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The China-US co-dependency and the elusive costs of growth rebalancing

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The China-US co-dependency and the elusive costs of growth rebalancing.

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Abstract

The global crisis burst in 2007 has revived the growth-rebalancing debate and backed the position of those advocating a fast reduction of the global imbalances centered on the symbiotic US-China relationship. In this work, we develop a two-country two-stage growth model reproducing the main features of the Sino-American co-dependency and we analyze alternative (medium- and long-term) scenarios for its evolution. We show that altering the Chinese exchange rate policy and down-sizing the US external deficits with a view to moving the production of tradables toward the US may imply some relevant costs. If exchange rate and fiscal policies are not properly tuned in both countries, the rebalancing process may lead to the emergence of structural unemployment in the US (due to the greater labor intensity of growth recorded in the nontradable sector than in the tradable sector) and to a slow-down in the process whereby the Chinese labor force is gradually absorbed in the modern sectors of the economy.

Key words: Growth-rebalancing, global imbalances, structural unemployment

Jel Codes : E42, F33, F41, F43, O41

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1. Introduction

The accumulation of large current account deficits by the US *vis-à-vis* the rest of the world (usually called global imbalances) has accelerated remarkably in the last decade. The insurgence and the persistence of this phenomenon have been widely investigated, and different scholars have emphasized specific economic aspects, ranging from the Chinese exchange rate (Blanchard et al., 2005; Ferguson and Schularick, 2009; Obstfeld and Rogoff, 2007) to the extremely high (low) saving rates in China (US) (Blanchard and Giavazzi, 2006; Chamon and Prasad, 2010; Roubini and Setser, 2004), from the lack of sound non-US investment opportunities after the Asian crisis (Caballero et al., 2008; Cooper, 2006; Mendoza et al., 2009) to the emergence of a global saving glut (Bernanke, 2005 and 2007).[1]

Our paper looks at global imbalances as the product of the different growth models characterizing the US, on the one hand, and many developing countries, on the other hand. In particular, we focus on the symbiotic relationship between the US and China, well captured by the "Sino-American co-dependency" view proposed by Dooley et al. (2003, 2004a,b, 2009). According to this view, China has purposefully maintained an undervalued exchange rate (mainly against the US dollar) to promote its exporting sectors, to foster its economic growth and to facilitate the mobilization of its labor force into the highly productive sectors of the economy.[2,3] To this end, China has progressively accumulated and (partially) sterilized a huge amount of foreign reserves.[4]

[1] See Blanchard and Milesi-Ferretti (2009), Eichengreen (2006), Fracasso (2007) and Obstfeld (2010) for an overview.

[2] While China accounted for about 20% of US current account deficits in the early 2000s, this share has reached almost 40% in the last few years. In 1994/1995, the Chinese authorities abolished exchange rate controls on current account transactions, unified the exchange rate and started pegging the renminbi to the US dollar. Besides boosting the expansion of the tradable sector, this strategy helped China to anchor its domestic price level. In 2005, a managed float with reference to a basket of eleven currencies substituted the hard peg to the dollar: the Chinese currency gradually appreciated, passing from 8.28 RMB per dollar in 2005 to 6.8 RMB per dollar until July 2008 (see Ferguson and Schularick, 2009; Frankel, 2009; Frankel and Wei, 2007). Since mid-2008, as a response to the crisis and to the temporary appreciation of the dollar against most currencies, the Chinese authorities have *de facto* started pegging the currency to the dollar again (see Fratzscher, 2009).

[3] The surplus labor employed in the agricultural sector ranges between 100 and 200 million people, according to Lipschitz et al. (2009). Surplus labor helps accounting for the limited wage growth observed in China over time (see Baldacci et al., 2010). On the interaction between exchange rate policy, capital account management and growth see Levy-Yayati and Sturzenegger (2009), Montiel and Serven (2008) and Rodrik (2008).

[4] According to Prasad and Sorkin (2009), Chinese current account surpluses accounted for 91% of the huge accumulation of exchange rate reserves occurred from 2004 to 2008. Reserves accumulation, pursued for both

The US, in turn, has exploited the Chinese willingness to finance its current account deficits to maintain high domestic consumption, while ensuring low interest rates, low yields on US Treasury bonds, and subdued inflation.

The crisis burst in 2007 has revealed some of the latent costs of this tacit bilateral arrangement and has revived the so-called growth-rebalancing debate by reinforcing the position of those advocating the reduction of the imbalances by means of coordinated policy changes both in the US and in China. Against those pointing to the unsustainability of the global imbalances centered on the US-China relationship, however, one can also find those arguing that down-sizing the US deficits and altering the Chinese exchange rate policy might have non-negligible undesirable consequences on both countries. Such policy changes would reduce the room for China's export-led growth strategy and, as we shall endeavor to show, might jeopardize the maintenance of full employment and high levels of consumption in the US. As shown in Blanchard and Milesi-Ferretti (2009), the adjustment process may bring both countries (and the world) on a lower trajectory of growth.

The negative implications of a correction in the Chinese policy mix on the economy's longer-term growth prospects (and on the ongoing structural change driven by the export-led growth) have already been discussed in the literature: as China's buoyant growth has been largely due to the rapid transition to producing tradable manufacturing goods, an abrupt and untimely abandonment of the export-led model of growth may turn out to be premature for China, which remains a developing country, albeit a fast growing one (see, for instance, Bonatti and Fracasso, 2009; Hua, 2007; McKinnon 2006,2007; McKinnon and Schnabl, 2009; Rodrik, 2009a,2009b).[5]

Much less attention has instead been paid to the impact that serious changes in the countries' models of growth (undertaken with a view to reducing their bilateral imbalances) may have on the US. Our paper aims to fill this gap in the literature and to contribute to the debate on global

mercantilist and self-insurance purposes, has made China the largest holder of foreign reserves in the world (see Aizenman and Lee, 2008 and Jeanne and Ranciere, 2008). Chinese total foreign reserves reached $2.4 trillion in December 2009, accounting for 30% of global reserves. In particular, China's holdings of UST securities passed from $60 billion in 2000 up to $400 in 2006, and reached $800 billion in August 2009 (according to Brad Setser and Simon Johnson these figures could largely underestimate the actual share of US Treasury in Chinese hands due to the large Chinese purchases through non-Chinese intermediaries). On the contrary, despite favorable valuation effects and capital gains (see Tille, 2008 and Gourinchas and Rey, 2007), the US has become the largest debtor in the world.

[5] Other studies, in fact, advocated a rapid rebalancing of the Chinese growth away from external demand and investment, and toward domestic demand and consumption (see Aziz, 2006; Blanchard and Giavazzi, 2006; Guo and N'Diaye, 2009b; Kuijs and Wang, 2006; Lardy, 2006; Makin, 2006; Prasad, 2009; Prasad and Rajan, 2006; Straub and Thimann, 2009; Zheng et al., 2009). According to these works, the costs for China coming from the maintenance of the current strategy are larger than those stemming from a policy switch.

rebalancing. Many scholars have argued that global rebalancing cannot be successful unless the US ultimately increases its savings (see Baldwin and Taglioni, 2009; Bergsten, 2009a,b; Frankel, 2006; Posen, 2009) and China revises its mercantilist exchange rate policy and appreciates the renminbi. We do not question these recommendations. Rather, we caution that re-orienting the US economy from domestic demand toward exports may eventually bring about a relative shrinking of the labor-intensive nontradable sectors, which have prospered in the last decades and that employ most of US workers. Notwithstanding a rich literature on the employment effects of exchange rate adjustments, the impact of an appreciated renminbi on overall US employment has not been addressed yet.[6] To our knowledge, thus, this is the first work investigating the medium- and long-term potential consequences of an adjustment process in which, on the one hand, China revaluates the currency and slows down its accumulation of US debt, and, on the other hand, the US moves away from domestic demand and toward tradable manufacturing products.

Notably, we accept the common tenet that an appreciation of the Chinese currency (either stemming from a one-off revaluation or deriving from the switch to a flexible exchange rate regime) tends to move the production of tradables toward the US. However, we show that, provided that the labor intensity of growth is larger in the nontradable than in the tradable sector, the shift toward US tradables produces (*ceteris paribus*) two effects. On the one hand, it boosts capital accumulation and long-run growth in the US tradable sector; on the other hand, it may determine the emergence (or the expansion) of structural unemployment as the employment gains in the tradable sector may not be sufficient to offset the losses in the nontradable sector. Similarly, we show that changing the pattern (i.e. size and sectoral allocation) of government expenditures in the US and in China may contribute to growth-rebalancing, but also affect structural (un)employment in the US.

The assumption that the nontradable sector in the US is more labor intensive than the tradable sector is adopted also by Cova et al. (2009) and finds empirical support. Using the data from the EU KLEMS Growth and Productivity Accounts (November 2009 Release) discussed in O'Mahony and Timmer (2009), we calculate the share of compensation accruing to labor and capital services (average values over the period 2000-2007) for the various sectors of the US economy: the shares accruing to labor in the nontradable service sectors (that account for three quarter of US employment) range between 70% and 90%, while the average shares in the tradable manufacturing and agricultural sectors amount, respectively, to about 65% and 55%. It is worth

[6] Among the studies assessing the effects of exchange rate appreciations on employment in the manufacturing sectors see Burgess and Knetter (1998), Campa and Goldberg (2001), Gourinchas (1999), Klein et al. (2003), Marquis and Trehan (2010), and Revenga (1992).

noting that, despite some heterogeneity across industries, nontradables appear to be labor intensive also in China (see Guo and N'Diaye, 2009a and Cova et al., 2009).[7]

This paper provides an original analytical setup able to reproduce several aspects of the "Sino-American co-dependency" story and broadly consistent with the available evidence. We present a two-stage growth model that allows the evaluation of alternative (medium- and long-term) scenarios of the evolution of the Sino-American relationship and of growth-rebalancing. Accordingly, the first stage (Phase 1) is characterized by an interaction similar to that described by Dooley and co-authors: the US runs current account deficits against China, whose authorities accumulate foreign reserves so as to keep the exchange rate at a level that guarantees the continuous growth of external demand and the absorption into the most productive sectors of the working population employed in the least productive ones. The second stage (Phase 2), instead, reflects two possible scenarios that can materialize, depending on whether China liberalizes the capital account and floats its currency. In Scenario A, the Chinese authorities never liberalize the capital account and never float the renminbi, which remains undervalued with respect to the US dollar. Within this Scenario, a trade-off is likely to emerge as a result of a permanent appreciation of the Chinese currency: in the long run, the US rate of real GDP growth tends to increase, but structural unemployment in the US may arise (or expand) because of the contraction of the nontradable (labor-intensive) sector. This permanent appreciation has controversial effects also for the Chinese economy: consumption is less compressed, but capital accumulation is lower and the full absorption of the Chinese manpower in the modern sectors of the economy may take more time. In Scenario B, we consider the possibility that the Chinese authorities liberalize the capital account and let the exchange rate float once that all Chinese manpower has been absorbed in the modern sectors of the economy. As in Scenario A, this regime switch raises the US long-run growth, but it may also generate (or expand) structural unemployment in the US.

The results of the paper may help understanding the reluctance of the Chinese ruling elite to abandon its successful export-led growth strategy, as it is signaled by its current refusal of accelerating the appreciation of the renminbi versus the US dollar. In other words, our paper may contribute to explain why the Chinese leadership seems to be willing to reassess its development strategy only to the extent that this is made inevitable by the gradual restriction of the possibility for China to rely on external demand to feed its growth. Our paper, in parallel, emphasizes the difficulties that the US policy-makers may face while seeking to re-orient the economy away from

[7] According to Thorbecke and Zhang (2009), only 21% of the Chinese exports fall in the class of labor intensive industries. The situation in China is different from that in most developing countries, which are often characterized by a relatively higher labor intensity in the manufacturing (tradable) industries (Loayza and Raddatz, 2009).

domestic consumption and toward exports: this rebalancing may bring about a relative shrinking of those labor-intensive nontradable sectors that provide most jobs, thus worsening the prospects of US employment.

The remainder of the paper proceeds as follows. The building blocks and the derivation of the model are discussed in section 2, while the characterization of the equilibrium path is presented in section 3. Section 4 is dedicated to growth dynamics under the abovementioned three policy scenarios. Section 5 concludes.

2. THE MODEL

The world economy includes two countries, US and China. Three market goods are produced in this world economy: an internationally tradable good that is produced in both countries, an (internationally) nontradable good that is produced and sold in the US, and an (internationally) nontradable good that is produced and sold in China. Hence, in both countries there are firms specialized in the production of tradable goods and firms specialized in the production of nontradable goods. The tradable good is used as capital in the production of both goods and as consumption good, while the nontradable good can be only consumed.[8] Each country has its own government sector. Labor is internationally immobile but can freely move across sectors within each country.[9] In the US, labor that is not employed in the two market sectors receives an unemployment benefit paid by the government. In China, labor that is not employed in the two market sectors is employed in the non-market sector of the economy (one can interpret this non-market sector as consisting of low-productive activities that people undertake if they cannot be employed profitably in the market economy). Goods and labor markets are perfectly competitive. Both countries are populated by households that supply labor, buy the consumer goods, accumulate financial assets and hold money. Two policy regimes governing the world financial markets are considered. Under the first regime, the Chinese authorities fix the nominal exchange rate and only official transactions in financial assets are permitted. The second regime is implemented if the Chinese authorities decide to liberalize the capital account and to let the nominal exchange rate float consistently with the two countries' policies and market fundamentals.

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[8] As argued by Turnovsky (1997), there is no agreed conclusion on the share of tradables and nontradables in total investment. For some evidence on the issue, see Bems (2008).

[9] The distinction between two main sectors (tradables and nontradables) and the assumption that labor is mobile across sectors but not across countries while the capital good is mobile both across sector and countries are consistent with the standard trade model developed by Obstfeld and Rogoff (1996), Chapter 4. We extend this framework by introducing a technological spillover in both sectors. The latter replaces the assumption of exogenous productivity improvements and generates endogenous growth.

Finally, time is discrete and the time horizon is infinite. There is no source of random disturbances and agents' expectations are rational (in the sense that they are consistent with the true processes followed by the relevant variables), thus implying perfect foresight.

Firms producing the (internationally) nontradable good

In each country j, j=us, ch, there is a large number (normalized to be one) of identical firms, which—in each period t—produce the nontradable good Y_{jNt}. This good is not storable and must be immediately consumed.[10] Firms produce Y_{jNt} according to the following technology:

$$Y_{jNt} = A_{jNt} K_{jNt}^{1-\gamma_j} L_{jNt}^{\gamma_j}, \; 0 < \gamma_j < 1, \tag{1}$$

where K_{jNt} and L_{jNt} are, respectively, the capital stock and the labor input used in country j to produce the (internationally) nontradable market good Y_{jNt}, and A_{jNt} is a variable measuring the state of technology of the firms operating in that sector of country j which produces the (internationally) nontradable good Y_{jNt}. It is assumed that A_{jNt} is a positive function of the capital installed in the sector of j which produces Y_{jNt}: $A_{jNt} = K_{jNt}^{\gamma_j}$.[11] This assumption combines the idea that learning-by-doing works through each firm's capital investment and the idea that knowledge and productivity gains spill over instantly across all firms (see Barro and Sala-i-Martin, 1995). Therefore, in accordance with Frankel (1962), it is supposed that although A_{jNt} is endogenous to the economy, each firm takes it as given, since a single firm's decisions have only a negligible impact on the aggregate stock of capital of the nontradable sector.[12]

In each t, the net profit (cash flow) π_{jNt} of the representative firm producing nontradables is given by:

$$\pi_{jNt}=P_{jNt}Y_{jNt}-W_{jt}L_{jNt}-P_{jTt}I_{jNt}, \; I_{jNt}\geq 0, \tag{2}$$

where P_{jNt} and P_{jTt} are, respectively, the price of the nontradable good and the price of the tradable good in country j at time t, W_{jt} is the nominal wage in country j at time t, and I_{jNt} is capital investment by the representative firm producing nontradables in country j at time t.

The capital stock installed in the nontradable sector evolves according to

$$K_{jNt+1}=I_{jNt}+(1-\delta_j)K_{jNt}, \; 0\leq \delta_j \leq 1, \; K_{jN0} \text{ given.} \tag{3}$$

[10] Typically, consumer services are consumed while they are produced.

[11] Consistently with this formal set-up, one can interpret technological progress as labor augmenting.

[12] This amounts to say that technological progress is endogenous to the economy, although it is an unintended by-products of firms' capital investment rather than the result of purposive R&D efforts.

In each t, firms decide on $\{L_{jNt+n}\}_{n=0}^{\infty}$ and $\{I_{jNt+n}\}_{n=0}^{\infty}$ subject to (3) in order to maximize their discounted sequence of net profits

$$\sum_{v=0}^{\infty}\frac{\pi_{jNt+v}}{\prod_{s=1}^{v}(1+i_{jt+s})}, \tag{4}$$

where $\prod_{s=1}^{0}(1+i_{jt+s})=1$, and i_{jt} is the nominal interest rate in country j at time t.

Firms producing the (internationally) tradable good

In each country j, there is a large number (normalized to be one) of identical firms producing the (internationally) tradable good Y_{jTt}. In each period t, these firms produce Y_{jTt} according to the following technology:

$$Y_{jTt}=A_{jTt}K_{jTt}^{1-\alpha_j}L_{jTt}^{\alpha_j},\ 0<\alpha_j<\gamma_j, \tag{5}$$

where K_{jTt} and L_{jTt} are, respectively, the capital stock and the labor input used in country j to produce the (internationally) tradable market good Y_{jTt}, and A_{jTt} is a variable measuring the state of technology of the firms operating in that sector of country j which produces the (internationally) tradable good Y_{jTt}. Notice that it is assumed that the labor elasticity of output is larger in the sector producing nontradables than in the sector producing tradables. Finally, A_{jTt} is a positive function of the capital installed in the sector of j which produces Y_{jTt}: $A_{jTt}=K_{jTt}^{\alpha_j}$.

In each t, the net profit π_{jTt} of the representative firm producing tradables is given by

$$\pi_{jTt}=P_{jTt}Y_{jTt}-W_{jt}L_{jTt}-P_{jTt}I_{jTt},\quad I_{jTt}\geq 0, \tag{6}$$

where I_{jTt} is capital investment by the representative firm producing tradables in country j at time t.

