry and hence on firm numbers.

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

$$(13) \quad m_i^R = \frac{afc_i + v_i}{v_i} .$$

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

$$(14) \quad m_i^C = (\varphi_i - 1)m_i^R + (2 - \varphi_i)m_i \quad \forall i .$$

²⁸ These elasticities are lengthy expressions in the numbers of firms (varieties), elasticities of substitution, conjectural variations parameters and demand source shares. They are offered in detailed appendices available from the authors.

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 2001.²⁹ 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 2, which shows that China's measured GDP is dominated by agriculture, mining, metals, textiles, other manufacturing, transport and construction. The major contributors to exports are also those that export the largest shares of their output. They include processed agricultural products, electronics, textiles and "other manufactures". Table 3 confirms that the traded industries in general and the exporting 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 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.³⁰ It is also a starting point for calibrating industry competitive structure. Second, rough estimates of strategically interacting firm numbers in each industry and their corresponding conjectural variations parameters are required. There is considerable diversity of firm size and output in each industry and many firms supply intermediate inputs to other firms in the same

²⁹ Documentation on the GTAP 6 Data Package may be viewed at:

<<http://www.gtap.agecon.purdue.edu/databases/>>.

³⁰ 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 constructed to account for low borrowing rates for these SOE dominated sectors and hence low capital service costs. See appendices available from the authors.

classification. Prices of the products that emerge from a particular industry are therefore commonly determined by a small proportion of the firms within it. Again, official statistics provide the distribution of revenue and accounting profit by firm size and ownership structure, from which we deduce recurrent capital costs, and hence economic profits, along with crude estimates of both the effective number of firms and the conjectural variations parameters (propensity to collude in setting prices) for each industry.

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.³¹ Preliminary industry demand elasticities are then calculated for each industry for each source of demand (final, intermediate, investment, government and export) from estimates of effective firm numbers, conjectural variations parameters and elasticities of substitution. To obtain weighted average elasticities of demand facing each industry the initial demand shares are drawn from the database. Preliminary mark-up ratios are deduced from these, via (10). The initial equilibrium industry shares, elasticities and mark-up ratios for each industry are given in Table 4.³² 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 total revenue is deducted from the mark-up to arrive at fixed cost revenue shares.³³ Total recurrent fixed cost in each industry then follows. A measure of industry scale is then constructed for each industry as the ratio of base revenue and revenue at minimum efficient scale, which is defined as that level of output at which average fixed cost has fallen to five per cent of average variable cost (Harris and Cox 1983). The results are summarised in Table 5. 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.³⁴

³¹ Summaries of this literature are offered by Dimaranan and McDougall (2002) and at <http://www.gtap.purdue.edu/databases/>.

³² 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.

³³ 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.

³⁴ 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.

Importantly for the interpretation of later results, Table 4 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 least³⁵ and so where exports dominate demand firms face larger elasticities and charge smaller mark-ups.³⁶ 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. Also, from Table 5, fixed cost shares are largest in chemicals, utilities and transport services, due to fixed physical infrastructure and network maintenance costs. Also, plausibly, the industries closest to their minimum efficient scale are agriculture, processed agricultural products, electronics, textiles and “other services”.

5 Policies to Moderate the Saving Rate

One approach to China’s large current account surplus is to address its saving rate through policies directed at the proportions of household and corporate incomes that are set aside as saving.³⁷ Two such policies are investigated, neither of which directly affect competitive behaviour and the scale of pure profits but each alters the national saving rate. In this section these policies are the focus of comparative static simulation using the model of the Section 4.

Public SOE dividends:

Dividends paid to the state are equivalent to industry-specific increases in corporate tax rates. As shown in Section 2, so long as the government maintains a conservative fiscal stance and uses the new revenue to reduce labour income tax³⁸, these tax increases reduce the national saving rate. The increments required in 2008, which are imposed here as shocks to the model, are as indicated in Section 2: 10% for mining and minerals, coal, petroleum, chemicals, electricity, and telecommunications, 5% for electronics, motor vehicles and transport, 2% for other manufactures and 1% for other services. The closure adopted is for the short run: the real

³⁵ 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. These issues are addressed empirically by Harris and Cox (1983).

³⁶ Water is a mainly non-traded industry that appears to face an exceptionally high average elasticity of demand. In part this represents the homogeneity of the product, though it stems in the calibration from a low initial mark-up due to state regulations.

³⁷ The alternative of reduced government saving, or a fiscal expansion, is considered separately by Tyers and Huang (2009).

³⁸ The labour income tax reduction is shorthand for transfers to households that could take the form of retirement or health insurance subsidies.

production wage is fixed, production employment is flexible and physical capital is immobile sectorally and internationally, so that rates of return vary across industries. The number of home firms (product varieties) is fixed in each industry while pure profits in each can vary. The results are summarised in Table 6.

As might be expected in the presence of distorting oligopoly rents, the use of the tax system to transfer income from corporations to labour-supplying households is marginally welfare improving. It certainly raises consumption expenditure and, by reducing national saving, offers a small reduction China's current account surplus. Yet, taken alone, the changes do not foster increased economic output or employment. The shifting of demand inward causes a slight real appreciation which reduces exports, and there are marginal contractions in GDP, investment and production employment.

In keeping with the slight real appreciation and the large share of non-traded services in household demand, the tendency is for traded goods industries to contract and services to expand. As is evident from Table 7, exceptions to this are agricultural products, which remain important in the household budget, and petroleum products, which are important intermediates in some services. Exceptions also include transport and construction, which are linked to China's contracting manufacturing base and, in the case of construction, to reduced investment. These sectoral responses stem from changes in strategic behaviour by oligopolistic firms. Transport, for example, has (for a service) and unusually high export share (Table 4). When this declines in favour of less elastic final demand, its mark-up rises as does its pure profit and this contributes to the contraction in its output.

Overall, the imposition of public dividend requirements on SOEs is shown to have only marginally healthy economic effects. It does not foster GDP growth. Nor does it significantly reduce the current account surplus or benefit labour supplying households.

