Trade Surpluses:
the Byproduct of a Development Strategy

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Abstract—I argue that an undervalued real exchange rate has a positive effect on economic growth in developing countries, by allowing the permanent acquisition of new comparative advantages. Indeed, if some production tasks move in the country whose exchange rate is relatively more undervalued, the same tasks can remain there permanently when dynamic increasing returns to scale allow relative productivities to change faster than the adjustment in price levels. In addition, an undervalued real exchange rate improves the trade balance, thus opposing the naïve belief that capitals should flow from rich countries to poor countries to finance their development. I provide some evidence about the positive relationship going from an undervalued real exchange rate to both a faster economic growth and an improved trade balance.

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1. Introduction

In international economics, the issue of economic development[2] has often been linked to the naïve idea that rich countries should finance the development of poor countries. In other words, poor countries should receive large capital inflows and contextually run current account deficits, in order to achieve faster economic growth, not least because capital is relatively scarce in poor countries and thus it has higher relative marginal productivity—the standard neoclassical theory. Yet, as questioned by Lucas (1990), developing countries did not receive such large capital inflows. But, even if we acknowledge that capitals did actually flow the right way—say because of capital markets imperfections or differences in fundamentals such that productivity growth in poor countries did actually not outpaced productivity growth in rich countries—the evidence remains puzzling. For instance, empirical evidence about the relationship between aid inflows and economic growth remains inconclusive (Rajan & Subramanian, 2008), with some even arguing that aid inflows have a perverse negative impact on economic growth (Rajan & Subramanian, 2011). Moreover, it is the empirical evidence about the distribution of net capital flows among developing countries that is puzzling. Indeed, during the last decades, international capitals seemed to flow (on net) towards those developing countries that experienced the slowest rates of growth in productivity and GDP per capita, while the countries that grew the most were the ones who ran the largest current account surpluses. Hence, the *allocation puzzle,* as Gourinchas and Jeanne (2009) named it. Strikingly, the opposite happens among industrial countries, *i.e.*, capitals did actually flow towards the fast-growing countries, as noted by Prasad *et al.* (2007). Moreover, this puzzle holds true even when taking into account the relative investment rates and inflows of FDI: fast-growing developing countries do use less foreign capital overall relative to slow-growing developing countries. Are international investors picking up the wrong investments (countries)?

In fact, one of the suggested solutions of the *allocation puzzle* focuses on the effects of capital inflows: eventually, large inflows of foreign capital lead to an appreciation of the real exchange rate that in turn hurts competitiveness and growth—in particular on the trade front. Symmetrically, capital outflows can lead to a depreciated real exchange rate that in turn could improve trade competitiveness and foster economic growth.

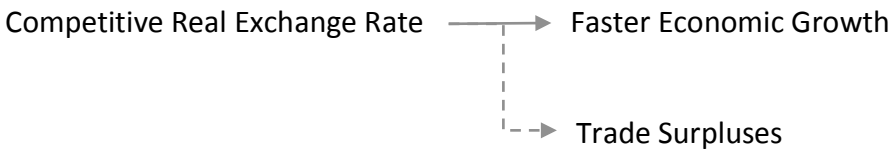
Therefore, economic development might not be as directly linked to the current account balance as traditionally assumed. Instead, both economic development and the current account balance might be related to another common determinant, which happens to be the real exchange rate. In particular, to keep an *undervalued* or *competitive*[3] real exchange rate might be part of a

[2] I refer to *economic development* with its narrowest sense: *economic growth* as rise in GDP per capita.

[3] A *competitive* or *undervalued* real exchange rate is defined as the deviation of the real exchange rate from Purchasing Power Parity, adjusted for the Balassa-Samuelson effect. References are Dollar (1992), Prasad *et al.* (2007), and Rodrik (2008), among many.

development strategy, whose aim is to enlarge and upgrade the commercial and production specialization—and even if we assume that the real exchange rate is an entirely endogenous variable that cannot be controlled by policies in the long term, the near term may still be enough. Eventually, to keep an undervalued real exchange rate will also improve the trade balance, which is typically the largest component of the current account balance, causing trade surpluses to be a byproduct of a development strategy. Hence, as illustrated in Figure 1 below, an undervalued (overvalued) real exchange rate can be the source of both current account surpluses (deficits) and fast (slow) economic growth.

Figure 1. Trade surpluses as a byproduct of a development strategy



Accordingly, the apparently puzzling preference of poor countries for financial assets of rich countries might be instrumental in pursuing a development strategy, insofar as the accumulation of foreign exchange assets helps to keep an undervalued real exchange rate that in turn promotes exports and growth. Thus, viewing persistent current account surpluses as the consequence of a development strategy might shed some light to the current debate on global imbalances, which is discussed in Part 2.

The remaining part of the paper is organized as follows. I review the economic literature in Part 3, I introduce the theoretical model in Part 4, and I discuss the long-term real effects of a nominal shock in Part 5, aiming at explaining one of the possible mechanisms through which growth is favored when the real exchange rate is kept at a competitive level. Finally, I present some preliminary empirical results in Part 6, while Part 7 concludes.

2. The debate on global imbalances

Recently, many authors wrote about the issue of global imbalances. From an economic perspective, there is no reason for current accounts to be balanced. As long as imbalances reflect private decisions, there are no distortions, and expectations are rational, then imbalances reflect the optimal allocation of capital across time and across countries, as stated in Blanchard and Milesi-Ferretti (2009). For example, current account surpluses might simply stand for delayed consumption, when an ageing population accumulates foreign savings in sight of future dis-savings, in the fashion of the intertemporal approach to the balance of payments (Obstfeld & Rogoff, 1995). Yet, as argued by Deardorff (2010), the intertemporal consumption view fits

hardly with the current situation: if China is the rapidly growing economy in respect to the United States, the current direction of trade flows may be actually worsening global welfare, since one would expect to see savings going to the opposite direction, *i.e.,* from the US to China. More generally, it seems that capital is flowing contrary to the predictions of the basic neoclassical models of trade and growth, as capital is not going where it would be more productive—the Lucas (1990) paradox.

The "mainstream view" explains the current pattern of global imbalances mainly by focusing on the determinants of saving and investment within each country or region. Indeed, by recalling the balance of payments identity:

$$CAB = S - I$$

Accordingly, different countries or regions are either in surplus or in deficit in line with their saving and investment behaviors, which in turn will (implicitly) determine the actual capital net flows, as done in Eichengreen (2006). The story on the US trade deficit (and its incongruences) goes as follows. First, the US saving rate is too low; however, if the problem is really a scarcity of savings, then one should ask why the US real interest rate is at its historical low, as a scarcity of savings would imply a high price of savings, *i.e.*, high interest rates. Second, the US offers relatively high returns on investment; however, simply looking at the US investment rate in the last decades, it might stand out a decrease in the investment rate, if anything, and notably US citizens earn higher yields on their foreign assets than they pay on US assets hold by foreigners—see Gourinchas and Rey (2005). Third, there is a global savings glut, which from a US perspective is equal to a global investment plunge. Bernanke (2005) advanced the argument that a favorable combination of circumstances, such as the fear instilled by the Asian financial crisis of 1997, an aging population and the lack of a strong social safety net, contributed to a huge increase in the supply of savings from oil-exporter countries and emerging economies, especially Asia, which had been redirected to US capital markets. This fact contributed both to an appreciation of the dollar, which in turn posed the basis for the emergence of a trade deficit, and to put a downward pressure on US real interest rates. Why towards the US financial market?

