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Structural Transformation in China and India: The Role of Macroeconomic Policies

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Abstract

This paper explores macroeconomic policies that can sustain structural change in China and India. A two--sector open--economy model with endogenous productivity growth, demand driven output and income distribution as an important determinant of economic activity is calibrated to a 2000 SAM for China and a 1999/2000 SAM for India. Short--run analysis concerns temporary equilibria for output, productivity and employment growth rates in the formal sector. In the long--run, the model allows for multiple equilibria which can describe cases of (a) underdevelopment and structural heterogeneity or (b) sustained growth and development. Several simulation exercises are conducted. Specifically, we consider how changes in investment, wages, labor productivity trend and a depreciation of currency affect the macroeconomy and job creation in the formal sector.

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February 1, 2011

Abstract

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1 Introduction

Higher labor productivity and economic growth do not necessarily reduce poverty. If output expansion is not accompanied by a transfer of labor to more productive and better paid jobs, problems of underdevelopment remain unresolved. Ocampo et al. (2009) and Easterly (2003), for example, discuss these themes, and *growth without development* as well as *jobless growth* are two labels applied to describe the phenomenon. Lack of labor transfer is of course due to the lack of dynamic structural change, which raises several issues.

First, efforts to fight wide–spread poverty are destined to fail unless good jobs are created for the many underemployed and poor. Further, economic history shows that sustainable growth is associated with rising shares (a) of industry and service sector output in total output, (b) of high–productivity employment in total employment and (c) high value–added products in total production. Pieper (1999), Ocampo et al. (2009), UN (2006), and Ros

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(2005)) are some recent studies documenting these stylized facts; Syrquin and Taylor (1984) and Chenery et al. (1987) are seminal references supporting the association between labor shifts and sustained development.

In this paper, we employ a model to illustrate such links between productivity, employment and output growth. The model highlights the fact that labor productivity growth is necessary but not sufficient to achieve sustainable development. Indeed, the share of formal sector activity in total activity must rise. In a nutshell, it is assumed that (a) output growth leads to productivity growth through a Kaldor–Verdoorn channel, and that (b) productivity growth *can* lead to further demand growth, if labor transfer occurs. In such a 'high road' equilibrium, growth is accompanied by structural change, and cumulative causation sustains it. If output growth is too weak to lead to labor transfer, growth but no structural change occurs. This 'low road' equilibrium implies jobless growth, and perpetuates underemployment and poverty—it may lead to a '*vicious circle of slowdown in productivity and economic growth, decline in investment, [and] increased structural heterogeneity as surplus manpower is absorbed into low-productivity activities*' (Ocampo (2005), page 22).

The model has previously been discussed in detail in Rada and Taylor (2006) and Rada (2007). We present it briefly in Section 3, but the focus of the paper is to examine the role of macroeconomic policies in guiding structural transformation in China and India. Since these two most populous countries and their—quite different—economic trajectories are on many an economist's mind, the comparison seems appropriate, and is further motivated in Section 2. Section 4 discusses simulations, and Section 5 concludes.

2 Recent growth experience in China and India

China and India have become economic powerhouses of the developing world. Both countries have consistently recorded impressive growth rates of output and labor productivity. While fast catching–up has been observed before—i.e., in Japan or South Korea—the sheer size of the two countries' population renders their deepening involvement in the global economy of particular importance. In fact, global poverty trends have improved when including China, and have not, when excluding China. The picture is more mixed in India.

Indeed, growth and development patterns of the two economies differ in many aspects. An extraordinarily high investment share in GDP has been a staple of China's rapid economic expansion. Relatively high public and private saving have facilitated capital accumulation in the face of a large external surplus. In India, in sharp contrast, growth (a) has not been as sustained over several decades,[1] and (b) is concentrated in regional pockets of high–skill,

[1]See Rodrik and Subramanian (2005) for a discussion of India's growth experience, roughly categorized as (1) the initial "budget–deficit" driven 80ies, (2) the liberalizing 90ies, and (3) recent (pre–crisis) years with still accelerating growth.

high–productivity activities, and often in services.[2] Despite external deficits, the investment share in GDP is significantly smaller than in China.

Let us consider a few statistics specifically relevant for this study. Table 1 summarizes average annual growth rates of macroeconomic time series for the two countries throughout the 1990s.

Table 1 here: China and India's economic performance during the 1990s

In China, formal sector output grew annually on average at a rate of roughly twelve per cent. A large chunk of that was due to, on average, labor productivity growth of nine and a half per cent; the remainder due to average formal sector employment growth of two and a half per cent. The labor force expanded roughly at one per cent per year, so that the formal sector increased its share in total employment to more than 42 per cent from about 36 per cent (Ghose (2005), Rada (2010)).

However, this was not a smooth process over the course of the decade. The transfer of labor to the formal sector slowed down considerably in the second half of the 1990s, when restructuring of state–owned enterprises led to closure of many industrial facilities. As a result, the share of formal sector employment *declined* by two percentage points between 1995 and 2000. Concomitantly, both output and investment demand expanded at a slower pace compared to the first half of the decade.

In India, job creation in the formal sector was stagnant throughout the decade. To be sure, formal sector output expanded annually at an average rate of more than six per cent. However, labor productivity grew only slightly slower, leaving little need for additional employment. Consequently, the share of formal sector employment declined slightly. By 2000, roughly 93 per cent of India's labor force remained employed—and underemployed—in the informal sector.

The resulting, and deepening, contrast between India's new rich on the one hand and those still poor on the other has been well documented. See for example, Breman (2010) and Chandrasekhar and Ghosh (2007). Similarly, Deaton and Drze (2002) find that Southern and Western states had relatively more success in reducing poverty—which is not surprising, since many high–productivity jobs in IT and business services are concentrated in these states.

Further, productivity differentials across formal and informal activities differ significantly between the two countries. A Chinese formal sector worker is roughly three times as productive as her informal counterpart. In India, a formal sector worker produces on average *eight* times the output of an informal worker. These numbers reflect the differing degrees of structural heterogeneity. Clearly, agricultural labor productivity is much higher in China than in India. China's state–led efforts to increase rural productivity during the initial reforms in

[2]Kochhar et al. (2006), for example, show that India—compared to other developing economies and when controlling for both size and state of development of the economy—is not specialized in labor–intensive but skill–intensive industries, and has relatively high labor productivity in labor–intensive activities.

the late 1970s and 1980s play an important role here.[3] The possibly detrimental effects of lagging agricultural productivity on industrial growth potential have long been at the heart of the development debate. The price of food in terms of the industrial wage presents a crucial structural bottleneck (Kalecki (1976)). Hence, there exists the possibility that food price increases choke off a virtuous cycle of formal sector output and employment growth; appropriate policies should be designed to aid agriculture in supporting industrial growth.