The capital stock installed in the tradable sector evolves according to

$$K_{jTt+1}=I_{jTt}+(1-\delta_j)K_{jTt},\ \ 0\leq\delta_j\leq 1,\ \ K_{jT0}\text{ given.} \tag{7}$$

In each t, firms decide on $\{L_{jTt+n}\}_{n=0}^{\infty}$ and $\{I_{jTt+n}\}_{n=0}^{\infty}$ subject to (7) in order to maximize their discounted sequence of net profits

$$\sum_{v=0}^{\infty}\frac{\pi_{jTt+v}}{\prod_{s=1}^{v}(1+i_{jt+s})}. \tag{8}$$

Households

Households are infinitely lived. Their large number living in country j is normalized to be one. Consumption, real money balances providing liquidity services and a public good provided by the government enter the period utility function of the representative household of country j, u_{jt}:

$$u_{jt} = \ln(C_{jt}) + \chi_j \ln\left(\frac{M_{jt}}{P_{jt}}\right) + v(G_{jt}),\ \chi_j > 0, v' > 0\,, \tag{9}$$

where M_{jt} and P_{jt} are, respectively, the household's nominal money holdings and the consumer price index in country j at time t, C_{jt} is the consumption index for the households located in country j at time t, and G_{jt} is the amount of public good provided by the government of country j in t. The consumption index is defined as

$$C_{jt} = C_{jNt}^{\eta_j} C_{jTt}^{1-\eta_j},\ 0 < \eta_j < 1\,, \tag{10}$$

where C_{jNt} and C_{jTt} are, respectively, the consumption of nontradables and the consumption of tradables by the representative household located in country j at time t. Notice that C_{jt} can be interpreted as a composite good. Given (10), P_{jNt} and P_{jTt}, the consumer price index P_{jt} is obtained by minimizing the expenditure necessary to buy one unit of C_{jt}:

$$P_{jt} = \frac{P_{jNt}^{\eta_j} P_{jTt}^{1-\eta_j}}{D_j},\ D_j \equiv \eta_j^{\eta_j}(1-\eta_j)^{1-\eta_j}\,. \tag{11}$$

The representative household's period budget constraint is:

$$B_{jHt+1}+E_{jt}F_{jHt+1}+M_{jt}+P_{jNt}C_{jNt}+P_{jTt}C_{jTt} \leq (1+i_{jt})B_{jHt}+(1+i_{it})E_{jt}F_{jHt}+M_{jt-1}+\pi_{jNt}+\pi_{jTt}+L_{jt}W_{jt}+$$
$$+(H_j-L_{jt})S_{jt}-T_{jt}, \qquad B_{jH0},\ F_{jH0} \text{ and } M_{j-1} \text{ given, } i \neq j, \tag{12}$$

where B_{jHt} are the domestic financial assets accumulated during period t-1 by the representative household of country j and carried over into period t with nominal yield i_{jt}, E_{jt} ($E_{jt}=1/E_{it}$) is the nominal exchange rate of country j at time t (the price in units of the j-country's currency of one unit of the i-country currency at time t), F_{jHt} are the foreign financial assets (denominated in foreign currency) accumulated during period t-1 by the representative household of country j and carried over into period t with nominal yield i_{it}, L_{jt} are the units of labor worked by the representative household of country j in period t, H_j is the fixed time endowment of each household located in country j, S_{jt} is a benefit paid by the government to unemployed labor of country j in t, and T_{jt} are the net monetary transfers ("net taxes") from the representative household of country j to its government in t. Notice that in each period the representative household of country j is entitled to receive the net profits earned by the firms located in its own country as dividend payments. It should be also apparent that nominal balances (no-interest bearing financial assets) M_{jt} are accumulated during period t and carried over into period t+1 because of the liquidity services that they provide to the households.

To rule out the possibility that households borrow arbitrary large sums, we impose the usual no-Ponzi condition

$$\sum_{v=0}^{\infty} \frac{(E_{jt+v} - E_{jt+v+1})F_{jHt+v+1} + i_{jt+v}M_{jt+v-1} + T_{jt} + P_{jNt+v}C_{jNt+v} + P_{jTt+v}C_{jTt+v}}{\prod_{s=0}^{v}(1+i_{jt+s})} \leq$$

$$\leq \sum_{v=0}^{\infty} \frac{\pi_{jNt+v} + \pi_{jTt+v} + W_{jt+v}L_{jt+v} + W_{jt+v}L_{jt+v} + (H_j - L_{jt+v})S_{jt+v} + (i_{it+v} - i_{jt+v})E_{jt+v}F_{jHt+v}}{\prod_{s=0}^{v}(1+i_{jt+s})} +$$

$$+ B_{jHt} + E_{jt}F_{jHt} + M_{jt-1}, \quad i \neq j. \tag{13}$$

The amount of labor supplied by the representative household of country j in period t is determined as follows:

$$L^s_{jt} = \begin{cases} H_j & \text{if } \dfrac{W_{jt}}{P_{jt}} \geq V_{jt} \\ 0 & \text{otherwise,} \end{cases} \tag{14}$$

where V_{jt} is the reservation wage for households located in j at time t. One could argue that in the US this reservation wage is proportional to the government's benefit paid to unemployed labor, while in China it depends on labor productivity in the non-market sector of the economy, which may be interpreted as a traditional sector where low-productive technologies are utilized for subsistence consumption[13] (it can be considered a proxy of China's primary sector). Thus, it is plausible to assume that V_{jt} is given by

$$V_{jt} = \begin{cases} \dfrac{\varphi_{us}S_{ust}}{P_{ust}} & \text{if } j = us,\ \varphi_{us} \geq 1 \\ (1+\omega_{ch})^t V_{ch0} & \text{if } j = ch,\ \omega_{ch} \geq 0,\ V_{ch0} > 0 \text{ given.} \end{cases} \tag{15}$$

In (15), we account for the possibility that the US households would prefer to stay at home if the level of the unemployment benefit were the same as the market wage (φ_{us} is a parameter capturing

[13] The net utility that the representative household gets by undertaking the non-market activities is assumed to be zero.

the households' disutility of working), and that some technological progress occurs in the Chinese non-market sector (the rate at which labor productivity grows in this sector is exogenously given).[14]

In each t, households located in country j decide on $\left\{L^{s}_{jt+v}\right\}_{v=0}^{\infty}$, $\left\{B_{jHt+1+v}\right\}_{v=0}^{\infty}$, $\left\{F_{jHt+1+v}\right\}_{v=0}^{\infty}$, $\left\{M_{jt+v}\right\}_{v=0}^{\infty}$, $\left\{C_{jNt+v}\right\}_{v=0}^{\infty}$ and $\left\{C_{jTt+v}\right\}_{v=0}^{\infty}$ subject to (12), (13) and (14) in order to maximize their discounted sequence of utilities

$$\sum_{v=0}^{\infty}\theta_j^{v}u_{jt+v},\ 0<\theta_j<1, \qquad (16)$$

where θ_j represents the subjective discount factor of country j's households.

Government sectors

In each period t the government of country j produces the public good G_{jt} combining nontradable and tradable goods according to:

$$G_{jt}=\min(G_{jNt}, \zeta_j G_{jTt}), \qquad \zeta_j>0, \qquad (17)$$

where G_{jNt} and G_{jTt} are, respectively, the quantity of nontradable good and the quantity of tradable good that the government of country j buys in t to produce the public good. Since it is assumed that the government produces efficiently, (17) implies that $G_{jNt}=\zeta_j G_{jTt}$ (the parameter ζ_j can be interpreted as a purely technological parameter or as a parameter reflecting the choice that the government of country j does concerning the characteristics of the public good that it intends to provide).[15]

Hence, in each period t, the government of country j has to decide the fraction g_{jt} of the country's GDP to be spent for the production of the public good:

$$P_{jNt}G_{jNt}+P_{jTt}G_{jTt}=g_{jt}(P_{jNt}Y_{jNt}+P_{jTt}Y_{jTt}),\ \ 0\leq g_{jt}<1. \qquad (18)$$

In each t, the government of country j must satisfy its period budget constraint:

$$B_{jGt+1}+E_{jt}F_{jGt+1}+(H_j-L_{jt})S_{jt}+g_{jt}(P_{jNt}Y_{jNt}+P_{jTt}Y_{jTt})\leq M_{jt}-M_{jt-1}+T_{jt}+(1+i_{jt})B_{jGt}+E_{jt}(1+i_{it})F_{jGt},$$

$$B_{jG0},\ F_{jG0} \text{ and } M_{j-1} \text{ given},\ \ i\neq j, \qquad (19)$$

where B_{jGt} are the domestic financial assets accumulated during period t-1 by the j-country's government sector and carried over into period t with nominal yield i_{jt}, and F_{jGt} are the foreign

[14] In China, nominal wages have increased over time in all sectors, but those in the manufacturing sector have grown faster than in the primary sector: the ratio between wages in the manufacturing and primary sector was equal to 1.38 in 1997 and reached 1.88 in 2007. This legitimates our choice of treating the average primary sector wage as reservation wage for the Chinese workers.

[15] For an alternative way of modeling government spending, see Monacelli and Perotti (2008).

financial assets (denominated in foreign currency) accumulated during period t-1 by the j-country's government sector and carried over into period t with nominal yield i_{it}.

The unemployment benefit is set by the US as a fraction of nominal GDP, while for simplicity it is assumed that the Chinese government pays no unemployment benefit:

$$S_{jt} = \begin{cases} s_{ust}(P_{usNt}Y_{usNt} + P_{usTt}Y_{usTt}) \text{ if } j = us,\ 0 < s_{ust} < 1 - g_{ust} \\ 0 \text{ if } j = ch. \end{cases} \quad (20)$$

Equations (15) and (20) make the reservation wage of both countries adjust over time. In particular, equation (20) is instrumental to capturing the fact that in an advanced country the opportunity cost of households' time tends to increase in the long run with the population's income.

The no-Ponzi condition of the j-country's government sector is

$$\sum_{v=0}^{\infty} \frac{(E_{jt+v} - E_{jt+v+1})F_{jGt+v+1} + (H_j - L_{jt+v})S_{jt+v} + g_{jt+v}(P_{jNt+v}Y_{jNt+v} + P_{jTt+v}Y_{jTt+v})}{\prod_{s=0}^{v}(1+i_{jt+s})} +$$

$$+ M_{jt-1} \leq B_{jGt} + E_{jt}F_{jGt} + \sum_{v=0}^{\infty} \frac{i_{jt+v}M_{jt+v-1} + T_{jt+v} + (i_{it+v} - i_{jt+v})E_{jt+v}F_{jt+v}}{\prod_{s=0}^{v}(1+i_{jt+s})},\ i \neq j. \quad (21)$$

Markets equilibrium conditions

Markets for labor and for the nontradable good are purely domestic. In equilibrium, the labor market of country j is characterized or by $\frac{W_{jt}}{P_{jt}} > V_{jt}$ entailing $L_{jt}=L_{jNt}+L_{jTt}=H_j$, or by $L_{jt}=L_{jNt}+L_{jTt}<H_j$ entailing $\frac{W_{jt}}{P_{jt}} = V_{jt}$. Equilibrium in the country j's market for the nontradable good requires:

$$Y_{jNt}=C_{jNt}+G_{jNt}. \quad (22)$$

The market for the tradable good is internationally integrated. Equilibrium in this market requires:

$$Y_{usTt}+Y_{chTt}=C_{usTt}+C_{chTt}+G_{usTt}+G_{chTt}+I_{usNt}+I_{usTt}+I_{chNt}+I_{chTt}. \quad (23)$$

In this internationally integrated market, the one-price law must hold:

$$P_{jTt}=E_{jt}P_{iTt},\ i \neq j, \quad (24)$$

Money market equilibrium in country j requires that in each t money supply is equal to money demand:

$$M^s_{jt} = M^d_{jt}. \quad (25)$$

Equilibrium in the world markets for financial assets requires

$$B_{usHt}+B_{usGt}+F_{chHt}+F_{chGt}=0, \tag{26}$$

and

$$B_{chHt}+B_{chGt}+F_{usHt}+F_{usGt}=0. \tag{27}$$

Policy regimes governing the world financial markets

We consider two possible scenarios for the world economy. Both scenarios share an initial phase ("phase 1") starting at t=0 in which some Chinese labor is still employed in the backward sector of the economy and the Chinese authorities impose capital controls so as to keep their currency undervalued in order to accelerate economic growth. As in period t*>0 China manages to absorb all its manpower in the modern sectors of the economy, phase 2 begins. In phase 2, the Chinese authorities can opt to maintain capital controls and an undervalued currency (Scenario A), or they can fully liberalize the capital account and let the exchange rate float (Scenario B).

In both phases, the US authorities decide on $\{s_{ust}\}_{t=0}^{\infty}$, on fiscal policy by setting $\{g_{ust}\}_{t=0}^{\infty}$ and on monetary policy by setting the fixed rate of growth of money supply $\bar{\mu}_{us}$, $\mu_{jt} \equiv \frac{M_{jt+1} - M_{jt}}{M_{jt}}$, $\bar{\mu}_j > \theta_j - 1$. [16] Similarly, the Chinese authorities set $\{g_{cht}\}_{t=0}^{\infty}$ and $\bar{\mu}_{ch}$.

When the Chinese capital account is not liberalized, the only international transactions in financial assets that take place are those operated by the Chinese authorities, which decide on the time path of E_t (the nominal exchange rate). Consistently, under this regime, the Chinese authorities let their foreign asset holdings ("foreign reserves") adjust so as to accommodate the flows of funds generated by this mix of policies. In other words, this policy regime is characterized by (26), (27),

$$F_{usHt}=F_{usGt}=F_{chHt}=0, \tag{28}$$

and

$$E_{cht} = \bar{E}_{cht} = \bar{E}_{ch0}\prod_{s=1}^{t}(1+\varepsilon_{s-1}), \quad \prod_{s=1}^{0}(1+\varepsilon_{s-1}) = 1, \tag{29}$$

where $\bar{E}_{ch0}$ (the level of the nominal exchange rate in period 0) and the time path of ε_t (the crawl rate of the exchange rate) are both decided by the Chinese authorities. Notice that (28)—together with (26) and (27)—entails $B_{usHt}+B_{usGt}+F_{chGt}=0$ and $B_{chHt}+B_{chGt}=0$: the Chinese accumulation of foreign reserves is the counterpart of the US negative net foreign asset position, and under this

[16] The condition $\bar{\mu}_j > \theta_j - 1$ is necessary for insuring that real money holdings in country j increase asymptotically at the same rate as K_{jTt} and K_{jNt}.

regime it is assumed that the Chinese net holdings of domestic assets are equal to zero.[17] Hence, when the Chinese capital account is not liberalized, China's foreign reserves evolve according to

$$F_{chGt+1}-F_{chGt}=i_{ust}F_{chGt}-TA_{ust}, \tag{30}$$

where $TA_{jt}\equiv P_{jTt}(Y_{jTt}-C_{jTt}-G_{jTt}-I_{jNt}-I_{jTt})$ is the trade account of country j (denominated in j currency) at time t. By considering (26) and (28), one can see that (30) can be written as $B_{usHt+1}+B_{usGt+1}=(1+i_{ust})(B_{usHt}+B_{usGt})+TA_{ust}$, which is the consolidated (government+private sector) balance sheet of the US economy under this policy regime: given the Chinese authorities' willingness to accumulate foreign reserves, it is immaterial how the US external debt is divided up according to government and private sector net liabilities.

If in period t* the Chinese authorities opt for an irreversible regime switch, they liberalize the capital account and the nominal exchange rate floats consistently with the two countries' policies and market fundamentals. Hence, under this new regime, the interest-parity condition holds:

$$(1+i_{cht})=\frac{E_{cht}}{E_{cht-1}}(1+i_{ust}), \tag{31}$$

and the Chinese authorities set the maximum amount of US trade deficit—as a fraction ξ of US GDP—that they are willing to finance in each period by maneuvering their foreign reserves.[18] Therefore, China's net foreign asset position (denominated in US currency) evolves under this new regime according to

$$\begin{aligned}F_{chHt+1}+F_{chGt+1}-E_{ust}(F_{usHt+1}+F_{usGt+1})-[F_{chHt}+F_{chGt}-E_{ust-1}(F_{usHt}+F_{usGt})]=\\=i_{ust}[F_{chHt}+F_{chGt}-E_{ust-1}(F_{usHt}+F_{usGt})]-TA_{ust},\end{aligned} \tag{32}$$

where $TA_{ust}\geq-\xi(P_{usNt}Y_{usNt}+P_{usTt}Y_{usTt})$, $\xi\geq0$.

Summarizing, the regime with full capital mobility and floating exchange rate is characterized by (26), (27), (31) and (32). Finally, it is worth to emphasize that also under this

[17] Typically, the People's Bank of China seeks to compensate the accumulation of foreign reserves by selling sterilization bills to domestic agents, so as to keep control over money supply. As a result of this kind of operations, it is normally the case that the government sector reduces its holdings of domestic assets, while private agents increase theirs. However, for our purposes, it is not necessary to model the specific modalities whereby the Chinese central bank controls the supply of money while accumulating foreign reserves. What is essential for us is that an increase in the government sector's holdings of foreign assets has its counterpart in an improvement of the country's trade account.

[18] There are alternative ways for setting the limit to the size of the US external deficit that the Chinese authorities are willing to finance (for instance, by setting a limit to the US current account deficit as a fraction of China's GDP). However, in a two-country setup it is not relevant how this external constraint imposed on the US is formulated: for simplicity and analytical convenience we opt for the formulation contained in the text.

regime the possibility for the US to run a persistent external deficit rests ultimately on the Chinese authorities' willingness to finance it.