The theoretical interpretation given by Caballero, Fahri, and Gourinchas (2008), which represents the mainstream view reasonably well, provides a model that indeed accounts for large and rising US current account deficits, a rising share of US assets in world portfolios, and low long-term interest rates since 2002. In order to explain this conundrum (indeed, capitals should outflow when interest rates are low) they assume an increased demand for US assets in particular, given by the inability of fast-growing emerging economies to generate local store of value instruments — or, conversely, the ability of advanced economies to produce attractive and safer assets, with deeper and more liquid financial markets. In addition, a larger share of global saving flowed to the US because of a larger growth potential in the US in respect to other advanced regions, the EU and Japan. Therefore, fast-growing and financially advanced countries will attract more foreign capital and hence run current account deficits, *ceteris paribus*.

However, in the words of Frankel (2006), *"they take as given US comparative advantage in the ability to generate financial assets that others want to hold. … Why is one on firmer ground taking this exceptionalism as exogenously and eternally given, as opposed to considering that the willingness of foreigners to hold dollars may be an unsustainable disequilibrium?"* To cite some other important authors, Obstfeld and Rogoff (2009) stated that *"the fundamental flaw in these analyses, of course, was the assumption that advanced-country capital markets, especially those of the United States, were fundamentally perfect, and so able to take on ever-increasing leverage risklessly."* It is not by chance that many economists, such as Obstfeld *et al.* (2005) and Blanchard *et al.* (2005), extensively discussed about the extent of the dollar depreciation required to eliminate the US current account deficit. Krugman (2007) even argued that we are in a Wile E. Coyote moment *"when investors realize that the dollar's value doesn't make sense, and that value plunges,"* as it is hard to reconcile the willingness of investors to hold dollar assets with a very small premium in real interest rates.

The mainstream view, achieved by combining different saving and investment behaviors, is certainly a valid *ex-post* interpretation—actually, it cannot be otherwise. However, why did the pattern of global imbalances proved to be so stable and long lasting, despite the alleged instability of explanations based on investors' preferences? Arguably, because something else is driving the imbalances. In particular, the willingness of some emerging countries to maintain an undervalued real exchange rate by contextually improving their current account balances.

3. Literature review

Already many authors advocated a positive relationship between a competitive real exchange rate and economic growth in developing countries. Among the empirical literature, Dollar (1992) was the first—to my knowledge—to provide robust evidence about the correlation between per capita GDP growth and real exchange rate undervaluation. Recently, Hausmann *et al.* (2005) pointed out that many episodes of growth accelerations since the 1950s tended to be correlated with increases in the investment rate, trade, and with a depreciated real exchange rate. Similarly, Johnson *et al.* (2007) suggested that the undervaluation of the real exchange rate might play a significant role in enabling a sustained growth process, while first-order problems such as institutions, macroeconomic stability, trade openness, education, and inequality might not matter that much.

As regard the theoretical literature, which is reviewed in Eichengreen (2008), the consensus seems to be that to maintain a competitive real exchange rate and to avoid excess volatility is at least a facilitating condition for achieving economic growth. Yet, the structural mechanism going from undervaluation to growth remains highly unspecified. The vast literature on export-led growth, which certainly cannot be reviewed here, focuses basically on the advantages of keeping the price of traded-goods high enough to make it attractive to shift resources into their production. Recent proponents of this view are Dooley *et al*. (2003), who argued that the evolution of the international monetary system cyclically entails a periphery whose development

strategy is export-led growth supported by undervalued exchange rates, capital controls and official capital outflows in the form of accumulation of reserve asset claims on the center country. Thus, the large accumulation of foreign reserve assets by China and other emerging Asian countries simply fulfills the goal of promoting an export-led growth, which will allow them to build a *competitive* national capital stock—whose exact definition is left unsaid.

Notably, export-led growth cannot be explained by simple Keynesians dynamics, such as the increase in exports and GDP following a devaluation or depreciation. Indeed, empirical evidence points to increase in real GDP per capita, which is a long-term phenomena, when employment is taken as given. Yet, it is still possible to follow a Keynesian fashion, as done by Gala (2008), who suggested that an undervalued real exchange rate stimulates long-term growth by favoring capital accumulation through higher firms' profits and in turn by increasing the investment rate.

Rodrik (2008), offering a less political but more technical story, argued that to shift resources from the non-traded goods sector to the traded goods sector is beneficial for overall growth, as the traded goods sector enjoys a higher relative productivity (Rodrik, 2011). This is especially true for developing countries, since domestic distortions (such as the weaknesses in the contracting environment and the presence of market failures in modern industrial production) could under allocate resources to the traded goods sector. Hence, any policy that promotes this sectoral shift, such as to keep an undervalued real exchange, will promote economic growth as well.

I instead argue that the pursuit of a mercantilist agenda, consisting of keeping an undervalued real exchange rate, can foster long-term economic growth by enlarging and upgrading the commercial and production specialization of an emerging country, as long as the undervaluation allows to permanently acquire new production tasks (and new comparative advantages). Naturally, an undervalued real exchange rate will improve the trade and current account balance as well, making the surpluses to be a byproduct of a development strategy.

The real exchange rate is defined as the ratio of the foreign price level converted in domestic currency to the domestic price level: $RER = eP^*/P$. In the short term, government policies can affect the level of the real exchange rate essentially because price levels adjust only slowly while the nominal exchange rate adjusts immediately (Dornbusch, 1976). For instance, the exchange rate regime has not a neutral effect on the real exchange rate (Mussa, 1986). Yet, in the long term, the real exchange rate is often regarded to be an endogenous variable. Hence, the crucial point to my thesis is the possibility that temporary shocks may have permanent real effects on the economy. Baldwin and Krugman (1986) already argued in favor of this possibility, by assuming hysteresis effects at the firm level. Differently, I focus on the presence of dynamic increasing returns so as to enable a variation in the nominal exchange rate to have permanent real effects—similar to Krugman (1987), as it will be evident in Part 4.