Discussion of such arguments complements the issues emphasized in the introduction above and analysis below, but we do not focus on it. We focus on the nexus between *formal* sector demand and *formal* sector productivity, and take prices as given. Since we consider policies and shocks to the formal sector and treat the informal sector as residual, the issue is not addressed explicitly in simulations below.

Lastly, exports and investment are essential components of effective demand. Investment in particular is required to accommodate more workers in formal activities. During the 1990s, China has strongly outperformed India with respect to both exports and investment growth. The difference is especially striking when it comes to the pace of the average annual rate of capital accumulation: roughly fourteen per cent in China, but only about six per cent in India.

In China, the task at hand appears to be to sustain recent rates of growth, possibly with an increased reliance on domestic consumption. India's future performance is contingent on more rapid capital accumulation, which should help to ignite the thus far lacking virtuous cycle of structural change and growth. These and related themes will be picked up further below; let us now discuss the model more formally.

3 A model of transformation and development

To explore dynamic structural change in the two economies we use a two–sector open economy model that functions according to the SAM presented in Table 2. The formal sector produces a tradable good using capital and labor. The informal sector utilizes labor only to produce a nontradable good. The tradable good can be consumed, invested or exported. The foreign sector supplies intermediate inputs used in the production of the tradable good. Capitalists and workers are two distinct classes within the formal sector only; capitalists own capital, invest, consume the tradable good and save; workers receive a wage which they spend entirely on consumption of both sectors' products. The model makes the classical assumption that workers do not save, or, if they do, the saving is at a level that can be ignored. In the

[3]Montalvo and Ravallion (2010) discuss Chinas success in poverty reduction, and conclude that "the primary sector was the real driving force in Chinas remarkable success against absolute poverty, rather than the secondary (manufacturing) or tertiary (services) sectors," (p.13) and that the "revealed importance of agricultural growth to Chinas success against poverty stands in marked contrast to India, where the services sector has been the more powerful force." (p.16)

simulations the assumption of no savings for workers is relaxed since household sector's saving rate is significant in both China and India.

Table 2 here

Macro equilibrium is reached when excess demands in the two sectors are zero. In line with standard fixed-flex price models (Hicks (1965), Taylor (1983)) excess capacity in the formal sector implies that equilibrium in the sector is attained through quantity adjustments. In the informal sector the price level in these type of models changes to bring the excess demand to zero.

There are two main ideas behind the workings of the economy in this model. First, the Kaldor-Verdoorn (KV) relation postulates that overall productivity growth responds to higher output growth in the industrial or formal sector[4] and therefore is endogenous. Secondly, formal output growth is determined from the demand-side in the short and medium run. In the informal sector labor productivity responds to the amount of employment (Sen (1966)). For example, a transfer of labor to the formal sector eventually leads to a rise in the average product in the informal sector as a smaller number of workers can produce the same amount of output as before.

Employment growth in the formal, high-productivity sector follows from the output–productivity dynamics. In the informal sector employment is obtained as a residual from the difference between total labor force and formal employment. Formal employment is lost if productivity grows faster than output or if output declines due to an exogenous shock such as a collapse in the external demand. The outcome is an increase in the structural heterogeneity of the economy with potential negative consequences on long-run development. The released labor ends up in the low-productivity, low-wage informal sector which has adverse effects on both overall productivity growth and output – the latter due to a loss in purchasing power and therefore a further decline in demand. The vicious circle replicates itself as lower output further spreads into falling rates of productivity growth unless macroeconomic policies to stimulate aggregate demand are implemented.

In a demand-driven model income distribution plays a crucial role. The analysis takes into account two types of demand-led growth regimes: wage-led and profit-led growth as incorporated in models developed by Dutt (1984), Taylor (1985) and Bhaduri and Marglin (1990). If, for example, economic activity is profit-led, redistribution of income towards wages causes a contraction in output and therefore a decline in formal employment.

In what follows we present the main relations of the model. We focus on the formal sector since output, employment, and productivity for the informal sector are derived as residuals.

[4]Due to "... dynamic economies of scale of a microeconomic character, associated with learning and induced innovations; those associated with the exploitation of intra- and intersectoral external economies [...]; and the positive links generated by variations in underemployment." Ocampo (2005)

3.1 The short-run model in growth terms

The model works with an endogenous rate of growth of employment and no unemployment in the standard sense since everyone not formally employed is absorbed by the informal sector. Log-differentiation of the output identity $X = L\varepsilon$, where X, L, ε are output, employment and labor productivity respectively in the formal sector gives us the growth rate of employment $\hat{L} = \hat{X} - \hat{\varepsilon}$. The Kaldor-Verdoorn (KV) technical progress function assumes that the growth rate of labor productivity increases linearly with output growth:

$$\hat{\varepsilon} = \bar{\varepsilon} + \gamma_0 \hat{X} \tag{1}$$

where γ_0 is the KV coefficient or the elasticity of labor productivity with respect to demand, and $\bar{\varepsilon}$ is a productivity trend term which responds to human capital growth, industrial policy, technological advancement and international openness. After replacing the growth rate of labor productivity with relation (1), the growth of employment in the formal sector depends on the slope of the KV schedule (or the KV coefficient), the growth rate of output in the sector and the trend in labor productivity according to:

$$\hat{L} = (1 - \gamma_0)\hat{X} - \bar{\varepsilon} \tag{2}$$

According to (2) formal employment expands if effective demand grows at a rate large enough to cover the incoming growth rate of labor productivity and a potential high KV coefficient.

It makes sense now to ask what drives output growth. In a Keynesian world output responds to aggregate demand in the short-run. Sources of demand are investment, I, and exports, E. Savings on the other hand act as leakages and therefore affect output negatively. After some algebra (see Rada (2007), p.721-722) output growth can be written as:

$$\hat{X} = (1 - \mu_1)\hat{E} + \mu_1 \hat{I} + \mu_2 \sigma(\hat{\omega} - \hat{\varepsilon}) - (1 - \mu_2)\hat{e} \tag{3}$$

where $\mu_1 = I/(I + E)$, $\mu_2 = s\pi/(s\pi + e_r a)$, and $\hat{\omega}$ and $\hat{e}$ are the growth rates of formal wage and the rate of currency depreciation respectively. The growth rate of saving, $\hat{s}$ is negatively related to the wage share, $\hat{s} = -\sigma\hat{\psi}$, where $\hat{\psi} = \hat{\omega} - \hat{\varepsilon}$ is the growth rate of the wage share in the formal sector and σ is the wage share elasticity of saving.[5] Investment and exports respond positively to higher demand (or output growth) and negatively to a loss in profitability as measured by the growth rate of the wage share according to:

$$\hat{I} = \hat{I}_0 + \phi_X \hat{X} - \phi_\psi \hat{\psi} \tag{4}$$

$$\hat{E} = \hat{E}_0 + \theta_X \hat{X} - \theta_\psi \hat{\psi} + \theta_e \hat{e}_r \tag{5}$$

[5]The assumption holds if savings out of profits are higher than out of wages, and usually that is the case for both developed and developing countries.

