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## Combating China's Export Contraction:

## Fiscal Expansion or Accelerated Industrial Reform?[*]

Rod TYERS
College of Business and Economics
Australian National University
and
Business School
University of Western Australia

Ling HUANG
School of Economics
Peking University

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## Abstract

Initially, the global financial crisis caused a surge of financial inflows to China, raising investment, but this abated in 2008, leaving a substantial contraction in export demand. The government's key response was to commit to an unprecedented fiscal expansion. Two oft-ignored consequences are, first that government spending is on non-traded goods and services and so enlarges the consequent real appreciation and, second, that a more inward-looking economy causes firms to face less elastic demand and hence to increase oligopoly rents, further enlarging the real appreciation. Both are important for China because of the contribution of its real-exchange-rate sensitive, low-margin labour-intensive export sector to total employment. An economy-wide analysis is offered, using a model that takes explicit account of oligopoly behaviour. The results suggest that a conventional fiscal expansion would further contract the Chinese economy. On the other hand, notwithstanding the export contraction further industrial reform, emphasising the largely state-owned sectors, would reduce costs and foster growth in both output and modern sector employment.

## 1 Introduction

With exports almost half of its GDP and most of these directed to Europe and North America, negative financial shocks in those regions might have been expected to retard China's growth.[1] And since China assembles manufactured components from elsewhere in Asia and the Pacific,[2] the extent of its "decoupling" was the key to wider regional performance. Early in the crisis, however, a mitigating factor was the transitory flight of more of the world's savings into Chinese investment in the form of both FDI and "hot money", the latter arising in spite of attempts by the government to strengthen inward capital controls on volatility grounds.[3] Subsequently, however, the fall in US and European investment began to be matched by a fall in their total saving, as income growth slowed and governments began issuing new debt. China was then left with a contraction in export demand uncompensated by further new investment from abroad. The scale of the export contraction was considerable, as indicated in Figure 1, and it was accompanied by declines in RMB export prices, though the latter effect was more than compensated by declines in petroleum and other import commodity prices as they came off their pre-crisis highs.

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[1] This is the more so since it appears that those financial shocks have caused a speculative retreat to commodities which has, at least temporarily, shifted the international terms of trade against China.

[2] For evidence supporting the prominence of the components trade with other Asian economies, see Athukorala (2005).

[3] FDI approvals were at unprecedented levels in the final quarter of 2007 and the first quarter of 2008 and there was clear evidence of "hot money" arriving against China's inward capital controls. See Pettis (2008), McKibbin and Stoekel and Tyers and Bain (2008).

The Chinese government's principal response has been to promise an unprecedented fiscal expansion, amounting to seven per cent of GDP, directed at sustaining growth by raising domestic demand.[4] In the long run there is wide agreement that China's growth will be underpinned by rising consumption rather than exports (Lardy, 2006; Kuijs, 2006, Kuijs and He 2007; Azziz and Cui, 2007). Yet the rise in government spending need not have this effect. Indeed, it is not clear whether so substantial an increase in the national debt is the best course of action for China. Much turns on the unusual structure of the Chinese economy, which has most modern sector employment concentrated in relatively low-margin export manufacturing, and the effect of such a shock on China's real exchange rate. By reducing national saving, other things equal the shock should cause a real appreciation which would hurt export industries already hit by the foreign demand contraction. The extent of this further damage depends on the scale of the real appreciation, which in turn depends on the distribution of government spending between the traded and non-traded sectors and on the tendency for a more inward-looking economy to cause firms to face less elastic demand and hence to increase oligopoly rents.[5] These effects are explored in this paper, in combination with the associated effects on sectoral structure and the distribution and level of employment.

The approach adopted differs from those of previous studies on these topics in that it employs an economy-wide model that takes explicit account of oligopoly behaviour in 17 industrial and service sectors.[6] This model makes it possible to examine the interactions between external shocks, fiscal policy, industrial reform and regulatory policy in response to the export slowdown. Not only can the implications of policy responses for overall economic performance be assessed but it is also possible to examine their effects on the current account surplus and, critically, China's real exchange rate. Indeed, the results suggest that a substantial fiscal expansion would not deliver a net retention of jobs in China. While the usual tendency of fiscal expansions to arrest deflation and, thereby, raise employment tends to more than offset the real appreciation effects due to expenditure on non-traded goods, we show that the real appreciation is considerably enlarged by the oligopoly effects. By contrast, further industrial reforms, incorporating privatisation and increased competition in heavy industry and services,

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[4] The Chinese government's concern over the export slowdown is exemplified by Premier Wen's address to the twin sessions of the National People's Congress and the Chinese Peoples Political Consultative Conference in March 2009 (news.xinhuanet.com).
[5] While the effects of unfettered oligopoly rents on the real exchange rate are explored by Tyers (2008), the idea that fiscal expansions cause real appreciations because governments spend mainly on non-traded goods goes back to De Gregorio et al. (1994) and Froot and Rogoff (1995), among others.
[6] The model is a distant descendant of that by Harris (1984).

3

would tend to depreciate the real exchange rate and thus have the effect of expanding both employment and exports along with overall growth.

The next section reviews Asia's, and in particular China's, past fiscal conservatism, highlighting the contrast between long term practice and China's current policy response. In Section 3, the special structure of the Chinese economy is detailed along with elemental reasoning behind the sensitivity of its employment performance to real exchange rate changes associated with government expenditure on the one hand and oligopoly rents in the largely non-traded sectors on the other. Section 4 then describes the model used and Section 5 presents the simulated effects of fiscal expansions. Section 6 then considers the alternative of further industrial reforms. Conclusions are provided in Section 7.

## 2. Fiscal Conservatism and Growth in Asia

That the Chinese government should consider so large a fiscal expansion to be the appropriate response to the export downturn contrasts with its revealed preference over three decades of strong economic performance accompanied by consistent fiscal conservatism. This may have reflected a cultural preference for more forward-looking behaviour that embodies higher private saving and investment and a corresponding social preference for similar fiscal policy. Whatever the origin, it has been associated with far superior economic growth performance than any other part of the world in recent decades. As Table 1 shows, with few exceptions the Asian region as a whole has exhibited more fiscal restraint than the rest of the world since the 1960s and this practice has been associated with its recording stronger GDP growth performances. By contrast, the practice in many more poorly governed developing regions, with attendant weaknesses in their power to tax combined with political pressures to redress distributional inequities through government spending, has often been to monetise fiscal deficits and thereby create financial and exchange rate instability sufficient to deter investment and slow GDP growth.[7]

In China's particular case, since the opening of its economy in the late 1970s, its level of general government final consumption expenditure has been stable at about 15 per cent of its GDP. As suggested by Figure 2, the development of its taxation system has been sufficient to ensure that its many surges in GDP growth have been accompanied by corresponding increases in revenue. At the same time industrial reforms have seen a general decline in the government's direct role in product and service supply and a retreat to indirect regulatory

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[7] See Little et al. (1993) and Corden (1994).

regimes and tax incentives. Government debt has remained low and, in spite of the Asian financial crisis of the 1990s and the more recent global slowdown, China's financial system has been comparatively stable. This is in no small measure the reason for China's absorption of more FDI than any other developing country and for its heretofore excellent economic performance.

More recently, fiscal profligacy has become popular in most regions of the world. As demand has contracted and private firms have deleveraged, governments have borrowed in attempts to replace lost spending. Even where Keynesian multipliers exceed unity, these fiscal expansions inevitably cause substantial realignment of real exchange rates.[8] It will turn out that, by virtue of its peculiar economic structure, China's Keynesian multiplier could well be negative, and certainly that its economic performance is strongly dependent on the implications of its policy response for its the real exchange rate.