Increasing returns to scale, which depict the broader notion of economies of scale, refer to the tendency of unit costs to decrease as total output increases. The more the output produced in the same location, the greater the economies of scale. While economies of scale can be either internal, at the level of the firm, or external, at the level of the industry, I focus exclusively on the

role played by external economies of scale, which actually seem to have received larger empirical support at the industry level—see Caballero and Lyon (1989) and (1990). Marshall (1890) was the first to formalize the concept of external economies of scale, by suggesting three major causes: (i) specialized suppliers, (ii) labor market pooling, and (iii) knowledge spillovers. In fact, external economies may arise from many different reasons. For instance, Meade (1952) distinguished between "unpaid factors" of production and the "creation of atmosphere." Nonetheless, the determinants of external economies basically rest on the idea that a larger industry takes better advantage of within-industry specialization, as well as on the idea that there are substantial benefits arising from the presence of conglomeration, indivisibilities, and public inputs such as roads (Helpman, 1984).

Recently, Grossman and Rossi-Hansberg introduced the presence of economies of scale in a fragmented production process both at the task level (2008) and at the industry level (2010). Similarly, Di Nino *et al.* (2011) discussed the role of external economies of scale as a channel through which nominal depreciation may exert persistent real effects. In their model, since the economies of scale arising from the increased volume of production, a real depreciation cuts firms' cost more than proportionally; moreover, there is no increase in prices (and wages) that can offset completely the firms' gains in productivity following the real depreciation, hence making the effects permanent. By further assuming that the traded-goods sector has a higher productivity, a real depreciation will translate into a rise in real GDP as long as resources move to the traded-goods sector.

4. The model

The basic structure of the model here presented harks back to the classic Dornbusch, Fischer, and Samuelson (1977), expanded with the contribution of Krugman (1987). Thus, it is a two-country Ricardian model of international trade with a continuum of *tasks*—borrowing the notion from Grossman and Rossi-Hansberg (2006) and (2008), since the focus is on the production of goods (tasks) more than on the consumption of goods—in which comparative advantage derives from dynamic increasing returns, *e.g.*, learning economies.

I shall describe how a temporary variation in the nominal exchange rate modifies international specialization also in the long term, particularly if the country benefiting from the devaluation (or depreciation) has a low level of cumulated experience, under the assumptions of sticky prices and production specialization that adjust relatively faster than prices do. Indeed, as long as tasks move across countries following a (temporary) change in the real exchange rate, the presence of dynamic increasing returns allows for a permanent change in international specialization: the country that has gained the production of some new tasks will increase its relative productivity over time, eventually inverting the comparative dis-advantage in some of those newly acquired tasks and thus modifying the long-run pattern of commercial and production specialization. Moreover, the adjustment to the new long-run equilibrium requires a change in relative prices that is greater than what was required by the initial exchange rate misalignment, implying that

trade imbalances will last longer, other things being equal. Hence, persistent trade surpluses become a byproduct of such a shift, which can be thought as a developing strategy as long as it is in the interest of a country to permanently enlarge and upgrade its specialization.

There are two countries, home (the *rich* or *advanced* country) and foreign (the *poor* or *emerging* country), and there is only one factor of production, labor, which is domestically but not internationally mobile. There is a continuum of production tasks whose output is a continuum of goods, indexed with the variable $i \in [1, n]$. At any point in time, the production of each intermediate good faces perfect competition and constant returns to scale:

$$x_i(t) = A_i(t)L_i(t), \qquad x_i^*(t) = A_i^*(t)L_i^*(t)$$

where x_i expresses the number of units produced by allocating L_i units of labor to the i-th task in the home country, while x_i^* is the corresponding in the foreign country. The presence of external economies of scale arises when considering the evolution of the economy over time. As in Krugman (1987), the productivity of each task depends on an index of cumulative experience:

$$A_i(t) = K_i(t)^{\varepsilon}, \qquad A_i^*(t) = K_i^*(t)^{\varepsilon}, \qquad 0 < \varepsilon < 1$$

The function $K_i(\cdot)$, which characterizes productivity in each taks i-th, is non-decreasing, concave, and everywhere has elasticity of productivity with respect to output smaller than one. Moreover, increasing returns to scale are entirely task-specific and country-specific. In the long term, this would be a rather strict assumption, but in the medium term it should well account for economies of scale that are country specific, such as public inputs or learning economies. The index of cumulative experience $K_i(\cdot)$ is defined as a function of previous cumulated output:

$$K_i(t) = \int_{-\infty}^{t} x_i(y)\, dy\,, \qquad K_i^*(t) = \int_{-\infty}^{t} x_i^*(y)\, dy$$

Now, I shall analyze the determination of relative productivities in the steady state, given the allocation of resources across countries: specialization in the long term. Then, I shall analyze the allocation of resources across tasks, given the relative productivities in a specific point in time: specialization in the short term.

Specialization in the long term

To begin with the determination of relative productivities in the steady state, which in turn define the international specialization in the long term, we know from above that relative productivity is a function of the relative index of experiences:

$$\alpha_i = \frac{A_i(t)}{A_i^*(t)} = \left(\frac{K_i(t)}{K_i^*(t)}\right)^{\varepsilon}$$

Moreover, the dynamics over time of the index of experience are given, by definition, as follows:

$$\frac{dK_i(t)}{dt} = x_i(t), \qquad \frac{dK_i^*(t)}{dt} = x_i^*(t)$$

Supposing to held constant the relative labor allocation $L_i(t)/L_i^*(t)$ in the steady state, we can assume that the relative change in the experience indexes is equal to zero, as follows:

$$\frac{dK_i(t)/dt}{K_i(t)} - \frac{dK_i^*(t)/dt}{K_i^*(t)} = \frac{x_i(t)}{K_i(t)} - \frac{x_i^*(t)}{K_i^*(t)} = 0$$

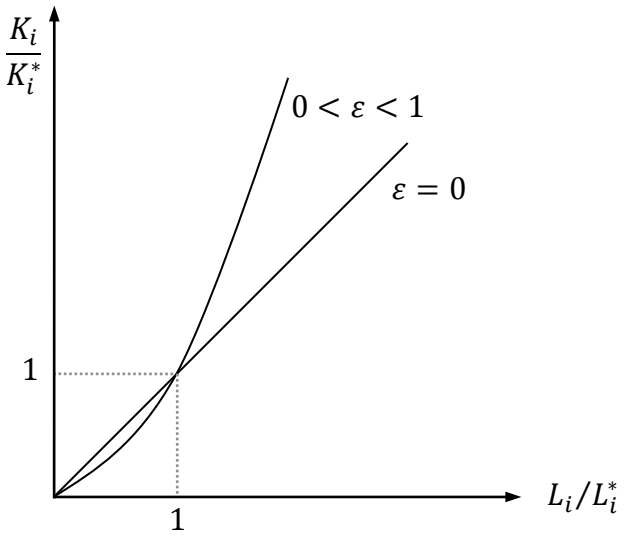
Rearranging and substituting, it is possible to obtain relationship (1) between the relative labor allocation across countries and the relative indexes of experience:

(1) $$L_i/L_i^* = \left(K_i/K_i^*\right)^{1-\varepsilon}$$

In the steady state, the left-hand side of equation (1) determines the right-hand side, as depicted in Figure 2. The basic idea is that the more the relative labor allocated to task i-th, and the greater the relative experience that home country will have in task i-th as well as the greater the relative labor productivity would be, depending on the scale coefficient ε. That is, comparative advantage is determined by history. At the extreme, when there are no dynamic economies of scale ($\varepsilon = 0$), the relative index of experience K_i/K_i^* will be still determined by the relative allocation of labor, but relative productivity A_i/A_i^* will be given only by technological differences, as in a standard Ricardian model. Indeed:

$$\alpha_i = \left(\frac{K_i(t)}{K_i^*(t)}\right)^{\varepsilon} = 1$$

Figure 2. Relative indexes of experience in the long term



To sum up, the relative allocation of labor will determine the relative experience in the steady state, which in turn will determine the relative productivity. Therefore, we can write the steady state relative productivity α_i as an increasing function φ of the relative labor force allocation:

$$\alpha_i = \varphi\left(\frac{L_i}{L_i^*}\right)$$

Specialization in the short term

Now, I analyze the system at a given point of time, in which relative productivity is given for any task, in order to determine the allocation of labor across tasks (and of tasks across countries). It turns out that the model is completely Ricardian in character. Accordingly, I now simply follow Dornbusch, Fischer, and Samuelson (1977).

First, I shall determine the allocation of tasks between countries by individuating the borderline $\tilde{\imath}$ task, given the relative real wage $\omega(t) = w(t)/w^*(t)$. I assume that tasks are ordered by their relative productivities, so that home country comparative advantage is decreasing in i. Accordingly, the tasks in the interval $[1, \tilde{\imath}]$ will be located in the home country, fulfilling the following condition:

$$w(t)a_i(t) \leq w^*(t)a_i^*(t)$$

in which $a_i(t)$ is defined as the inverse of labor productivity $A_i(t)$ and corresponds to the unit labor requirement for each i-th task. In other words, the tasks that are cheaper to perform in home country will be located there; otherwise they will be located in foreign country. By rearranging, I obtain the AA relationship (2), which is decreasing in i by construction:

(2) $$\omega(t) = \frac{A_i(t)}{A_i^*(\mathrm{t})}$$

Second, I determine the equilibrium relative real wage $\omega(t)$ by imposing the labor market-clearing condition. Setting the equilibrium relative wage will allow to determine the associated pattern of efficient geographic specialization. Given the fraction $\vartheta(\tilde{\imath})$ of income spent (anywhere) on those goods for which home country has a comparative advantage, I impose the equality between domestic income and world spending on domestically produced intermediate goods:

$$w(t)L(t) = \vartheta(\tilde{\imath})[w(t)L(t) + w^*(t)L^*(t)]$$

Alternatively, the same equation can be expressed in terms of the balance of trade, by assuming the equality between imports and exports, as follows:

$$[1 - \vartheta(\tilde{\imath})]w(t)L(t) = \vartheta(\tilde{\imath})w^*(t)L^*(t)$$

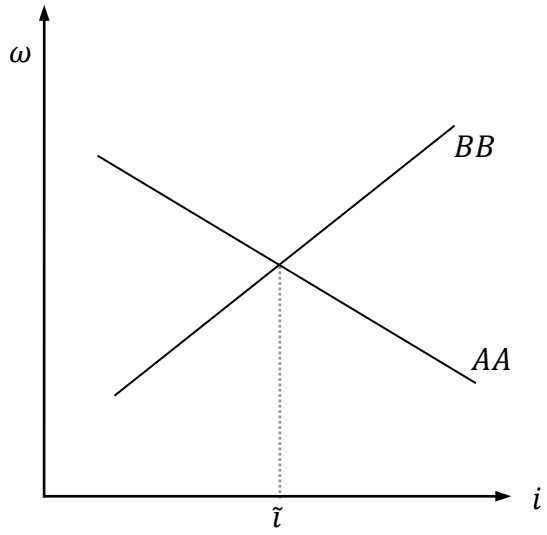
By rearranging the same equation, I obtain the BB relationship (3):

$$\omega(t) = \frac{\vartheta(\tilde{\imath})}{1-\vartheta(\tilde{\imath})}\frac{L^*(t)}{L(t)} \quad (3)$$

There are two basic interpretations of equation (3). First, the greater is the world relative demand for home-produced goods, and the greater will be the relative wage, everything else being equal. Second, the greater the relative labor force of foreign country, and the higher will be the relative wage; indeed, home country could increase its specialization by diminishing the number of goods produced domestically, hence raising productivity and the relative wage.

Now we can determine the short-run equilibrium production specialization and the short-run equilibrium relative real wage through the intersection of the BB curve, which depicts the relative world demand, and the AA curve, which depicts the relative world supply, as in Figure 3. Hence, in the short-run, without considering dynamic increasing returns, it is exactly equal to the standard Ricardian framework with a continuum of goods.

Figure 3. Equilibrium specialization in the short term

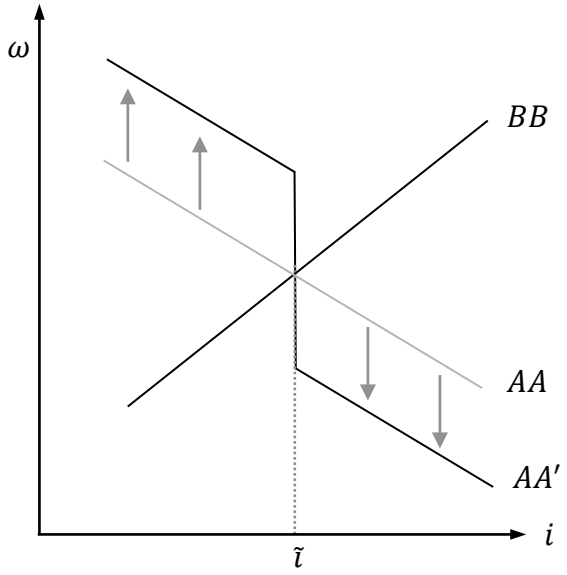


Dynamics of specialization

Now that the basic model is fully described, we analyze the dynamics of the system over time. Assume that the initial situation is the one depicted in Figure 3 above, so that a pattern of specialization is already determined, in line with the division of tasks across countries set by the borderline intermediate good $\tilde{\imath}$. Once this pattern is established, the flow of time will increasingly strengthen this international division of labor. Indeed, the decision of home country to allocate labor only to the tasks in the interval $[1, \tilde{\imath}]$ will greatly influence its future comparative advantage. Indeed, once a country specialize in the production of a certain set of tasks, the country will lock into this pattern of specialization, as relative productivity increases with the

numbers of units produced. This process can be graphically represented in Figure 4, in which the AA curve modifies into a *step* as time passes, moving from AA to AA' and so forth.