$\hat{I}_0$ and $\hat{E}_0$ are trends in the growth rates of investment demand and exports respectively. In addition, a depreciation of the exchange rate raises competitiveness in external markets and therefore stimulates export growth. From (4) and (5) we solve for output growth in the formal sector:

$$\hat{X} = \chi_1 \hat{I}_0 + \chi_2(\hat{\varepsilon} - \hat{\omega}) + \chi_3 \hat{e}_r + \chi_4 \hat{E}_0 \tag{6}$$

where:

$$\begin{aligned}
\chi_1 &= \frac{\mu_1}{1 - \mu_1\phi_x + (1-\mu_1)\theta_X}, \\
\chi_2 &= \frac{(1-\mu_1)\theta_\psi + \mu_1\phi_\psi - \mu_2\sigma}{1 - \mu_1\phi_x + (1-\mu_1)\theta_X}, \\
\chi_3 &= \frac{(1-\mu_1)\theta_e - (1-\mu_2)}{1 - \mu_1\phi_x + (1-\mu_1)\theta_X}, \text{ and} \\
\chi_4 &= \frac{1-\mu_1}{1 - \mu_1\phi_x + (1-\mu_1)\theta_X}.
\end{aligned}$$

χ_1 and χ_4 have to be positive for the model to have an economic meaning. This condition is met unless the accelerator ϕ_x is considerably larger than unity, an unlikely empirical case. The other two coefficients, χ_2, χ_3 can take either signs. The sign and magnitude of χ_2 captures the effect of changes in the wage share (or income distribution) on the economy. A weak impact of the wage share on investment and exports and a high propensity to save out of profits can make $\chi_2 < 1$. In this case the economy is said to be wage-led. If $0 < \chi_2 < 1$ the economy is weakly profit-led. Alternatively, a χ_2 larger than one makes economic activity profit-led.[6] The sign of χ_3 depends on how strongly the depreciation stimulates exports relative to the increase in costs of imported inputs and income redistribution effects. Using (1), (2) and (6) we can solve simultaneously for the variables of interest:

$$\hat{X} = \frac{1}{1-\gamma_0\chi_2}[\chi_2(\bar{\varepsilon} - \hat{w}) + \chi_1\hat{I}_0 + \chi_3\hat{e}_r + \chi_4\hat{E}_0] \tag{7}$$

$$\hat{\varepsilon} = \frac{1}{1-\gamma_0\chi_2}[\bar{\varepsilon} + \gamma_0(\chi_1\hat{I}_0 + \chi_3\hat{e}_r - \chi_2\hat{w} + \chi_4\hat{E}_0)] \tag{8}$$

$$\hat{L} = \frac{1}{1-\gamma_0\chi_2}[(1-\gamma_0)(\chi_1\hat{I}_0 - \chi_2\hat{\omega} + \chi_3\hat{e}_r + \chi_4\hat{E}_0) - (1-\chi_2)\bar{\varepsilon}] \tag{9}$$

We can now conduct comparative statics on how output, employment and productivity in the formal sector respond to shifts in exogenous variables. Higher incoming productivity, $\bar{\varepsilon}$, raises overall labor productivity but its impact on output and employment can vary. In the wage-led case (when $\chi_2 < 0$) both employment and output decline. If the economy is weakly profit-led case only employment growth suffers. In the strongly profit-led case (when $\chi_2 > 1$) higher incoming productivity leads to output and employment growth. Similar exercises can

[6] It will be seen later on why this more detailed distinction rather than only profit versus wage-led matters.

be performed for the other exogenous variables. Visually the model for a weakly profit-led and strongly profit-led economy is described by figures 1(a) and (b) respectively.

Figure 1(a) and (b) here

Employment growth is determined at the intersection of the output and Kaldor-Verdoorn schedules. $\hat{L}$ is constant along each employment growth contours drawn at a 45 degree angle. For example, employment growth is zero if equilibrium is on the 45 degree line from the origin where $\hat{X} = \hat{\varepsilon}$. Employment expands faster when the equilibrium point moves on contours situated towards the south-east. An increase in labor productivity shifts the KV schedule upwards and creates jobs only if the slope of the output schedule, $d\hat{\varepsilon}_{LT}/d\hat{X}_T = 1/\chi_2$ is smaller than one – or χ_2 is larger than one. This is the case of a strongly profit-led economy.

3.2 The model's long-run dynamics

This section discusses the dynamics of the model in the long-run. Following Kaldor (1957) the model assumes a retardation mechanism acting on the cumulative effect of output growth on productivity. More specifically, the retardation is captured by a declining value of the KV coefficient as a result of "decreasing increasing returns" (Vaciago (1975), Pieper (2003)). The story is that as the economy matures and the formal sector becomes dominant the labor surplus declines which limits gains from economies of scale. Maturity is measured here by the share of formal employment in total employment, λ. The retardation mechanism is generically written as:

$$\gamma_0 = f(\lambda) \tag{10}$$

The growth rate of formal employment share, $\hat{\lambda} = \hat{L} - n$, together with relation (9) reduces the model and the analysis in the long-run to one non-linear differential equation:

$$\dot{\lambda} = \lambda[\frac{(1 - f(\lambda))A - B}{1 - f(\lambda)\chi_2} - n] = \left(\frac{\lambda}{1 - f(\lambda)\chi_2}\right)(A - B - n + f(\lambda)(n\chi_2 - A)) \tag{11}$$

where $A = \chi_1\hat{I}_0 - \chi_2\hat{\omega}_M + \chi_3\hat{e}_r + \chi_4\hat{E}_0$ and $B = (1 - \chi_2)\bar{\varepsilon}_{LM}$. If a quadratic function is chosen for $f(\lambda)$, the differential equation in (11) has three fixed points. To be economically meaningful all have to meet the restriction $0 \leq \lambda^* \leq 1$. The three root-case is interesting from an economic point of view because it describes (I) the situation of an underdevelopment trap when $\lambda^* = 0$, (II) the case of structural heterogeneity when the economy settles at the middle equilibrium point, or (III) the case of sustainable development and growth when the economy approaches and eventually settles at the upper equilibrium point characterized by a large share of formal employment.

4 Simulations and discussion

What measures can effectively stimulate an increase of the share of formal in total employment? In this section, we investigate the impact of a number of shocks and policies on growth and structural change in China and India. First, though, the following subsection discusses issues related to the underlying data and model calibration.

4.1 Data, parameters, and calibration

Since the informal sector is considered residual, the focus here is only on the dynamics within the formal sector—which is fully described by the system of equations (7)-(9). Tables 3(a) and (b) provide estimates for the relevant parameters. They are obtained either directly from the base year SAMs, are taken from previous econometric studies, or are residually calculated to reflect the relevant statistics for productivity, output and employment growth. See the appendix for further information on data sources and procedures.