## 3. The Role of the Real Exchange Rate

The special sensitivity of China's economic performance to its real exchange rate stems from its economic structure, as summarised in Table 2. Note that 1) the great majority of non-agricultural employment is in the export-oriented light manufacturing sector – indeed, employment in this sector exceeds that in agriculture, 2) this sector is relatively competitive – price mark-ups are low and so pure or economic profits make up only a small share of total revenue, and 3) the SOE-dominated energy, metals and services sectors are less labour-intensive and at the same time they are oligopolistic, generating substantial rents that form a buffer against downturns. These facts clearly suggest that total labour demand in China is comparatively sensitive to the relativities between home wages and export prices, and hence to its real exchange rate.

The key sensitivities explored in this paper are between China's real exchange rate and its government spending on the one hand and the oligopoly rents earned in its energy, metals and services sectors on the other. Consider first the effects of increased government spending. It is well understood that, in the realistic case where financial capital is imperfectly mobile internationally, other things equal increased government borrowing raises home yields and induces financial inflow. The net effect is to raise demand for home relative to (more elastically supplied) foreign products and services and hence to appreciate the real exchange rate. Beyond this, however, it was recognised by De Gregorio et al. (1994) and Froot and

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[8] Empirical research on fiscal expansions during peacetime is not supportive of strong multiplier effects. See, for the case of the US, Barro (1981).

Rogoff (1995), and more recently Galstyan and Land (2009), that boosting government expenditure further appreciates the real exchange rate by changing the composition of aggregate demand.[9] This is because governments spend mainly on non-traded goods and services. This effect is illustrated in Figure 3, 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.

In assessing fiscal expansions, these well known negative effects are seen as being more than offset by the resulting expansion in aggregate demand. A key mechanism for this is that the increase in government dissaving reduces the *national* saving rate, at least temporarily, requiring the failure of Ricardian equivalence.[10] Because reduced national saving contracts the leakage of expenditure abroad, which in China takes the form of foreign reserve accumulation, the current account surplus is reduced and more Chinese expenditure falls on the home relative to the foreign economy. This has the effect of either inducing a home inflation or arresting a deflation, thus preventing output prices from falling relative to wage costs in the short run and hence preserving employment. Other things equal, by lowering real wage costs, this effect tends to constrain any real appreciation due to the composition of government spending.

But there is a further real appreciating effect not commonly recognised. This is due to oligopoly rents, which are considerable in China's energy, metals and services sectors.[11] In essence, since the excess profits are achieved by supplying less output than would occur in competitive markets they 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 4. It raises the prices of non-traded goods relative to traded goods and hence China's real exchange rate. Fiscal expansions tend to exacerbate this effect by redirecting demand to toward the oligopoly sectors. By contrast, further reforms to competition policy and regulatory practice that reduce these oligopoly rents would have the opposite effect and spur Chinese employment by sustaining the expansion in the labour-intensive and real-exchange-rate-sensitive light manufacturing sector. To quantify the effects of these changes on the real exchange rate and

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[9] Galstyan and Lane (2009) distinguish between government spending and government investment, finding that the latter tends to cause real depreciation. In the short run, however, all investment is intensive in non-traded services like construction and, within its gestation period, should cause appreciation. Of course, in the long run it adds to the capital stock and causes depreciation. For an application to China, see Tyers et al. (2008).

[10] Consistent with the empirical evidence, in what follows we assume Ricardian equivalence does fail in China.

[11] The wider effects of these on the Chinese economy are examined by Tyers and Lu (2008).

hence on China's economic performance, we turn to a more complete model of the Chinese economy.

## 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.[12] 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.[13] 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.[14]

*Model structure*

The scope of the model is detailed in Table 3. 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 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

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[12] It is a distant descendant of that by Harris (1984), Gunasekera and Tyers (1990) and Tyers (2005), though it is considerably generalised to include macroeconomic behaviour, as in Tyers and Lu (2008).
[13] Income taxes are approximated by flat rates deduced as the quotient of revenue and the tax base in each case.
[14] Hereafter the capital, financial and official sub-accounts of China's balance of payments will be referred to as the "capital account".

purchasers of primary factors or intermediate inputs.[15] 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.[16] 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 real GNP.[17]

The quantity of domestically-owned physical capital is fixed both in the short and long runs, 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 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

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[15] 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).

[16] 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).

[17] 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:

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

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.

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 would affect production in the future. Central is the open economy capital market which is built around the market clearing identity:

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

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 $S_H = s_H \, Y_{DH}$. Following Tyers and Lu (2008), China's extraordinarily high level of corporate saving, $S_C$, is assumed to stem only from pure profits, $\pi$, with a distinct but fixed saving rate assumed for each industry:

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

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 $\Delta R$ 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:

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

where $P^K$ is the price of capital goods, $P^Y$ is the product price and $\delta$ 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:

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

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.

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.

(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 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 (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 $b_{DR} >> b_{SF}$. 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.[18]

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 abroad[19]]. 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.

*Short run effects in a real model*

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[18] 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 (14) is intended merely as a reduced form description of this process.

[19] 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.

In the short run nominal wage rigidity is important and this is not readily represented in real models such as this one. Indeed, nominal rigidity is essential to properly representing the effects of fiscal expansions, since their claimed beneficial effects depend on demand effects that alter the relationship between product prices and wage costs in the short run. China's nominal exchange rate targeting macroeconomic policy regime makes it possible to overcome this deficiency of our real model, however. In this case, any change in the real exchange rate takes the form of a corresponding change in the domestic price level. If the nominal exchange rate, $E$, is defined as the number of units of foreign exchange obtained for a unit of the domestic currency, then the real exchange rate, $e^R$, can be defined correspondingly as the rate of exchange between the home product bundle and corresponding bundles produced abroad. It follows that the bilateral real exchange rate with foreign trading partner $i$ can be approximated as the common currency ratio of the GDP prices of the two countries, $P^Y$ and $P_F^Y / E$,

$$(16) \quad e^R = \frac{P^Y}{P_F^Y / E},$$

and so, when $E$ is targeted and there is no indirect effect on the foreign currency price level in the rest of the world, a real appreciation must take the form of an inflation:

$$(17) \quad e^R \uparrow = \bar{E} \frac{P^Y \uparrow}{\bar{P}_F^Y}.$$

If we then assume that our short run is sufficiently tight to render the nominal wage of production workers rigid, then the short run real wage movement mirrors the real appreciation:

$$(18) \quad \frac{\bar{W}}{P^Y \uparrow} = w \downarrow \text{ so that } \hat{w} = -\hat{e}^R.$$

Our short run closure is therefore modified to tie the real production wage to the endogenous real exchange rate changes.

*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 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:

$$(19) \quad m_i = \frac{p_i}{v_i} = \frac{1}{1 + \dfrac{1}{\varepsilon_i}} \qquad \forall i \ ,$$

where $p_i$ is the firm's product price, $v_i$ is its average variable cost and $\varepsilon_i$ 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 $j$:

$$(20) \quad \mu_i = \frac{\partial p_{ij}}{\partial p_{ik}} \ .$$

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 (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 $i$, $\varepsilon_i$, 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.[20]

$$(21) \quad \varepsilon_i = s_i^F \varepsilon_i^F + s_i^V \varepsilon_i^V + s_i^I \varepsilon_i^I + s_i^X \varepsilon_i^X + s_i^G \varepsilon_i^G \qquad \forall i$$

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

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

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, which we do not examine in this paper, 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:

$$(22) \quad m_i^R = \frac{afc_i + v_i}{v_i} \ .$$

Compromise mark-ups can be simulated by altering the parameter $\varphi_i$ in an equation for the "chosen" mark-up:

$$(23) \quad m_i^C = (\varphi_i - 1)m_i^R + (2 - \varphi_i)m_i \quad \forall i \ .$$

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.[21] 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 light manufacturing and services. The major contributors to exports are also those that export the largest shares of their output. Table 4 confirms that the 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

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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.[22] 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.[23]

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.[24] 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 (19). The initial equilibrium industry shares, elasticities and mark-up ratios for each industry are given in Table 5.[25] 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.[26] 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 recommended with new initial elasticities.[27]

Importantly for the interpretation of later results, Table 5 also makes clear that the five sources of demand facing firms in each industry are not equally elastic. Export and final

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[22] Pure profit shares of total revenue in 2005were 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).