Privatisation:

Following privatisation of the remaining SOEs, and with the continued deepening of China's financial markets, it might be expected that most accounting profit, after corporate tax, would be returned to private owners (households), whose saving rates would then be the primary determinant of national saving. Assuming that the household saving rate remains constant in the face of this rise in household disposable income, this would reduce national saving unambiguously, as shown in Section 2.³⁹ In this analysis, therefore, the shock is simply

³⁹ This saving reduction would be moderated, however, were the sudden rise in household disposable income to cause the household saving rate to increase in the short run. Thanks are due to Jenny Corbett for suggesting this.

a reduction to the corporate saving rate until corporate saving contributes only five per cent of total saving. A short run closure is again assumed: a fixed real production wage with flexible production employment, no sectoral or international mobility of physical capital and fixed numbers of home firms (product varieties) with variable pure profits.⁴⁰ The economy-wide results are summarised in Table 6.

The loss of most corporate saving is sufficiently large to almost eliminate its current account surplus. Consumption expenditure would be larger by a fifth and national saving smaller by a sixth. Again, exports would be smaller and the broad focus of Chinese production would be more inward than before. All this appears to comply with external pressures on Chinese policy makers, yet the effects on other measures of economic performance are not so positive. GDP is hardly different, home financial market tightening due to the reduced national saving contracts investment and there is no rise in either production employment or the skilled wage. This policy change would certainly not be a growth stimulus.

The sectoral details shown in Table 8 indicate the expected response to the real appreciation – most tradable industries contract in output and employment while most services expand. The exceptions are again agricultural products, the demand for which is boosted by the higher consumption expenditure and petroleum products which are key intermediate inputs to expanding services. Transport and construction contract, though this is due in part to their links as intermediate inputs to export oriented manufacturing on the one hand and investment on the other. As before, however, these patterns tend to be exacerbated by changes in strategic pricing by oligopoly firms. As with the other policies to address excess saving, the cut in corporate and national saving turns demand inward where elasticities are lower. This raises mark-ups and producer prices, particularly in metals, coal, motor vehicles, telecommunications and transport; with the largest such change once again in transport.

6 Policies to Reduce Oligopoly Rents

Since China's very high level of corporate saving is associated with the profitability of its oligopolistic and SOE dominated industries, an alternative approach to resolving the external imbalance would be to directly constrain the oligopoly pricing that yields these profits.

⁴⁰ Thus, privatisation is here assumed not to accompany mergers, acquisitions or new entries.

This can be achieved both by price regulation, which forces oligopoly firms to set prices nearer to their average costs, and anti-trust policy, which can take the form of splitting monopolies or simply relaxing barriers to entry. Here these two approaches are considered in turn.

Price regulation

Price cap regulation is now common in the privatised services of most industrialised economies.⁴¹ Here the extreme assumption is made that it is possible, without social cost, to compel firms to set prices equal to their average costs. For this purpose strategic behaviour in price setting is switched off in the model, to be replaced by equations (13) and (14). This eliminates the pure profits that are shown in Table 5 to be particularly large in metals, petroleum, telecommunications, finance and transport. It therefore requires a very large departure from the 2005 initial equilibrium.⁴² The closure chosen might be considered “medium run” in that the market for production labour is now flexible, with production employment fixed and the real production wage endogenous, while physical capital remains fixed and immobile sectorally and internationally. The government maintains a fixed fiscal surplus. The economy-wide results are summarised in Table 9.

Most striking is the fall in the prices of many of China’s intermediate products and services and hence the reduction in costs throughout the economy, relative to its foreign competition. There is, therefore, a large real depreciation and a considerable expansion in exports and GDP. Moreover, real production wage is larger by two thirds and the real skilled wage is more than doubled. The external imbalance is reversed, from large current account surplus to large deficit, though this extraordinary change occurs primarily because of the assumed immobility and rigid allocation of physical capital. Capital returns are larger by a fifth (notwithstanding the loss of pure profits) and this stimulates investment to a more than realistic degree, compounding the shift of the current account toward deficit. Indeed, if this rise in (annual) investment were halved, as it might be were a slightly longer run considered and capital mobility allowed, then the external imbalance would be just eliminated.⁴³

The sectoral effects of price cap regulation are presented in Table 12. There is a very large redistribution of the production labour force out of agriculture, processed agricultural products and textiles and into industries that benefit most from cost reductions. These are less

⁴¹ See OECD (1997), Bradley and Price 1988 and Brennan 1989.

⁴² The implications of this are that the accuracy of the solution algorithm is strained somewhat, though at least two-figure accuracy is achieved throughout, and that the relevance of the behavioural assumptions underlying the model might come into question in the search for so distant a new general equilibrium.

⁴³ At roughly 45% of GDP already, the scope for yet larger annual commitments to investment in China must be limited by absorption capacity and the availability of viable projects (Tyers and Bain 2008).

labour-intensive industries and they include metals, motor vehicles, other manufactures, finance and transport. As Table 9 showed, price cap regulation brings large increases in real wages and so those industries with highest labour intensity (Table 3) tend to contract both their levels of employment and their output. Even considering the higher unit factor rewards, many industries enjoy reductions in unit fixed costs as production runs expand.⁴⁴ These include metals, petroleum, motor vehicles, chemicals, other manufactures, transport and construction. Finally, the composition of exports changes with increased concentration in metals and motor vehicles with an expanded external role for the Chinese transport industry.

In aggregate, then, even though this policy regime retains some potentially distorting oligopolies (albeit regulated to eliminate these distortions), it is attractive in that it is clearly growth sustaining, it restores the prominence of consumption in that growth and it eliminates the external imbalance. Moreover, it moves the structure of the economy away from its prior dependence on inexpensive production labour toward a more mature phase in which China's services industries are larger and more competitive and the composition of its trade is more similar to that of most industrialised economies.

Anti-trust policies

In this experiment a long run closure is selected, in which labour markets are flexible and physical capital is mobile internationally and intersectorally. Free entry and exit of firms (varieties) are allowed, sufficient to reduce the magnitudes of pure profit levels in each industry by a third.⁴⁵ For those industries making pure losses in the 2005 base equilibrium, including processed agricultural products and the utilities (electricity, water and gas), this implies the feasibility of exits sufficient to reduce these pure losses by a third. The economy-wide results are summarised in Table 9.