Table 3(a)–(b) here — Parameters and growth rates of exogenous variables

The top of Table 3(a) shows statistics on income shares, saving rates, investment shares; they are discussed in more detail in Rada (2010). The formal sector's profit share π is 0.43 in China and 0.39 in India; the investment share $\mu_1 = I/(I+E)$ is 0.56 in China and 0.51 in India. The ratio of domestic savings relative to total savings μ_2 is 0.59 in China and 0.40 in India, indicating the Indian economy's reliance on external resources.

As mentioned above, we relax the assumption that households conduct no savings. According to data from the Flows of Funds for the year 2000 (Table 3–21, National Bureau of Statistics of China 2003), formal and informal Chinese households saved about 25 per cent of its disposable income. In the simulations we use the savings rate of the formal household sector which, based on the 2000 SAM, is calculated to be 40 per cent. Indian formal households save somewhere around 22 per cent of their income. The economy–wide propensity to save follows from $s = \psi s_w + (1-\psi) s_\pi$, and comes to 47 per cent and 24 per cent in China and India respectively. Based on these numbers, the elasticity of the savings rate $\sigma = -(\psi/s)(s_r - s_w)$ with respect to the wage share takes a value of 0.18 in China and 0.11 in India.

The remaining parameters are chosen ad hoc, using plausible values and information from other studies; for example, see Naastepad (2006). The accelerator ϕ_X is usually set around unity. A higher wage share has a negative impact on investment and export growth through ϕ_ψ and θ_ψ; both are set to -0.20. The elasticity of external demand with respect to an exchange rate depreciation is $\theta_e = 1$. Finally, an increase in domestic demand stimulates exports. This stylized fact is assumed on the basis of the Kaldor–Verdoorn relationship: higher demand leads to higher productivity; hence to improved competitiveness, and θ_X is set to 0.10 for China and 0.40 for India.

Various empirical studies find the Kaldor–Verdoorn coefficient γ_0 to be between 0.40 and 0.60 (McCombie (1983), Thirlwall (1983)). Fast productivity growth observed since the 1990s in the two economies allows us to pick the upper limit of 0.60 for the short-run simulations.

The parameters just discussed feed into χ_1, χ_2, χ_3 and χ_4. These four structural parameters determine the effects that $\hat{I}_0$, $\hat{E}_0$, $\hat{w}$, $\bar{\varepsilon}$, and $\hat{e}_r$ will have on growth rates of endogenous variables. Table 3(b) summarizes the values of the incoming growth rates of exogenous variables. Aside from the growth rate of wages, they are selected to depict plausible long–run trends.

From Table 3(a) we see that a one percentage point increase in $\hat{I}_0$ leads to 1.44 and 1.55 percentage point rise in $\hat{X}$ in China and India, respectively. Changes in the wage share follow from differential growth rates in labor productivity compared to wages, and affect output growth with a magnitude given by χ_2. A positive value for χ_2 in both economies signals a profit–led growth regime. A real exchange rate depreciation leads to a rise in output growth only in China where $\chi_3 = 0.07$. For India, $\chi_3 = -0.37$ which implies that a depreciation of the Rupee has a negative impact on economic growth. Finally, an increase in the autonomous external demand has a strong impact on both economies as suggested by the value of χ_4.

4.2 Short–run dynamics in the formal sector

Table 4 reports simulation results. The base run scenario, shown in the first row, replicates the growth rates of output, productivity and employment observed during the period from 1995 to 2000. For example, two and a half per cent growth of autonomous investment, ten per cent growth of wages, real depreciation of two per cent and trend labor productivity growth of two and a half percent lead to roughly seven and a half per cent average annual expansion of India's formal sector output. This value is close to the actual growth rate of output observed during the 1990s. Labor productivity growth follows from the Kaldor–Verdoorn equation as 7.45 per cent. The base run simulation predicts a (small) loss of formal jobs, and a decline of the share of formal in total employment. In China, on the other hand, formal sector demand growth in excess of labor productivity growth adds up to positive formal sector job growth.

Table 4 here — Comparative statics for the model in short-run

The remaining rows in Table 4 summarize simulation results: specifically, the effects of changes in exogenous variables on output, productivity and employment growth and therefore on the share of formal sector's employment in the two economies. The results provide some insights regarding policies that would be most effective in stimulating economic growth and structural change in the two economies.

What could be expected from an increase in trend growth of capital accumulation? A higher rate of growth of autonomous investment has an expansionary effect on all three variables: output, labor productivity and employment. In China, an increase of half a percentage

point of the growth rate of investment generates an increase of four fifth of a percentage point of the growth rate of output. Labor productivity growth accelerates to more than nine per cent annually, which allows formal employment to grow at a respectable rate of more than one per cent. Given labor force growth of one per cent per year, the assumed acceleration of investment demand growth implies that the formal sector employment share begins to rise—structural transformation is under way. For India, a one percentage point rise in the growth rate of autonomous investment increases output and productivity growth, and formal sector employment now grows at a positive rate. However, labor force growth continues to outpace it; the end result is that the demand for formal labor remains below the rate necessary generate a rise of the share of formal in total employment.

What could be expected from an increase in trend productivity growth? Improved industrial policies or human capital can cause a shift in $\bar{\varepsilon}$. Graphically, the effect is a shift upwards of the Kaldor–Verdoorn schedule. In a profit–led economy, both productivity and output will be growing faster. In the weakly profit-led regime (Figure 1(b))—which applies to China and India—the slope of the output schedule is larger than one or $\chi_2 < 1$. A one percentage point increase in labor productivity growth stimulates $\hat{X}$ and $\hat{\varepsilon}$ in both economies—output grows now at an annual rate of about ten per cent in China and eight per cent in India, while productivity expands by ten per cent and almost nine percent, respectively. However, the new equilibrium point rests on a higher employment growth contour where the rate of job growth is *lower*. In other words, gains in output growth are mostly due to improved efficiency, and occur at the expense of demand for formal employment. The formal sector employment share declines in India, and stagnates in China: The exercise sheds light on mechanisms that may be behind de–industrialization and jobless growth processes observed in the Indian economy as well as other parts of the developing world. The repercussions for structural change are obvious. If the loss of formal employment is further followed by a deterioration in human development (Ranis et al. (2000)), long–run sustainability of growth is put in doubt. Obviously, capital deepening as well as technological upgrading remain important. Rather, relevant policies should be adopted to not let output and productivity growth aggravate structural heterogeneity. Results in the next row ("Productivity and Investment") of Table 4 suggests how that might look. In China, for example, an increase in the trend of labor productivity growth from three percent to four percent *combined* with an expansion in investment growth from three per cent to four and a half per cent) is sufficient to lead to an acceleration in the demand for formal employment.