[23] *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).

[24] Summaries of this literature are offered by Dimaranan and McDougall (2002) and at http://www.gtap. purdue.edu/databases/.

[25] 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.

[26] 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.

[27] 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.

demand are the most elastic and intermediate demand the least.[28]  Also from Table 5 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. The Export Slowdown with a Fiscal Expansion

Here we simulate a contraction in export demand for Chinese goods, combined with two alternative fiscal expansion scenarios.  The first is a rise in government spending by about seven per cent of initial GDP and the second is a reduction in corporate taxation that differs by sector so as to eliminate company tax on export production.[29]  A short run closure is adopted, which embodies nominal exchange rate targeting and nominal wage rigidity as per (18) and flexible production employment, no sectoral or international mobility of physical capital and fixed numbers of home firms (product varieties) with variable pure profits.[30]  Fiscal closures have a fixed government deficit and endogenous expenditure when the export demand shock is applied alone, consistent with China's heretofore fiscal conservatism, and a flexible deficit and exogenous spending when fiscal policy changes are introduced.

*The export slowdown*

This takes the form of a uniform shock to all foreign excess demand functions sufficient to reduce the value of China's exports by the proportion observed to the end of 2008 - eight per cent.  In addition there is a fall in the petroleum import price by a quarter, reflecting the observed change to that point since 2005.  As Table 6 shows, lower foreign demand reduces the home price level and so depreciates the real exchange rate.[31]  This offsets somewhat the extent of the export loss but, with the decline in aggregate demand and the rigidity of the nominal production wage, GDP and employment are substantially smaller, with the latter decline (as shown in Table 7) amounting to 20 million jobs.  Skilled wages and resource rents also decline, indicating that the negative shock is shared across the key primary factors and not

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[28] 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).

[29] Consistent with the failure of Ricardian equivalence, in neither case is there any associated change in the household or corporate saving rate.

[30] Although the experiments have been carried out with long run and intermediate closures, except where mentioned subsequently in the text, the results add little value that is not revealed in the short run.

[31] The associated initial decline in export prices can be seen in reality from Figure 1.

borne only by labour.[32] The sectoral effects are indicated in Table 7. As expected, the shocks see substantial job losses in the principal export sectors, electronics, textiles and "other manufactures" but also in the state-owned sectors, construction and "other services". The demand facing firms switches away from exports and so demand elasticities contract and mark-ups rise, most substantially in petroleum, transport, other manufactures and metals. Nonetheless, all but agriculture face declines in their economic profits.[33]

*Adding the expenditure expansion*

The expansion of spending by seven per cent of GDP substantially reduces domestic saving and so constrains the current account (reducing the need for further foreign reserve accumulation). Yet, as Table 6 shows, it has all the usual crowding out effects in the home economy. The home investment financing interest rate rises[34] and investment falls, though by less than domestic saving. Reduced net outflows on the capital account combine with increased government expenditure on home products and (mainly) services to raise relative demand for home varieties, yielding a net real appreciation (a 3.2 per cent turn-around). Contrary to Keynesian wisdom, the expenditure expansion does not increase output and employment. Instead, the negative consequences of the export contraction are exacerbated.

As discussed in Section 3, the reasons for this departure from Keynesian convention are two-fold. First, as the fifth column of Table 5 attests, most government expenditure is on non-traded services. The fiscal expansion therefore diverts expenditure away from home tradeable goods, further appreciating the real exchange rate and hurting the low-margin, labour-intensive export sectors. This is clear from the sectoral pattern of employment changes indicated in Table 7. Second, as can also be seen in Table 5, export demand is comparatively elastic and so the expansion in domestically directed government expenditure reduces the average elasticity faced in traded sectors and hence raises mark-ups charged by home firms, further appreciating the real exchange rate and hurting export employment. From Table 7 it is clear that this effect is strongest in metals, petroleum, motor vehicles, transport and "other services", where the rises in domestic prices are sufficient to cause a contraction in total demand in spite of the fiscal stimulus. Construction demand also contracts substantially, though this is because of its significance in investment which is crowded out by government expenditure.

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[32] Land rents rise very slightly relative to the CPI but fall relative to foreign prices.

[33] Note, however, that the declines in pure profits in the heretofore immensely profitable state-owned sectors are small, as simulated, particularly compared with Chinese media pronouncements.

[34] Recall that this rate is that which equates saving with investment in the home capital market and the supply of saving falls. The capital stock is fixed (there is no steady state) and so the rate of return on fixed capital falls, squeezing expected net returns from investment.

The relative power of the two contractionary effects of China's fiscal expansion is readily examined using the model. For this purpose we examine the fiscal expansion in isolation. As Table 8 shows, it causes modest net contractions in both GDP and total employment. To assess the size of the oligopoly pricing effect, we constructed a new initial equilibrium following the imposition of average cost pricing in all sectors. We then imposed the fiscal expansion while retaining the average cost pricing. In this case the real appreciation is only a third as large and the real wage restraining force dominates, so that modest expansions in both GDP and employment are achieved.[35]. The final two columns of the table indicate the difference made by the oligopoly pricing effect. Oligopoly behaviour is clearly significant. The inward redirection of demand that occurs following such a large fiscal expansion reduces demand elasticities and raises mark-ups yielding a negative turn-around of two per cent of GDP and 19 million jobs.

Finally, our result that, given the special structure of China's economy, the positive short run effects of a fiscal expansion are too weak to offset the real exchange rate effects needs to be seen in the context of our underlying assumptions. A perfectly rigid nominal production wage, a rigid nominal exchange rate target and no Ricardian equivalence represent extreme conditions that favour the largest possible output effects from a fiscal expansion. If anything, therefore, the power of a fiscal expansion is overstated in this analysis.

*Corporate tax reduction*

Here we approximate the stated intent of the Chinese government to relax the tax pressure on sectors suffering declines in export demand. Separately for each industry, we reduce corporate tax rates by the proportion of exports in total revenue. The results from this experiment are also displayed in Tables 6 and 7, the latter including the shocks to the powers of industry-specific capital income taxes. Overall, these changes deny the government revenue amounting to a per cent and a half of initial GDP. The effect of this is, once again, not to offer any significant offset to the contractionary effects of the export demand shocks. The reason for this is that there is no exit of firms in the short run so the change in capital income tax rates has no direct effect on oligopoly pricing – it simply means that larger shares of accounting profits are retained by firms, reducing the sizes of the losses in corporate saving and consumption.

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[35] Expenditure of seven per cent of GDP achieves a GDP expansion of one per cent. Though it is not shown in the table, this gain comes at the expense of considerable structural change, with employment expanding in services and contracting in the export manufacturing sectors.

The loss of government revenue, combined with the assumption that government expenditure remains constant, increases government borrowing as with the expenditure expansion, with the same pattern of negative consequences. From a social standpoint, the key short run consequence of this tax relief, evident from comparing the sixth and final columns of Table 7, is to cushion the loss of profitability in export sectors such as textiles and "other manufactures". Though this simulation does not quantify it, the tax relief would therefore have the effect of forestalling exits and thereby reducing the employment loss in export sectors.[36] "Dollar for dollar", the tax relief is better than the expenditure expansion because expenditure by government does not directly replace demand in export sectors whereas the private expenditure that is facilitated does replace some of the lost foreign demand. Moreover, the tax relief reduces costs and hence prices in the medium run (once firm numbers adjust) and so fosters the depreciation of the real exchange rate.