Figure 4. *Locking* into one's initial specialization

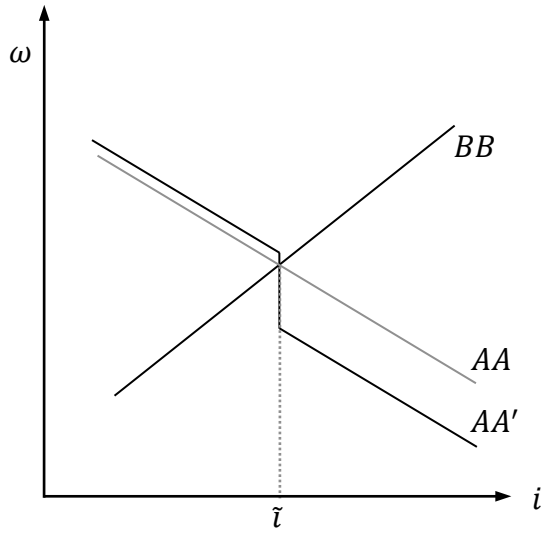


Theoretically, specialization could increase *ad infinitum*, until each country will be able to perform only the set of tasks in which it has specialized, being the differences in productivities large enough to be insurmountable. However, this is a quite unreasonable occurrence mainly for two reasons—even though they are not included in the model. First, the presence of international diffusion of knowledge sets a limit to the comparative advantage that a country can acquire through experience, as discussed in Krugman (1987). Second, the must assume that tasks will be continuously replaced over time, as new tasks (in which no country has a comparative advantage deriving from experience) will replace old tasks; for instance because the introduction of new production technologies or goods.

Dynamics of specialization: asymmetries

Suppose that both home and foreign country were autarchies until now. However, home country is more "advanced" as managed to achieve a far better productivity uniformly across the whole range of tasks. What happens when economies open to international trade? At first, we see the reallocation of tasks across countries in line with comparative advantage. This is exactly what happens in a pure Ricardian framework when we allow free trade. However, when considering the dynamics, things become pretty different. In fact, the AA curve will evolve over time in an asymmetric way. Suppose we start from a straight AA curve. After a period T of time, the left-hand side of the curve will move upward while the right-hand side will move downward—but by a greater extent. As depicted in Figure 5, the AA will steepen into the AA'.

Figure 5. Dynamics of specialization becomes asymmetric



To figure out the reason of this asymmetry, let's focus on the dynamic over time of the two side of the curve. First, the left-hand side depicts the set of tasks $[1, \tilde{\imath}]$ that are performed in home country (in our case, the more experienced country) and moves upward because home productivity changes over time, while foreign productivity remains unchanged over the same set of tasks—given that no experience is accumulated as no foreign labor is allocated to them. Briefly, we can say that home productivity increases by an amount δ over the set of home-performed tasks:

$$\frac{dA_i(t)}{dt} = \delta, \qquad 1 < i < \tilde{\imath},$$

Conversely, foreign productivity increases as well over the set of foreign-produced tasks:

$$\frac{dA_i^*(t)}{dt} = \delta^*, \qquad \tilde{\imath} < i < n,$$

However, as home country is more "advanced" or "experienced", experience cumulated so far by foreign country is less than that of home country. Therefore, since marginal productivity is decreasing, we have that foreign productivity increases more than home productivity:

$$\delta^* > \delta$$

In other words, the foreign country improves productivity in the tasks that are foreign-produced (and in which it has a comparative advantage) more than home country does in the tasks that are home-produced. This translates into an asymmetric modification over time of the AA curve, with the behavior of the left-hand side differing from the behavior of the right-hand side of the curve.

Furthermore, the response of the system to exogenous shocks is now affected by this asymmetry. For instance, the effect on international specialization of an upward shift of the BB curve now differs in respect to a downward shift. Indeed, an increased demand for home-produced goods (an upward shift of the BB) both increases the relative wage level and moves the production of some tasks to foreign country; on the other hand, a symmetrical downward shift of the BB curve decreases the relative wage level only, without modifying the international specialization of production—at least for relatively small shifts.

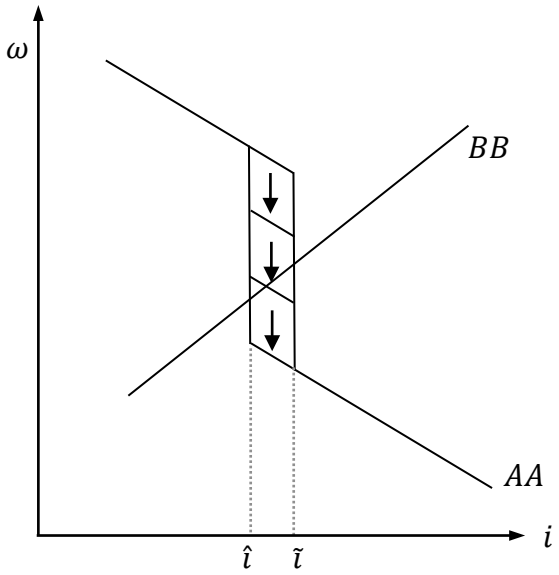
5. Dynamics and effects of a temporary shock

The interesting feature arises when considering the effects of temporary shocks. In fact, temporary conditions that alter short-run specialization may also modify comparative advantage and long-run specialization.

First of all, as discussed in Krugman (1987), let's see the long-term effects of a protectionist policy, which may actually be successful. Indeed, the allocation of labor to tasks whose output was previously imported raises experience and productivity in the same tasks; eventually, the protectionist country will create a real comparative advantage if the dedicated resources are large enough—which in fact is not an easy condition to fulfill. Figure 6 portraits this point: foreign country imposes import restrictions on of the set of intermediate goods $[\hat{\imath}, \tilde{\imath}]$, which are now produced domestically instead of being imported. Over time, because of the accumulation of experience, foreign country will progressively diminish its comparative disadvantage in the set of tasks $[\hat{\imath}, \tilde{\imath}]$ (providing that foreign country employs relatively less resources in the production of the same goods) up to the point that it actually gains a comparative advantage. Then, import restrictions become irrelevant, as foreign country has now enlarged the set of tasks over which it has a comparative advantage. (Note that I assumed no further change in the comparative advantages in the tasks outside the interval $[\hat{\imath}, \tilde{\imath}]$, but exclusively for the sake of simplicity.)

The Dutch disease is another example that involves the presence of long-term consequences of a short-term disturbance. Indeed, a temporary discovery of a natural resource, by affecting the real exchange rate, may endure enough to produce a long-term loss of some industries, which move abroad and do not come back when the natural resource is exhausted, given that the flow of time makes the country to definitively lose its comparative advantage.

Figure 6. Imposing a protectionist policy



In the following paragraphs I shall analyze the long-term effect of a temporary real exchange variation, which is commanded by a variation in the nominal exchange variation, under the assumption of fixed prices in the short term. Of course, I am assuming that a country can control the nominal exchange rate e, or simply that variations in e can happen.