Because corporate saving is derived in the model from pure profits this shock also reduces corporate saving by a third. This is the principal factor in a reduction of national saving by five percent of base GDP. Yet this reduces the current account surplus by only a fifth because the long run equilibrium level of investment is lower than that in 2005. This, in turn, is due to the lower but more "normal" capital returns earned with reduced oligopoly rents and a capital stock that eventually becomes larger by a fifth. Since the increment to the capital

⁴⁴ The scale of output per firm changes by the same proportion as total industry output, since the number of firms is constant in this experiment.

⁴⁵ Because pure profits in the 2005 equilibrium are so large, particularly in the services industries, the number of new entrants required to eliminate them is many hundreds of per cent in some industries. The new free entry equilibrium with zero pure profits therefore lies beyond credible range.

stock is foreign-owned there is more outflow of factor income on the current account. And, as in the case of price cap regulation, there are reduced home costs and so the real exchange rate depreciates. In one consequence is an offsetting increase in the trade surplus, even though net factor income rises cause the current account surplus to contract.

Real wages and resource rents are raised substantially yet real GNP falls and the rise in real GDP is modest compared with the effect of price cap regulation. So why are aggregate the effects of eliminating a third of pure profits so modest? The answer lies in the effects of free entry. The number of firms rises nationally by more than a quarter and with each new establishment comes additional fixed costs. The effects of this are evident from the sectoral effects of the shock, shown in Table 11. Output is larger in most industries but by proportions that are restrained compared with the price cap results of Table 10, and this is despite expansions in total capital use. The additional output stems primarily from new entries, which are very large in metals, petroleum, electronics, other manufactures, telecommunications, finance, transport and “other services”. Indeed, by contrast with the price cap results, the scale of output per firm declines in almost all these industries and, in association, the burden of fixed cost (as measured by the results for unit fixed cost supplied in the table) rises as do home producer prices.⁴⁶

The general pattern of labour reallocation is similar to the price cap results – contractions in employment in the labour intensive industries (agriculture, processed agricultural products and textiles) with expansions in motor vehicles, “other manufactures” finance and transport. Associated changes to the composition of exports are also similar, with refined petroleum, metals, motor vehicles and chemicals contributing the largest expansions in the proportions of their output that is exported. Overall, notwithstanding higher fixed costs, the option of free entry to the SOE-dominated industries would appear economically productive for the government in that it would increase GDP, moderate the external imbalance and substantially raise real wage income.

7 Conclusions

China’s controversial current account surplus is linked directly to its retention of half of its GDP as savings. The primary cause of this is not exchange rate misalignment, nor is it new risks facing households in relation to health, education and retirement costs, even though these

⁴⁶ Of course, for those industries with negative pure profits in the 2005 base equilibrium (processed agricultural products and the utilities), there are partially offsetting contractions in firm numbers, unit fixed costs and producer prices.

appear to have contributed to higher household saving rates. A full 40 per cent of the national saving is corporate and it appears to emerge from industries still dominated by SOEs, which profited greatly from the post-2000 surge in China's overall growth. These firms have enjoyed protection against domestic competition, infusions of cost-constraining foreign technology through various forms of state-sanctioned and assisted FDI and comparatively low corporate tax burdens. In particular, while they have been permitted to issue private equity and therefore pay dividends to private owners, they remain majority state-owned and, at least until 2008, they paid no dividends to the state.

Since households receive capital income after corporate tax and corporate saving, if the household saving rate from this income is constant, a decline in the corporate saving must reduce national saving. Policies that reduce corporate saving therefore address the problem of the excessive current account surplus. These include increased corporate taxation, or the payment of state dividends by profitable SOEs, or further privatisation of SOEs, so that dividends are paid directly to households which can divide them between household saving and consumption. Such policies are directed to the scale and distribution of China's saving and they do not address oligopoly rents as the source of corporate saving, without which the current account surplus would be non-existent. The oligopoly rents are more readily addressed through competition policies, which include monitoring and price cap regulation on the one hand and the removal of barriers to private entry on the other. Both types of policies are here analysed using a model of the Chinese economy that incorporates full oligopoly behaviour.

Policies directed at savings, including SOE dividends and privatisation, all have the effect of redirecting demand facing Chinese firms inward, away from exports. While these policies all control the external imbalance the results indicate that they would not foster China's continued growth. A key reason for this is that all forms of domestic demand are less elastic than export demand. In the absence of sound competition policy, mark-ups therefore rise and oligopoly rents increase, appreciating China's real exchange rate and raising costs in its low-margin labour-intensive export sectors. These policies would not significantly increase real wage income and they would retard investment.

Turning to competition policies, the mere imposition of price caps to eliminate pure profits is shown to have a transforming effect on the Chinese economy. It would remove the external imbalance, raise GDP and exports by 40 per cent and consumption by two thirds. The associated improvement in aggregate welfare is suggested by a rise in CPI deflated GNP by a third and the real production wage by two thirds. Of course no competition policy has this level of effectiveness. Yet, so long as China's remaining SOEs are to continue to be protected,

these results strongly support tighter regulation. Of course, if free entry is to be allowed into industries currently dominated by SOEs, similar improvements in economic performance might still be expected. Simulation results confirm that this is the case, particularly in terms of real wage growth, with the caveat that new entries bring fixed costs and that these constrain the magnitude of the associated aggregate gains.

Competition policies that will address the oligopoly rents directly therefore appear to offer more attractive prospects than policies to redistribute corporate saving. Moreover, even if existing oligopoly rents are not to be addressed immediately by government policy, since the pattern of development in other regions suggests that domestic demand must eventually be more prominent in China, the implications of this more inelastic demand for future oligopoly pricing suggest an increasing role for competition policy in any case.