3. CHARACTERIZATION OF AN EQUILIBRIUM PATH

Using the market equilibrium conditions and solving the agents' optimization problems (see the Appendix for the derivations), we obtain the system of equations governing the equilibrium path of the economy:

$$Z_t\left[\frac{G_{usTt}}{K_{usTt}} - L_{usTt}^{\alpha_{us}} + \left(1+\frac{K_{usNt+1}}{K_{usTt+1}}\right)(1+\rho_{ust}) + \frac{C_{usTt}}{K_{usTt}} - (1-\delta_{us})\left(1+\frac{K_{usNt}}{K_{usTt}}\right)\right] + \frac{G_{chTt}}{K_{chTt}} - L_{chTt}^{\alpha_{ch}} +$$

$$+\left(1+\frac{K_{chNt+1}}{K_{chTt+1}}\right)(1+\rho_{cht}) + \frac{C_{chTt}}{K_{chTt}} - (1-\delta_{ch})\left(1+\frac{K_{chNt}}{K_{chTt}}\right) = 0,\ Z_t \equiv \frac{K_{usTt}}{K_{chTt}},\ \rho_{jt} \equiv \frac{K_{jTt+1}}{K_{jTt}} - 1, \quad (33)$$

$$\frac{C_{jTt}}{K_{jTt}} = C\left(\frac{K_{jNt}}{K_{jTt}}, L_{jNt}, L_{jTt}, g_{jt}\right) = \frac{(1-\eta_j)\alpha_j L_{jNt}}{\eta_j\gamma_j L_{jTt}^{1-\alpha_j}}\left[1 - \frac{\dfrac{K_{jTt}L_{jTt}^{\alpha_j}\zeta_j g_{jt}}{K_{jNt}L_{jNt}^{\gamma_j}}\left(\dfrac{\alpha_j L_{jNt}}{\gamma_j L_{jTt}}+1\right)}{\left(\dfrac{\zeta_j\alpha_j K_{jTt}L_{jNt}^{1-\gamma_j}}{\gamma_j K_{jNt}L_{jTt}^{1-\alpha_j}}+1\right)}\right], \quad (34)$$

$$\frac{G_{jTt}}{K_{jTt}} = G\left(\frac{K_{jNt}}{K_{jTt}}, L_{jNt}, L_{jTt}, g_{jt}\right) = \frac{L_{jTt}^{\alpha_j} g_{jt}\left[\dfrac{\alpha_j L_{jNt}}{\gamma_j L_{jTt}}+1\right]}{\dfrac{\zeta_j\alpha_j K_{jTt}L_{jNt}^{1-\gamma_j}}{\gamma_j K_{jNt}L_{jTt}^{1-\alpha_j}}+1}, \quad (35)$$

$$Z_{t+1} = \left(\frac{1+\rho_{ust}}{1+\rho_{cht}}\right)Z_t, \quad (36)$$

$$\rho_{jt} = \frac{\theta_j[(1-\alpha_j)L_{jTt+1}^{\alpha_j} + 1 - \delta_j]C\left(\dfrac{K_{jNt}}{K_{jTt}}, L_{jNt}, L_{jTt}, g_{jt}\right)}{C\left(\dfrac{K_{jNt+1}}{K_{jTt+1}}, L_{jNt+1}, L_{jTt+1}, g_{jt+1}\right)} - 1, \quad (37)$$

$$\frac{K_{jNt}}{K_{jTt}} = \begin{cases} K(L_{jNt}, L_{jTt}) = \dfrac{\alpha_j(1-\gamma_j)L_{jNt}}{\gamma_j(1-\alpha_j)L_{jTt}} & \text{if } t>0 \\ \dfrac{K_{jN0}}{K_{jT0}} & \text{otherwise,} \end{cases} \quad (38)$$

$$L_{jNt} = \begin{cases} H_j - L_{jTt} \ \text{ if } \ \dfrac{\alpha_j D_j}{L_{jTt}^{1-\alpha_j}}\left[\dfrac{\gamma_j K_{jNt} L_{jTt}^{1-\alpha_j}}{\alpha_j K_{jTt}(H_j - L_{jTt})^{1-\gamma_j}}\right]^{\eta_j} \geq N_{jt} \equiv \dfrac{V_{jt}}{K_{jTt}} \\ \mathcal{L}\left(\dfrac{K_{jNt}}{K_{jTt}}, N_{jt}, L_{jTt}\right) = \left[\left(\dfrac{\gamma_j K_{jNt}}{\alpha_j K_{jTt}}\right)^{\eta_j} \dfrac{\alpha_j D_j}{N_{jt} L_{jTt}^{(1-\alpha_j)(1-\eta_j)}}\right]^{\frac{1}{(1-\gamma_j)\eta_j}} \ \text{ otherwise,} \end{cases} \tag{39}$$

$$N_{cht+1} = \left(\frac{1+\omega_{ch}}{1+\rho_{cht}}\right) N_{cht}, \tag{40}$$

$$E_{jt} = \frac{(1+\bar{\mu}_j - \theta_j)(1-\eta_j)\chi_i (1+\bar{\mu}_j)^t M_{j-1} C_{iTt}}{(1+\bar{\mu}_i - \theta_i)(1-\eta_i)\chi_j (1+\bar{\mu}_i)^t M_{i-1} C_{jTt}}, i \neq j, \tag{41}$$

$$i_{jt} = \begin{cases} \dfrac{1+\bar{\mu}_j}{\theta_j} - 1 \ \text{ if } t > 0 \\ i_{j0} \ \text{ otherwise, } i_{j0} \text{ given,} \end{cases} \quad ^{19} \tag{42}$$

$$\frac{P_{jNt}}{P_{jTt}} = \frac{\alpha_j K_{jTt} L_{jNt}^{1-\gamma_j}}{\gamma_j K_{jNt} L_{jTt}^{1-\alpha_j}}, \tag{43}$$

$$TA_{jt} = \frac{\left[L_{jTt}^{\alpha_j} - \dfrac{C_{jTt}}{K_{jTt}} - \dfrac{G_{jTt}}{K_{jTt}} - \left(1+\dfrac{K_{jNt+1}}{K_{jTt+1}}\right)(1+\rho_{jt}) + (1-\delta_j)\left(1+\dfrac{K_{jNt}}{K_{jTt}}\right)\right]}{\dfrac{C_{jTt}}{K_{jTt}} \chi_j [(1-\eta_j)(1+\bar{\mu}_j - \theta_j) M_{j-1} (1+\bar{\mu}_j)^t]^{-1}}. \tag{44}$$

It is easy to verify that equation (33) is derived from the equilibrium condition of the world market for the tradable good (23) by using (5) and (7). Equations (34) and (35) give us the amounts of tradables that are purchased in equilibrium, respectively, by the households and by the government of country j. Equation (36) governs the equilibrium trajectory of the ratio between the capital installed in the US tradable sector and that installed in the Chinese tradable sector.[20] Equation (37)

[19] Along an equilibrium path, the real rate of interest, $r_{jt} \equiv \dfrac{(1+i_{jt})P_{jt-1}}{P_{jt}} - 1$, is given by

$$r_{jt} = \begin{cases} \left(\dfrac{L_{jTt-1}^{\alpha_j} L_{jNt}^{\gamma_j}}{L_{jTt}^{\alpha_j} L_{jNt-1}^{\gamma_j}}\right)^{\eta_j} \dfrac{C_{jTt}}{\theta_j C_{jTt-1}} - 1 \ \text{ if } t > 0 \\ r_{j0} \ \text{ otherwise, } r_{j0} \text{ given.} \end{cases}$$

[20] It should be noticed that K_{jTt} and K_{jNt} can be considered as, respectively, the stock of capital per household in the tradable sector of country j and the stock of capital per household in the nontradable sector of country j.

shows—together with (38)—that the rate of growth of the capital installed in the tradable sector of country j depends in any t>0 on the quantities of labor that j devotes to the production of tradables and nontradables both in t and in t+1. In (38), one can see the relationship linking, in each country j, the evolution of the capital installed in the nontradable sector to that of the capital installed in the tradable sector. Notice that the rate of growth of the capital installed in the nontradable sector of country j in any t>0 can be easily derived from (37) and (38): $\frac{K_{jNt+1}}{K_{jNt}} = (1+\rho_{jt})\frac{L_{jNt+1}L_{jTt}}{L_{jNt}L_{jTt+1}}$. In (39), one can check that the possibility for country j to employ all its manpower in the two market sectors of the economy depends crucially on its endowments of capital in both sectors relatively to its reservation wage (again, consistently with the stylized facts, it is reasonable to assume that at time 0 China employs some of its labor in the traditional sector of the economy, while in no period this is the case for the US). The law of motion of the Chinese ratio between the reservation wage and the capital installed in the tradable sector is given by (40). Equation (41) is derived from the one-price law (24) and gives the equilibrium level of the nominal exchange rate of country j. In equation (42), one has the equilibrium level of the nominal interest rate in country j, which is constant since the rate of money growth is fixed in both countries. Equation (43) states that in equilibrium the relative price of the nontradable good in terms of the tradable good must equalize the ratio between the marginal productivity of labor in the production of tradables and the marginal productivity of labor in the production of nontradables. Finally, equation (44) gives the equilibrium level of the trade account of country j.

By using (1), (5), (11), (15), (20) and (43), one can rewrite (39) as

$$L_{usNt} = h(L_{usTt}, s_{ust}) = \begin{cases} H_{us} - L_{usTt} \text{ if } L_{usTt} \leq \frac{\alpha_{us}(\gamma_{us} - s_{ust}\varphi_{us}H_{us})}{s_{ust}\varphi_{us}(\gamma_{us} - \alpha_{us})}, \; s_{ust} < \frac{\gamma_{us}}{\varphi_{us}H_{us}} \; ^{21} \\ \gamma_{us}\left(\frac{1}{s_{ust}\varphi_{us}} - \frac{L_{usTt}}{\alpha_{us}}\right) < H_{us} - L_{usTt} \quad \text{otherwise.} \end{cases} \tag{45}$$

It is apparent in (45) that unemployment emerges in the US whenever L_{usTt} exceeds the threshold $\frac{\alpha_{us}(\gamma_{us} - s_{ust}\varphi_{us}H_{us})}{s_{ust}\varphi_{us}(\gamma_{us} - \alpha_{us})}$, and that beyond this threshold total unemployment increases with L_{usTt}. This reflects the fact that the labor elasticity of output—and consequently the elasticity of labor demand with respect to the product wage—is larger in the nontradable sector than in the tradable sector $(\gamma_{us} > \alpha_{us})$. Hence, in the presence of full employment, an increment in L_{usTt} must be

[21] Since $\gamma_{us} > \alpha_{us}$, the restriction $s_{ust} < \frac{\gamma_{us}}{\varphi_{us}H_{us}}$ is necessary in order to insure that one may have full employment at equilibrium.

accommodated in equilibrium—other things remaining equal—by a relatively large fall in the product wage of the tradable sector, while the offsetting decrease of L_{usNt} is accompanied by a relatively small increase in the product wage of the nontradable sector.[22] Therefore, as L_{usTt} approaches the threshold $\frac{\alpha_{us}(\gamma_{us} - s_{ust}\varphi_{us}H_{us})}{s_{ust}\varphi_{us}(\gamma_{us} - \alpha_{us})}$, the consumer wage tends to become closer to the workers' reservation wage. Moreover, in the presence of unemployment, the consumer wage is equal to the workers' reservation wage and an increment in L_{usTt} is accompanied by a larger increase in the product wage of the nontradable sector than that occurring with full employment, thus determining a more than offsetting fall in L_{usNt}. In sum, having assumed that the labor intensity of growth is larger in the nontradable sector, an increase in L_{usTt} requires a change in relative prices that tends to be detrimental for total employment. Finally, one can show that along an equilibrium path such an increase goes together with a fall of both $\frac{C_{usTt}}{K_{usTt}}$ and $\frac{C_{usNt}}{K_{usTt}}$ (see the Appendix): a re-balancing of employment away from the nontradable sector and towards the production of tradables is paralleled by a reduction of the relative importance of private consumption as a source of demand for domestic output.

4. GROWTH DYNAMICS UNDER DIFFERENT POLICY REGIMES

We examine the growth dynamics of the world economy under the hypothesis that at time 0 China—differently than the US—employs some of its labor in the backward sector of the economy. This amounts to assume that the initial endowments K_{chT0} and K_{chN0} are relatively low with respect to V_{ch0} (see (39)). The objective of accelerating economic growth can possibly justify the Chinese policy to set the time profile of the nominal exchange rate. Under this policy, equation (29) can be used to rewrite (41) as

$$\frac{(1+\overline{\mu}_{us} - \theta_{us})(1-\eta_{us})\chi_{ch}(1+\overline{\mu}_{us})^{t} M_{us\text{-}1}\overline{E}_{cht}}{(1+\overline{\mu}_{ch} - \theta_{ch})(1-\eta_{ch})\chi_{us}(1+\overline{\mu}_{ch})^{t} M_{ch\text{-}1}} = \frac{C_{usTt}}{C_{chTt}}. \qquad (46)$$

One can easily see from (46) that—by keeping their currency undervalued with respect to the US currency—the Chinese authorities compress the Chinese consumption of tradables relatively to that of the US (this compression of the Chinese consumption of tradables is consistent with the stylized facts documented in the Introduction). By using (34), (38) and (39) for substituting C_{jTt}, K_{jNt} and

[22] Notice that in equilibrium the increment in L_{usTt} is accompanied by a reduction of the relative price of the nontradables in terms of tradables.

L_{jNt}, one can also verify that equation (46) defines implicitly the level of employment in the US tradable sector as a function of L_{chTt}, L_{chNt}, Z_t, g_{cht}, s_{ust}, g_{ust}, $\overline{E}_{cht}$, $\overline{\mu}_{us}$ and $\overline{\mu}_{ch}$:

$$L_{usTt} = e(L_{chTt}, L_{chNt}, Z_t, g_{cht}, s_{ust}, g_{ust}, \overline{E}_{cht}, \overline{\mu}_{us}, \overline{\mu}_{ch}).^{23} \tag{47}$$

One can see in equation (47) that when the Chinese authorities set the nominal exchange rate, systematic monetary policies in US and in China can affect the dynamics of the real variables. This is not the case when the nominal exchange rate can float consistently with the two countries' policies and market fundamentals: monetary policies have no effect on real variables. Under this policy regime, indeed, the relation between L_{usTt} and L_{chTt} is given by (see the Appendix)

$$L_{usTt} = l(L_{chTt}) = \left[\frac{(1-\alpha_{ch})L_{chTt}^{\alpha_{ch}} + \delta_{us} - \delta_{ch}}{(1-\alpha_{us})}\right]^{\frac{1}{\alpha_{us}}}. \tag{48}$$

We may capture the China's policy of keeping its currency undervalued so as to maintain the Chinese tradables relative cheap with respect to the US tradables by setting

$$\overline{E}_{ch0} = \frac{Q(1+\overline{\mu}_{ch} - \theta_{ch})(1-\eta_{ch})\chi_{us}M_{ch-1}Z_0}{(1+\overline{\mu}_{us} - \theta_{us})(1-\eta_{us})\chi_{ch}M_{us-1}}, \quad Q>0 \tag{49}$$

and

$$\varepsilon_t = \frac{(1+\overline{\mu}_{ch})(1+\rho_{ust})}{(1+\overline{\mu}_{us})(1+\rho_{cht})}, \tag{50}$$

where Q is a constant whose value is decided by the Chinese authorities (it measures the degree of "aggressiveness" of the mercantilist strategy adopted by the Chinese authorities: a larger Q means that—other things being equal—the Chinese currency is maintained more undervalued with respect to the US currency). Notice that as Z_t decreases, that is as China reduces its gap relatively to the US in terms of capital per household in the tradable sector, the Chinese authorities let their currency gradually appreciate, but preserving the price competitiveness of the Chinese tradables relatively to the US tradables.

Given (36), (46), (49) and (50), one can rewrite (47) as (see the Appendix)

$$L_{usTt} = f(L_{chTt}, L_{chNt}, g_{cht}, s_{ust}, g_{ust}, Q), \quad f_Q < 0, \; f_{g_{ust}} < 0.^{24} \tag{51}$$

Equations (48) and (51) allow us to state that the Chinese currency is undervalued any time that $Q > \underline{Q}_t$, where $\underline{Q}_t$ is that value of Q such that $l(L_{chTt}) = f(L_{chTt}, L_{chNt}, g_{cht}, s_{ust}, g_{ust}, Q)$: any time

[23] At time 0, the level of employment in the US tradable sector depends also on the initial endowments of capital K_{chT0}, K_{usT0}, K_{chN0} and K_{usN0}.

[24] At time 0, the level of employment in the US tradable sector depends also on the initial endowments of capital K_{chT0}, K_{usT0}, K_{chN0} and K_{usN0}.

that $Q > \underline{Q}_t$, the US employment in the tradable sector is lower than its equilibrium level under a floating exchange-rate regime.

We consider two possible scenarios for the world economy depending on whether the Chinese authorities decide to fully liberalize the capital account and let the exchange rate float once that all its manpower has been absorbed in the modern (market) sectors of the economy. The two scenarios have in common phase 1.

Phase 1

The equilibrium trajectory of the real variables is governed for 0<t<t* (phase 1) by three difference equations in L_{chTt}, N_{cht} and Z_t (see the Appendix):

$$\Omega(L_{chTt+1}, N_{cht+1}, L_{chTt}, Z_t, N_{cht}, \hat{s}_{us}, \hat{g}_{us}, \hat{g}_{ch}, Q) = Z_t \varsigma(L_{chTt+1}, N_{cht+1}, L_{chTt}, N_{cht}, \hat{s}_{us}, \hat{g}_{us}, \hat{g}_{ch}, Q) + \\ + \vartheta(L_{chTt+1}, N_{cht+1}, L_{chTt}, N_{cht}, \hat{g}_{ch}) = 0, \quad Q > \underline{Q}_t, \qquad (52)$$

$$\Phi(L_{chTt+1}, Z_{t+1}, N_{cht+1}, L_{chTt}, Z_t, N_{cht}, \hat{s}_{us}, \hat{g}_{us}, \hat{g}_{ch}, Q) = 0, \; Q > \underline{Q}_t, \qquad (53)$$

$$\Theta(L_{chTt+1}, N_{cht+1}, L_{chTt}, N_{cht}, \hat{g}_{ch}) = 0 .^{25} \qquad (54)$$

Equations (52) and (53) are derived, respectively, from (33) and (36) by using (34), (35), (37), (38), (39) (with $L_{usNt}=h(L_{usTt}, \hat{s}_{us})$ and $L_{chNt} = L\left(\frac{K_{chNt}}{K_{chTt}}, N_{cht}, L_{chTt}\right) < H_{ch} - L_{chTt}$) and (51). Equation (54) is derived from (40) by using (34), (35), (37), (38) and (39) (again, with $L_{chNt} = L\left(\frac{K_{chNt}}{K_{chTt}}, N_{cht}, L_{chTt}\right) < H_{ch} - L_{chTt}$). Notice that we assume for simplicity and without loss of generality that in phase 1 policy variables do not change ($s_{ust} = \hat{s}_{us}$, $g_{ust} = \hat{g}_{us}$ and $g_{cht} = \hat{g}_{ch}$ $\forall t < t*$).

From (52)-(54) we have that Q (the degree of aggressiveness of the mercantilist policy undertaken by the Chinese authorities) affects the dynamics of the real variables. Moreover, equations (42) and (49)-(50) show that having decided on Q the Chinese authorities can still choose their preferred combination of (equilibrium) level of the nominal interest rate and level (and time profile) of the nominal exchange rate: given $\bar{\mu}_{us}$ (the US rate of nominal money growth), there is a continuum of combinations of $\bar{\mu}_{ch}$ and $\bar{E}_{cht}$ that are consistent with a given Q. Similarly, if the US authorities implement a more (less) inflationary monetary policy by setting a higher (lower) $\bar{\mu}_{us}$, the Chinese authorities may keep the dynamics of the real variables and their nominal interest rate

[25] At time 0, the dynamics of the economy depends also on the initial endowments of capital K_{chT0}, K_{usT0}, K_{chN0} and K_{usN0} (see the Appendix).

unchanged by fixing their nominal exchange rate at a lower (higher) level and letting it appreciate at a higher (lower) rate.

The fact that in phase 1 the dynamics of the world economy depends also on N_{cht} reflects the presence in China during this phase of some labor which is still employed in the backward sector of the economy. As in period t* all Chinese labor is absorbed in the modern sectors of the economy, phase 2 begins.

Phase 2 (Scenario A)

In scenario A, the Chinese authorities never liberalize the capital account and never let the exchange rate float, even if from period t*>0 onwards China employs its entire manpower in the modern sectors of the economy. In this case, the equilibrium trajectory of the real variables of the world economy is governed for t≥t* by two difference equations in L_{chTt} and Z_t (see the Appendix):

$$\Pi(L_{chTt+1}, L_{chTt}, Z_t, \bar{s}_{us}, \bar{g}_{us}, \bar{g}_{ch}, Q) = Z_t\sigma(L_{chTt+1}, L_{chTt}, \bar{s}_{us}, \bar{g}_{us}, \bar{g}_{ch}, Q) + \\ + o(L_{chTt+1}, L_{chTt}, \bar{g}_{ch}) = 0, Q > \underline{Q}_t, \quad (55)$$

$$X(L_{chTt+1}, Z_{t+1}, L_{chTt}, Z_t, \bar{s}_{us}, \bar{g}_{us}, \bar{g}_{ch}, Q) = 0, \; Q > \underline{Q}_t. \quad (56)$$

Equations (55) and (56) are obtained, respectively, from (33) and (36) by using (34), (35), (37), (38), (39) (with $L_{usNt}=h(L_{usTt}, \bar{s}_{us})$ and $L_{chNt} = H_{ch} - L_{chTt}$) and (51), where for simplicity and without loss of generality it is assumed that $s_{ust} = \bar{s}_{us}$, $g_{ust} = \bar{g}_{us}$ and $g_{cht} = \bar{g}_{ch}$ $\forall t \geq t^*$. It is significant that—in this scenario—long-run growth depends also on Q, namely on the exchange-rate policy conducted by the Chinese authorities.