Variation in the nominal exchange rate

In order to examine the impact of a nominal variation, I firstly derive the nominal relationships of the model. Accordingly, the product of the real wage w and the price level P gives the nominal wage W, while the nominal exchange rate is the domestic currency price of foreign exchange and the real exchange rate R is standardly defined as follows:

$$w(t)P(t) = W(t), \qquad w^*(t)P^*(t) = W^*(t)$$

$$R(t) = \frac{e(t)P^*(t)}{P(t)}$$

Then, by following exactly the same procedure as before, I get the nominal versions of the AA and BB curves, with the relative nominal wage on the left-hand side and the nominal exchange rate on the right-hand side, as follows:

(4) $$\frac{W(\mathrm{t})}{W^*(t)} = \frac{A_i(t)}{A_i^*(t)}e(t)$$

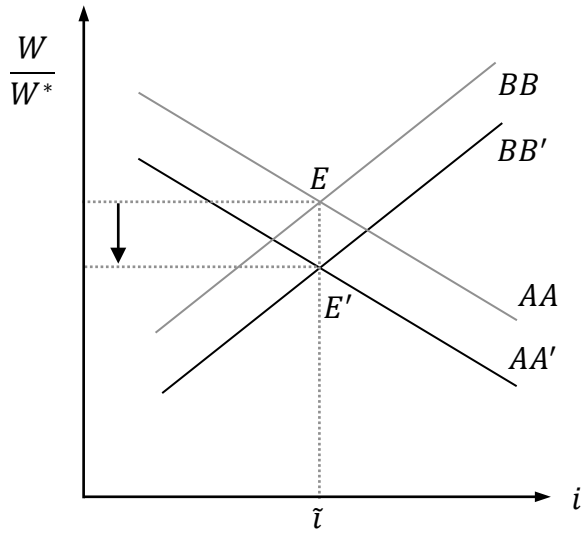
(5) $$\frac{W(t)}{W^*(t)} = \frac{\vartheta(\tilde{\imath})}{1-\vartheta(\tilde{\imath})}\frac{L^*(t)}{L(t)}e(t)$$

It would be possible to endogenously determine the nominal and the real exchange rates, for instance by assuming the standard relationship between the price level and the money supply as

in the fashion of the neutral-money Quantity Theory, $Mv = Py$. The analysis, however, would be straightforward—not because of it simplicity, but because it is already described in Dornbusch *et al.* (1977). Instead, I shall simply evaluate the effect of a variation in a nominal variable, the nominal exchange rate.

Suppose that foreign country devalues its currency, which corresponds to a decrease in e and R. Given the new vertical axis, which identifies the relative nominal wage, the AA and BB curves will shift downwards, individuating a new long-term equilibrium E' with a lower level of the relative nominal wage but with the same borderline intermediate good $\tilde{\imath}$, as shown in Figure 7.

Figure 7. Devaluation of foreign currency



However, adjustment to E' takes time. Indeed, the required increase in foreign prices (and wages) will occur only in the long term, as prices are sticky. Notably, during the transition from E to E', foreign country will run a trade surplus. Indeed, any point above the BB curve represents a trade surplus for foreign country. In other words, the classic Ricardian model without dynamic increasing returns model delivers the intuitive effect of an exchange rate devaluation: an improvement in the trade balance in the short term without any real effect in the long term, as specialization and the relative level of real wages remain unchanged.

Presence of permanent real effects

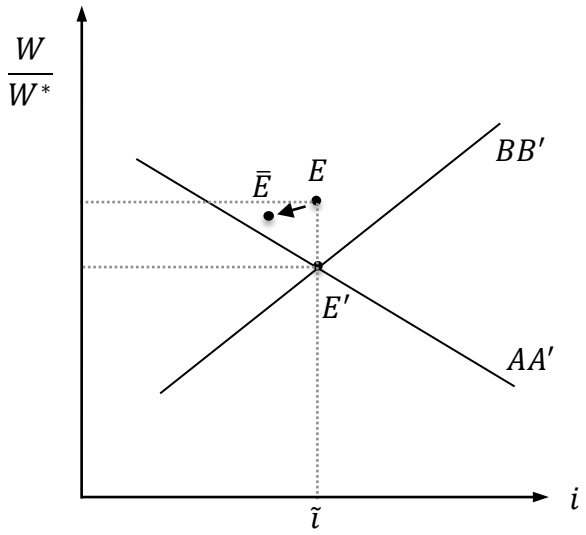
Under the assumption of dynamic increasing returns to scale, a nominal exchange rate variation will exert long-term real effects if production specialization changes in the short term—more generally, if it changes more rapidly than price levels adjust. Indeed, once a country acquires the production of new tasks, its relative productivity (in those tasks) will improve over time, eventually up to the point that the country will acquire a new comparative advantage. Notably, this mechanism is even more effective than a protectionist policy, as the production of each task

now supplies the world and not only the domestic market; hence, once tasks move from one country to another, relative productivity will always be inverted sooner or later, regardless the relative size of the domestic markets.

The underlying idea is that production tasks do move across countries so as to minimize production costs whenever it is profitable, in line with the increasing importance of global production networks worldwide. It can be argued that a competitive real exchange rate not only promotes exports but also attracts inward FDI, as the acquisition of domestic assets becomes relatively cheaper for foreigners; thus, a competitive real exchange rate attracts newer tasks.

Let's now depict the dynamics in the model. Assume that both countries opened to international trade only recently, so that the AA curve does not show a *step* shape. We are now interested in analyzing the consequences of a devaluation of foreign currency, which moved the long-run equilibrium to E', as shown before. If production tasks move across countries at a faster rate than prices adjusts, so as to have the most efficient specialization (in terms of production costs) at any point of time, the transitional equilibrium $\bar{E}$ moves towards the AA curve (Figure 8).

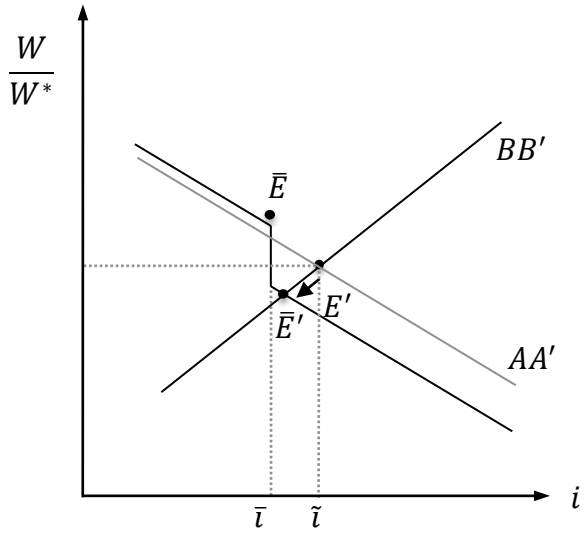
Figure 8. Transitional equilibrium moves towards the AA curve



Then, during the transition, the borderline good moves to $\bar{\imath}$, changing the temporary production specialization (Figure 9). Now, the longer the transitional equilibrium is in $\bar{E}$, and the more dynamic external economies of scale will affect the pattern of long-run international specialization. Indeed, while in $\bar{E}$, the AA' modifies its shape in line with the evolution of relative productivity: foreign country accumulates experience (and increases productivity) in the set of tasks $[\bar{\imath}, \tilde{\imath}]$ that has temporary moved within its boundaries, while home country ceases to increase its own productivity (as it no longer performs those tasks).