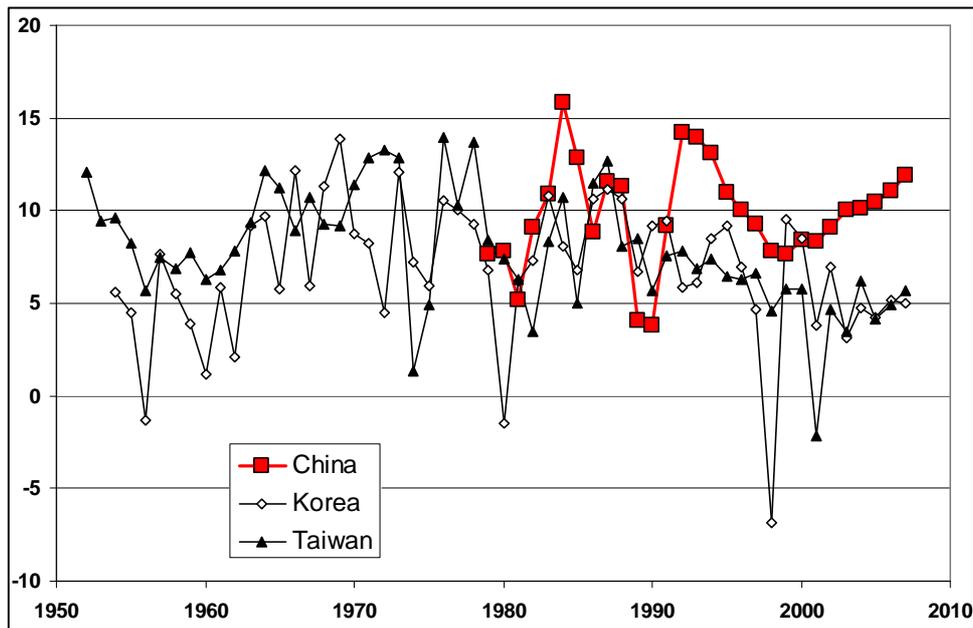
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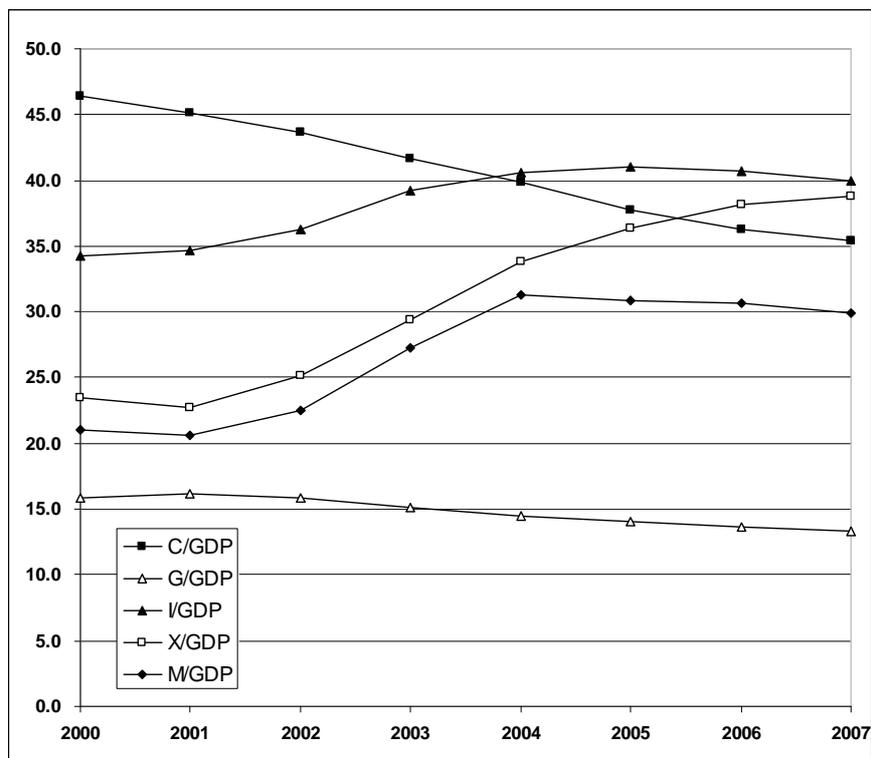
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Figure 1: GDP Growth Rates in Korea, Taiwan and Mainland China



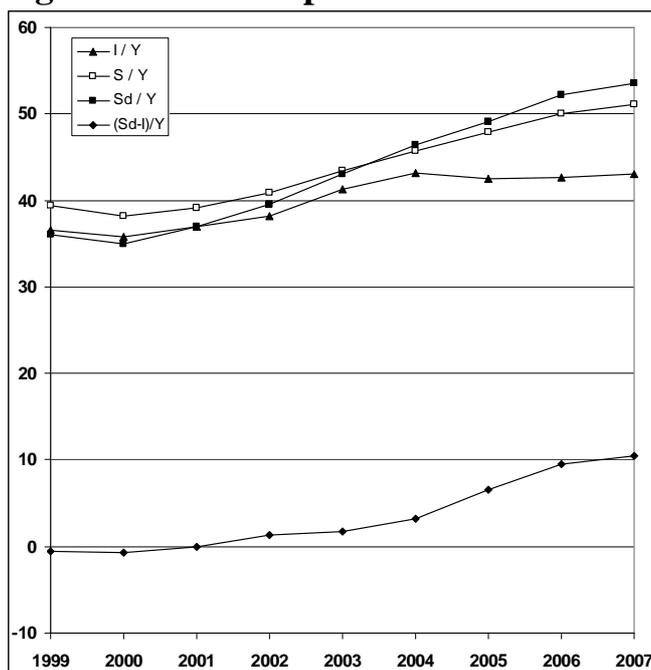
Source: For Mainland China and the Republic of Korea the data is from International Financial Statistics, www.imf.org. For Taiwan it is from the Taiwan Statistical Yearbook of 2008, CEPD, Taiwan.

Figure 2: Trends in the Structure of Chinese GDP



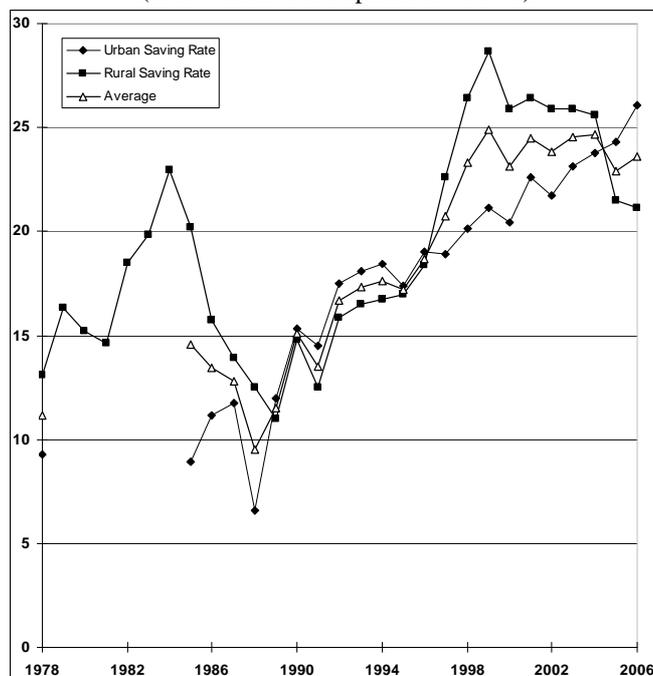
Source: United Nations Statistics Division, <http://unstats.un.org/unsd/snaama/>.