## 6. The Export Slowdown with Further Industrial Reforms

China's industrial reforms have contributed substantially to its overall economic growth in the past two decades, and this includes its spectacular growth in non-agricultural employment. It is therefore of interest to consider whether more of the same could further boost employment in the face of the export slowdown. Here we combine the export slowdown with two key elements of the industrial reform program: privatisation and competition policy. State-dominated sectors in the Chinese economy, including steel and other metals, motor vehicles, coal and petroleum, transport and finance have enjoyed extremely large economic profits in recent years (Lu et al. 2008). Since these profits have not been distributed to owners (tax-payers), about a fifth of China's GDP is not available to households to allocate between consumption and saving (Kuijs 2006). The result has been a declining consumption share of GDP and "excess" national saving. By reducing oligopoly rents and hence corporate saving, privatisation and competition policy have been shown to have the potential to accelerate China's growth, in both modern sector employment and output (Tyers and Lu 2008). In this section we investigate the short run potential of such industrial reforms to offset the negative external shock.

*Privatisation:*

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[36] We have carried out this experiment with intermediate and long run closures that illustrate this effect on employment and its distribution. The effect of the tax relief alone is to boost employment in "other manufacturing" by 2%, textiles by .3%, chemicals by .6% and motor vehicles by .3%.

The first shock simply places the majority of SOE assets in private hands so that profits are distributed to households. In effect, the rates of corporate saving across industries are reduced until total corporate saving falls to a more normal five per cent of GDP.[37] A short run closure is again assumed: a fixed nominal 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.[38] The economy-wide results are summarised in Table 9. The loss of so much corporate saving raises the home interest rate and slows the rate of accumulation of official foreign reserves. Higher borrowing costs further reduce investment but the fall is smaller than that in national saving and so the current account surplus is reduced by more than half. The contraction in net outflows on the capital account appreciates the real exchange rate, which is bad for the low-margin export sectors. This effect is more than offset, however, by a rise in private consumption expenditure. Privatisation alone is, nonetheless, insufficiently positive to fully offset the negative effects of the export slowdown on production employment or GDP.

*Price regulation*

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. This can be achieved both by regulation in the form of price surveillance, direct price caps and anti-trust policy, the latter in this case implying no more than the relaxation of barriers to entry. The experience in the industrial economies suggests that this forces oligopoly firms to set prices nearer to their average costs.[39] Here we think of these as delivering mark-ups in all sectors that are half-way between the most profitable levels on the one hand and the Ramsay levels, which set price equal to average cost, on the other. For this purpose strategic behaviour in price setting is switched off in the model, to be replaced by equations (22) and (23). This substantially reduces the pure profits that are shown in Table 2 to have been particularly large in the energy and metal sectors and in many of the services and in Table 7 to have been only slightly contracted by the export slowdown. Once again, short run closures are chosen. Because the price caps have a large effect on labour demand, however, it is no longer realistic

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[37] This is the scale of corporate saving in Taiwan. See Tyers and Lu (2008).
[38] Thus, privatisation is here assumed not to accompany mergers, acquisitions or new entries.
[39] See OECD (1997), Bradley and Price (1988) and Brennan (1989).

to maintain nominal wage rigidity and so the market for production labour is set to clear.[40] Finally, the government is assumed to set spending so as to maintain a constant fiscal surplus. The economy-wide results are summarised in Table 9.

The addition of the regulatory constraints on mark-ups has a very striking effect. The prices of key intermediate products fall and so costs fall throughout the economy, relative to foreign competition. There is, therefore, a large real depreciation and, even including the slowdown in export demand, considerable expansions in real GDP and GNP. Even the real volume of exports grows (although export earnings fall slightly relative to import prices, export prices fall by more, as suggested by the real exchange rate change). Moreover, the now flexible real production wage is larger by almost a third and the real skilled wage is larger by almost a half. The external imbalance is eliminated, with the current account surplus being replaced by a smaller deficit, and foreign reserves begin to contract. These extraordinary changes are, however, due in part to the assumed short run immobility of physical capital. Capital returns are larger by a fifth (the market rate of return rises, yielding this gain in spite of smaller pure profits) and this stimulates investment to a more than realistic degree, compounding the shift of the current account toward deficit.[41]

The sectoral effects of the slowdown combined with these industrial reforms are presented in Table 10. There is in this case 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 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 4) 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. 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 and there is an expanded external role for the Chinese transport industry.

In aggregate, then, even though this policy regime retains some potentially distorting oligopolies, it is attractive in that it restores the prominence of consumption expenditure (which rises by a third) and it eliminates the external imbalance. Yet it clearly sustains both export

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[40] With this shock, were the real production wage held constant, the demand for production labour would rise by more than a quarter, well beyond China's pool of underemployed workers.

[41] 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).

and GDP growth. Moreover, it moves the structure of the economy away from its prior dependence on inexpensive raw 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.

## 7. Conclusions

The Chinese government's key response to the global economic slowdown, and the consequent reduction in export demand, was to commit to an unprecedented fiscal expansion. We offer an economy-wide analysis of the effects of the export slowdown, using a 17 sector model of the Chinese economy that takes explicit account of oligopoly behaviour. This model is used to simulate both the export demand contraction and a range of policy responses, with the simulated contraction causing substantial losses of both output and employment in the short run. When fiscal expansions are applied, however, the results contrast with Keynesian conventional wisdom in that, whether by spending increase or tax relief, they are shown to exacerbate the contractions in both employment and GDP.

The special structure of China's economy proves important in these results, and in particular, the immense contribution to GDP and employment of the low-margin, privately owned export manufacturing sector, which competes for resources with high-margin, mainly state-owned oligopolies in metals, energy, motor vehicles, telecommunications, finance and transport. This structure exacerbates two consequences of fiscal expansions for China's economic performance. First, government spending (and even government investment in the short run) is largely on non-traded goods and services and so there is an expenditure composition effect that enlarges the consequent real appreciation, hurting export manufacturing. Second, and less widely understood, is that fiscal expansions shift demand inward and that a more inward-looking economy causes firms to face less elastic demand and hence to increase oligopoly rents. Given that China's oligopolies are not in its export manufacturing sector this further enlarges the deleterious real appreciation. Indeed this latter effect is shown, under our modelling assumptions, to be large enough to more than reverse net short run gains from fiscal expansions.

The alternative of continuing, or accelerating, China's program of industrial reforms, is shown to offer new growth that swamps the effect of the export demand contraction. With further privatisation and price cap regulation in the sectors that remain dominated by state-owned oligopoly firms, costs are shown to be sufficiently reduced across the entire economy to

depreciate the real exchange rate, allowing growth in both output and modern sector employment to continue. Yet that growth is no longer led by the low-margin labour-intensive manufacturing sector. Real wages of China's production workers rise considerably and there is a modernisation of the structure of both its economy and its external trade.