Some propositions concerning long-run growth hold in Scenario A.

Proposition 1 The asymptotic rate of real GDP growth of country j increases with L_{jT}, where $L_{jT} = \lim_{t\to\infty} L_{jTt}$ is the asymptotic equilibrium level of employment in the tradable sector of country j.

Proof: If $L_{jTt}\to L_{jT}$ as $t\to\infty$, then the country j's rate of real GDP growth approaches $\rho_j = \theta_j[(1-\alpha_j)L_{jT}^{\alpha_j} + 1 - \delta_j] - 1$, where $\rho_j = \lim_{t\to\infty}\rho_{jt}$ (see the Appendix), thus entailing $\frac{\partial \rho_j}{\partial L_{jT}} > 0$.[26]

Proposition 1 is a consequence of the fact that the long-run rate of real GDP growth is a function of the marginal productivity of capital in the production of tradables, since the production process of all market sectors of the economy requires capital goods that are typically tradables (e.g. equipment and machinery), and technological progress is driven by the accumulation and installment of capital.

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[26] As shown in the Appendix, $L_{jTt}\to L_{jT}$ as $t\to\infty$ implies that $\lim_{t\to\infty}\rho_{GDP_{jt}} = \lim_{t\to\infty}\rho_{jt}$.

Since by pegging their exchange rate the Chinese authorities affect the difference between L_{usTt} and L_{chTt}, they can set $\overline{E}_t$ so as to have higher long-run growth in China than in the US:

Proposition 2 Supposing that in the long run China tends to grow faster than the US, China's asymptotic rate of real GDP growth depends on its fiscal policy. Moreover, China displays a higher asymptotic rate of real GDP growth than the US if its exchange rate is maintained sufficiently undervalued, i.e., if $Q > \overline{Q}$, where the threshold $\overline{Q}$ depends on the structural and policy parameters of the two countries (α_{ch}, α_{us}, γ_{ch}, γ_{us}, η_{ch}, η_{us}, θ_{ch}, θ_{us}, δ_{ch}, δ_{us}, H_{ch}, H_{us}, ζ_{ch}, ζ_{us}, φ_{us}, $\overline{g}_{ch}$, $\overline{s}_{us}$, $\overline{g}_{us}$).

Proof: See the Appendix.

It should be stressed that the pegging of the exchange rate by the Chinese authorities may not be necessary to insure that the asymptotic rate of real GDP growth is higher in China than in the US: the structural and policy parameters of the two countries may be sufficient to guarantee higher long-run growth in China, without the need of keeping its exchange rate artificially undervalued (see Proposition 7 below). The relationship linking the asymptotic rate of real growth of the country growing faster in the long run to its fiscal policy is captured by the following Proposition:

Proposition 3 Supposing that in the long run China tends to grow faster than the US ($Q > \overline{Q}$), China's asymptotic rate of real growth increases with $\overline{g}_{ch}$, namely with the fraction of its GDP devoted to the provision of the public good, if the latter is produced by using a relatively small proportion of nontradable good, i.e., if ζ_{ch} is below a critical threshold $\overline{\zeta}_{ch}$ depending on α_{ch}, γ_{ch}, η_{ch}, θ_{ch}, δ_{ch} and H_{ch}. The opposite is true if ζ_{ch} is relatively large: if $\zeta_{ch} > \overline{\zeta}_{ch}$, a larger fraction of GDP spent for producing the public good in China (that is a larger $\overline{g}_{ch}$) depresses China's long-run real growth. If ζ_{ch} is close to $\overline{\zeta}_{ch}$, a change in $\overline{g}_{ch}$ has little effect on China's long-run real growth (in the special case in which $\zeta_{ch} = \overline{\zeta}_{ch}$, a change in $\overline{g}_{ch}$ has no effect on long-run real growth).

Proof: See the Appendix.

Long-run real growth in China (the country which has the higher asymptotic rate of growth) is sensitive to both the fraction of its GDP devoted to public expenditures and the composition of public expenditures (the mix of tradables and nontradables purchased by the government). This result reflects the fact that fiscal policy can affect the composition of aggregate demand and shift domestic production towards the sector producing tradables, thus feeding long-run growth (see Proposition 1). Finally, notice that—as ζ_{ch} is very close to the threshold $\overline{\zeta}_{ch}$—changes in China's fiscal policy have very little effect on its long-run real growth.

Proposition 4 Supposing that the asymptotic rate of real GDP growth is higher in China than in the US ($Q > \overline{Q}$), a permanent appreciation of the Chinese currency (a lower Q) boosts the US asymptotic rate of real GDP growth, but it may generate structural unemployment (or increase the volume of structural unemployment) in the US.

Proof: See the Appendix.

It is intuitive that the appreciation of the Chinese currency moves some production of tradables towards the US, thus increasing L_{usT}. As we know from Proposition 1, this increase boosts long-run growth in the US. However, as we know from equation (45) and related discussion, the increase in L_{usT} may be accompanied by the emergence of some structural unemployment (if the long-run equilibrium associated with the initial value of Q exhibits full employment), or it can increase the volume of structural unemployment (if the long-run equilibrium associated with the initial value of Q is characterized by the presence of unemployment). It is straightforward that this unpleasant effect of an appreciation of the Chinese currency can be eliminated or mitigated by a reduction of the US workers' reservation wage, which can be brought about by a cut in the unemployment benefit (a lower $\bar{s}_{us}$).

Proposition 5 Supposing that the asymptotic rate of real GDP growth is higher in China than in the US ($Q > \overline{Q}$), a permanent decrease in the fraction of the US GDP devoted to the provision of the public good (a lower $\bar{g}_{us}$) boosts the US asymptotic rate of real GDP growth, but it may generate structural unemployment (or increase the volume of structural unemployment) in the US.

Proof: See the Appendix.

A fall of government consumption allows the US to increase capital accumulation and the relative weight of the sector producing capital goods (i.e., the tradable sector). As a result, long-run growth is boosted in the US, but the shrinking of the nontradable sector may be detrimental for total employment.

For studying the transitional path along which the world economy moves from period t* onwards in Scenario A, we linearize the system (55)-(56) around (L_{chT}, Z=0) under the assumption that $Q > \overline{Q}$, where $Z = \lim_{t\to\infty} Z_t$. The linearized system thus obtained has only one path converging to (L_{chT}, Z=0), which is governed for t≥t* by

$$\tilde{L}_{chTt} = \frac{\dfrac{Z_t \Pi_{Z_t}}{\Pi_{L_{chTt+1}}}}{-\dfrac{\Pi_{L_{chTt}}}{\Pi_{L_{chTt+1}}} + \dfrac{X_{Z_t}}{X_{Z_{t+1}}}}, \tag{57}$$

$$Z_t = Z_{t^*}\left(-\frac{X_{Z_t}}{X_{Z_{t+1}}}\right)^{t-t^*}, \tag{58}$$

where all the partial derivatives Π_{Z_t}, $\Pi_{L_{chTt}}$, $\Pi_{L_{chTt+1}}$, X_{Z_t} and $X_{Z_{t+1}}$ are evaluated at (L_{chT}, Z=0) and are such that $0 < -\frac{X_{Z_t}}{X_{Z_{t+1}}} < 1$, $-\frac{\Pi_{L_{chTt}}}{\Pi_{L_{chTt+1}}} > 1$ and $\frac{\Pi_{Z_t}}{\Pi_{L_{chTt+1}}} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0$ whenever $TA_{us} \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} 0$, where $TA_j = \lim_{t\to\infty} TA_{jt}$ (see the Appendix). Considering (57), this implies that—along the transitional path—L_{chTt}>L_{chT} if and only if TA_{us}<0: along the transitional path, China's employment in the tradable sector is higher than its long-run level whenever the US tends asymptotically to run a trade account deficit. It is not surprising that this deficit is associated with an aggressive exchange-rate policy on the part of the Chinese authorities:

Proposition 6 The US tends asymptotically to run a trade account deficit (TA_{us}<0) whenever the Chinese currency is kept sufficiently depreciated.

Proof: See the Appendix.

Numerical examples also show that a more depreciated Chinese currency tends to be associated with a faster accumulation of capital and absorption of the entire Chinese manpower in the modern sectors of the economy, and thus with a shorter phase 1: a larger Q may lower t* (see the Appendix). In this way, the model captures an important reason that is often mentioned to explain why the Chinese authorities are willing to keep their currency systematically undervalued and to finance the persistent US trade deficit, thus compressing Chinese consumption. Conversely, these examples show that an appreciation of the Chinese currency tends to prolong phase 1 and may increase (or generate) unemployment in the US also along the transitional path: the US trade deficit shrinks and the employment level rises in the US tradable sector, but not enough to offset the decline of employment in the US sector producing nontradables. Thus, a trade-off tends to emerge for the US also along the transition path: an appreciation of the Chinese currency boosts the US tradable sector and raises the US rate of growth, but the structural change made necessary to meet the different composition of demand may have a negative net impact on US total employment.

Phase 2 (Scenario B)

In scenario B, the Chinese authorities liberalize the capital account and let the exchange rate float in period t*>0. In this case, the equilibrium trajectory of the real variables of the world economy is governed for t≥t* by two difference equations in L_{chTt} and Z_t (see the Appendix):

$$\Psi(L_{chTt+1}, L_{chTt}, Z_t, \bar{s}_{us}, \bar{g}_{us}, \bar{g}_{ch}) = Z_t \upsilon(L_{chTt+1}, L_{chTt}, \bar{s}_{us}, \bar{g}_{us}) + o(L_{chTt+1}, L_{chTt}, \bar{g}_{ch}) = 0, \quad (59)$$

$$\Lambda(L_{chTt+1}, Z_{t+1}, L_{chTt}, Z_t, \bar{s}_{us}, \bar{g}_{us}, \bar{g}_{ch}) = 0, \quad (60)$$

where (see the Appendix)

$$\upsilon(\mathrm{L}_{\mathrm{chTt+1}},\mathrm{L}_{\mathrm{chTt}},\bar{\mathrm{s}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{us}}) \le \xi[l(\mathrm{L}_{\mathrm{chTt}})]^{\alpha_{\mathrm{us}}}\left\{\frac{\alpha_{\mathrm{us}}h(l(\mathrm{L}_{\mathrm{chTt}}),\bar{\mathrm{s}}_{\mathrm{us}})}{\gamma_{\mathrm{us}}l(\mathrm{L}_{\mathrm{chTt}})}+1\right\}. \quad (61)$$

Equations (59) and (60) are obtained, respectively, from (33) and (36) by using (34), (35), (37), (38), (39) (with $\mathrm{L}_{\mathrm{usNt}} = h(\mathrm{L}_{\mathrm{usTt}},\bar{\mathrm{s}}_{\mathrm{us}})$ and $\mathrm{L}_{\mathrm{chNt}} = \mathrm{H}_{\mathrm{ch}} - \mathrm{L}_{\mathrm{chTt}}$) and (48). The inequality (61) reflects the constraint imposed on US policies by the Chinese willingness to finance the US external deficit, where $\upsilon(\mathrm{L}_{\mathrm{chTt+1}},\mathrm{L}_{\mathrm{chTt}},\bar{\mathrm{g}}_{\mathrm{us}}) = \frac{-\mathrm{TA}_{\mathrm{ust}}}{\mathrm{P}_{\mathrm{usTt}}\mathrm{K}_{\mathrm{usTt}}}$ and

$$\xi[l(\mathrm{L}_{\mathrm{chTt}})]^{\alpha_{\mathrm{us}}}\left\{\frac{\alpha_{\mathrm{us}}h(l(\mathrm{L}_{\mathrm{chTt}}),\bar{\mathrm{s}}_{\mathrm{us}})}{\gamma_{\mathrm{us}}l(\mathrm{L}_{\mathrm{chTt}})}+1\right\} = \frac{\xi[\mathrm{P}_{\mathrm{usNt}}\mathrm{Y}_{\mathrm{usNt}} + \mathrm{P}_{\mathrm{usTt}}\mathrm{Y}_{\mathrm{usTt}}]}{\mathrm{P}_{\mathrm{usTt}}\mathrm{K}_{\mathrm{usTt}}}.$$

Proposition 1 holds even in Scenario B. Furthermore, in Scenario B one has:

Proposition 7 Asymptotically, the real GDP of the country whose households are less impatient, say China ($\theta_{ch}>\theta_{us}$), grows at a higher rate.

Proof: Since in Scenario B (48) holds $\forall t \ge t^*$, it is trivial to see that $(1-\alpha_{\mathrm{us}})\mathrm{L}_{\mathrm{usT}}^{\alpha_{\mathrm{us}}} + 1 - \delta_{\mathrm{us}} = (1-\alpha_{\mathrm{ch}})\mathrm{L}_{\mathrm{chT}}^{\alpha_{\mathrm{ch}}} + 1 - \delta_{\mathrm{ch}}$, thus implying that $\rho_{\mathrm{ch}} > \rho_{\mathrm{us}}$ since $\theta_{ch}>\theta_{us}$.

Proposition 7 implies that if we treat the US as the relatively impatient country ($\theta_{us}<\theta_{ch}$), consistently with the evidence in favor of a lower propensity to save for US households relative to their European and Asian counterparts (see Ghironi et al., 2008), under a floating exchange rate and no capital control one should expect higher long-run real growth in China than in the US and Z=0. Maintaining that the Chinese households are less impatient than their US counterparts ($\theta_{ch}>\theta_{us}$), Proposition 5 holds also in Scenario B, together with:

Proposition 8 If $\theta_{ch}>\theta_{us}$, the abandonment by the Chinese authorities of the exchange-rate regime of Phase 1 (namely, an exchange-rate pegging implying a systematic undervaluation of the Chinese currency) in favor of the regime characterizing Scenario B (namely a regime in which the exchange rate floats freely in response to market fundamentals and government policies) raises the US asymptotic rate of real GDP growth, but it may generate structural unemployment (or increase the volume of structural unemployment) in the US.

Proof: See the Appendix.

The intuition underlying Proposition 8 is very similar to that discussed while commenting Proposition 4, since the abandonment of the exchange-rate pegging brings about a permanent appreciation of the Chinese currency.

Proposition 9 If $\theta_{ch}>\theta_{us}$, a reduced willingness on the part of the Chinese authorities to finance the US external deficit (a lower ξ) may force the US to lower $\bar{\mathrm{g}}_{\mathrm{us}}$, namely the fraction of its GDP devoted to public expenditures in tradable and nontradable goods, if the latter are disproportionally dedicated to the purchase of tradables, i.e., if ζ_{us} is below a critical threshold $\bar{\zeta}_{us}$. The opposite is true if ζ_{us} is relatively large: if $\zeta_{us} > \bar{\zeta}_{us}$, a smaller $\bar{g}_{us}$ can further increase the US long-run trade deficit.

Proof: See the Appendix.

Proposition 9 is a consequence of the fact that, if the US public consumption is relatively more intense in tradables than private consumption, a reduction of the US public consumption (which increases US households' disposable income) improves the US trade account.

Also in the case of Scenario B, one can capture why the Chinese authorities may be willing to finance a structural US external deficit and to accumulate foreign reserves forever, namely that may explain why ξ>0, by studying the transitional path along which the world economy moves from period t* onwards. For studying this transitional path, we linearize the system (59)-(60) around (L_{chT}, Z=0) under the assumption that $\theta_{ch}>\theta_{us}$. The linearized system thus obtained has only one path converging to (L_{chT}, Z=0), which is governed for t≥t* by

$$\tilde{L}_{chTt} \equiv L_{chTt} - L_{chT} = \frac{\dfrac{Z_t \Psi_{Z_t}}{\Psi_{L_{chTt+1}}}}{-\dfrac{\Psi_{L_{chTt}}}{\Psi_{L_{chTt+1}}} + \dfrac{\Lambda_{Z_t}}{\Lambda_{Z_{t+1}}}}, \tag{62}$$

$$Z_t = Z_{t*}\left(-\frac{\Lambda_{Z_t}}{\Lambda_{Z_{t+1}}}\right)^{t-t*}, \tag{63}$$

where all the partial derivatives Ψ_{Z_t}, $\Psi_{L_{chTt}}$, $\Psi_{L_{chTt+1}}$, Λ_{Z_t} and $\Lambda_{Z_{t+1}}$ are evaluated at (L_{chT}, Z=0) and are such that $0 < -\frac{\Lambda_{Z_t}}{\Lambda_{Z_{t+1}}} < 1$, $-\frac{\Psi_{L_{chTt}}}{\Psi_{L_{chTt+1}}} > 1$, and $\frac{\Psi_{Z_t}}{\Psi_{L_{chTt+1}}} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0$ whenever $TA_{us} \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} 0$ (see the Appendix). Considering (62), this implies that—along the transitional path—$L_{chTt}>L_{chT}$ if and only if $TA_{us}<0$. The same remarks made while discussing the analogous result obtained from the analysis of the transitional path in Scenario A apply here.

5. CONCLUSIONS

Our two-country two-stage growth model captures the symbiotic relationship linking the US to China in recent years, provides an analytical setup able to reproduce several aspects of the "Sino-American co-dependency" story that are broadly consistent with the available evidence, and helps to analyze alternative (medium- and long-term) scenarios for the evolution of the Sino-American relationship.[27] Hence, this work contributes to the debate on global growth-rebalancing, a process that, according to most scholars, the recent economic and financial crisis has made more likely and desirable.

The first stage of the model (Phase 1) reproduces the Sino-American co-dependency emerged in the last decade. The Chinese leaderships maintains an undervalued exchange rate *vis-à-vis* the US dollar aiming to boost the country's exporting sectors and to mobilize part of rural workers into the industrial sectors. In so doing, China runs persistent and large current account surpluses that lead to the rapid accumulation of a huge stock of foreign reserves (most of which denominated in US dollars). The US, in turn, exploits the Chinese willingness to finance its current account deficits in order to keep high households' consumption.

The second stage of the model (Phase 2) reflects two possible scenarios that can materialize, depending on whether the Chinese authorities liberalize the capital account and float the renminbi, once that all the Chinese labor force employed in the backward sectors of the economy has been mobilized in the most productive sectors. We summarize below the main results described and discussed in the main text of the paper and in the Appendix.

In Scenario A, China never liberalizes the capital account and never floats the currency. As long as the domestic currency remains undervalued with respect to the dollar, the long-run rate of real GDP growth in China is i) greater than in the US and ii) depends on the size and the composition (in terms of the relative share of tradables and nontradables) of Chinese public expenditures. Provided that the labor intensity of growth is larger in the nontradable sector than in the tradable sector, a more appreciated Chinese currency leads to a structural adjustment of the US economy toward the production of tradables, thus reducing the US trade deficits and raising the long-run US growth. However, the employment gains in the tradable sector may not be sufficient to offset the job losses in the nontradable sector. In this way, structural unemployment may emerge (or expand) in the US.