In Figure 9, the AA' curve changes in an asymmetric way because I assumed that the two countries have different levels of experience: home country is more experienced while foreign country is less; hence, relative productivity will change relatively faster in foreign country, steepening the AA' curve much more on the right side. Intuitively, the more the countries are experienced, and the greater must be a currency devaluation to have a long-run impact on specialization. In other words, poor countries can more easily acquire new comparative advantages following currency devaluations.

Figure 9. A temporary change in specialization has a permanent effect



Now international specialization has permanently changed: long-run equilibrium has moved from E' to $\bar{E}'$, with a new borderline good somewhere in the interval $[\bar{\imath}, \tilde{\imath}]$. Foreign country gained a new comparative advantage in some of the tasks that have moved within its boundaries following the devaluation. Moreover, the price (wage) adjustment required to reach the new long-term equilibrium $\bar{E}'$ is now greater than what was required to reach the previous long-term equilibrium E'. Thus, trade imbalances will last longer, *everything else being equal*.

6. Empirical Testing

The aim of this Part is to assess the reduced-form relationships between the undervaluation of the real exchange rate[4], the rate of economic growth, and the current account balance. I focused

[4] The undervaluation measure is the difference between the actual real exchange rate and its predicted value from the panel regression of real exchange rate on real per capita GDP, so as to take into account the Balassa-Samuelson effect, with a sample of 187 countries over the period 1960-2009.

on the Asian development experience of the last half-century, analyzing 13 countries. All data is from the IMF, the World Bank, and the Penn World Table 7.0 databases.

I begin with testing the relationship between the undervaluation measure and the growth rate of real GDP per capita. First, I run different panel regressions (reported in table 1) in order to assess what is the best specification for including country-specific and/or time-specific effects. The coefficient of the undervaluation measure is positive and the estimated values are similar and statistically significant in specifications from (1) to (4), with data over the period 1960-2009. In specification (4), I also test for the importance of the stability of the undervaluation measure (which in fact it seems not an important factor), by using five-years averaged values. In specifications (5) and (6) I restrict the time span to the period 1980-2009 and the coefficient of the undervaluation measure lowers and loses statistical significance in both cases, probably due to the lower statistical power of the restricted sample. To conclude, the results of the Hausman test and the Breusch-Pagan test suggest that the random effects specification should be preferable—hence specification (3) is my preferred estimation.

Table 1. Growth rate of real GDP per capita and RER undervaluation

Dependent variable: real GDP per capita growth rate

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.055	-0.248	4.057	4.335	2.941	3.814
	(0.005)***	(1.371)	(0.399)***	(0.468)***	(1.345)**	(0.412)***
Undervaluation	3.047	3.403	3.043	3.614	0.550	0.699
	(1.250)**	(1.033)***	(0.650)***	(0.864)***	(0.877)	(0.848)
Undervaluation volatility				−3.321		
(five year St.Dev.)				(2.487)		
Time dummies	NO	YES	NO	NO	YES	NO
Fixed effects	YES	YES	NO	NO	YES	NO
Random effects	NO	NO	YES	YES	NO	YES
Breusch-Pagan test			80.828	19.816		37.161
Chi-square (p-value)	-	-	(2.4e-19)	(8.5e-06)	-	(1.1e-09)
Hausman test			0.398	0.209		0.903
Chi-square (p-value)	-	-	(0.528)	(0.900)	-	(0.342)
N° of observations	627	627	627	128	390	390
N° of countries	13	13	13	13	13	13
R-squared	0.12	0.34	-	-	0.40	-

*(Standard errors are reported in brackets; *, **, and *** indicates statistical significance at 10%, 5%, and 1% level.)*

In table 2, I test the robustness of the results presented above. My preferred estimation, which is reported as specification (1), is the panel regression with random effects with annual values over the period 1960-2009. In specification (2), I add three control variables that leave the coefficient of the undervaluation measure practically unaffected. The coefficient of the “investment rate” is statistically significant with the expected sign, while the variable “openness” (defined as the sum

of imports plus exports over GDP) seems to be largely unrelated with the real GDP per capita growth rate. Due to data availability (the data of some control variables comes from either the IMF WEO database or the World Bank database, which start coverage only from the 1980s), I must restrict the sample to the period 1980-2009 for specifications from (3) to (5). The coefficient of the undervaluation measure seems to retain its statistical significance in specification (4) but not in specification (5), probably due to the decrease in the number of observations.

Table 2. Growth rate of real GDP per capita and RER undervaluation, robustness

Dependent variable: real GDP per capita growth rate

	(1)	(2)	(3)	(4)	(5)
Constant	4.057	0.359	-2.111	-0.405	0.418
	(0.399)***	(0.735)	(1.048)**	(0.935)	(1.702)
Undervaluation	3.043	2.923	1.776	2.633	2.531
	(0.650)***	(0.630)***	(1.009)*	(1.045)**	(1.577)
Investment rate (%GDP)		0.153	0.208	0.162	0.148
		(0.023)***	(0.031)***	(0.028)***	(0.044)***
Openness		-0.007	0.002	-0.006	-0.004
		(0.003)**	(0.004)	(0.006)	(0.007)
School enrollment, Tertiary (%)			-0.027	-0.048	-0.032
			(0.015)*	(0.019)***	(0.027)
FDI net inflow (%GDP)				0.198	0.076
				(0.094)**	(0.120)
Government fiscal Balance (%GDP)					0.190
					(0.109)*
Random effects	YES	YES	YES	YES	YES
Breusch-Pagan	80.828	32.000	1.163	0.088	0.301
(p-value)	(2.4e-19)	(1.5e-08)	(0.281)	(0.766)	(0.583)
Hausman	0.398	4.046	2.249	10.667	19.763
(p-value)	(0.528)	(0.257)	(0.689)	(0.058)	(0.003)
N° of observations	627	627	267	225	165
N° of countries	13	13	11	10	10

*(Standard errors are reported in brackets; *, **, and *** indicates statistical significance at 10%, 5%, and 1% level.)*