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**Figure 1: Chinese Exports Volume and Price Indices, 1993M1=100**
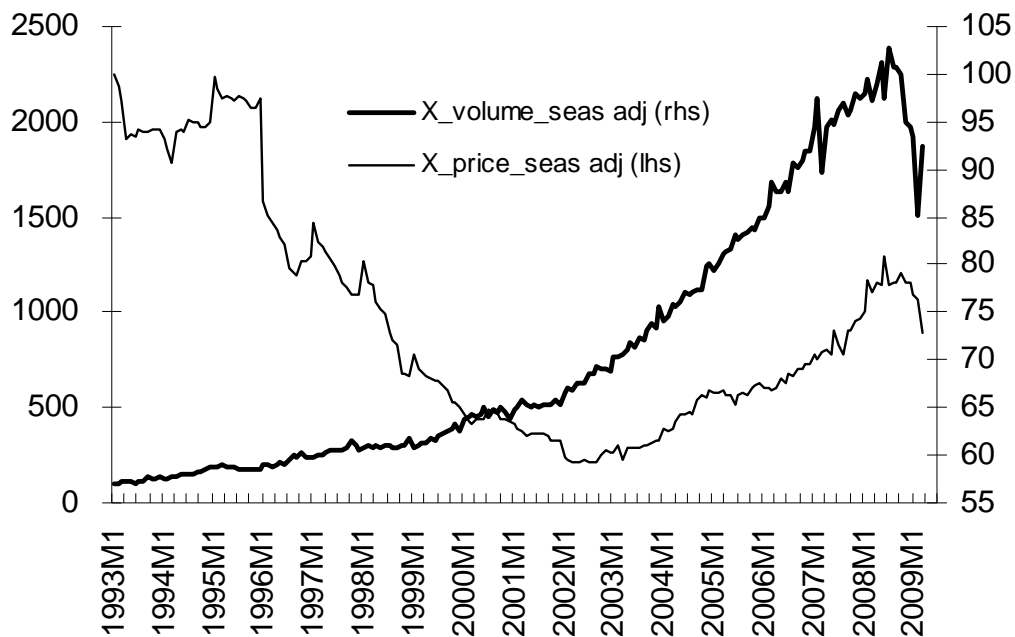


Source: *China's External Trade Indices* Monthly, since 2005. Data before 2005 was provided by Professor Guoqing SONG, China Center for Economic Research, Peking University, drawn originally from unpublished customs statistics.

**Figure 2: Chinese Government Expenditure Growth and GDP Share**



Source: World Bank, *World Development Indicators*, 2008**.**

24
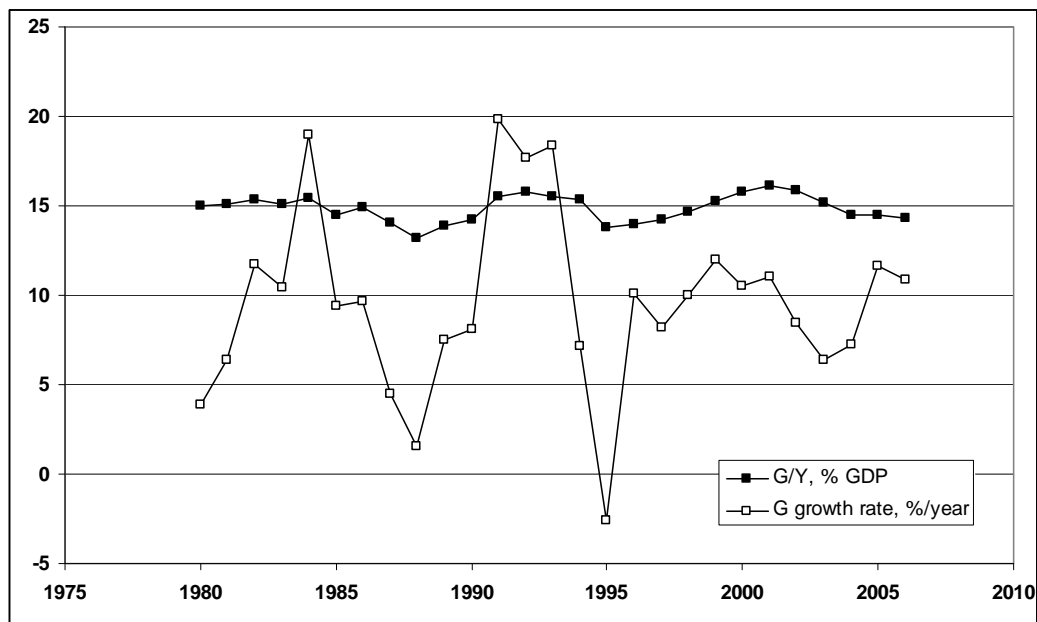
**Figure 3: Expenditure Composition and the Real Exchange Rate**
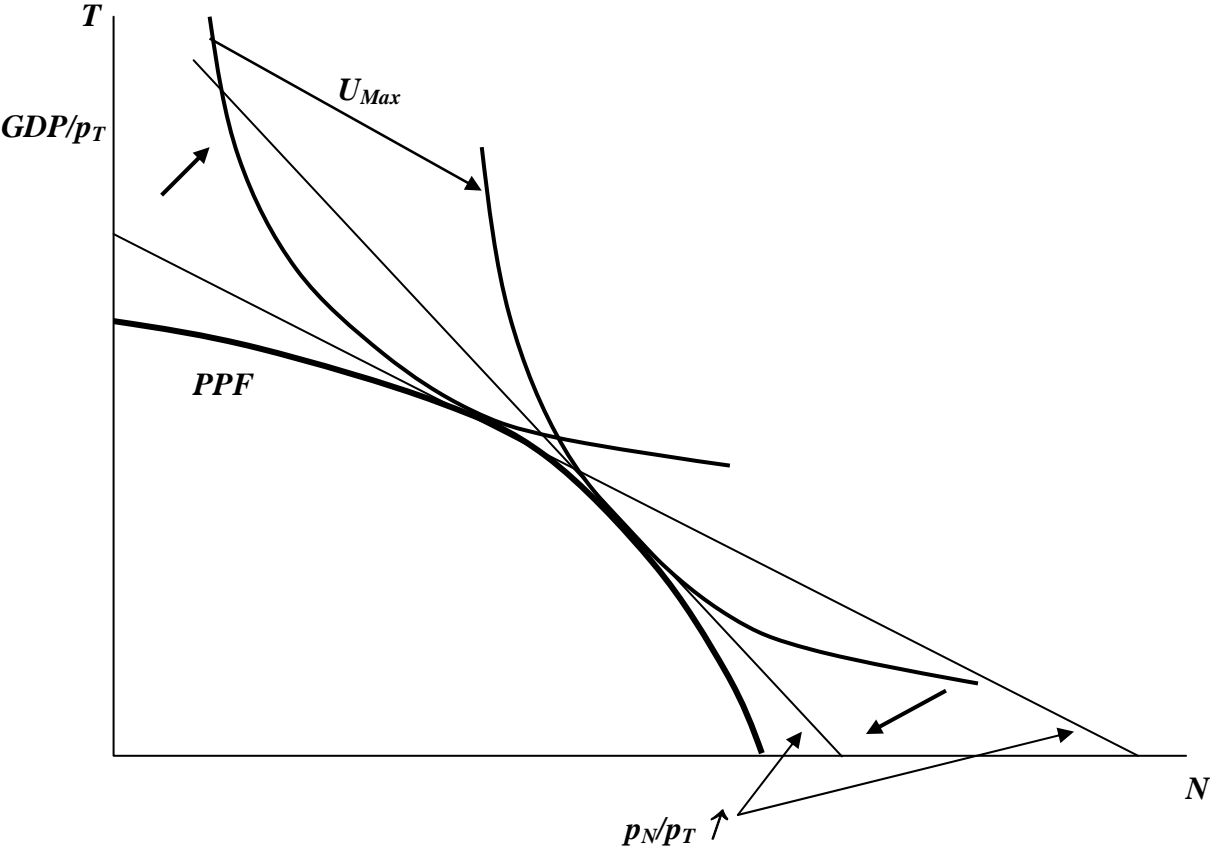
**Figure 4:  Service Oligopoly Rents and the Real Exchange Rate**
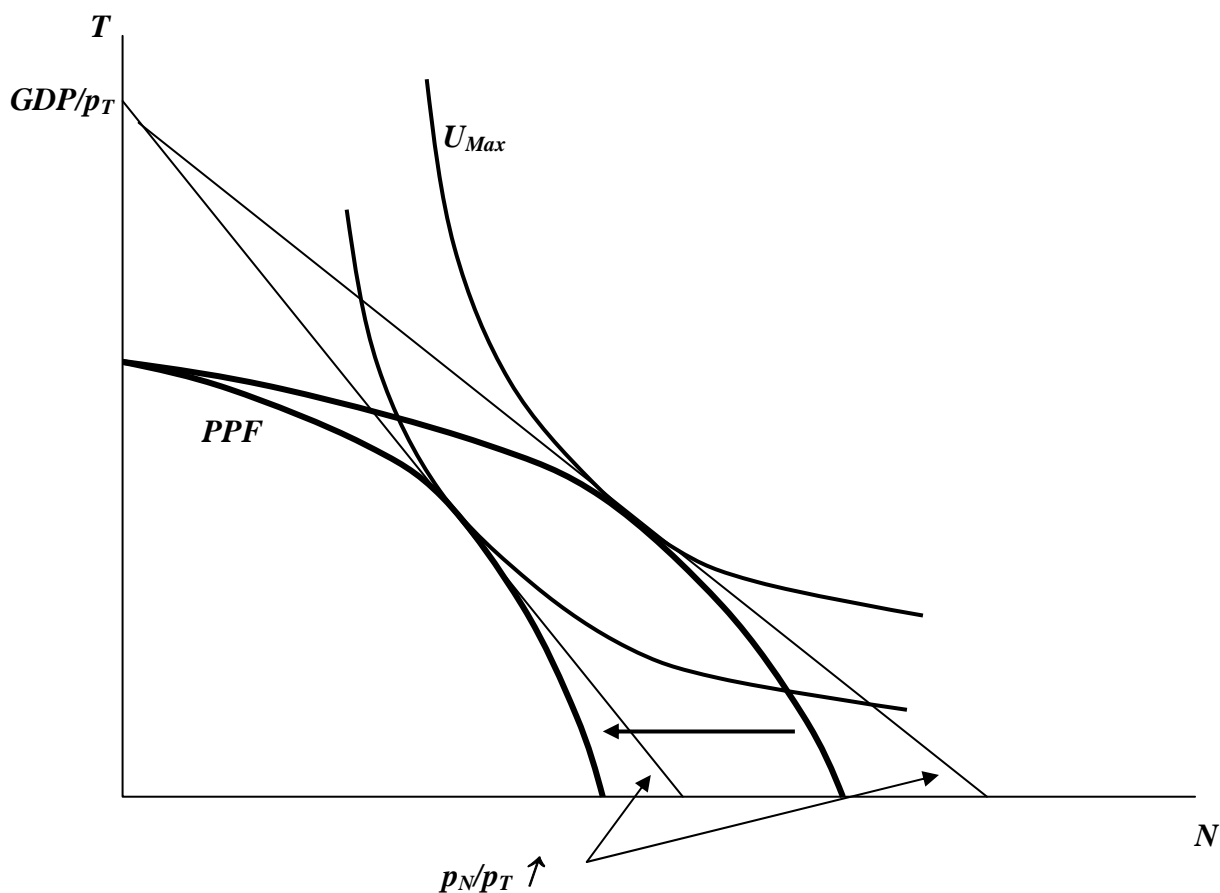