It is worth noticing that the undervaluation of the renminbi in Phase 1 guarantees that US consumption and production of nontradables remain high, and leads to a faster accumulation of capital in China, thereby reducing the time necessary to absorb the Chinese manpower into the productive sectors of the economy. A more appreciated Chinese currency tends to lengthen this

[27] To keep the model tractable, we deliberately neglect some aspects (which represent avenues for future research), such as the features of the financial sectors in the US and in China, the role played by third countries in growth-rebalancing, the implications of processing trade and different invoicing strategies, and the different behavior of privately and publicly owned companies in China.

period, thus jeopardizing the achievement of full labor mobilization in China[28] and possibly creating US unemployment also during the transition path.[29]

In Scenario B, the Chinese authorities fully liberalize the capital account and let the exchange rate float once complete labor mobilization has occurred. This switch amounts to a permanent appreciation of the Chinese currency generating effects that are similar to those considered in the previous Scenario. If the Chinese authorities reduce the extent to which they are willing to finance the US deficits, the US policy-makers would be forced to change their fiscal policy depending on the composition of government spending in terms of tradables and nontradables.

Some general questions are raised by our analysis. To what extent can a change in the Chinese exchange rate regime *alone* be beneficial to both US growth and employment in the medium and long term? Is the re-orientation of the US economy toward tradable manufacturing sectors conducive to a desirable redistribution of the US labor force across sectors? Can the Chinese and American authorities use exchange rate and fiscal policies to engineer an adjustment process that does neither jeopardize the growth prospects of the Chinese economy nor cause structural unemployment problems in the US?

This model suggests that the maintenance of the Sino-American co-dependency has both served the growth and labor mobilization goals of China and allowed the US households to enjoy a high level of consumption. However, this has come at the cost of a persistently subdued level of domestic consumption in China and of an increasing dependence of the US on the Chinese willingness to finance its external deficits.[30] Our analysis shows that redressing global imbalances may imply some relevant costs. If exchange rate and fiscal policies are not properly tuned in both

[28] In a companion paper (see Bonatti and Fracasso, 2009), we show that a premature appreciation may even prevent forever the complete absorption of the Chinese manpower into the modern sectors.

[29] We consider here neither population nor labor force growth rates. In fact, a decline in the US population rate of growth and in the labor force participation rate (as argued in Feldstein, 2009) might mitigate the rise in unemployment due to sectoral reallocation of demand.

[30] China has maintained a high degree of domestic financial repression in order to facilitate the sterilization of mounting foreign reserves and to drive the allocation of domestic investment across alternative uses. In addition, to preserve its export-driven model of growth, China has accepted very limited monetary policy independence and, despite its efforts to the contrary, a certain degree of capital misallocation. The US, on its part, has progressively increased its dependence on the willingness of the Chinese authorities to finance the US external deficits by accumulating even more dollar-denominated US Treasuries. Moreover, its manufacturing sector has progressively declined, while exotic financial activities have prospered, facilitating the emergence of excess liquidity and overleveraging, as much as the persistence of very low households' savings (see, in this, Obstfeld, 2010).

countries, the rebalancing process may lead to the emergence of transitional and, eventually, structural unemployment in the US and to a slow-down in the process whereby the Chinese labor force is gradually absorbed in the modern sectors of the economy.

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APPENDIX

1 Derivation of the equations characterizing an equilibrium path

1.1 From firms' first-order conditions with respect to labor, we get:

$$L_{jNt} = \left(\frac{\gamma_j P_{jNt} A_{jNt} K_{jNt}^{1-\gamma_j}}{W_{jt}} \right)^{\frac{1}{1-\gamma_j}}, \tag{A1}$$

$$L_{jTt} = \left(\frac{\alpha_j P_{jTt} A_{jTt} K_{jTt}^{1-\alpha_j}}{W_{jt}} \right)^{\frac{1}{1-\alpha_j}}. \tag{A2}$$

One can use (A1) and (A2) to obtain equation (43). Moreover, by using (A1) to obtain the labor demanded by each firm producing Y_{jNt}, the intertemporal problem of the representative firm producing nontradables can be solved by maximizing

$$\sum_{v=0}^{\infty} \frac{\left\{ (1-\gamma_j) \left(\frac{\gamma_j^{\gamma_j} P_{jNt+v} A_{jNt+v} K_{jNt+v}^{1-\gamma_j}}{W_{jt+v}^{\gamma_j}} \right)^{\frac{1}{1-\gamma_j}} - P_{jTt+v} I_{jNt+v} - \lambda_{jNt+v} [K_{jNt+v+1} - I_{jNt+v} - (1-\delta_j) K_{jNt+v}] \right\}}{\prod_{s=1}^{v} (1+i_{jt+s})}$$ with

respect to I_{jNt}, K_{jNt+1} and the Lagrange multiplier λ_{jNt}, and then by eliminating λ_{jNt}, thus obtaining:

$$\frac{(1-\gamma_j)}{(1+i_{jt+1})} \left(\frac{\gamma_j^{\gamma_j} P_{jNt+1} A_{jNt+1}}{W_{jt+1}^{\gamma_j}} \right)^{\frac{1}{1-\gamma_j}} + \frac{(1-\delta_j) P_{jTt+1}}{(1+i_{jt+1})} = P_{jTt}, \tag{A3}$$

$$K_{jNt+1} = I_{jNt} + (1-\delta_j) K_{jNt}. \tag{A4}$$

An optimal path must also satisfy the transversality condition

$$\lim_{v \to \infty} \frac{P_{jTt+v} K_{jNt+v}}{\prod_{s=1}^{v} (1+i_{jt+s})} = 0. \tag{A5}$$

1.2 Similarly, one can solve the intertemporal problem of the representative firm producing tradables, thus obtaining

$$\frac{(1-\alpha_j)}{(1+i_{jt+1})} \left(\frac{\alpha_j^{\alpha_j} P_{jTt+1} A_{jTt+1}}{W_{jt+1}^{\alpha_j}} \right)^{\frac{1}{1-\alpha_j}} + \frac{(1-\delta_j) P_{jTt+1}}{(1+i_{jt+1})} = P_{jTt}, \tag{A6}$$

$$K_{jTt+1} = I_{jTt} + (1-\delta_j) K_{jTt}, \tag{A7}$$

$$\lim_{v \to \infty} \frac{P_{jTt+v} K_{jTt+v}}{\prod_{s=1}^{v} (1+i_{jt+s})} = 0. \tag{A8}$$

1.3 By using (14) to obtain the labor supplied by each household, the intertemporal problem of the representative household can be solved by maximizing

$$\sum_{v=0}^{\infty}\theta_j^v\left\{\left[\ln\left(\frac{C_{jNt+v}^{\eta_j}}{C_{jTt+v}^{\eta_j-1}}\right)+\chi_j\ln\left(\frac{M_{jt+v}}{P_{jt+v}}\right)+v(G_{jt+v})\right]+\lambda_{jHt+v}[(1+i_{jt+v})B_{jHt+v}+E_{jt+v}(1+i_{it+v})F_{jHt+v}+\pi_{jNt+v}+\right.$$

$$\left.+\pi_{jTt+v}+L_{jt+v}W_{jt+v}+M_{jt+v-1}-T_{jt+v}-B_{jHt+v+1}-E_{jt+v}F_{jHt+v+1}-M_{jt+v}-P_{jNt+v}C_{jNt+v}-P_{jTt+v}C_{jTt+v}]\right\}$$ with

respect to C_{jNt}, C_{jTt}, M_{jt}, B_{jHt+1}, F_{jHt+1} and the Lagrange multiplier λ_{jHt}, and then by eliminating λ_{jHt}, thus obtaining:

$$\eta_j P_{jTt}C_{jTt}=(1-\eta_j)P_{jNt}C_{jNt}, \tag{A9}$$

$$\chi_j[(1-\eta_j)M_{jt}]^{-1}=(P_{jTt}C_{jTt})^{-1}-\theta_j(P_{jTt+1}C_{jTt+1})^{-1}, \tag{A10}$$

$$P_{jTt+1}C_{jTt+1}=\theta_j P_{jTt}C_{jTt}(1+i_{jt+1}), \tag{A11}$$

$$E_{jTt}P_{jTt+1}C_{jTt+1}=\theta_j P_{jTt}C_{jTt}E_{jTt+1}(1+i_{it+1}),\ i\neq j,\ t\geq t^*, \tag{A12}$$

$$\begin{aligned}&B_{jHt+1}+B_{jGt+1}+E_{jt}(F_{jHt+1}+F_{jGt+1})-(1+i_{jt})(B_{jHt}+B_{jGt})-E_{jt}(1+i_{it})(F_{jHt}+F_{jGt})=\\&=P_{jTt}[Y_{jTt}-K_{jTt+1}-K_{jNt+1}-C_{jTt}-G_{jTt}+(K_{jTt}+K_{jNt})(1-\delta_j)],\ i\neq j.\end{aligned} \tag{A13}$$

Notice that (A13) is obtained by using (19) (the government's budget constraint) for substituting T_{jt} in the household's budget constraint, and by using (2), (3), (6), (7), (18),(21) and (22).
The household's optimal path must also satisfy the transversality conditions

$$\lim_{v\to\infty}\frac{\theta_j^v(1-\eta_j)B_{jHt+v+1}}{C_{jTt+v}P_{jTt+v}}=0, \tag{A14}$$

$$\lim_{v\to\infty}\frac{\theta_j^v(1-\eta_j)E_{jt+v+1}F_{jHt+v+1}}{C_{jTt+v}P_{jTt+v}}=0. \tag{A15}$$

1.4 To derive (35), one can use (18) and the fact that the government produces efficiently ($G_{jNt}=\zeta_j G_{jTt}$) to obtain

$$G_{jTt}=\frac{g_{jt}(P_{jNt}Y_{jNt}+P_{jTt}Y_{jTt})}{P_{jNt}\zeta_j+P_{jTt}}=\frac{g_{jt}\left(\dfrac{P_{jNt}Y_{jNt}}{P_{jTt}}+Y_{jTt}\right)}{\left(\dfrac{P_{jNt}\zeta_j}{P_{jTt}}+1\right)}. \tag{A16}$$

Finally, one can use (43) and the production functions (1) and (5) to rewrite (A16) as (35).
1.5 To derive (34), one can use $G_{jNt}=\zeta_j G_{jTt}$, the equilibrium condition (22), the production function (1) and (35) to obtain

$$C_{jNt}=K_{jNt}L_{jNt}^{\gamma_j}-\frac{K_{jTt}L_{jTt}^{\alpha_j}\zeta_j g_{jt}\left[\dfrac{\alpha_j L_{jNt}}{\gamma_j L_{jTt}}+1\right]}{\dfrac{\zeta_j\alpha_j K_{jTt}L_{jNt}^{1-\gamma_j}}{\gamma_j K_{jNt}L_{jTt}^{1-\alpha_j}}+1}. \tag{A17}$$

Moreover, one can use (A9) and (43) to obtain

$$C_{jTt} = \frac{(1-\eta_j)\alpha_j K_{jTt} L_{jNt}^{1-\gamma_j} C_{jNt}}{\eta_j \gamma_j K_{jNt} L_{jTt}^{1-\alpha_j}}. \tag{A18}$$

Finally, one can use (A17) to rewrite (A18) as (34).

1.6 To derive (38), one can use (A1) and the fact that $A_{jNt} = K_{jNt}^{\gamma_j}$ to rewrite (A3) as

$$\frac{(1-\gamma_j)L_{jNt+1}^{\gamma_j} P_{jNt+1}}{(1+i_{jt+1})} + \frac{(1-\delta_j)P_{jTt+1}}{(1+i_{jt+1})} = P_{jTt}, \tag{A19}$$

Similarly, one can use (A2) and the fact that $A_{jTt} = K_{jTt}^{\alpha_j}$ to rewrite (A6) as

$$\frac{(1-\alpha_j)L_{jTt+1}^{\alpha_j} P_{jTt+1}}{(1+i_{jt+1})} + \frac{(1-\delta_j)P_{jTt+1}}{(1+i_{jt+1})} = P_{jTt}, \tag{A20}$$

Finally, one can use (43), (A19) and (A20) to obtain (36).

1.7 To derive (37), one can use (A11) to rewrite (A20) as

$$\theta_j[(1-\alpha_j)L_{jT}^{\alpha_j} + 1 - \delta_j]\frac{C_{jTt}}{C_{jTt+1}} = 1 \tag{A21}$$

Finally, one can use (34) to rewrite (A21) as (37).

1.8 To derive (39), one should consider that (14), (A1) and (A2)—together—rule out the possibility that $\frac{W_{jt}}{P_{jt}} < V_{jt}$ along an equilibrium path. Hence, labor market equilibrium requires $\frac{W_{jt}}{P_{jt}} \geq V_{jt}$. Furthermore, one can conclude from (14), (A1) and (A2) that $\frac{W_{jt}}{P_{jt}} > V_{jt}$ entails $L_{jTt}+L_{jNt}=H_j$, which—in its turn—implies (consider (11), (A2), (A17) and $N_{jt} \equiv \frac{V_{jt}}{K_{jTt}}$) that $\frac{\alpha_j D_j}{L_{jTt}^{1-\alpha_j}}\left[\frac{\gamma_j K_{jNt} L_{jTt}^{1-\alpha_j}}{\alpha_j K_{jTt}(H_j - L_{jTt})^{1-\gamma_j}}\right]^{\eta_j} > N_{jt}$ entails $L_{jNt}=H_j-L_{jTt}$.

Thus,

$$L_{jNt} = H_j - L_{jTt} \quad \text{if} \quad \frac{\alpha_j D_j}{L_{jTt}^{1-\alpha_j}}\left[\frac{\gamma_j K_{jNt} L_{jTt}^{1-\alpha_j}}{\alpha_j K_{jTt}(H_j - L_{jTt})^{1-\gamma_j}}\right]^{\eta_j} > N_{jt}. \tag{A22}$$

Finally, $\frac{\alpha_j D_j}{L_{jTt}^{1-\alpha_j}}\left[\frac{\gamma_j K_{jNt} L_{jTt}^{1-\alpha_j}}{\alpha_j K_{jTt}(H_j - L_{jTt})^{1-\gamma_j}}\right]^{\eta_j} \leq N_{jt}$ entails $\frac{W_{jt}}{P_{jt}} = V_{jt}$ (again, consider (11), (14), (43) and (A2)).

Thus, one can use (A1) and (43) to obtain

$$L_{jNt} = \left[\left(\frac{\gamma_j K_{jNt}}{\alpha_j K_{jTt}}\right)^{\eta_j} \frac{\alpha_j D_j}{N_{jt} L_{jTt}^{(1-\alpha_j)(1-\eta_j)}}\right]^{\frac{1}{(1-\gamma_j)\eta_j}} \quad \text{if} \quad \frac{\alpha_j D_j}{L_{jTt}^{1-\alpha_j}}\left[\frac{\gamma_j K_{jNt} L_{jTt}^{1-\alpha_j}}{\alpha_j K_{jTt}(H_j - L_{jTt})^{1-\gamma_j}}\right]^{\eta_j} \leq N_{jt}. \tag{A23}$$

1.9 To derive (41), rewrite (A10) as

$$\chi_j(1-\eta_j)^{-1} = x_{jt} - x_{jt+1}\theta_j(1+\overline{\mu}_j)^{-1},\ x_{jt} \equiv M_{jt}(P_{jTt}C_{jTt})^{-1}, \qquad (A24)$$

Since $\theta(1+\overline{\mu}_j)^{-1} < 1$, equation (A24) is such that if $x_{j0}>x_j$ then $x_{jt}\to\infty$ as $t\to\infty$, if $x_{j0}<x_j$ then $x_{jt}\to-\infty$ as $t\to\infty$, if $x_{j0}=x_j$ then $x_{jt}=x_j$ for all t, where $x_j = \frac{\chi_j(1+\overline{\mu}_j)}{(1-\eta_j)(1+\overline{\mu}_j-\theta_j)}$. Therefore, the only value of x_{jt} that is consistent with the optimality and boundary conditions is $x_{jt}=x_j$ for all t. This implies that along an equilibrium path one has

$$P_{jTt} = \frac{M_{jt}}{C_{jTt}x_j} = \frac{(1-\eta_j)(1+\overline{\mu}_j-\theta_j)(1+\overline{\mu}_j)^t M_{j-1}}{C_{jTt}\chi_j}. \qquad (A25)$$

Considering (A25), one can use the one-price law (24) to obtain (41).

2 Derivation of equation (48)

Considering (31) and (A11), one can check that

$$\frac{E_{jt}}{E_{jt-1}} = \frac{1+i_{jt}}{1+i_{it}} = \frac{P_{jTt}P_{iTt-1}\theta_i C_{jTt}C_{iTt-1}}{P_{iTt}P_{jTt-1}\theta_j C_{jTt-1}C_{iTt}},\ i \neq j. \qquad (A26)$$

Considering (24), one has

$$\frac{E_{jt}}{E_{jt-1}} = \frac{P_{jTt}P_{iTt-1}}{P_{iTt}P_{jTt-1}},\ i \neq j. \qquad (A27)$$

Thus, (A26) and (A27)—together—imply that under a floating exchange-rate regime one has $\frac{\theta_i C_{jTt}C_{iTt-1}}{\theta_j C_{jTt-1}C_{iTt}} = 1,\ i \neq j$ which in its turn entails (48) (see equation (A21)).

3 Derivation of equation (51)

Consider that—by using (29), (52) and (53) to substitute for $\overline{E}_{cht}$ in (44)—one obtains

$$\frac{C_{usTt}}{K_{usTt}} = Q\frac{C_{chTt}}{K_{chTt}}. \qquad (A28)$$

By using (34), (38) and (45), (A28) becomes

$$C(K(h(L_{usTt},s_{ust}),L_{usTt}),h(L_{usTt},s_{ust}),L_{usTt},g_{ust}) = QC(K(L_{chNt},L_{chTt}),L_{chNt},L_{chTt},g_{cht}),\ t>0, \qquad (A29)$$

from which one can obtain L_{usTt} as an implicit function of $L_{chTt}, L_{chNt}, g_{cht}, s_{ust}, g_{ust}$ and Q: $L_{usTt} = f(L_{chTt}, L_{chNt}, g_{cht}, s_{ust}, g_{ust}, Q)$.

In particular, one can check that $\frac{\partial C(K(h(L_{usTt},s_{ust}),L_{usTt}),h(L_{usTt},s_{ust}),L_{usTt},g_{ust})}{\partial L_{usTt}} < 0$ and $\frac{\partial C(K(h(L_{usTt},s_{ust}),L_{usTt}),h(L_{usTt},s_{ust}),L_{usTt},g_{ust})}{\partial g_{ust}} < 0$, thus entailing $f_Q < 0$ and $f_{g_{ust}} < 0$.