Figure 3: The Saving-Investment Gap from the National Accounts (% GDP)



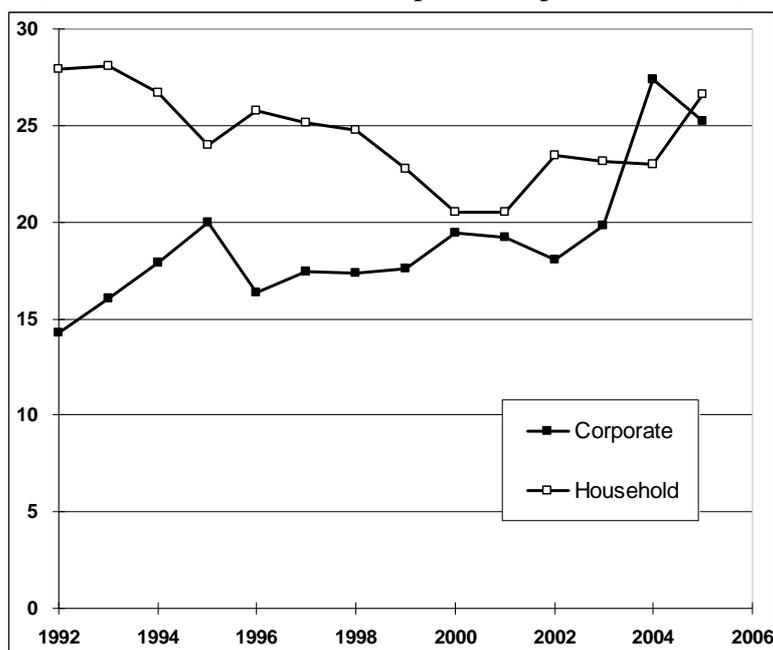
Source: GDP is from the Chinese Statistical Yearbook 2007 except that values for 2006 and 2007 are revised data from the National Bureau of Statistics of China, published April 2007. Final consumption expenditure in 2007 is estimated using the growth rate of total retail sales of consumer goods in 2007 and final consumption expenditure in 2006. Investment is Gross Capital Formation and the value for 2007 is estimated with the growth rate of Total Investment in Fixed Assets in 2007 and gross capital formation in 2006. Net exports in 2007 is estimated from the growth rate of net exports of goods in 2007 and net export of goods and services in 2006. Government consumption expenditure in 2007 is estimated from final consumption expenditure in 2007 and the share of government in total consumption expenditure in 2006.

Figure 4: Household Saving Rate from Consumption Survey Data
(% of household disposable income)



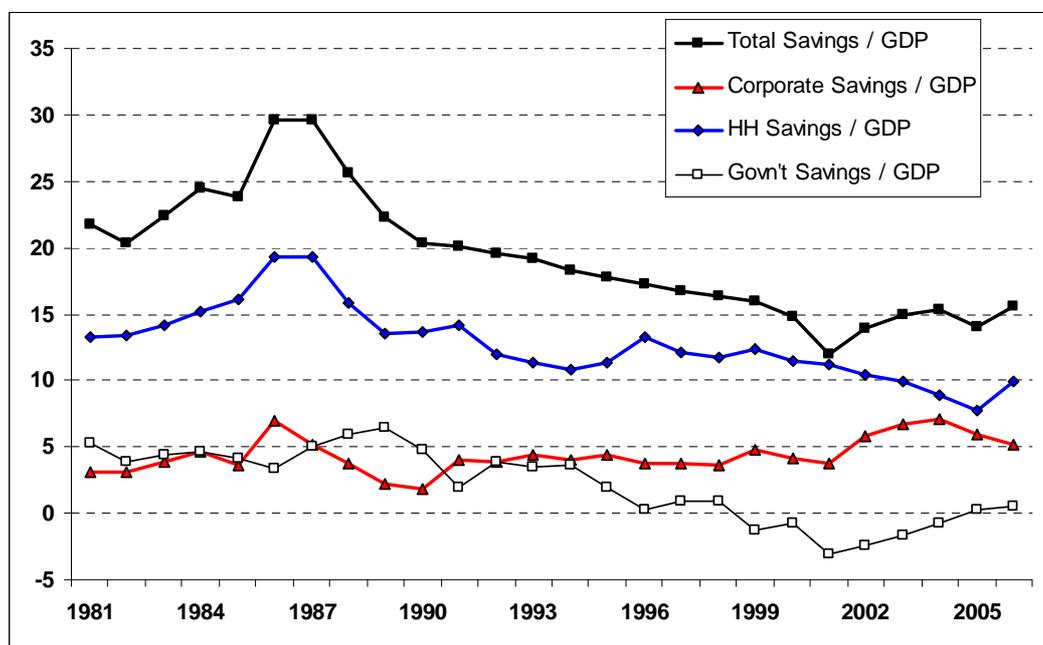
Source: The data are from the China Statistical Yearbook. Urban income is per capital annual disposable income of urban households. Urban consumption is per capital annual consumption expenditure of urban households. Correspondingly for rural households.

Figure 5: Household and Corporate Saving from disposable income
 (% of total household and corporate disposable income)



Source: National Accounts Flow of Funds tables in the *China Statistical Yearbook*, 1994-2007. Note that, at the time of writing, the data had not been updated for years beyond 2005.

Figure 6: Components of Total Saving in Taiwan



Source: Directorate-General of Budget, Accounting and Statistics, Statistical Abstract of National Income, Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C.