**Table 1: Government expenditure and GDP growth rate, 131 countries**
(Ranked according to G/Y in 1999-2006)

| region | G/Y | | Real GDP growth rate | |
|---|---|---|---|---|
| | 1960-2006 | 1999-2006 | 1960-2006 | 1999-2006 |
| Asian developing | 11.3 | 9.6 | 5.4 | 5.9 |
| Latin America | 11.6 | 12.4 | 3.5 | 3.2 |
| Africa | 14.2 | 13.6 | 3.7 | 4.2 |
| Europe and Middle East | 17.8 | 17.0 | 3.6 | 5.5 |
| Industrialised | 18.0 | 19.8 | 3.2 | 2.5 |

Source:  World Bank, *World Development Indicators*, 2008**.**

## Table 2: Structure of the Chinese Economy[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 (social accounting matrix), derived from Dimaranan and McDougall (2002), and an updating of the national data to 2005, as described in Tyers and Lu (2008).


## Table 3: 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 4: 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 5: 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 6: Short Run Economic Effects of the Export Slowdown and Fiscal Responses[a]

| | Export slowdown alone[b] | | Export slowdown with government expenditure expansion, 7% GDP[c] | | Export slowdown with tax relief in export sectors[d] | |
|---|---|---|---|---|---|---|
| | % changes | % base real GDP[e] | % changes | % base real GDP[e] | % changes | % base real GDP[e] |
| Real GNP[f] | -2.8 | | -3.2 | | -3.0 | |
| Real GDP[g] | -3.5 | | -4.2 | | -3.6 | |
| Real exchange rate | -1.1 | | 2.2 | | -0.7 | |
| Consumption[f] | -1.9 | -1.5 | -3.9 | -1.4 | -1.6 | -1.3 |
| Household saving[e] | -3.7 | -0.9 | -3.4 | -0.8 | -3.2 | -0.8 |
| Corporate saving[e] | -7.3 | -1.2 | 0.3 | 0.1 | -5.4 | -0.9 |
| Government saving[e] | 0.0 | 0.0 | -998 | -7.5 | -194 | -1.5 |
| National saving[e] | -5.0 | -2.1 | -19.6 | -8.3 | -7.5 | -3.1 |
| Investment[e] | -6.8 | -2.4 | -8.4 | -3.0 | -7.2 | -2.5 |
| Foreign investment[e] | -0.1 | 0.0 | 2.7 | 0.1 | 0.3 | 0.0 |
| Reserve accumulation[e] | 2.6 | 0.3 | -54.5 | -5.3 | -6.4 | -0.6 |
| Value of Exports[e] | -8.7 | -3.4 | -20.1 | -7.9 | -10.2 | -4.0 |
| Value of Imports[e] | -8.6 | -2.6 | -6.7 | -2.0 | -8.4 | -2.6 |
| Trade surplus[e] | -9.2 | -0.8 | -67.2 | -5.8 | -16.4 | -1.4 |
| Current account surplus[e] | 1.8 | 0.1 | -75.7 | -5.5 | -10.5 | -0.8 |
| Production employment | -2.5 | | -2.6 | | -2.4 | |
| Real unskilled wage[f] | 1.1 | | -2.2 | | 0.7 | |
| Real skilled wage[f] | -3.7 | | -2.3 | | -3.5 | |
| Real land rent[f] | 0.5 | | -4.4 | | 0.1 | |
| Real resource rent[f] | -4.8 | | -8.2 | | -5.1 | |
| Av gross rate of return[h] | -5.3 | | -3.3 | | -5.1 | |

a  All these simulations use a short run closure in which numbers of firms are fixed and pure profits endogenous, physical capital is fixed at the sectoral level with rates of return endogenous and the real wage of production workers is fixed with all labour mobile between sectors.  The fiscal closure differs depending on the simulation.

b  The export slowdown is a common shift in all rest-of-world excess demand functions sufficient to reduce the real value of total exports by 8%.  In this case the fiscal closure maintains an exogenous fiscal deficit and hence has endogenous government spending.

c  This simulation has the same export demand shock.  But here government spending is made exogenous and the fiscal surplus endogenous.  Government spending is then shocked upward by 47%, or about 7% of initial GDP, keeping all rates of taxation constant.

d  The powers of industry-specific capital income taxes are adjusted to reflect zero tax on capital income from export production.

e  Measured relative to (fixed) international (import) prices.