What is the effect of higher wage growth? Both economies are profit–led, so that redistribution of income towards profits would stimulate investment demand and therefore economic growth. In India, a decline of three percentage points in $\hat{w}$ leads to increases of about two and a bit more than one percentage points in output and productivity growth, respectively. Formal employment expands. In China, redistribution towards profit stimulates the three

variables but its effect is weaker, because the demand regime is less strongly profit–led.

Next, a depreciation of currency can be expansionary if the positive effect on exports is strong enough to counteract the adverse outcomes from higher costs of imported inputs. In China an exchange rate depreciation has a positive but weak impact on output growth, as captured by χ_3. Since $\chi_3 < 0$ in India, economic activity decreases following a depreciation of the Rupee. The difference in depreciation effects between the two economies is not surprising as the Indian economy remains more dependent on imported inputs.

4.3 Long–run dynamics

How would policies affecting accumulation and productivity play out in the long run? In this section, we employ the model with a retardation effect on the Kaldor–Verdoorn elasticity: At low levels of development—as proxied by the formal sector employment share λ—output growth has strong productivity growth effects; as λ rises with labor transfer, the Kaldor–Verdoorn relationship peaks; and, as the economy matures, weakens. The exercises here suggest that it can be possible to move in the right direction.

Let us mention some limitations beforehand. First, the parameters discussed in the previous section provide three non–negative, economically meaningful equilibria. Due to the highly abstract character of the model, shocks to exogenous variables can lead to negative roots, $\lambda < 0$, which have to excluded from the discussion.[7] Further, in the long–run not only γ_0 but as well other structural parameters might be endogenous. By assuming constancy of all other parameters, we focus, possibly unduly, on the productivity regime, but do so in the hope to shed light on this one particular issue. It should as well be noted that the assumed exogenous growth rates of wages and investment are adjusted downward from those shown in Table 3(b); the investment growth trend is reduced to two and a half per cent in China and two per cent in India, and real wage growth to five per cent in both countries.

Figure 2 here — Long–run dynamics

Figure 2 illustrates dynamics. The first set of graphs describes the base run story. The model is solved using the values for exogenous variables and parameters from Tables 3(a) and (b). Additionally, the retardation mechanism acts on the Kaldor–Verdoorn elasticity through a quadratic equation: $\gamma_0 = -a\lambda^2 + b\lambda + c$, with λ the share of formal in total employment. γ_0 for the base year is calculated using a, b, c from Table 5 and the base year λ.

Table 5 here — Retardation parameters

To illustrate, we discuss China in more detail. Solving equation (11) we obtain three positive roots: $\lambda_1 = 0, \lambda_2 = 0.26$ and $\lambda_3 = 0.89$. Stability analysis shows numerically as

[7] Presumably, incorporation of non–linear feedback effects should provide global stability, in the sense that negative state variables are excluded.

well as visually—see the top left panel in Figure 2—that the middle solution $\lambda_2 = 0.26$ is an attractor. Since the Chinese economy in 2000 is at the right of λ_2, and to the left of λ_3, the economy is set to converge towards $\lambda_2 = 0.26$. In other words, if no changes take place with respect to the structural parameters or in the growth rates of investment, wage, exports, the trend in productivity or the real exchange rate, output in the formal sector does not grow at a rate that is sufficient for the sector to demand labor above the rate of increase in labor supply. Analogously, the top right panel shows the Indian case.

These base run simulation results confirm actual trends for both economies. Despite impressive growth recorded by China and India in the recent period, job creation lags significantly in India and does so to some extent in China. The decline in the share of formal employment is likely to continue, unless policy stimulates aggregate demand and therewith structural change. What are these policies? In what follows, we attempt to provide some insights, based on how each economy responds to shocks to exogenous variables. The goal is to observe shifts in the non–zero fixed points vis–á–vis the actual position of the economy.

Let us begin with an increase in the *long–run* trend of accumulation. A higher rate of growth of autonomous investment has significant positive effects in both economies. A rise of three quarters of a percentage point in $\hat{I}_0$ increases the value of the stable middle equilibrium to $\lambda = 0.42$ for China, and $\lambda = 0.19$ for India. The second set of panels in Figure 2 illustrate the dynamics through an upward shift of $\dot{\lambda}$, as shown by the dashed line. Comparing the new equilibria for λ with the base year values of roughly 42 per cent in China and seven per cent in India, it is clear that the assumed acceleration in trend accumulation aids structural transformation in India. In China, aggravation of structural heterogeneity can be stopped, but not further reduced.

A higher growth rate of wages in the formal sector lowers profitability and competitiveness and therefore the demand for investment and exports. The outcome is a decline in the expansion of output and formal jobs. The dynamics are captured by a downward shift in $\dot{\lambda}$ such that the middle, stable equilibrium point has a lower value than in the base run. Similarly, industrial policies or investment in labor–saving technology enhances the trend in labor productivity. Both output and productivity expand at a more rapid pace, but formal sector employment growth is reduced.

Importantly, these results should be taken with a grain of salt: While the functional distribution can and has shown trends over decades, over still longer time periods it tends to be stable. Hence, high wage growth could be expected to lead to accelerated productivity growth along the lines of induced technical change. Vice versa, an acceleration of productivity growth could be expected to improve labor's real earnings; principally, history across countries shows that to be the case. Further, China's strategy to solely focus on external demand and investment to drive growth has been questioned. A more balanced approach to growth with increased emphasis on the development of domestic markets and consumption of non–

tradables might be desirable, both on the grounds of equity and human development within China on the one hand, and global rebalancing on the other.[8]

A depreciation of the currency has opposite outcomes in the two economies. A faster depreciation of the Yuan relative to the dollar has an expansionary effect on the Chinese economy. The gain in competitiveness stimulates Chinese exports enough to counteract pressures from higher costs with imported inputs. A deeper reliance on imported intermediates in India turns a depreciation policy of the Rupee into a net negative effect on the economic activity in the long-run and lower shares of formal jobs.

Lastly, a decline of the growth rate of the labor force increases the stable equilibrium value of the formal sector employment share. A decline of 0.15 percentage points in the growth rate of the labor force raises the stable solution for λ to about one third in China. In India a $\hat{L}$ lower by 0.3 percentage points leads to a ten percentage point increase in λ. The exercise simply shows that lower population and labor force growth would reduce the burden of residual absorption in the informal sector. However, falling labor supply growth might spell trouble if the demographic transition is advanced—as it is in China. See, for example, UN (2007).

5 Conclusions

In this paper we discuss why economic growth and improved efficiency are necessary but not sufficient conditions for long–run human and economic development. Structural transformation towards higher valued–added sectors and jobs is also required. This paper further explores macroeconomic policies that can sustain structural change in China and India. It does so by using a two-sector, open-economy model with endogenous productivity growth, demand driven output and income distribution as an important determinant of economic activity. The model addresses both short and long-run dynamics and it is calibrated to a 2000 SAM for China and a 1999/2000 SAM for India. The short–run analysis concerns temporary equilibria for output, productivity and employment growth rates in the formal sector. In the long-run the model allows for multiple equilibria which can be used to describe cases of underdevelopment, structural heterogeneity or sustained growth and development. The state variable is the share of formal employment in the economy which we assess vis–á–vis the stable equilibrium point. Several simulation results are noteworthy.