Table 1: Model structure

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 Water 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 2: Economic Structure in the Model Database

	Value added share of GDP	Share of total exports	Export share of output	Share of total imports
Agriculture	12.9	2.0	3.6	4.8
Metals & minerals	11.5	7.6	9.7	10.6
Coal	0.5	0.8	33.1	0.0
Petroleum	4.1	1.1	5.3	4.2
Processed agriculture	3.9	6.7	14.7	5.5
Electronic equipment	3.2	18.3	65.4	18.4
Motor vehicles	1.5	2.3	15.1	4.3
Chemical products	3.9	6.5	17.1	14.0
Textiles	6.8	23.8	44.0	8.7
Other manufactures	9.9	24.8	35.5	17.1
Electricity	1.6	0.1	0.8	0.0
Water	0.2	0.0	1.4	0.0
Gas mfg & distribution	0.1	0.0	0.0	0.0
Communications	3.0	0.1	1.4	0.1
Insurance and finance	3.2	0.3	2.2	0.7
Transport	6.0	1.6	7.8	1.7
Construction	8.7	0.2	0.3	0.3
Other Services	19.1	3.7	4.1	9.5

Source: Model database (social accounting matrix), derived 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
Water	8	30	16	47
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
Water	71	18	1	0	9	-20.1	-42.5	-60.1	-27.6	-28.3	-25.5	1.04
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: Calibrated Pure Profit, Fixed and Variable Cost Shares of Total Revenue and Industry Scale

Per cent of industry turnover	Pure profit ^a	Fixed cost ^b	Variable cost ^b	Scale ^c
Agriculture	0	5	95	95
Metals & minerals	16	12	72	30
Coal	6	10	84	42
Petroleum	35	6	59	49
Processed agriculture	-3	8	95	60
Electronic equipment	9	5	87	94
Motor vehicles	4	11	85	40
Chemical products	5	15	80	26
Textiles	1	5	94	92
Other manufactures	10	8	82	52
Electricity	-3	17	86	25
Water	-17	21	96	23
Gas mfg & distribution	-1	20	81	20
Telecommunications	51	8	41	25
Insurance and finance	40	6	54	44
Transport	40	15	44	15
Construction	15	8	77	45
Other Services	15	7	79	95

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.

b The first three columns of the table are calibrated. First, elasticities are estimated, from which mark-up ratios are calculated. The pure profit shares are then used to deduce the fixed cost residual.

c Scale is defined as the ratio (in %) of the gross quantity produced and minimum efficient scale, which in turn, is the level of output where unit fixed cost is 5% of unit variable cost.

Source: Pure profit proportions are deduced from profits data supplied in China's Statistical Yearbook, as detailed in Appendices available from the authors.

Table 6: Short Run Economic Effects of Saving Policy Shocks^a

	Public SOE dividends ^c		Privatisation (reduced corporate saving) ^d	
	% changes	% of base GDP	% changes	% of base GDP
Real GNP ^e	0.74		0.2	
Real GDP ^f	-0.03		0.1	
Real exchange rate	0.32		2.2	
Consumption ^g	2.67	1.22	18.1	8.3
Household saving ^g	2.95	0.73	20.0	5.0
Corporate saving ^g	-5.71	-0.95	-72.7	-11.9
Government saving ^g	0.00	0.00	0.0	0.0
National saving ^g	-0.51	-0.21	-16.8	-6.9
Investment ^g	-0.04	-0.01	-3.2	-1.1
Foreign investment ^g	0.10	0.00	3.1	0.1
Reserve accumulation ^g	-2.08	-0.20	-61.1	-5.9
Value of Exports ^g	-1.86	-0.73	-11.3	-4.4
Value of Imports ^g	0.61	0.18	4.5	1.4
Trade surplus ^g	-10.50	-0.91	-67.1	-5.8
Current account surplus ^g	-2.73	-0.20	-82.3	-5.9
Real skilled wage ^e	0.00		0.0	
Real land rent ^e	-0.04		0.5	
Real resource rent ^e	0.40		3.1	
Production employment	-0.13		-0.3	
Av gross rate of return ^h	-0.20		-0.9	

a Here the shocks are directed at reducing the gross saving rate by reducing government saving and redistributing corporate saving to the public via increased corporate tax or complete privatisation, whereby corporations return all net income to public owners.

b The powers of corporate tax rates (the base values of which vary by industry in the model) are increased by 10% for mining and minerals, coal, petroleum, chemicals, electricity, and telecommunications, 5% for electronics, motor vehicles and transport, 2% for other manufactures and 1% for other services. The fiscal closure retains fixed government expenditure and a fixed fiscal surplus, with additional corporate tax revenue allowing reduced labour income tax, the power of which falls by 8 %.

c Government spending and the fiscal surplus are here made endogenous and the current account surplus exogenous. Spending is increased sufficiently eliminate the current account surplus. This turns out to require spending to increase by 65%, or roughly 10% of initial GDP.

d In this simulation corporate saving is reduced by contracting the rate until the volume of corporate savings falls to 5% of GDP, on the assumption that SOEs become public companies that return most net earnings after corporate tax to share-holding households.

e To facilitate welfare interpretation this is expressed relative to the consumer price index.

f As a measure of collective output volume, this is expressed relative to the GDP price.

g This is expressed relative to (fixed) international (import) prices.

h The rate of return on physical capital is here gross of depreciation and inclusive of pure economic profits. The percentage change in the rate is shown, rather than the difference in percentage or basis points.

Source: Simulations of the model described in the text.