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

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

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 the Export Slowdown and Fiscal Responses[a]

| | Export slowdown alone[b] | | | Export slowdown with government expenditure expansion, 7% GDP[c] | | | Export slowdown with tax relief in export sectors[d] | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Change in production employment, million jobs | Mark-up ratio, % change | Change in after tax pure profit, % | Change in production employment, million jobs | Mark-up ratio, % change | Change in after tax pure profit, % | Change in power of capital income tax, % | Change in production employment, million jobs | Mark-up ratio, % change | Change in after tax pure profit, % |
| Agriculture | -0.7 | 0.0 | -9.2 | -3.8 | -0.1 | -30.3 | 0.0 | -0.7 | 0.0 | -11.0 |
| Metals & minerals | -2.9 | 0.4 | -8.0 | -4.2 | 1.6 | -6.8 | -1.0 | -3.0 | 0.6 | -8.0 |
| Coal | 0.0 | -0.8 | -14.4 | -0.2 | 0.3 | -8.6 | -2.1 | 0.0 | -0.7 | -13.8 |
| Petroleum | -0.1 | 5.6 | -7.4 | 0.0 | 5.0 | 0.0 | -0.3 | -0.1 | 5.4 | -6.6 |
| Proc agriculture | 0.1 | 0.0 | -0.7 | -1.4 | 0.0 | -1.2 | -0.9 | 0.0 | 0.0 | -0.7 |
| Electronics | -1.4 | 0.2 | -12.2 | -1.9 | 0.4 | -15.7 | -0.2 | -1.5 | 0.2 | -12.6 |
| Motor vehicles | -0.2 | -0.3 | -12.7 | -0.9 | 2.0 | 3.8 | -1.8 | -0.3 | 0.0 | -11.2 |
| Chemical products | -0.4 | 0.3 | -8.2 | -0.8 | 0.9 | -12.3 | -2.3 | -0.4 | 0.4 | -8.5 |
| Textiles | -1.5 | 0.0 | -5.7 | -6.0 | 0.1 | -20.1 | -4.6 | -1.9 | 0.0 | -7.1 |
| Other manufactures | -3.9 | 0.5 | -7.9 | -5.6 | 1.0 | -9.5 | -4.5 | -4.1 | 0.6 | -8.2 |
| Electricity | -0.1 | -0.1 | 8.3 | -0.1 | -0.1 | 9.7 | -0.1 | -0.1 | -0.1 | 8.6 |
| Gas mfg & distn | 0.0 | 0.0 | 61.5 | 0.1 | -0.1 | -105 | 0.0 | 0.0 | -0.1 | 44.8 |
| Telecommunications | 0.0 | 0.2 | -5.7 | 0.0 | -0.2 | 9.5 | -0.1 | 0.0 | 0.2 | -4.0 |
| Finance | -0.3 | -0.1 | -5.9 | 0.0 | 0.4 | -0.3 | -0.1 | -0.3 | 0.0 | -5.2 |
| Transport | -1.1 | 2.7 | -4.4 | -1.2 | 9.4 | 9.8 | -0.6 | -1.1 | 3.5 | -2.7 |
| Construction | -3.5 | 0.0 | -8.2 | -1.0 | -1.1 | -10.3 | 0.0 | -3.3 | -0.2 | -8.7 |
| Other Services | -4.1 | -0.1 | -6.3 | 5.9 | 1.7 | 17.5 | -0.6 | -2.9 | 0.0 | -3.8 |
| Total | -20.0 | .. | -7.3 | -21.2 | .. | 0.5 | .. | -19.8 | .. | -6.6 |

a  All these simulations use a short run closure in which numbers of firms are fixed and pure profits endogenous, physical capital is fixed at the sectoral level with rates of return endogenous and the real wage of production workers is fixed with all labour mobile between sectors. The fiscal closure differs depending on the simulation.
b  The export slowdown is a common shift in all rest-of-world excess demand functions sufficient to reduce the real value of total exports by 8%. In this case the fiscal closure maintains an exogenous fiscal deficit and hence has endogenous government spending.
c  This simulation has the same export demand shock. But here government spending is made exogenous and the fiscal surplus endogenous. Government spending is then shocked upward by 47%, or about 7% of initial GDP, keeping all rates of taxation constant.
d  The powers of industry-specific capital income taxes (1+rate) are adjusted to reflect zero tax on industry-specific capital income from export production.
Source: Simulations of the model described in the text.

## Table 8: Short Run Economic Effects of the Fiscal Expansion *Alone*[a]

| | Government expenditure expansion alone, 7% GDP[b] | | Government expenditure expansion alone, 7% GDP with no oligopoly rents[c] | | Difference in fiscal expansion effects due to changes in oligopoly rents[d] | |
|---|---|---|---|---|---|---|
| | % changes | % base real GDP[e] | % changes | % base real GDP[e] | % changes | % base real GDP[e] |
| Real GNP[f] | -0.7 | | 1.2 | | -2.0 | |
| Real GDP[g] | -1.1 | | 1.3 | | -2.4 | |
| Real exchange rate | 2.9 | | 0.9 | | 2.0 | |
| Consumption[f] | -2.1 | 0.0 | 2.3 | 1.2 | -4.3 | -1.2 |
| Household saving[e] | 0.0 | 0.0 | 3.0 | 0.7 | -3.0 | -0.7 |
| Corporate saving[e] | 6.2 | 1.0 | 0.1 | 0.0 | 6.1 | 1.0 |
| Government saving[e] | -901 | -6.8 | -871 | -6.6 | -29.9 | -0.2 |
| National saving[e] | -13.6 | -5.7 | -13.7 | -5.8 | 0.1 | 0.0 |
| Investment[e] | -2.3 | -0.8 | -3.3 | -1.2 | 1.0 | 0.4 |
| Foreign investment[e] | 2.5 | 0.1 | 2.4 | 0.1 | 0.2 | 0.0 |
| Reserve accumulation[e] | -50.4 | -4.9 | -47.3 | -4.6 | -3.2 | -0.3 |
| Value of Exports[e] | -10.5 | -4.1 | -6.7 | -2.6 | -3.8 | -1.5 |
| Value of Imports[e] | 1.3 | 0.4 | 5.4 | 1.6 | -4.1 | -1.2 |
| Trade surplus[e] | -52.1 | -4.5 | -49.2 | -4.3 | -2.9 | -0.3 |
| Current account surplus[e] | -68.5 | -4.9 | -63.2 | -4.6 | -5.3 | -0.4 |
| Production employment | -0.3 | | 2.0 | | -2.4 | |
| Real unskilled wage[f] | -2.9 | | -0.9 | | -2.0 | |
| Real skilled wage[f] | 0.6 | | 7.9 | | -7.2 | |
| Real land rent[f] | -4.4 | | -1.3 | | -3.1 | |
| Real resource rent[f] | -3.6 | | 1.2 | | -4.9 | |
| Av gross rate of return[h] | 1.1 | | 1.5 | | -0.4 | |

a  All these simulations use a short run closure in which numbers of firms are fixed and pure profits endogenous, physical capital is fixed at the sectoral level with rates of return endogenous and the real wage of production workers is fixed with all labour mobile between sectors.  The fiscal closure has government expenditure exogenous, and shocked, while the fiscal deficit is endogenous.

b  This is a fiscal expansion shock considered in isolation - in the absence of any changes in export demand.

c  Here full price regulation is imposed at the outset, so that P=AC in all sectors and hence there are no oligopoly rents.  The fiscal expansion is then introduced while maintaining this regulatory regime.  Mark-ups change only to retain zero economic profits.

d  These columns show the differences between the effects of the pure fiscal expansion with and without simulated oligopoly pricing responses.

d  The powers of industry-specific capital income taxes are adjusted to reflect zero tax on capital income from export production.

e  Measured relative to (fixed) international (import) prices.