Demand Shocks. Main sources of demand are investment and exports. Labor reserves in the informal sector together with favorable demand shocks result in a positive output adjustment. Productivity and employment in the formal sector grow now at a faster pace in both economies. The degree of labor transfer and the share of formal employment depends on the size of the spending multiplier and on the growth rate of the labor force. A labor

[8]Naastepad (2006) presents a model with induced technical change; von Arnim (2010) presents discussion and model simulations regarding Chinese growth rebalancing.

force expanding at almost 2 percent in India means that macroeconomic policy must aggressively pursue a rise in demand to attain significant structural change in the economy-wide employment. If business as usual is maintained the share of formal employment is expected to decline in the long-run. Sufficient incentives to investment and exports demand can reverse the situation in both China and India.

Technical Change. There is little doubt that developing economies benefit a great deal from adoption of technological knowledge from more advanced economies. Most of all, it fosters international competitiveness. At the same time, labor productivity gains can have adverse effects on the demand for labor inputs, if profitability from increased efficiency does not stimulate investment and export demand sufficiently. To use the terminology from this paper, such a situation signals a weakly profit-led economy which given parameter choices seems to be the case for both China and India. Technical change therefore, by itself, and in a weakly profit-led regime leads to jobless growth which has undesirable effects on structural transformation and development in the long-run. The dilemma between increased productivity and more and better jobs can be relaxed if both pro-growth and socially relevant economic policies are implemented as discussed in section 4.

Income Distribution. The distribution of income has overarching implications for growth and development in both classical and Keynesian paradigms. This paper aligns itself with the latter and assumes that distribution of income acts upon economic activity through its implications on sources of demand. A profit-led regime in China and India means that a shift of income towards profits stimulates investment and exports enough to counteract the detrimental effects on consumption demand. Output, productivity and employment will all be growing at a faster rate. These outcomes hold for both short and long-run simulations and indicate that a policy targeting moderation in wage growth benefits both labor and capital.

Currency Depreciation. It can be said without exageration that the exchange rate is one of the most important price in an open economy and that smart exchange rate management has been crucial for the success of the East Asian Tigers (see Amsden (2001), Wade (1992)). Simulation results show that currency depreciation is expansionary in China but contractionary in India. Differences in the economic structure and the degree of reliance on imported inputs as captured by the μ_2 parameter partially explain these outcomes.

The policy lesson stemming from this brief review of main results is that economic structure matters. Historically, several developing economies, mostly from the East Asian region, have successfully set off a virtuous spiral of dynamic structural change characterized by labor transfers to higher value-added sectors as well as rapid productivity growth. The key to success appears to be the partnership between a developmental state and markets (Amsden (2001), Wade (1992)). Integration in the global economy provides valuable externalities related to technological transfer, financing and access to larger markets. A state active through macroeconomic policies of the sort discussed here is also essential. It can shape a develop-

mental path that is sustainable and ignite dynamic structural changes to prevent detrimental social and economic outcomes such as the loss or absence of good jobs.

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A Data Sources

Table 1: China: Data for output, investment and exports is from Recent Trends and Prospects for Major Asian Economies (Table 3.1) provided by *The Institute the International Center for the Study of East Asian Development* (http://www.icsead.or.jp/ 7publication/eaep_e.html). Data on formal/informal employment is from Ghose (2005). Total wage bill for the formal/informal sectors is estimated using employment data from Ghose (2005), data on the levels of wages in the formal sector provided in China Statistical Yearbook (2003) and own estimations of levels of wages in the informal sector (see Rada (2010)). Data for output is divided into formal/informal using the shares of formal/informal wage bill for the entire economy.

India: Data for output, formal employment, investment and exports is from Key Indicators 2004 provided by the *Asian Development Bank* (ADB) (www.adb.org/statistics). Informal employment is calculated as a residual between total employment provided by Key Indicators of the Labor Market provided by *International Labor Organization*, and formal employment from *ADB*. Formal wages are taken from Compensation of Employees in the Organized Sector, *National Accounts Statistics* published by the Ministry of Statistics and Programme Implementation. Overall output is divided into formal/informal shares using the organized/unorganized factor incomes from Statement 76.1: Factor incomes by Kind of Economic Activity, *Central Statistical Organization*.

Table 3: Data on investment shares, saving propensities and income shares are from the Social Accounting Matrices for the formal/informal sectors estimated by Rada (2010).

Tables and Figures:

Variable	Sector	China	India
Output	Formal	12.20	6.60
	Informal	6.82	5.06
Productivity	Formal	9.42	6.11
	Informal	6.74	3.15
Employment	Formal	2.53	0.45
	Informal	0.07	2.21
Wage growth	Formal	8.90	5.40
Investment growth	Economy	14.10	6.30
Exports growth	Economy	16.00	12.80
Formal employment share	$\lambda_{1990/91}$	36.5	8.4
	λ_{2000}	42.3	7.2
Relative labor productivity	$(\varepsilon_F / \varepsilon_I)_{2000}$	2.84	8.37

Table 1: China and India's economic performance during the 1990s
Sources: See data appendix
Note: Initial series for output, investment, exports and wages are in 1990 Yuan for China and 1993/94 Rupee for India.

SAM for an economy with formal/informal sectors	Costs		Use of Income					TOTALS
	Formal (A)	Informal (B)	Formal Households (C)	Business (D)	Informal households (E)	Exports (G)	Investment (H)	(I)
(1) Formal			Formal HH consumption of formal goods	Formal goods consumption	Informal HH consumption of formal goods	Foreign Demand	Capital accumulation of formal goods	Formal sector output
(2) Informal			Formal HH consumption of informal goods		Informal HH consumption of informal goods			Informal sector output
(3) Labor(F)	Wages of formal HH							Formal HH income
(4) Business (F)	Profits							Business sector income
(5) Labor (I)		Wages and operating surplus of informal HH						Informal HH income
(6) Imports	Imported inputs							Payments to the rest of the world
(7) Savings			Formal HH saving	Corporate sector saving	Informal HH saving	Foreign saving	Total capital accumulation	0
(8) TOTALS	Formal sector output	Informal sector output	Use of formal HH income	Use of business income	Use of informal HH income	Receipts from the rest of the world	0	

Table 2: A Social Accounting Matrix for an open, two-sector economy

Parameters	China	India
π	0.43	0.39
μ_1	0.56	0.52
μ_2	0.59	0.40
s_w	0.40	0.22
s_r	0.55	0.26
s	0.47	0.24
σ	0.18	0.11
φ_X	1.00	1.00
φ_ψ	-0.20	-0.20
θ_X	1.00	1.00
θ_ψ	-0.20	-0.20
γ_0	0.60	0.60
χ_1	1.44	1.55
χ_2	0.23	0.46
χ_3	0.07	-0.37
χ_4	1.11	1.41

Table 3(a): Main parameters

Parameters	China	India
$\hat{w}$	10.3	10.4
$\hat{e}_r$	2.0	2.0
$\bar{\varepsilon}$	3.0	3.0
$\hat{I}_0$	3.0	2.5
n	1.0	1.9

Table 3(b): Incoming growth rates of exogenous variables (percentages).
Table 3 (a),(b): Main parameters and incoming growth rates of exogenous variables
Source: See data appendix.