Table 7: Short Run Sectoral Effects of Public SOE Dividends^a

% changes	Output volume	Production employment	Gross rate of return ^b	Producer price ^c	Mark-up	Pure profit	% point changes in shares of demand facing firms				
							Intermediate	Final	Export	Investment	Government
Agriculture	0.4	0.8	0.4	0.4	-0.01	-0.4	-0.4	0.8	-0.4	0.0	0.0
Metals & minerals	-0.8	-0.3	-0.5	0.4	0.11	-0.1	0.1	0.1	-0.2	0.0	0.0
Coal	-1.3	0.0	-0.5	0.4	0.17	0.8	0.6	0.2	-0.8	0.0	0.0
Petroleum	0.2	0.0	0.0	0.1	-0.04	0.3	-0.2	0.3	-0.1	-0.1	0.0
Proc agriculture	-0.1	-0.1	-0.4	0.3	-0.01	0.7	-0.1	0.9	-0.8	0.0	0.0
Electronics	-0.5	-0.1	-0.6	0.1	0.02	-0.3	0.0	0.1	-0.2	0.0	0.0
Motor vehicles	-1.5	-0.1	-0.6	0.5	0.20	1.6	0.1	0.3	-0.7	0.2	0.0
Chemical products	-0.7	-0.1	-0.6	0.3	0.07	-0.1	0.1	0.2	-0.3	0.0	0.0
Textiles	-0.9	-0.8	-1.1	0.1	0.02	-1.4	0.0	0.4	-0.4	0.0	0.0
Other manufactures	-0.5	-0.3	-0.6	0.2	0.04	-0.2	0.0	0.2	-0.2	0.0	0.0
Electricity	0.0	0.0	-0.2	0.3	-0.04	1.5	-0.3	0.4	0.0	0.0	0.0
Water	0.1	0.0	0.3	0.3	-0.01	0.4	-0.3	0.4	-0.2	0.0	0.0
Gas mfg & distn	0.1	0.0	-0.1	0.2	-0.04	4.9	-0.2	0.3	0.0	0.0	-0.1
Telecommunications	0.2	0.0	0.5	0.5	0.19	0.9	-0.3	0.5	0.0	0.0	-0.2
Finance	0.6	0.0	0.5	0.3	-0.13	0.8	-0.5	0.6	0.0	0.0	-0.1
Transport	-0.7	-0.1	0.5	1.0	0.80	1.3	-0.2	0.5	-0.3	0.0	0.0
Construction	-0.3	-0.2	-0.4	0.3	-0.01	-0.1	0.0	0.1	0.0	-0.1	0.0
Other Services	0.4	0.4	0.0	0.2	-0.12	-0.1	-0.3	0.5	-0.1	0.0	-0.1

a Here the powers of corporate tax rates (the base values of which vary by industry in the model) are increased by 10% for mining and minerals, coal, petroleum, chemicals, electricity, and telecommunications, 5% for electronics, motor vehicles and transport, 2% for other manufactures and 1% for other services. The fiscal closure retains fixed government expenditure and a fixed fiscal surplus, with additional corporate tax revenue allowing reduced labour income tax, the power of which falls by 8 %.

b The rate of return on physical capital is here gross of depreciation and inclusive of pure economic profits. The percentage change in the rate is shown, rather than the difference in percentage or basis points.

c The producer price is here defined relative to international (import) prices. Changes in it therefore indicate adjustments in the sectoral real exchange rate.

Source: Simulations of the model described in the text.

Table 8: Short Run Sectoral Effects of Privatisation^a

% changes	Output volume	Production employment	Gross rate of return ^b	Producer price ^c	Mark-up	Pure profit	% point changes in shares of demand facing firms				
							Intermediate	Final	Export	Investment	Government
Agriculture	2.8	3.1	3.0	2.5	-0.1	-7.2	-2.8	5.0	-1.9	-0.3	0.0
Metals & minerals	-5.2	-2.6	-3.8	2.6	0.6	-1.6	0.3	0.7	-1.1	0.0	0.1
Coal	-8.4	-6.3	-1.8	3.2	1.4	7.8	4.5	1.1	-5.8	0.0	0.2
Petroleum	2.6	0.1	0.8	0.6	-0.5	2.4	-1.1	1.9	-0.3	-0.9	0.4
Proc agriculture	-0.2	-0.3	-1.4	1.8	-0.1	5.0	-0.8	5.5	-4.8	0.0	0.0
Electronics	-3.2	-3.2	-4.2	0.8	0.1	-2.5	0.3	1.0	-1.2	-0.1	0.0
Motor vehicles	-7.2	-3.4	-4.8	2.4	0.8	2.2	0.7	2.1	-3.1	0.2	0.1
Chemical products	-4.1	-1.0	-3.4	2.0	0.5	0.0	0.6	1.3	-1.9	0.0	0.0
Textiles	-5.8	-6.1	-7.0	1.0	0.1	-9.0	0.3	2.8	-3.1	0.0	0.0
Other manufactures	-3.3	-2.7	-3.9	1.4	0.1	-2.4	0.5	1.1	-1.3	-0.3	0.0
Electricity	0.2	0.0	-0.2	1.9	-0.2	9.4	-2.1	2.3	-0.2	-0.1	0.0
Water	1.7	0.5	5.9	2.2	0.0	3.3	-2.0	2.6	-0.9	0.0	0.2
Gas mfg & distn	2.6	1.2	2.5	1.8	-0.3	17.1	-1.6	1.6	0.0	-0.6	0.6
Telecommunications	2.4	0.2	5.1	3.8	0.9	7.5	-2.4	3.1	-0.3	-0.4	0.0
Finance	4.7	3.8	4.5	2.1	-0.8	5.9	-3.0	3.6	-0.3	-0.3	0.0
Transport	-2.6	-1.7	4.2	5.7	4.2	8.4	-1.5	3.0	-1.6	-0.4	0.5
Construction	-3.7	-2.6	-5.6	1.9	-0.3	-4.6	0.3	0.4	0.0	-1.2	0.7
Other Services	3.4	2.8	2.1	1.7	-0.6	2.3	-2.1	2.7	-0.6	-0.4	0.3

a Here corporate saving is reduced by contracting the rate until the volume of corporate savings falls to 5% of GDP, on the assumption that SOEs become public companies that return most net earnings after corporate tax to share-holding households.

b The rate of return on physical capital is here gross of depreciation and inclusive of pure economic profits. The percentage change in the rate is shown, rather than the difference in percentage or basis points.

c The producer price is here defined relative to international (import) prices. Changes in it therefore indicate adjustments in the sectoral real exchange rate.

d Percentage *point* changes in shares of demand facing firms.

Source: Simulations of the model described in the text.