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

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

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 9: Short Run Economic Effects of the Export Slowdown with Accelerated Industrial Reforms[a]**

| | Export slowdown alone[b] | | Export slowdown with further SOE privatisation[c] | | Export slowdown with SOE privatisation and price cap regulation[d] | |
|---|---|---|---|---|---|---|
| | % changes | % base real GDP[e] | % changes | % base real GDP[e] | % changes | % base real GDP[e] |
| Real GNP[f] | -2.8 | | -1.4 | | 14.0 | |
| Real GDP[g] | -3.5 | | -2.1 | | 20.4 | |
| Real exchange rate | -1.1 | | 0.8 | | -5.4 | |
| Consumption[f] | -1.9 | -1.5 | 15.4 | 6.3 | 33.2 | 13.2 |
| Household saving[e] | -3.7 | -0.9 | 15.2 | 3.8 | 32.0 | 8.0 |
| Corporate saving[e] | -7.3 | -1.2 | -71.2 | -11.8 | -69.1 | -11.5 |
| Government saving[e] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| National saving[e] | -5.0 | -2.1 | -19.1 | -8.1 | -8.4 | -3.5 |
| Investment[e] | -6.8 | -2.4 | -8.0 | -2.8 | 21.0 | 7.4 |
| Foreign investment[e] | -0.1 | 0.0 | 2.7 | 0.1 | 5.6 | 0.1 |
| Reserve accumulation[e] | 2.6 | 0.3 | -53.5 | -5.2 | -111.3 | -10.8 |
| Value of Exports[e] | -8.7 | -3.4 | -18.2 | -7.1 | -1.4 | -0.5 |
| Value of Imports[e] | -8.6 | -2.6 | -4.1 | -1.2 | 31.3 | 9.5 |
| Trade surplus[e] | -9.2 | -0.8 | -67.9 | -5.9 | -116.2 | -10.1 |
| Current account surplus[e] | 1.8 | 0.1 | -73.7 | -5.3 | -145.4 | -10.5 |
| Production employment | -2.5 | | -0.4 | | 0.0 | |
| Real unskilled wage[f] | 1.1 | | -0.8 | | 28.2 | |
| Real skilled wage[f] | -3.7 | | -1.9 | | 43.7 | |
| Real land rent[f] | 0.5 | | 4.9 | | 14.3 | |
| Real resource rent[f] | -4.8 | | -3.8 | | 40.7 | |

a  All these simulations use a short run closure in which numbers of firms are fixed and pure profits endogenous, physical capital is fixed at the sectoral level with rates of return endogenous and the real wage of production workers is fixed with all labour mobile between sectors.  The fiscal closure differs depending on the simulation.

b  The export slowdown is a common shift in all rest-of-world excess demand functions sufficient to reduce the real value of total exports by 6%.  In this case the fiscal closure maintains an exogenous fiscal deficit and hence has endogenous government spending.

c  This simulation has the same export demand shock.  But here the corporate saving rate is reduced sufficient to contract corporate saving to about 5% of GDP.

d  Here the shocks combine the export slowdown, privatisation sufficient to reduce corporate saving to about 5% of GDP and price cap regulation sufficient to reduce mark-ups half way to the Ramsay (zero pure profit) rates.  Because a fixed real production wage yields an unrealistically large rise in labour use a flexible wage closure is used.

d  The powers of industry-specific capital income taxes are adjusted to reflect zero tax on capital income from export production.

e  Measured relative to (fixed) international (import) prices.

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

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

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 10: Short Run Sectoral Effects of the Export Slowdown with Accelerated Industrial Reforms[a]

| % changes | Export slowdown alone[b] | | | Export slowdown with further SOE privatisation[c] | | | Export slowdown with SOE privatisation and price cap regulation[d] | | |
|---|---|---|---|---|---|---|---|---|---|
| | Change in production employment, million jobs | Mark-up ratio, % change | Change in after tax pure profit, % | Change in production employment, million jobs | Mark-up ratio, % change | Change in after tax pure profit, % | Change in production employment, million jobs | Mark-up ratio, % change | Change in after tax pure profit, % |
| Agriculture | -0.7 | 0.0 | -9.2 | 11.1 | -0.1 | 10.1 | -21.8 | -0.1 | -108.1 |
| Metals & minerals | -2.9 | 0.4 | -8.0 | -3.5 | 1.0 | -7.2 | 15.5 | -2.4 | -20.1 |
| Coal | 0.0 | -0.8 | -14.4 | -0.2 | 0.5 | -5.2 | -0.2 | 5.7 | 4.5 |
| Petroleum | -0.1 | 5.6 | -7.4 | 0.0 | 4.5 | -4.0 | 0.1 | 2.4 | -6.2 |
| Proc agriculture | 0.1 | 0.0 | -0.7 | 1.1 | -0.1 | 1.5 | -5.9 | 0.1 | -39.1 |
| Electronics | -1.4 | 0.2 | -12.2 | -1.6 | 0.3 | -13.0 | -0.5 | 0.8 | -37.9 |
| Motor vehicles | -0.2 | -0.3 | -12.7 | -0.4 | 0.6 | -4.2 | 2.2 | -2.4 | -36.1 |
| Chemical products | -0.4 | 0.3 | -8.2 | -0.5 | 0.8 | -3.0 | 0.8 | 0.4 | -19.0 |
| Textiles | -1.5 | 0.0 | -5.7 | -3.5 | 0.1 | -5.2 | -23.7 | 0.8 | -67.3 |
| Other manufactures | -3.9 | 0.5 | -7.9 | -4.3 | 0.7 | -7.5 | 2.9 | 1.9 | -22.7 |
| Electricity | -0.1 | -0.1 | 8.3 | 0.0 | -0.3 | 10.8 | 0.2 | 0.2 | -54.0 |
| Gas mfg & distn | 0.0 | 0.0 | 61.5 | 0.0 | -0.3 | 45.9 | 0.0 | -0.1 | -78.0 |
| Telecommunications | 0.0 | 0.2 | -5.7 | 0.0 | 1.2 | 2.4 | 0.1 | 0.0 | -9.6 |
| Finance | -0.3 | -0.1 | -5.9 | 0.2 | -0.7 | 0.9 | 2.8 | 0.6 | -11.6 |
| Transport | -1.1 | 2.7 | -4.4 | -1.1 | 6.6 | 4.8 | 8.6 | -12.6 | -26.1 |
| Construction | -3.5 | 0.0 | -8.2 | -3.3 | -0.3 | -9.8 | 6.4 | -0.3 | -33.6 |
| Other Services | -4.1 | -0.1 | -6.3 | 2.6 | -0.6 | -2.3 | 12.4 | 0.2 | -30.5 |
| Total | -20.0 | .. | -7.3 | -3.4 | .. | -4.0 | 0.0 | .. | -22.8 |

a  All these simulations use a short run closure in which numbers of firms are fixed and pure profits endogenous, physical capital is fixed at the sectoral level with rates of return endogenous and the real wage of production workers is fixed with all labour mobile between sectors.  The fiscal closure differs depending on the simulation.

b  The export slowdown is a common shift in all rest-of-world excess demand functions sufficient to reduce the real value of total exports by 6%.  In this case the fiscal closure maintains an exogenous fiscal deficit and hence has endogenous government spending.

c  This simulation has the same export demand shock.  But here government spending is made exogenous and the fiscal surplus endogenous.  Government spending is then shocked upward by 47%, or 7% of initial GDP, keeping all rates of taxation constant.

d  Here the shocks combine the export slowdown, privatisation sufficient to reduce corporate saving to about 5% of GDP and price cap regulation sufficient to reduce mark-ups half way to the Ramsay (zero pure profit) rates.  Because a fixed real production wage yields an unrealistically large rise in labour use a flexible wage closure is used.
Source: Simulations of the model described in the text.