	Shock		Output growth	Productivity growth	Employment growth
Base run		China	9.7%	8.8%	0.9%
		India	7.42%	7.45%	0.0%
Investment growth	3% to 3.5%	China	10.5%	9.3%	1.2%
	2.5% to 3.5%	India	9.6%	8.7%	0.8%
Productivity growth	3% to 4%	China	9.9%	10.0%	0.0%
	3% to 4%	India	8.1%	8.8%	-0.8%
Productivity and Investment	3% to 4%, 3% to 4.5%	China	12.6%	11.6%	1.0%
	3% to 4%, 2.5% to 4%	India	11.3%	10.8%	0.5%
Wage growth	10% to 7%	China	10.6%	9.3%	1.2%
	10% to 7%	India	9.6%	8.7%	0.8%
Depreciation	2% to 4%	China	9.8%	8.9%	0.9%
	2% to 4%	India	6.4%	6.8%	-0.4%

Table 4: Comparative statics for the model in growth terms

Retardation Parameters	China	India
a	-0.70	-0.70
b	0.80	0.80
c	0.40	0.40
γ_0	0.61	0.45

Table 5: Retardation parameters and Kaldor-Verdoorn coefficient in the base year.

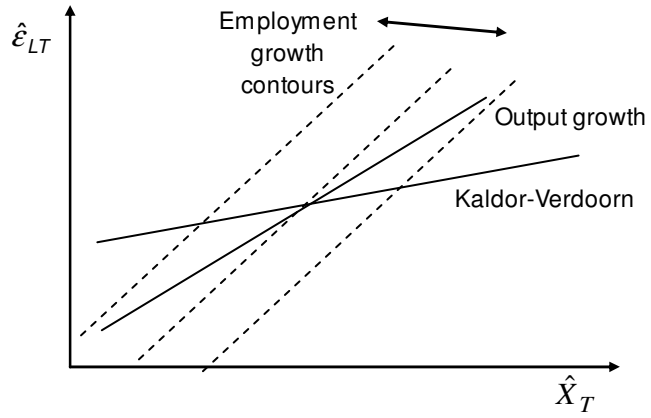


Figure 1a: Productivity, Output and Employment Determination in the Formal Sector (when slope is smaller than 45 degree)

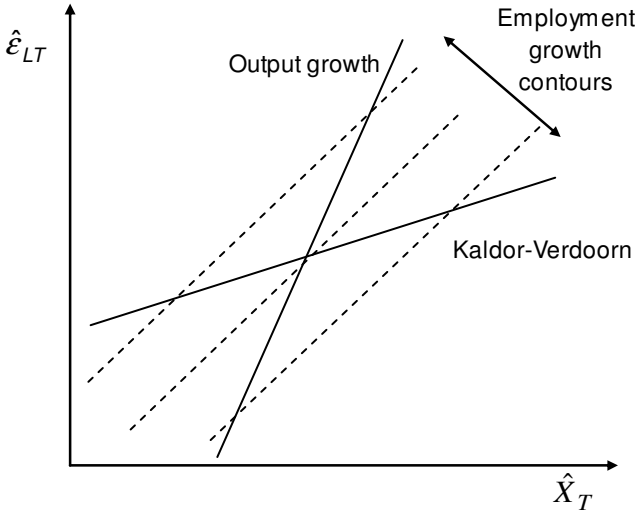
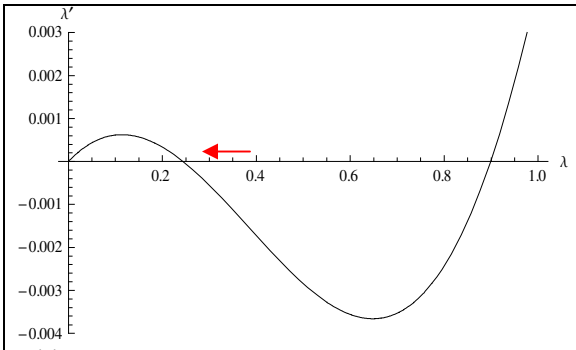
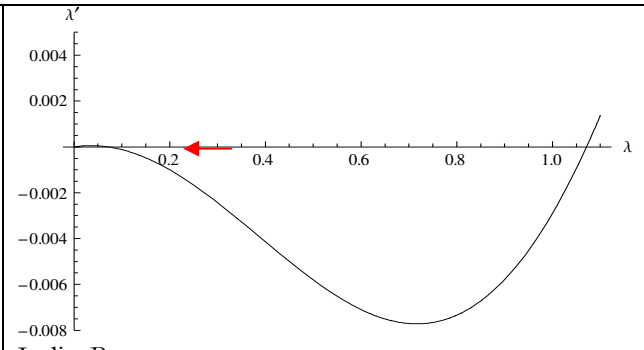


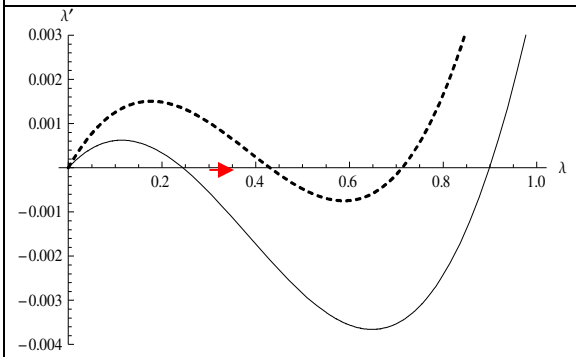
Figure 1b: Productivity, Output and Employment Determination in the Formal Sector (when slope is larger than 45 degree)