4 Derivation of equations (52)-(54)

To derive the system (52)-(54), consider that $L_{chNt} = L(K(L_{chNt},L_{chTt}),N_{cht},L_{chTt}) < H_{ch} - L_{chTt},\ 0<t<t^*$ (see equations (38) and (39)), from which one obtains

$$L_{chNt} = n(N_{cht}, L_{chTt}) = \left[\left(\frac{1-\alpha_{ch}}{1-\gamma_{ch}}\right)^{\eta_{ch}} \frac{N_{cht} L_{chTt}^{1-\alpha_j(1-\eta_j)}}{\alpha_{ch} D_{ch}}\right]^{\frac{1}{\gamma_{ch}\eta_{ch}}} < H_{ch} - L_{chTt}, 0 < t < t^*. \quad \text{(A30)}$$

Equation (52) contains $\varsigma(L_{chTt+1}, N_{cht+1}, L_{chTt}, N_{cht}, \hat{s}_{us}, \hat{g}_{us}, \hat{g}_{ch}, Q) = -\frac{TA_{ust}}{P_{usTt} K_{usTt}}$ and $\vartheta(L_{chTt+1}, N_{cht+1}, L_{chTt}, N_{cht}, \hat{g}_{ch}) = -\frac{TA_{cht}}{P_{chTt} K_{chTt}}$, where $\varsigma(L_{chTt+1}, N_{cht+1}, L_{chTt}, N_{cht}, \hat{s}_{us}, \hat{g}_{us}, \hat{g}_{ch}, Q)$ is obtained by setting $L_{usTt} = f(L_{chTt}, n(N_{cht}, L_{chTt}), \hat{g}_{ch}, \hat{s}_{us}, \hat{g}_{us}, Q)$ (see equation (51)), $s_{ust+1} = s_{ust} = \hat{s}_{us}$ and $g_{ust+1} = g_{ust} = \hat{g}_{us}$ $g_{ust+1} = g_{ust} = \hat{g}_{us}$ $\forall t$ such that 0<t<t* in

$$\begin{aligned}&\frac{[1+K(h(L_{usTt+1}, s_{ust+1}), L_{usTt+1})]\theta_{us} C(K(h(L_{usTt}, s_{ust}), L_{usTt}), h(L_{usTt}, s_{ust}), L_{usTt}, g_{ust})}{[(1-\alpha_{us})L_{usTt+1}^{\alpha_{us}} + 1 - \delta_{us}]^{-1} C(K(h(L_{usTt+1}, s_{ust+1}), L_{usTt+1}), h(L_{usTt+1}, s_{ust+1}), L_{usTt+1}, g_{ust+1})} - L_{usTt}^{\alpha_{us}} - \\ &-(1-\delta_{us})[1+K(h(L_{usTt}, s_{ust}), L_{usTt})] + G(K(h(L_{usTt}, s_{ust}), L_{usTt}), h(L_{usTt}, s_{ust}), L_{usTt}, g_{ust}) + \\ &+ C(K(h(L_{usTt}, s_{ust}), L_{usTt}), h(L_{usTt}, s_{ust}), L_{usTt}, g_{ust}), \; t > 0\end{aligned} \quad \text{(A31)}$$

while $\vartheta(L_{chTt+1}, N_{cht+1}, L_{chTt}, N_{cht}, \hat{g}_{ch})$ is obtained by setting $L_{chNt} = n(N_{cht}, L_{chTt})$ (see equation (A30)) and $g_{cht} = g_{cht+1} = \hat{g}_{ch}$ $\forall t$ such that 0<t<t* in

$$\begin{aligned}&\frac{[1+K(L_{chNt+1}, L_{chTt+1})]\theta_{ch} C(K(L_{chNt}, L_{chTt}), L_{chNt}, L_{chTt}, g_{cht})}{[(1-\alpha_{ch})L_{chTt+1}^{\alpha_{ch}} + 1 - \delta_{ch}]^{-1} C(K(L_{chNt+1}, L_{chTt+1}), L_{chNt+1}, L_{chTt+1}, g_{cht+1})} - (1-\delta_{ch})[1+K(L_{chNt}, L_{chTt})] - \\ &- L_{chTt}^{\alpha_{ch}} + G(K(L_{chNt}, L_{chTt}), L_{chNt}, L_{chTt}, g_{cht}) + C(K(L_{chNt}, L_{chTt}), L_{chNt}, L_{chTt}, g_{cht}), \; t > 0.\end{aligned} \quad \text{(A32)}$$

In their turn, equations (A31) and (A32) are derived by using (34), (35), (37), (38) and (45).

Equation (53) is obtained by setting $L_{usTt} = f(L_{chTt}, n(N_{cht}, L_{chTt}), \hat{g}_{ch}, \hat{s}_{us}, \hat{g}_{us}, Q)$, $s_{ust+1} = s_{ust} = \hat{s}_{us}$, $L_{chNt} = n(N_{cht}, L_{chTt})$, $g_{ust} = g_{ust+1} = \hat{g}_{us}$ and $g_{cht} = g_{cht+1} = \hat{g}_{ch}$ $\forall t$ such that 0<t<t* in

$$Z_{t+1} - \frac{\dfrac{Z_t \theta_{us} C(K(h(L_{usTt}, s_{ust}), L_{usTt}), h(L_{usTt}, s_{ust}), L_{usTt}, g_{ust})}{C(K(h(L_{usTt+1}, s_{ust+1}), L_{usTt+1}), h(L_{usTt+1}, s_{ust+1}), L_{usTt+1}, g_{ust+1})}}{\dfrac{[(1-\alpha_{ch})L_{chTt+1}^{\alpha_{ch}} + 1 - \delta_{ch}]\theta_{ch} C(K(L_{chNt}, L_{chTt}), L_{chNt}, L_{chTt}, g_{cht})}{[(1-\alpha_{us})L_{usTt+1}^{\alpha_{us}} + 1 - \delta_{us}] C(K(L_{chNt+1}, L_{chTt+1}), L_{chNt+1}, L_{chTt+1}, g_{cht+1})}} = 0, \; t>0, \quad \text{(A33)}$$

where (A33) is derived from (36) by using (34), (35), (37), (38) and (45).

Equation (54) is obtained by setting $L_{chNt} = n(N_{cht}, L_{chTt})$ and $g_{cht} = g_{cht+1} = \hat{g}_{ch}$ $\forall t$ such that 0<t<t* in

$$N_{cht+1} - \frac{N_{cht}(1+\omega_{ch}) C(K(L_{chNt+1}, L_{chTt+1}), L_{chNt+1}, L_{chTt+1}, g_{cht+1})}{\theta_{ch}[(1-\alpha_{ch})L_{chTt+1}^{\alpha_{ch}} + 1 - \delta_{ch}] C(K(L_{chNt}, L_{chTt}), L_{chNt}, L_{chTt}, g_{cht})} = 0, \; t>0, \quad \text{(A34)}$$

In its turn, equation (A34) is derived from (40) by using (34), (35), (37) and (38).

Notice that for t=0 equations (52), (53) and (54) become, respectively,

$$Z_0 \left\{ G\left(\frac{K_{usN0}}{K_{usT0}}, h(L_{usT0}, \hat{s}_{us}), L_{usT0}, \hat{g}_{us}\right) + C\left(\frac{K_{usN0}}{K_{usT0}}, h(L_{usT0}, \hat{s}_{us}), L_{usT0}, \hat{g}_{us}\right) - L_{usT0}^{\alpha_{us}} - 1 + \delta_{us} + \right.$$

$$+\frac{\left[1+K(h(\mathrm{L}_{\mathrm{usT1}},\hat{\mathrm{s}}_{\mathrm{us}}),\mathrm{L}_{\mathrm{usT1}})\right]\theta_{\mathrm{us}}C\left(\frac{\mathrm{K}_{\mathrm{usN0}}}{\mathrm{K}_{\mathrm{usT0}}},h(\mathrm{L}_{\mathrm{usT0}},\hat{\mathrm{s}}_{\mathrm{us}}),\mathrm{L}_{\mathrm{usT0}},\hat{\mathrm{g}}_{\mathrm{us}}\right)}{\left[(1-\alpha_{\mathrm{us}})\mathrm{L}_{\mathrm{usT1}}^{\alpha_{\mathrm{us}}}+1-\delta_{\mathrm{us}}\right]^{-1}C\left(K(h(\mathrm{L}_{\mathrm{usT1}},\hat{\mathrm{s}}_{\mathrm{us}}),\mathrm{L}_{\mathrm{usT1}}),h(\mathrm{L}_{\mathrm{usT1}},\hat{\mathrm{s}}_{\mathrm{us}}),\mathrm{L}_{\mathrm{usT1}},\hat{\mathrm{g}}_{\mathrm{us}}\right)}\Bigg\}-(1-\delta_{\mathrm{us}})\frac{\mathrm{K}_{\mathrm{usN0}}}{\mathrm{K}_{\mathrm{chT0}}}+$$

$$+G\left(\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}},\mathrm{L}_{\mathrm{chN0}},\mathrm{L}_{\mathrm{chT0}},\hat{\mathrm{g}}_{\mathrm{ch}}\right)-\mathrm{L}_{\mathrm{chT0}}^{\alpha_{\mathrm{ch}}}+C\left(\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}},\mathrm{L}_{\mathrm{chN0}},\mathrm{L}_{\mathrm{chT0}},\hat{\mathrm{g}}_{\mathrm{ch}}\right)-(1-\delta_{\mathrm{us}})\left(1+\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}}\right)+$$

$$+\frac{\left[1+K(\mathrm{L}_{\mathrm{chN1}},\mathrm{L}_{\mathrm{chT1}})\right]\theta_{\mathrm{ch}}C\left(\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}},\mathrm{L}_{\mathrm{chN0}},\mathrm{L}_{\mathrm{chT0}},\hat{\mathrm{g}}_{\mathrm{ch}}\right)}{\left[(1-\alpha_{\mathrm{us}})\mathrm{L}_{\mathrm{chT1}}^{\alpha_{\mathrm{ch}}}+1-\delta_{\mathrm{ch}}\right]^{-1}C\left(K(\mathrm{L}_{\mathrm{chN1}},\mathrm{L}_{\mathrm{chT1}}),\mathrm{L}_{\mathrm{chN1}},\mathrm{L}_{\mathrm{chT1}},\hat{\mathrm{g}}_{\mathrm{ch}}\right)}=0, \qquad \text{(A35)}$$

$$\mathrm{Z}_1=\frac{\dfrac{\mathrm{Z}_0\theta_{\mathrm{us}}C\left(\frac{\mathrm{K}_{\mathrm{usN0}}}{\mathrm{K}_{\mathrm{usT0}}},h(\mathrm{L}_{\mathrm{usT0}},\hat{\mathrm{s}}_{\mathrm{us}}),\mathrm{L}_{\mathrm{usT0}},\hat{\mathrm{g}}_{\mathrm{us}}\right)}{C\left(K(h(\mathrm{L}_{\mathrm{usT1}},\hat{\mathrm{s}}_{\mathrm{us}}),\mathrm{L}_{\mathrm{usT1}}),h(\mathrm{L}_{\mathrm{usT1}},\hat{\mathrm{s}}_{\mathrm{us}}),\mathrm{L}_{\mathrm{usT1}},\hat{\mathrm{g}}_{\mathrm{us}}\right)}}{\dfrac{[(1-\alpha_{\mathrm{ch}})\mathrm{L}_{\mathrm{chT1}}^{\alpha_{\mathrm{ch}}}+1-\delta_{\mathrm{ch}}]\theta_{\mathrm{ch}}C\left(\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}},\mathrm{L}_{\mathrm{chN0}},\mathrm{L}_{\mathrm{chT0}}),\hat{\mathrm{g}}_{\mathrm{ch}}\right)}{[(1-\alpha_{\mathrm{us}})\mathrm{L}_{\mathrm{usT1}}^{\alpha_{\mathrm{us}}}+1-\delta_{\mathrm{us}}]C\left(K(\mathrm{L}_{\mathrm{chN1}},\mathrm{L}_{\mathrm{chT1}}),\mathrm{L}_{\mathrm{chN1}},\mathrm{L}_{\mathrm{chT1}},\hat{\mathrm{g}}_{\mathrm{ch}}\right)}} \qquad \text{(A36)}$$

and

$$\mathrm{N}_{\mathrm{ch1}}=\frac{\mathrm{N}_{\mathrm{ch0}}(1+\omega_{\mathrm{ch}})C\left(K(\mathrm{L}_{\mathrm{chN1}},\mathrm{L}_{\mathrm{chT1}}),\mathrm{L}_{\mathrm{chN1}},\mathrm{L}_{\mathrm{chT1}},\hat{\mathrm{g}}_{\mathrm{ch}}\right)}{\theta_{\mathrm{ch}}[(1-\alpha_{\mathrm{ch}})\mathrm{L}_{\mathrm{chT1}}^{\alpha_{\mathrm{ch}}}+1-\delta_{\mathrm{ch}}]C\left(\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}},\mathrm{L}_{\mathrm{chN0}},\mathrm{L}_{\mathrm{chT0}}),\hat{\mathrm{g}}_{\mathrm{ch}}\right)}, \qquad \text{(A37)}$$

where

$$\mathrm{L}_{\mathrm{chN0}}=L\left(\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}},\mathrm{N}_{\mathrm{ch0}},\mathrm{L}_{\mathrm{chT0}}\right)<\mathrm{H}_{\mathrm{ch}}-\mathrm{L}_{\mathrm{chT0}}\ ,\ \mathrm{L}_{\mathrm{usT0}}=f(\mathrm{L}_{\mathrm{chT0}},L\left(\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}},\mathrm{N}_{\mathrm{ch0}},\mathrm{L}_{\mathrm{chT0}}\right),\hat{\mathrm{g}}_{\mathrm{ch}},\hat{\mathrm{s}}_{\mathrm{us}},\hat{\mathrm{g}}_{\mathrm{us}},\mathrm{Q})\ ,$$

and where Z_0, $\frac{\mathrm{K}_{\mathrm{chN0}}}{\mathrm{K}_{\mathrm{chT0}}}$, $\frac{\mathrm{K}_{\mathrm{usN0}}}{\mathrm{K}_{\mathrm{usT0}}}$, $\frac{\mathrm{K}_{\mathrm{usN0}}}{\mathrm{K}_{\mathrm{chT0}}}$ and $\mathrm{N}_{\mathrm{ch0}}$ are given.

5 Derivation of equations (55)-(56)

Equation (55) contains $\sigma(\mathrm{L}_{\mathrm{chTt+1}},\mathrm{L}_{\mathrm{chTt}},\bar{\mathrm{s}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{ch}},\mathrm{Q})=-\frac{\mathrm{TA}_{\mathrm{ust}}}{\mathrm{P}_{\mathrm{usTt}}\mathrm{K}_{\mathrm{usTt}}}$ and $o(\mathrm{L}_{\mathrm{chTt+1}},\mathrm{L}_{\mathrm{chTt}},\bar{\mathrm{g}}_{\mathrm{ch}})=-\frac{\mathrm{TA}_{\mathrm{cht}}}{\mathrm{P}_{\mathrm{chTt}}\mathrm{K}_{\mathrm{chTt}}}$, where $\sigma(\mathrm{L}_{\mathrm{chTt+1}},\mathrm{L}_{\mathrm{chTt}},\bar{\mathrm{s}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{ch}},\mathrm{Q})$ is obtained by setting $\mathrm{L}_{\mathrm{usTt}}=f(\mathrm{L}_{\mathrm{chTt}},\mathrm{H}_{\mathrm{ch}}-\mathrm{L}_{\mathrm{chTt}},\bar{\mathrm{s}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{ch}},\mathrm{Q})$, $\mathrm{s}_{\mathrm{ust+1}}=\mathrm{s}_{\mathrm{ust}}=\bar{\mathrm{s}}_{\mathrm{us}}$, $\mathrm{g}_{\mathrm{ust}}=\mathrm{g}_{\mathrm{ust+1}}=\bar{\mathrm{g}}_{\mathrm{us}}$ and $\mathrm{g}_{\mathrm{cht}}=\mathrm{g}_{\mathrm{cht+1}}=\bar{\mathrm{g}}_{\mathrm{ch}}$ $\forall \mathrm{t}\geq\mathrm{t}^*$ in (A31), while $o(\mathrm{L}_{\mathrm{chTt+1}},\mathrm{L}_{\mathrm{chTt}},\bar{\mathrm{g}}_{\mathrm{ch}})$ is obtained by setting $\mathrm{L}_{\mathrm{chNt}}=\mathrm{H}_{\mathrm{ch}}-\mathrm{L}_{\mathrm{chTt}}$ and $\mathrm{g}_{\mathrm{cht}}=\mathrm{g}_{\mathrm{cht+1}}=\bar{\mathrm{g}}_{\mathrm{ch}}$ $\forall \mathrm{t}\geq\mathrm{t}^*$ in (A32).

Equation (56) is obtained by setting $\mathrm{L}_{\mathrm{chNt}}=\mathrm{H}_{\mathrm{ch}}-\mathrm{L}_{\mathrm{chTt}}$, $\mathrm{L}_{\mathrm{usTt}}=f(\mathrm{L}_{\mathrm{chTt}},\mathrm{H}_{\mathrm{ch}}-\mathrm{L}_{\mathrm{chTt}},\bar{\mathrm{s}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{ch}},\mathrm{Q})$, $\mathrm{s}_{\mathrm{ust+1}}=\mathrm{s}_{\mathrm{ust}}=\bar{\mathrm{s}}_{\mathrm{us}}$, $\mathrm{g}_{\mathrm{ust}}=\mathrm{g}_{\mathrm{ust+1}}=\bar{\mathrm{g}}_{\mathrm{us}}$ and $\mathrm{g}_{\mathrm{cht}}=\mathrm{g}_{\mathrm{cht+1}}=\bar{\mathrm{g}}_{\mathrm{ch}}$ $\forall \mathrm{t}\geq\mathrm{t}^*$ in (A33).