Table 9: Economic Effects of Competition Policy Shocks^a

	Price caps in the medium run ^b		Increased entry in the long run ^c	
	% changes	% of base GDP	% changes	% of base GDP
Real GNP ^d	31.0		-2.6	
Real GDP ^e	41.2		4.0	
Real exchange rate	-6.3		-3.7	
Consumption ^f	60.4	25.6	3.8	1.0
Household saving ^f	61.9	15.4	2.4	0.6
Corporate saving ^f	-97.2	-15.9	-33.0	-5.6
Government saving ^f	0.0	0.0	0.0	0.0
National saving ^f	-1.9	-0.6	-11.6	-5.0
Investment ^f	60.9	21.4	-9.6	-3.4
Foreign investment ^f	11.3	0.3	0.8	0.0
Reserve accumulation ^f	-225.9	-21.9	-15.3	-1.5
Value of Exports ^f	44.2	17.3	10.1	3.9
Value of Imports ^f	124.5	37.9	4.3	1.3
Trade surplus ^f	-237.6	-20.6	30.5	2.6
Current account surplus ^f	-284.0	-20.5	-19.3	-1.4
Real production wage ^d	68.0		19.3	
Real skilled wage ^d	122.3		13.3	
Real land rent ^d	2.5		-1.9	
Real resource rent ^d	151.6		13.2	
Total number of firms	0.0		27.3	
National capital stock	0.0		22.4	
Av gross rate of return ^g	21.6		-23.1	

a Here the shocks are directed at reducing oligopoly rents, from which corporate savings flow, through price regulation and anti-trust policies. All shocks are designed to remove pure profits and induce more competitive pricing.

b The market for production labour is flexible, so that full employment is retained, but capital is fixed in total stock and in sectoral distribution, as is the number of firms (varieties) in each industry. Oligopoly rents (pure profits) are driven to zero.

c In the long run the labour market is flexible, physical capital is domestically and internationally mobile and pure profits are eliminated by free entry and exit of firms (varieties). Here the number of firms (varieties) is endogenous and oligopoly rents (pure profits) are exogenous. The latter are shocked down by a third, encouraging new entries and raising fixed costs, foreign ownership of domestic capital and capital income repatriated abroad.

d To facilitate welfare interpretation this is expressed relative to the consumer price index.

e As a measure of collective output volume, this is expressed relative to the GDP price.

f This is expressed relative to (fixed) international (import) prices.

g The rate of return on physical capital is here gross of depreciation and inclusive of pure economic profits. The percentage change in the rate is shown, rather than the difference in percentage or basis points.

Source: Simulations of the model described in the text.

Table 10: Sectoral Effects of Price Caps in the Medium Run^a

% changes	Output volume	No of firms (varieties)	Unit fixed cost	Gross rate of return ^b	Producer price	Production employment	Export share of output
Agriculture	-25	0	63	4	22	-40	-99
Metals & minerals	262	0	-30	24	-27	53	81
Coal	56	0	16	34	18	19	-86
Petroleum	421	0	-34	7	-40	11	95
Proc agriculture	-16	0	48	57	17	-29	-96
Electronics	67	0	0	-1	-6	6	-11
Motor vehicles	190	0	-23	126	-11	32	62
Chemical products	115	0	-12	69	-9	7	-4
Textiles	-35	0	73	-22	11	-48	-63
Other manufactures	98	0	-6	40	-7	20	-25
Electricity	94	0	3	215	20	6	-95
Water	-51	0	114	345	57	-18	-100
Gas mfg & distn	100	0	-5	173	5	17	-71
Telecommunications	135	0	23	37	-20	8	21
Finance	160	0	3	11	-20	85	21
Transport	258	0	-19	23	-38	76	117
Construction	115	0	-16	-41	-23	18	207
Other Services	61	0	13	12	4	21	-53

a Here the shocks is directed at reducing oligopoly rents, from which corporate savings flow, through price regulation. All shocks are designed to remove pure profits and induce more competitive pricing. In this “medium run” the market for production labour is flexible, so that full employment is retained, but capital is fixed in total stock and in sectoral distribution, as is the number of firms (varieties) in each industry. Oligopoly rents (pure profits) are driven to zero.

b The rate of return on physical capital is here gross of depreciation and inclusive of pure economic profits. The percentage change in the rate is shown, rather than the difference in percentage or basis points.

Source: Simulations of the model described in the text.

Table 11: Sectoral Effects of Increased Entry in the Long Run^a

% changes	Output volume	No of firms (varieties)	Production scale ^b	Unit fixed cost	Gross rate of return ^c	Producer price	Production employment	Export share of output
Agriculture	-9	-7	-2	6	-2	4	-18	-58
Metals & minerals	21	42	-15	23	-35	-8	22	39
Coal	2	31	-22	34	-20	2	1	-18
Petroleum	49	188	-48	101	-55	-18	179	80
Proc agriculture	-5	-18	16	-10	10	1	-17	-21
Electronics	5	63	-36	62	-24	-1	12	1
Motor vehicles	65	21	36	-24	-16	-9	28	107
Chemical products	19	17	2	2	-14	-4	14	20
Textiles	-19	-12	-8	13	-2	3	-26	-12
Other manufactures	10	46	-24	37	-20	-3	12	5
Electricity	16	-2	19	-12	5	-5	-2	60
Water	5	-27	43	-27	115	0	-22	-17
Gas mfg & distn	14	1	13	-8	1	-5	-2	57
Telecommunications	13	174	-59	152	-39	-9	165	37
Finance	8	216	-66	205	-43	-3	63	6
Transport	55	52	2	2	-41	-25	40	126
Construction	-4	27	-25	38	-34	-4	-7	40
Other Services	0	69	-41	76	-23	1	4	-58

a Here the shocks are directed at reducing oligopoly rents, from which corporate savings flow, through anti-trust policies. Firms price more competitively. In this “long run” the labour market is flexible, physical capital is domestically and internationally mobile and entry and exit of firms (varieties) is allowed. The model closure therefore has the number of firms (varieties) endogenous and oligopoly rents (pure profits) exogenous. Sufficient new entries are allowed to reduce pure profits by a third.

b Scale is defined here as the ratio of firm-level output to minimum efficient scale, where the latter is the volume of output at which average fixed cost falls to 5% of average total cost when unit factor rewards are held constant.

c The rate of return on physical capital is here gross of depreciation and inclusive of pure economic profits. The percentage change in the rate is shown, rather than the difference in percentage or basis points.

Source: Simulations of the model described in the text.