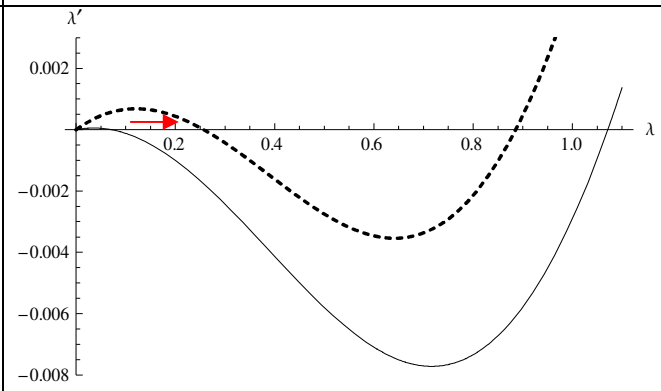
China: Base run



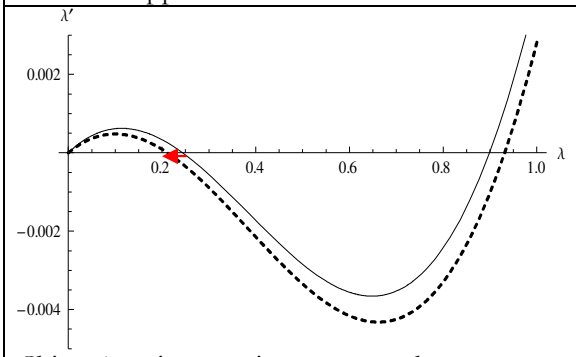
India: Base run



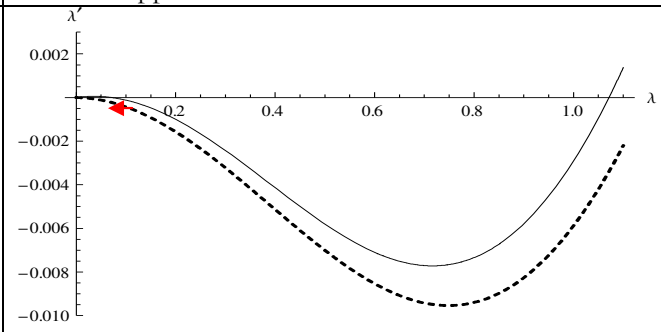
China:0.75 pp increase in rate of investment



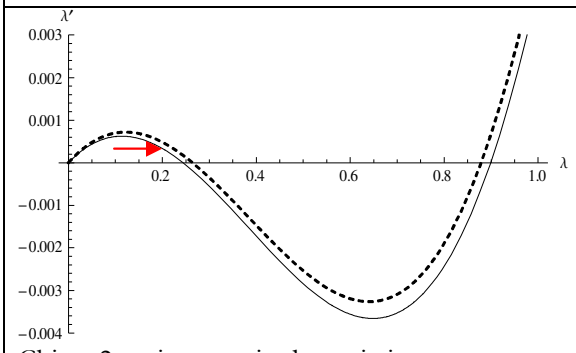
India:0.75 pp increase in rate of investment



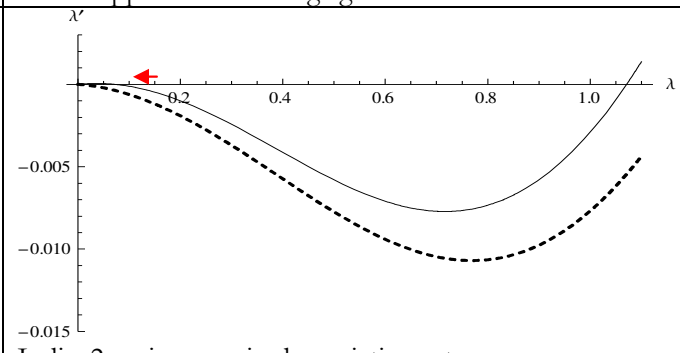
China: 1 pp increase in wage growth



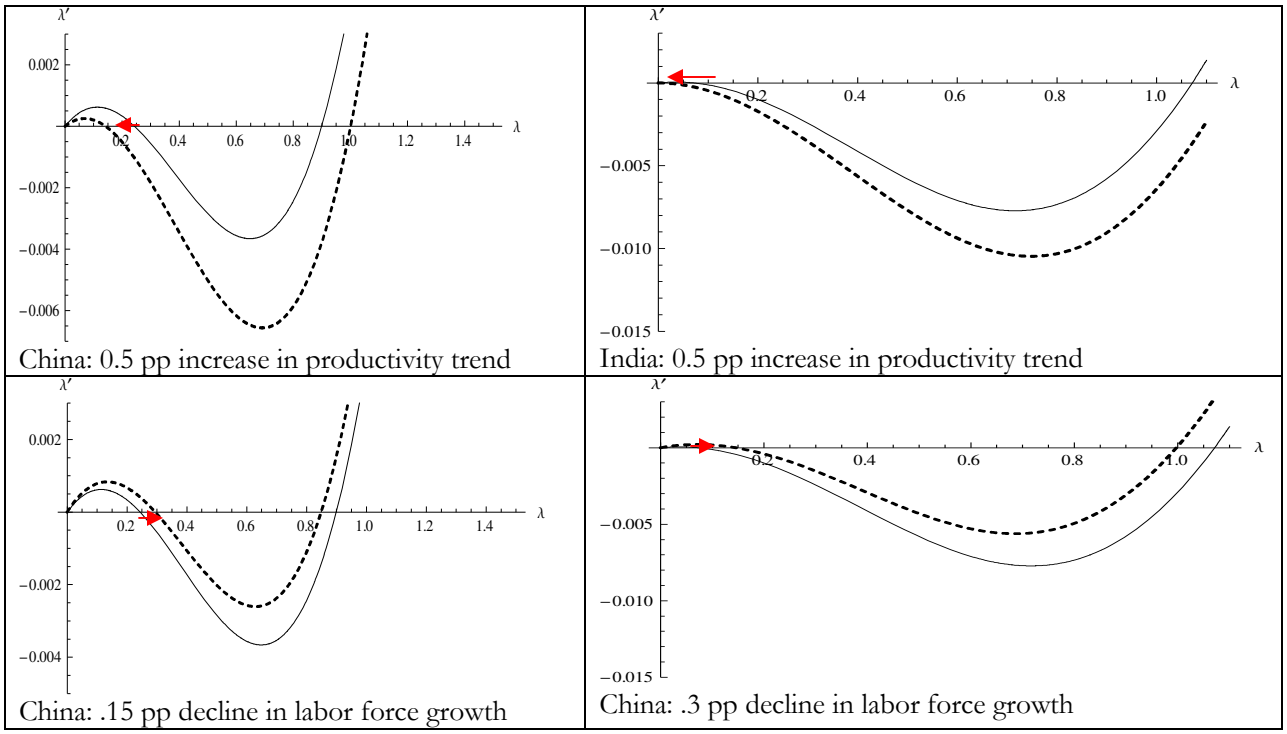
India: 1 pp increase in wage growth



China: 2 pp increase in depreciation rate



India: 2 pp increase in depreciation rate



China: 0.5 pp increase in productivity trend

India: 0.5 pp increase in productivity trend

China: .15 pp decline in labor force growth

China: .3 pp decline in labor force growth

Figure 2: Long-run dynamics