6 Proof that if $L_{jTt}\to L_{jT}$ as $t\to\infty$, then in Scenario A the country j's rate of real GDP growth approaches $\rho_j = \theta_j[(1-\alpha_j)L_{jT}^{\alpha_j} + 1 - \delta_j] - 1$, where $\rho_j = \lim_{t\to\infty} \rho_{jt}$

Considering (1), (5), (11), (37), (38) and (43), one can verify that the country j's rate of real GDP growth is given in Scenario A by

$$\rho_{GDP_{jt}} = (1+\rho_{jt})\frac{\dfrac{L_{jNt+1}^{\gamma_j\eta_j} L_{jTt+1}^{\alpha_j(1-\eta_j)-1}}{L_{jNt}^{\gamma_j\eta_j} L_{jTt}^{\alpha_j(1-\eta_j)-1}}}{\left[\dfrac{\gamma_j L_{jTt} + \alpha_j L_{jNt}}{\gamma_j L_{jTt+1} + \alpha_j L_{jNt+1}}\right]} - 1,\ t \geq t^*, \qquad \text{(A38)}$$

where $\rho_{GDP_{jt}} \equiv \dfrac{\dfrac{P_{jTt+1}Y_{jTt+1} + P_{jNt+1}Y_{jNt+1}}{P_{jt+1}} - \left(\dfrac{P_{jTt}Y_{jTt} + P_{jNt}Y_{jNt}}{P_{jt}}\right)}{\dfrac{P_{jTt}Y_{jTt} + P_{jNt}Y_{jNt}}{P_{jt}}}$ and $L_{jNt} = \begin{cases} H_{ch} - L_{chTt} & \text{if } j = ch \\ h(L_{usTt}, \bar{s}_{us}) & \text{if } j = us, t \geq t^*. \end{cases}$

By inspecting (A38), one can easily check that $L_{jTt}\to L_{jT}$ as $t\to\infty$ implies that $\lim_{t\to\infty} \rho_{GDP_{jt}} = \lim_{t\to\infty} \rho_{jt}$. Finally, by considering (37) and (38), one can also check that $L_{jTt}\to L_{jT}$ as $t\to\infty$ implies that $\lim_{t\to\infty} \rho_{jt} = \rho_j = \theta_j[(1-\alpha_j)L_{jT}^{\alpha_j} + 1 - \delta_j] - 1$. Thus, $L_{jTt}\to L_{jT}$ as $t\to\infty$ entails

$$\lim_{t\to\infty} \rho_{GDP_{jt}} = \theta_j[(1-\alpha_j)L_{jT}^{\alpha_j} + 1 - \delta_j] - 1.$$

7 Proof of Proposition 2

To verify that, if in the long run China tends to grow faster than the US, China's asymptotic rate of real GDP growth depends on its fiscal policy, consider that if China's asymptotic rate of real GDP growth is higher than the US asymptotic rate of real GDP growth, one must have $\rho_{ch}>\rho_{us}$ (see the proof of Proposition 1). In its turn, $\rho_{ch}>\rho_{us}$ implies that $Z_t \equiv \dfrac{K_{iTt}}{K_{jTt}} \to 0$ as $t\to\infty$. Hence, as $t\to\infty$, equation (55) becomes

$$w(L_{chT}, \bar{g}_{ch}) = C(K(H_{ch} - L_{chT}, L_{chT}), H_{ch} - L_{chT}, L_{chT}, \bar{g}_{ch}) + G(K(H_{ch} - L_{chT}, L_{chT}), H_{ch} - L_{chT}, L_{chT}, \bar{g}_{ch}) +$$

$$+ \frac{[1 + K(H_{ch} - L_{chT}, L_{chT})]\theta_{ch}}{[(1-\alpha_{ch})L_{chT}^{\alpha_{ch}} + 1 - \delta_{ch}]^{-1}} - (1-\delta_{ch})[1 + K(H_{ch} - L_{chT}, L_{chT})] - L_{chT}^{\alpha_{ch}} = \frac{\left[1 + \dfrac{(1-\gamma_{ch})\alpha_{ch}(H_{ch} - L_{chT})}{(1-\alpha_{ch})\gamma_{ch}L_{chT}}\right]}{[\theta_{ch}(1-\alpha_{ch})L_{chT}^{\alpha_{ch}} - (1-\delta_{ch})(1-\theta_{ch})]^{-1}} +$$

$$+ \frac{\alpha_{ch}(H_{ch} - L_{chT})}{(1-\eta_{ch})^{-1}\eta_{ch}\gamma_{ch}L_{chT}^{1-\alpha_{ch}}} - \left\{ \frac{\left[\dfrac{(1-\eta_{ch})(1-\alpha_{ch})L_{chT}^{\alpha_{ch}}\zeta_{ch}}{\eta_{ch}(1-\gamma_{ch})(H_{ch} - L_{chT})^{\gamma_{ch}}} - 1\right]\bar{g}_{ch}L_{chT}^{\alpha_{ch}}}{\left(\dfrac{\zeta_{ch}(1-\alpha_{ch})L_{chT}^{\alpha_{ch}}}{(1-\gamma_{ch})(H_{ch} - L_{chT})^{\gamma_{ch}}} + 1\right)\left(\dfrac{\alpha_{ch}(H_{ch} - L_{chT})}{\gamma_{ch}L_{chT}} + 1\right)^{-1}} \right\} - L_{chT}^{\alpha_{ch}} = 0. \qquad \text{(A39)}$$

The asymptotic equilibrium level of employment in China's tradable sector is a value of $L_{chT} \in [0, H_{ch}]$ that satisfies (A39). If it exists, this asymptotic equilibrium level is unique. Indeed, in the special case in which $\delta_{ch}=1$, there is at most one value of $L_{chT} \in [0, H_{ch}]$ satisfying (A39): in this case, the equilibrium level of employment in China's tradable sector is this unique value of L_{chT}. In the case in which $\delta_{ch}<1$, there are at most two values of $L_{chT} \in [0, H_{ch}]$ satisfying (A39) and the asymptotic equilibrium level of employment in China's tradable sector exists if the values of $L_{chT} \in [0, H_{ch}]$ satisfying (A39) are two. In this case, the equilibrium level of employment is the largest of these two values and it is unique, since the smallest value cannot be an equilibrium because it is inconsistent with $I_{chNt} + I_{chTt} \geq 0 \; \forall t$. Thus, given that the asymptotic equilibrium level of employment of China's tradable sector is a value of L_{chT} satisfying (A39) and it is unique, this equilibrium level is a function of China's structural parameters and of $\bar{g}_{ch}$:

$$L_{chT}=p(\bar{g}_{ch}). \qquad \text{(A40)}$$

Hence, if China's long-run growth is higher than US long-run growth, the asymptotic level of employment of China's tradable sector is given by (A40) and China's asymptotic rate of real GDP growth is given by $\rho_{ch} = \theta_{ch}\left\{(1-\alpha_{ch})[p(\bar{g}_{ch})]^{\alpha_{ch}} + 1 - \delta_{ch}\right\} - 1$, which depends on $\bar{g}_{ch}$.

To verify that China displays a higher asymptotic rate of real GDP growth than the US if $Q > \bar{Q}$, consider that $\rho_{ch}>\rho_{us}$ if and only if $\left\{\dfrac{\theta_{ch}[(1-\alpha_{ch})L_{chT}^{\alpha_{ch}} + 1 - \delta_{ch}] - \theta_{us}(1-\delta_{us})}{\theta_{us}(1-\alpha_{us})}\right\}^{\frac{1}{\alpha_{us}}} > L_{usT}$. Given (51), this implies that $\rho_{ch}>\rho_{us}$ if and only if

$$\left\{\frac{\theta_{ch}[(1-\alpha_{ch})L_{chT}^{\alpha_{ch}} + 1 - \delta_{ch}] - \theta_{us}(1-\delta_{us})}{\theta_{us}(1-\alpha_{us})}\right\}^{\frac{1}{\alpha_{us}}} > f(L_{chT}, H_{ch} - L_{chT}, \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q). \qquad \text{(A41)}$$

By using (A40), one can rewrite the inequality (A41) as

$$\left\{\frac{\theta_{ch}[(1-\alpha_{ch})[p(\bar{g}_{ch})]^{\alpha_{ch}} + 1 - \delta_{ch}] - \theta_{us}(1-\delta_{us})}{\theta_{us}(1-\alpha_{us})}\right\}^{\frac{1}{\alpha_{us}}} > f(p(\bar{g}_{ch}), H_{ch} - p(\bar{g}_{ch}), \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q). \qquad \text{(A42)}$$

Since $f_Q < 0$, the inequality (A42) holds for all $Q > \bar{Q}$, where $\bar{Q}$ is that value of Q satisfying

$$\left\{\frac{\theta_{ch}[(1-\alpha_{ch})[p(\bar{g}_{ch})]^{\alpha_{ch}} + 1 - \delta_{ch}] - \theta_{us}(1-\delta_{us})}{\theta_{us}(1-\alpha_{us})}\right\}^{\frac{1}{\alpha_{us}}} = f(p(\bar{g}_{ch}), H_{ch} - p(\bar{g}_{ch}), \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q). \qquad \text{(A43)}$$

Considering (A29), (A39) and (A43), one can check that $\bar{Q}$ depends on α_{ch}, γ_{ch}, η_{ch}, θ_{ch}, δ_{ch}, H_{ch}, ζ_{ch}, $\bar{g}_{ch}$, α_{us}, γ_{us}, η_{us}, θ_{us}, δ_{us}, H_{us}, ζ_{us}, φ_{us}, $\bar{s}_{us}$ and $\bar{g}_{us}$.

Finally, notice that if $Q > \bar{Q}$ one has $\rho_{ch}>\rho_{us}$, implying that $L_{chT}=p(\bar{g}_{ch})$.

8 Proof of Proposition 3

If China's asymptotic rate of real GDP growth is higher than the US asymptotic rate of real GDP growth, one must have $\rho_{ch}>\rho_{us}$, where $\rho_{ch} = \theta_{ch}\left\{(1-\alpha_{ch})[p(\overline{g}_{ch})]^{\alpha_{ch}} + 1 - \delta_{ch}\right\} - 1$. Hence, $\frac{\partial \rho_{ch}}{\partial \overline{g}_{ch}} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0$ whenever

$\frac{dp(\overline{g}_{ch})}{d\overline{g}_{ch}} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0$. Therefore, Proposition 3 amounts to claim that $\frac{dp(\overline{g}_{ch})}{d\overline{g}_{ch}} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0$ whenever $\zeta_{ch} \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} \overline{\zeta}_{ch}$. To verify this claim, consider $L_{chT}^{\overline{g}_{ch}=0} = p(\overline{g}_{ch})\big|_{\overline{g}_{ch}=0}$, that is the asymptotic equilibrium level of employment in China's tradable sector conditional on $\overline{g}_{ch} = 0$, and define $\overline{\zeta}_{ch} \equiv \frac{\eta_{ch}(1-\gamma_{ch})\left(H_{ch} - L_{chT}^{\overline{g}_{ch}=0}\right)^{\gamma_{ch}}}{(1-\eta_{ch})(1-\alpha_{ch})\left(L_{chT}^{\overline{g}_{ch}=0}\right)^{\alpha_{ch}}}$. One can easily check that

$$\text{if } \zeta_{ch} > \overline{\zeta}_{ch}, \text{ then } \left.\frac{\partial w(L_{chT}, \overline{g}_{ch})}{\partial \overline{g}_{ch}}\right|_{L_{chT} \geq L_{chT}^{\overline{g}_{ch}=0}} < 0 \tag{A44}$$

and

$$\text{if } \zeta_{ch} < \overline{\zeta}_{ch}, \text{ then } \left.\frac{\partial w(L_{chT}, \overline{g}_{ch})}{\partial \overline{g}_{ch}}\right|_{L_{chT} \leq L_{chT}^{\overline{g}_{ch}=0}} > 0, \tag{A45}$$

where $\frac{\partial w(L_{chT}, \overline{g}_{ch})}{\partial \overline{g}_{ch}} = -\frac{\left[\frac{(1-\eta_{ch})(1-\alpha_{ch})L_{chT}^{\alpha_{ch}}\zeta_{ch}}{\eta_{ch}(1-\gamma_{ch})(H_{ch} - L_{chT})^{\gamma_{ch}}} - 1\right]\left(\frac{\alpha_{ch}(H_{ch} - L_{chT})}{\gamma_{ch}L_{chT}} + 1\right)L_{chT}^{\alpha_{ch}}}{\left(\frac{\zeta_{ch}(1-\alpha_{ch})L_{chT}^{\alpha_{ch}}}{(1-\gamma_{ch})(H_{ch} - L_{chT})^{\gamma_{ch}}} + 1\right)}$. Moreover, consider that

$$\left.\frac{\partial w(L_{chT}, \overline{g}_{ch})}{\partial L_{chT}}\right|_{L_{chT} = p(\overline{g}_{ch})} < 0, \tag{A46}$$

thus implying that in a neighbourhood of $L_{chT}^{\overline{g}_{ch}=0}$ one has

$$w(L_{chT}, \overline{g}_{ch})\big|_{\overline{g}_{ch}=0} \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} 0 \text{ whenever } L_{chT} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} L_{chT}^{\overline{g}_{ch}=0}, \tag{A47}$$

where $w(L_{chT}, \overline{g}_{ch})\big|_{\overline{g}_{ch}=0} = \frac{\left[1 + \frac{(1-\gamma_{ch})\alpha_{ch}(H_{ch} - L_{chT})}{(1-\alpha_{ch})\gamma_{ch}L_{chT}}\right]}{[\theta_{ch}(1-\alpha_{ch})L_{chT}^{\alpha_{ch}} - (1-\delta_{ch})(1-\theta_{ch})]^{-1}} + \frac{(1-\eta_{ch})\alpha_{ch}(H_{ch} - L_{chT})}{\eta_{ch}\gamma_{ch}L_{chT}^{1-\alpha_{ch}}} - L_{chT}^{\alpha_{ch}}$.

From (A44), (A45) and (A47)—together—one can conclude that

$$\mathrm{L_{chT}}=p(\bar{\mathrm{g}}_{\mathrm{ch}})\Big|_{\bar{\mathrm{g}}_{\mathrm{ch}}>0}\begin{Bmatrix}<\\=\\>\end{Bmatrix}\mathrm{L}_{\mathrm{chT}}^{\bar{\mathrm{g}}_{\mathrm{ch}}=0} \text{ whenever } \zeta_{\mathrm{ch}}\begin{Bmatrix}>\\=\\<\end{Bmatrix}\bar{\zeta}_{\mathrm{ch}}. \tag{A48}$$

Furthermore, consider that $w(\mathrm{L_{chT}}, \bar{\mathrm{g}}_{\mathrm{ch}})=w(\mathrm{L_{chT}}, \bar{\mathrm{g}}_{\mathrm{ch}})\Big|_{\bar{\mathrm{g}}_{\mathrm{ch}}=0}+\bar{\mathrm{g}}_{\mathrm{ch}}\frac{\partial w(\mathrm{L_{chT}},\bar{\mathrm{g}}_{\mathrm{ch}})}{\partial\bar{\mathrm{g}}_{\mathrm{ch}}}=0$. This allows us to conclude from (A46), (A47) and (A48) that $\frac{dp(\bar{\mathrm{g}}_{\mathrm{ch}})}{d\bar{\mathrm{g}}_{\mathrm{ch}}}=-\frac{\frac{\partial w(\mathrm{L_{chT}},\bar{\mathrm{g}}_{\mathrm{ch}})}{\partial\bar{\mathrm{g}}_{\mathrm{ch}}}}{\frac{\partial w(\mathrm{L_{chT}},\bar{\mathrm{g}}_{\mathrm{ch}})}{\partial\mathrm{L_{chT}}}}\begin{Bmatrix}<\\=\\>\end{Bmatrix}0$ whenever $\zeta_{\mathrm{ch}}\begin{Bmatrix}>\\=\\<\end{Bmatrix}\bar{\zeta}_{\mathrm{ch}}$.

Finally, one should observe that the absolute value of $\frac{\partial w(\mathrm{L_{chT}},\bar{\mathrm{g}}_{\mathrm{ch}})}{\partial\bar{\mathrm{g}}_{\mathrm{ch}}}$ becomes smaller as ζ_{ch} becomes closer to $\bar{\zeta}_{\mathrm{ch}}$, thus reducing the effect of a change in $\bar{\mathrm{g}}_{\mathrm{ch}}$ on the asymptotic rate of real GDP growth.

9 Proof of Proposition 4

Since $\mathrm{L_{usT}}=f(p(\bar{\mathrm{g}}_{\mathrm{ch}}),\mathrm{H_{ch}}-p(\bar{\mathrm{g}}_{\mathrm{ch}}),\bar{\mathrm{g}}_{\mathrm{ch}},\bar{\mathrm{s}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{us}},\mathrm{Q}),\ f_{\mathrm{Q}}<0$, and $\rho_{\mathrm{us}}=\theta_{\mathrm{us}}[(1-\alpha_{\mathrm{us}})\mathrm{L}_{\mathrm{usT}}^{\alpha_{\mathrm{us}}}+1-\delta_{\mathrm{us}}]-1$, where $\mathrm{Q}>\bar{\mathrm{Q}}$, it is easy to verify that $\frac{\partial\mathrm{L_{usT}}}{\partial\mathrm{Q}}<0$ and $\frac{\partial\rho_{\mathrm{us}}}{\partial\mathrm{Q}}<0,\ \mathrm{Q}>\bar{\mathrm{Q}}$. Considering that the US asymptotic rate of real GDP approaches ρ_{us} as $t\to\infty$ (see the proof of Proposition 1), one can conclude from $\frac{\partial\rho_{\mathrm{us}}}{\partial\mathrm{Q}}<0$ that the US long-run GDP growth is boosted by a decrement in Q. Considering (45), one can conclude from $\frac{\partial\mathrm{L_{usT}}}{\partial\mathrm{Q}}<0$ that the US long-run equilibrium may be characterized by some unemployment brought about by the decrease in Q (if—as a result of the decrease in Q—$\mathrm{L_{usT}}$ overpasses the threshold $\frac{\alpha_{\mathrm{us}}(\gamma_{\mathrm{us}}-\bar{\mathrm{s}}_{\mathrm{us}}\varphi_{\mathrm{us}}\mathrm{H}_{\mathrm{us}})}{\bar{\mathrm{s}}_{\mathrm{us}}\varphi_{\mathrm{us}}(\gamma_{\mathrm{us}}-\alpha_{\mathrm{us}})}$), or by an increased volume of unemployment (if—at the initial value of Q—$\mathrm{L_{usT}}$ already exceeds the threshold $\frac{\alpha_{\mathrm{us}}(\gamma_{\mathrm{us}}-\bar{\mathrm{s}}_{\mathrm{us}}\varphi_{\mathrm{us}}\mathrm{H}_{\mathrm{us}})}{\bar{\mathrm{s}}_{\mathrm{us}}\varphi_{\mathrm{us}}(\gamma_{\mathrm{us}}-\alpha_{\mathrm{us}})}$).

10 Proof of Proposition 5

Since $\mathrm{L_{usT}}=f(p(\bar{\mathrm{g}}_{\mathrm{ch}}),\mathrm{H_{ch}}-p(\bar{\mathrm{g}}_{\mathrm{ch}}),\bar{\mathrm{g}}_{\mathrm{ch}},\bar{\mathrm{s}}_{\mathrm{us}},\bar{\mathrm{g}}_{\mathrm{us}},\mathrm{Q}),\ f_{\bar{\mathrm{g}}_{\mathrm{us}}}<0$, and $\rho_{\mathrm{us}}=\theta_{\mathrm{us}}[(1-\alpha_{\mathrm{us}})\mathrm{L}_{\mathrm{usT}}^{\alpha_{\mathrm{us}}}+1-\delta_{\mathrm{us}}]-1$, where $\mathrm{Q}>\bar{\mathrm{Q}}$, it is easy to verify that $\frac{\partial\mathrm{L_{usT}}}{\partial\bar{\mathrm{g}}_{\mathrm{us}}}<0$ and $\frac{\partial\rho_{\mathrm{us}}}{\partial\bar{\mathrm{g}}_{\mathrm{us}}}<0,\ \mathrm{Q}>\bar{\mathrm{Q}}$. Given $\frac{\partial\mathrm{L_{usT}}}{\partial\bar{\mathrm{g}}_{\mathrm{us}}}<0$ and $\frac{\partial\rho_{\mathrm{us}}}{\partial\bar{\mathrm{g}}_{\mathrm{us}}}<0$, one can follow the same arguments as in the proof of Proposition 4 to conclude that a decrease in $\bar{\mathrm{g}}_{\mathrm{us}}$ boosts US long-run growth, but it may have detrimental long-run effects on US total employment.

11 Transitional path of the economy in Scenario A

By solving the characteristic equation of the system obtained by linearizing (55)-(56) around (L_{chT}, Z=0), one can find the eigenvalues $\beta_1 = -\frac{\Pi_{L_{chTt}}}{\Pi_{L_{chTt+1}}}$ and $\beta_2 = -\frac{X_{Z_t}}{X_{Z_{t+1}}}$, where $\beta_1 > 1$ and $0 < \beta_2 < 1$, since $-\Pi_{L_{chTt}} > \Pi_{L_{chTt+1}} > 0$ and $-\frac{X_{Z_t}}{X_{Z_{t+1}}} = \frac{1+\rho_{us}}{1+\rho_{ch}}$ (notice that all derivatives must be evaluated at (L_{chT}, Z=0)). Having only one initial condition (solely Z_{t*} is given at time t*), $\beta_1 > 1$ and $0 < \beta_2 < 1$ imply that the linearized system is saddle-path stable.

By using the eigenvector $\frac{\Pi_{Z_t}}{(\beta_1 - \beta_2)\Pi_{L_{chTt+1}}}$, one can derive the system (57)-(58) governing the saddle path.

Since $\Pi_{Z_t} = \frac{C_{usT}}{K_{usT}} + \frac{G_{usT}}{K_{usT}} + (\rho_{us} + \delta_{us})\left[1 + \frac{\alpha_{us}(1-\gamma_{us})h(L_{usT}, \bar{s}_{us})}{\gamma_{us}(1-\alpha_{us})L_{usT}}\right] - L_{usT}^{\alpha_{us}} = \frac{-TA_{us}}{K_{usT}P_{usT}}$ and $\Pi_{L_{chTt+1}} > 0$, one can see that $\frac{\Pi_{Z_t}}{\Pi_{L_{chTt+1}}} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0$ whenever $TA_{us} \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} 0$. Given $\beta_1 - \beta_2 > 0$, this implies that—along the transitional path—L_{chTt}>L_{chT} if and only if TA_{us}<0.

12 Proof of Proposition 6

Consider $L_{usT} = f(p(\bar{g}_{ch}), H_{ch} - p(\bar{g}_{ch}), \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q)$ and $TA_{us} = K_{usT}P_{usT}m(L_{usT}, \bar{s}_{us}, \bar{g}_{us})$, where

$$m(L_{usT}, \bar{s}_{us}, \bar{g}_{us}) = L_{usT}^{\alpha_{us}} - \frac{\alpha_{us}h(L_{usT}, \bar{s}_{us})}{(1-\eta_{us})^{-1}\eta_{us}\gamma_{us}L_{usT}^{1-\alpha_{us}}} -$$

$$-\frac{\left[1 + \frac{(1-\gamma_{us})\alpha_{us}h(L_{usT}, \bar{s}_{us})}{(1-\alpha_{us})\gamma_{us}L_{usT}}\right]}{[\theta_{us}(1-\alpha_{us})L_{usT}^{\alpha_{us}} - (1-\delta_{us})(1-\theta_{us})]^{-1}} + \left\{ \frac{\left[\frac{(1-\eta_{us})(1-\alpha_{us})L_{usT}^{\alpha_{us}}\zeta_{us}}{\eta_{us}(1-\gamma_{us})[h(L_{usT}, \bar{s}_{us})]^{\gamma_{us}}} - 1\right]\bar{g}_{us}L_{usT}^{\alpha_{us}}}{\left(\frac{\zeta_{us}(1-\alpha_{us})L_{usT}^{\alpha_{us}}}{(1-\gamma_{us})[h(L_{usT}, \bar{s}_{us})]^{\gamma_{us}}} + 1\right)\left(\frac{\alpha_{us}h(L_{usT}, \bar{s}_{us})}{\gamma_{us}L_{usT}} + 1\right)^{-1}} \right\}. \quad (A49)$$

Since $f_Q < 0$ and $m_{L_{usT}} < 0$, one can conclude that TA_{us}<0 $\forall Q$ such that $Q > \hat{Q}$, where $\hat{Q}$ is that value of Q satisfying $m(f(p(\bar{g}_{ch}), H_{ch} - p(\bar{g}_{ch}), \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q), \bar{s}_{us}, \bar{g}_{us}) = 0$.

13 Numerical example

We compare the dynamics of our two-country economy under two different sets of policies both consistent with scenario A (no capital account liberalization and exchange-rate floating): we keep the same values for the structural parameters and the initial conditions, and we let vary the policy parameters, accounting for a permanent appreciation of the Chinese currency. In Phase 1, this appreciation is accompanied in both countries by some increase in the fraction of GDP spent by the government, while in Phase 2 it is accompanied only by a very minor increase in the fraction of GDP spent by the US government.

Structural parameters: $\alpha_{ch}=\alpha_{us}=0.5$, $\gamma_{ch}=\gamma_{us}=2/3$, $\delta_{ch}=\delta_{us}=0.05$, $\eta_{ch}=\eta_{us}=0.5$, $\theta_{ch}=0.95$, $\theta_{us}=0.945$, $\zeta_{ch}=\zeta_{us}=0.25$, $\varphi_{us}=51$, $\omega_{ch}=0.0715989$, $H_{us}=H_{ch}=0.2226363$.

Initial conditions: $N_{ch0}=0.4189382$, $Z_0=0.153241$, $\frac{K_{chN0}}{K_{chT0}}=0.3366798$, $\frac{K_{usN0}}{K_{usT0}}=0.3600964$.

First set of policy parameters: $Q^{'}=1.4161436, \hat{g}^{'}_{ch}=0.002988953, \hat{g}^{'}_{us}=0.00080093569, \hat{s}^{'}_{us}=0.0499819$, $\bar{g}^{'}_{ch}=0.146116, \bar{g}^{'}_{us}=0.1656187$, $\bar{s}^{'}_{us}=0.0490979$.

Second set of policy parameters: $Q^{''}=0.9888988, \hat{g}^{''}_{ch}=0.1225549, \hat{g}^{''}_{us}=0.1435044, \hat{s}^{''}_{us}=0.0499819$, $\bar{g}^{''}_{ch}=0.146116, \bar{g}^{''}_{us}=0.1682551$, $\bar{s}^{''}_{us}=0.0490979$.

Notice that with $Q=Q^{''}$ the Chinese currency is permanently more appreciated than with $Q=Q^{'}$, and that the change in policies does not regard the policy parameters that affect the reservation wage of the US workers ($\hat{s}^{'}_{us}=\hat{s}^{''}_{us}$ and $\bar{s}^{'}_{us}=\bar{s}^{''}_{us}$).

Values of the endogenous variables associated with the first set of policy parameters: $t*^{'}=1$, $L^{'}_{chT0}=0.144$, $L^{'}_{chN0}=0.0747589, \rho^{'}_{ch0}=0.121619, L^{'}_{usT0}=0.123, L^{'}_{usN0}=0.097532$, $\rho^{'}_{us0}=0.1014321$, $L^{'}_{chT1}=0.1366363$, $L^{'}_{chN1}=H_{ch}-L^{'}_{chT1}=0.086$, $\rho^{'}_{ch1}=0.0768557$, $L^{'}_{usT1}=0.116$, $L^{'}_{usN1}=H_{us}-L^{'}_{usT1}=0.1066363$, $\rho^{'}_{us1}=0.0574646$, $Z^{'}_1=0.150483$, $N^{'}_1=0.400255$, $L^{'}_{chTt}=0.1336363+(0.003)(0.9814653)^{t-1}, t\geq 1$, $L^{'}_{chNt}=H_{ch}-L^{'}_{chTt}=0.089-(0.003)(0.9814653)^{t-1}, t\geq 1$, $0.1124506\leq L^{'}_{usTt}\leq 0.1159339\ \forall t\geq 1$, $0.1067024\leq L^{'}_{usNt}=H_{us}-L^{'}_{usTt}\leq 0.1101857\ \forall t\geq 1$, $L^{'}_{chT}=0.1336363$, $L^{'}_{chN}=H_{ch}-L^{'}_{chT}=0.089$, $\rho^{'}_{ch}=0.0761424$, $L^{'}_{usT}=0.1124506$, $L^{'}_{usN}=H_{us}-L^{'}_{usT}=0.1101857$, $\rho^{'}_{us}=0.0561965$, $\frac{TA^{'}_{us}}{K^{'}_{usT}P^{'}_{usT}}=-0.097529$.

Values of the endogenous variables associated with the second set of policy parameters: $t*^{''}=2$, $L^{''}_{chT0}=0.131$, $L^{''}_{chN0}=0.0861589, \rho^{''}_{ch0}=0.0883243, L^{''}_{usT0}=0.1309, L^{''}_{usN0}=0.0869987$, $\rho^{''}_{us0}=0.0824711$, $L^{''}_{chT1}=0.1312$, $L^{''}_{chN1}=0.0854948$, $\rho^{''}_{ch1}=0.075114$, $L^{''}_{usT1}=0.1310115$, $L^{''}_{usN1}=0.08685$, $\rho^{''}_{us1}=0.068514$, $Z^{''}_1=0.1524169$, $N^{''}_1=0.4125$, $L^{''}_{chTt}=L^{''}_{chT}=0.1336363\ \forall t\geq 2$, $L^{''}_{chNt}=H_{ch}-L^{''}_{chTt}=L^{''}_{chN}=L^{''}_{chN}=H_{ch}-L^{''}_{chT}=0.089\ \forall t\geq 2$, $\rho^{''}_{cht}=\rho^{''}_{ch}=0.0761424\ \forall t\geq 2$, $L^{''}_{usTt}=L^{''}_{usT}=0.1321807\ \forall t\geq 2$, $L^{''}_{usNt}=L^{''}_{usN}=0.09\ \forall t\geq 2$ $\rho^{''}_{us}=0.0695352$, $\frac{TA^{''}_{us}}{K^{''}_{usT}P^{''}_{usT}}=0$.

Notice that China is faster in absorbing its entire manpower in the modern sectors of the economy when its currency is more depreciated ($((t^{'}<t*^{''})$. The adoption of the policy mix characterized by a less aggressive exchange-rate peg on the part of the Chinese authorities allows the US to raise its asymptotic rate of GDP

growth and to eliminate (both along the transitional path and asymptotically) the trade account deficit that it runs when the Chinese currency is more depreciated. However, one has unemployment in the US (again, both along the transitional path and asymptotically) only when the second set of policy parameters is adopted, namely when the Chinese currency is more appreciated.

14 Derivation of equations (59)-(60)

Equation (59) contains $\upsilon(L_{chTt+1}, L_{chTt}, \bar{s}_{us}, \bar{g}_{us}) = -\frac{TA_{ust}}{P_{usTt}K_{usTt}}$ and $o(L_{chTt+1}, L_{chTt}, \bar{g}_{ch}) = -\frac{TA_{ust}}{P_{usTt}K_{usTt}}$,

where $\upsilon(L_{chTt+1}, L_{chTt}, \bar{s}_{us}, \bar{g}_{us})$ is obtained by setting $L_{usTt} = l(L_{chTt})$ (see equation (48)), $s_{ust+1} = s_{ust} = \bar{s}_{us}$ and $g_{ust} = g_{ust+1} = \bar{g}_{us}$ $\forall t \geq t*$ in (A31), while $o(L_{chTt+1}, L_{chTt}, \bar{g}_{ch})$ is obtained by setting $L_{chNt} = H_{ch} - L_{chTt}$ and $g_{cht} = g_{cht+1} = \bar{g}_{ch}$ $\forall t \geq t*$ in (A32).

Equation (60) is obtained by setting $L_{chNt} = H_{ch} - L_{chTt}$, $L_{usTt} = l(L_{chTt})$, $s_{ust+1} = s_{ust} = \bar{s}_{us}$, $g_{ust} = g_{ust+1} = \bar{g}_{us}$ and $g_{cht} = g_{cht+1} = \bar{g}_{ch}$ $\forall t \geq t*$ in (A33).

15 Derivation of inequality (61)

Since $\upsilon(L_{chTt+1}, L_{chTt}, \bar{s}_{us}, \bar{g}_{us}) = -\frac{TA_{ust}}{P_{usTt}K_{usTt}} \leq \frac{\xi[P_{usNt}Y_{usNt} + P_{usTt}Y_{usTt}]}{P_{usTt}K_{usTt}}$, one can use (1), (5), (38), (43), $L_{usNt} = H_{us} - L_{usTt}$ and $L_{usTt} = l(L_{chTt})$ to obtain (61).

16 Proof of Proposition 8

From the proof of Proposition 2, we know that if in the long run China tends to grow faster than the US, the asymptotic level of employment in China's tradable sector is given by $L_{chT}=p(\bar{g}_{ch})$ (see equation (A40)). From Proposition 7, we know that in Scenario B $\theta_{ch}>\theta_{us}$ entails higher long-run growth in China than in the US. Hence, if $\theta_{ch}>\theta_{us}$ Scenario B is characterized by $L_{chT}=p(\bar{g}_{ch})$ and $L_{usT}=l(p(\bar{g}_{ch}))$.

Under the exchange-rate regime of Scenario A, one has $Q > \underline{Q}_t$, where $\underline{Q}_t$ is that value of Q satisfying $l(L_{chTt}) = f(L_{chTt}, H_{ch} - L_{chTt}, \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q)$. Since $f_Q < 0$, this implies that for any $Q > \underline{Q}_t$ and L_{chTt} one has $l(L_{chTt}) > f(L_{chTt}, H_{ch} - L_{chTt}, \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q)$: for any level of employment in the Chinese tradable sector, the level of employment in the US tradable sector is lower in Scenario A than in Scenario B. In particular, for any $Q > \underline{Q}$ and L_{chT} one has $l(L_{chT}) > f(L_{chT}, H_{ch} - L_{chT}, \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q)$: for any L_{chT}, the asymptotic level of employment in the US tradable sector is lower in Scenario A than in Scenario B. From Proposition 1, this implies that for any L_{chT} the asymptotic rate of US GDP growth is lower in Scenario A than in Scenario B. Therefore, since in Scenario B $\theta_{ch}>\theta_{us}$ implies that the asymptotic rate of growth is higher in China than in the US and $L_{chT}= p(\bar{g}_{ch})$, *a fortiori* in Scenario A the asymptotic rate of growth is higher in China than in the US whenever $\theta_{ch}>\theta_{us}$ and $L_{chT}= p(\bar{g}_{ch})$. Hence, again from the proof of Proposition 2, we know that if $\theta_{ch}>\theta_{us}$ also in Scenario A one must have $L_{chT}= p(\bar{g}_{ch})$, thus entailing $L_{usT} = f(p(\bar{g}_{ch}), H_{ch} - p(\bar{g}_{ch}), \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q)$.

Given that $l(p(\bar{g}_{ch})) > f(p(\bar{g}_{ch}), H_{ch} - p(\bar{g}_{ch}), \bar{g}_{ch}, \bar{s}_{us}, \bar{g}_{us}, Q)$, one can conclude from Proposition 1 that with $\theta_{ch}>\theta_{us}$ the US asymptotic rate of GDP growth is higher under the exchange-rate regime of Scenario B than under the exchange-rate regime of Scenario A. Finally, following the argument presented in the proof of Proposition 4, one can easily verify that with $\theta_{ch}>\theta_{us}$ the higher L_{usT} brought about by China's abandonment of the regime of Phase 1 in favor of a floating exchange-rate regime may be detrimental in the long run for US total employment.

17 Proof of Proposition 9

Considering the inequality (61), it is easy to check that—keeping $\bar{s}_{us}$ constant—a lower ξ forces the US to change $\bar{g}_{us}$ in order to lower $\frac{-TA_{ust}}{P_{usTt}K_{usTt}} = \upsilon(L_{chTt+1}, L_{chTt}, \bar{s}_{us}, \bar{g}_{us})\ \forall t$. In particular, a lower ξ forces the US to lower $\frac{-TA_{us}}{P_{usT}K_{usT}} = \upsilon(L_{chTt+1}, L_{chTt}, \bar{s}_{us}, \bar{g}_{us})\Big|_{L_{chTt+1} = L_{chTt} = p(\bar{g}_{ch})}$, where we assume $\theta_{ch}>\theta_{us}$.

To verify the impact of a change in $\bar{g}_{us}$ on $\frac{-TA_{us}}{P_{usT}K_{usT}}$, consider that if $\theta_{ch}>\theta_{us}$, then

$$\frac{\partial\upsilon(L_{chTt+1}, L_{chTt}, \bar{s}_{us}, \bar{g}_{us})}{\partial\bar{g}_{us}}\Bigg|_{L_{chTt+1} = L_{chTt} = p(\bar{g}_{ch})} \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0 \text{ whenever } \zeta_{us} \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} \bar{\zeta}_{us}, \text{ where}$$

$$\bar{\zeta}_{us} \equiv \frac{\eta_{us}(1-\gamma_{us})[h(L_{usT}^{\bar{g}_{us}=0}, \bar{s}_{us})]^{\gamma_{us}}}{(1-\eta_{us})(1-\alpha_{us})\left(L_{usT}^{\bar{g}_{us}=0}\right)^{\alpha_{us}}}$$ and $L_{usT}^{\bar{g}_{us}=0}$ is that value of L_{usT} satisfying

$$\frac{\left[1+\frac{(1-\gamma_{us})\alpha_{us}h(L_{usT}, \bar{s}_{us})}{(1-\alpha_{us})\gamma_{us}L_{usT}}\right]}{[\theta_{us}(1-\alpha_{us})L_{usT}^{\alpha_{us}} - (1-\delta_{us})(1-\theta_{us})]^{-1}} + \frac{(1-\eta_{us})\alpha_{us}h(L_{usT}, \bar{s}_{us})}{\eta_{us}\gamma_{us}L_{usT}^{1-\alpha_{us}}} - L_{usT}^{\alpha_{us}} = 0.$$

Hence, if $\theta_{ch}>\theta_{us}$, one can conclude that—keeping $\bar{s}_{us}$ constant—a lower ξ forces the US to reduce $\bar{g}_{us}$ whenever $\zeta_{us} < \bar{\zeta}_{us}$, or to increase it whenever $\zeta_{us} > \bar{\zeta}_{us}$.

18 Transitional path of the economy in Scenario B

By solving the characteristic equation of the system obtained by linearizing (59)-(60) around (L_{chT}, Z=0), one can find the eigenvalues $\kappa_1 = -\frac{\Psi_{L_{chTt}}}{\Psi_{L_{chTt+1}}}$ and $\kappa_2 = -\frac{\Lambda_{Z_t}}{\Lambda_{Z_{t+1}}}$, where $\kappa_1 > 1$ and $0 < \kappa_2 < 1$, since $-\Psi_{L_{chTt}} > \Psi_{L_{chTt+1}} > 0$ and $-\frac{\Lambda_{Z_t}}{\Lambda_{Z_{t+1}}} = \frac{1+\rho_{us}}{1+\rho_{ch}}$ (notice that all derivatives must be evaluated at (L_{chT}, Z=0)).

Having only one initial condition (solely Z_{t*} is given at time t*), $\kappa_1 > 1$ and $0 < \kappa_2 < 1$ imply that the linearized system is saddle-path stable.

By using the eigenvector $\frac{\Psi_{Z_t}}{(\kappa_1 - \kappa_2)\Psi_{L_{chTt+1}}}$, one can derive the system (62)-(63) governing the saddle path. Since $\Psi_{Z_t} = \frac{C_{usT}}{K_{usT}} + \frac{G_{usT}}{K_{usT}} + (\rho_{us} + \delta_{us})\left[1 + \frac{\alpha_{us}(1-\gamma_{us})(H_{us} - L_{usT})}{\gamma_{us}(1-\alpha_{us})L_{usT}}\right] - L_{usT}^{\alpha_{us}} = \frac{-TA_{us}}{K_{usT}P_{usT}}$ and $\Psi_{L_{chTt+1}} > 0$, one can see that $\frac{\Psi_{Z_t}}{\Psi_{L_{chTt+1}}}\begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0$ whenever $TA_{us}\begin{Bmatrix} < \\ = \\ > \end{Bmatrix} 0$. Given $\kappa_1 - \kappa_2 > 0$, this implies that—along the transitional path—$L_{chTt} > L_{chT}$ if and only if $TA_{us} < 0$.

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