Second, in table 3, I test the relationship between the undervaluation measure and the current account balance. Again, I run a panel regression with various specifications, with the current account balance (in percentage of GDP) as the dependent variable and the undervaluation measure as the independent variable. All observations are yearly values and range from 1980 to 2009. In specification (1), I run the simple regression with no control variables and the coefficient of the undervaluation measure is positively correlated with the current account balance: the more the real exchange rate is undervalued, and the better is the current account balance. In specifications (2) and (5), I add some control variables and the coefficient of the undervaluation

measure becomes larger and more statistically significant. Specifications from (4) to (6) include also time-dummies. In specifications (3) and (6) I test the relationship using also a one-year lag of the independent variable; yet, the coefficients of the undervaluation measure (current and lagged) lose statistical significance. However, their values are in line with expectations. Perhaps, the lagged variable is correlated with the current account balance in some observations only, while it is completely unrelated in some other observations, increasing the standard deviation and hindering the estimation of the coefficient. As regards the control variables, the government fiscal balance seems to be negatively correlated with the current account balance, which is the opposite of what would suggest the "twin deficits" hypothesis, and the population growth rate is negatively correlated with the current account balance as well, which may indicate that ageing countries run relatively larger surpluses (or narrower deficits) than younger countries. Finally, the coefficient of the "openness" variable is positively correlated with the current account balance.

Table 3. Current account balance and RER undervaluation

Dependent variable: current account balance (% GDP)

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.525	2.338	2.115	−5.161	−4.543	1.936
	(0.276)***	(3.243)	(3.275)	(1.368)***	(5.039)	(3.808)
Undervaluation	2.766	6.277	3.934	2.783	6.019	3.646
	(1.193)**	(2.050)***	(3.749)	(1.048)***	(2.417)**	(4.665)
Undervaluation (t-1)			3.469			2.966
			(3.580)			(4.296)
Government fiscal Balance (%GDP)		−0.210	−0.221		−0.150	−0.154
		(0.108)*	(0.110)**		(0.135)	(0.136)
Exports of Oil (USD)		−0.069	−0.073		−0.076	−0.075
		(0.049)	(0.050)		(0.055)	(0.056)
Openness		0.049	0.049		0.045	0.044
		(0.020)**	(0.020)**		(0.023)*	(0.023)*
FDI inflow (%GDP)		−0.118	−0.123		−0.176	−0.177
		(0.103)	(0.103)		(0.108)	(0.109)
Real interest rate		0.059	0.060		0.066	0.071
		(0.010)	(0.102)		(0.119)	(0.121)
Population growth rate		−3.429	−3.293		−1.155	−1.212
		(0.976)***	(0.994)***		(1.195)	(1.203)
Time-dummies	NO	NO	NO	YES	YES	YES
Fixed-effects	YES	YES	YES	YES	YES	YES
N° of observations	387	199	197	387	199	197
N° of countries	13	13	13	13	13	13
R-squared	0.343	0.703	0.705	0.575	0.754	0.754

*(Standard errors are reported in brackets; *, **, and *** indicates statistical significance at 10%, 5%, and 1% level.)*

To conclude, the results of the empirical analysis, which yet tested only the very reduced form of thesis, seem not to contradict the main arguments presented in this paper.

7. Conclusions

Firstly, I shall discuss why the enlargement and upgrading of production specialization could promote economic growth, which is equal to the proposition that an undervalued real exchange rate is a successful development strategy. Next, the concluding remarks.

Discussion

Hausmann *et al.* (2007) argued that countries that specialize in the kind of goods in which rich countries are specialized are likely to grow faster than countries that specialize in other goods. In other words, *"countries become what they produce";* therefore emerging countries had better produce the *goods of the rich*. How do they do? By acquiring some of the comparative advantages of the richer countries, thus upgrading their specialization, through the maintenance of an undervalued real exchange rate.

International trade allows different countries to specialize in the production of the goods in which they have a comparative advantage, thereby raising world's output. Eventually, in the presence of dynamic increasing returns, over time countries will get locked into their comparative advantages. In the case of poor countries, it is often the case that they have a comparative advantage in the poorest or simplest tasks, hence international trade will simply condemn them to remain poor countries producing simple goods. In fact, tasks are different and have different long-term growth rates of productivity—say because of task-specific dynamic external economies of scale[5].

To illustrate it with an anecdotal example: designing aircrafts requires decades of experience, while only few years may be enough for reaching the technological frontier in the production of shoes. Thus, there is an obvious limit to the accumulation of experience in the tasks that are commonly performed by emerging economies, making the case that it is beneficial for long-term growth to get rid of these tasks and upgrade one's specialization—even if this comes at the cost of specializing in tasks presenting an initial comparative dis-advantage.

[5] It would be possible to differentiate tasks by assuming different growth rates of productivity for each task. Hence, it would be straightforward to demonstrate that rich countries have specialized (and have a comparative advantage) in the production of those tasks whose productivity is the highest (as well as their potential growth rate of productivity). Yet, unless we assume that final demand for each good is insensible to the supplied quantities, it then would become necessary to specify also the mechanism through which occurs the resources' sectoral shift from fast-growing to slow-growing tasks.

Therefore, trying to upgrade one's specialization is simply trying to escape one's destiny, which is given by the initial *observed* comparative advantage that will lock a poor country into tasks that have only small long-term potential of productivity growth. That is, a development strategy based on keeping an undervalued real exchange rate must not be seen as a naïve mercantilist agenda, even if this strategy will eventually generate trade surpluses. In fact, this strategy aims at achieving economic growth through the acquisition of new production tasks, which have better long-term prospects of productivity growth, while a naïve mercantilist strategy can be completely detrimental on growth if the aim is to obtain trade surpluses regardless—for instance, promoting exports while constraining imports could only depress national welfare if such a policy decision does not have also positive consequences on growth, which are probably negligible in many rich countries.

To believe this story is to believe that the pattern of international specialization given by the ranking of relative productivities when measured at the current equilibrium scales of production (the *observed* comparative advantage) needs not to correspond to the pattern of specialization given by the ranking of relative productivities when measured at a common scale of production or cumulated experience (which we may call the *natural* comparative advantage). In fact, rich countries might have a comparative advantage on certain tasks only because poor countries simply started later to perform those tasks—but having the same level of cumulated output and experience, who knows which country would have a comparative advantage? Of course, this discussion could end up without any certain solution but with a confusing variety of equilibriums and distortions to the pattern of specialization, as Krugman (1995) already pointed out.

Concluding remarks

If experience does matter (and if it does improve productivity), I discussed how a temporary variation of a nominal variable, the nominal exchange rate, can have permanent effects on a real variable, the commercial and production specialization of a country, whenever we assume that production tasks move across countries (so as to minimize production costs on a global scale) at a faster pace than relative price levels adjust. Put in other terms, emerging countries that are willing to enlarge and upgrade their production specialization could well be successful in doing it, through a development strategy[6] aimed at keeping an undervalued real exchange rate over time. Of course, an undervalued real exchange rate could also happen by chance, given with "*how little wisdom the world is governed*[7]." Moreover, an undervalued real exchange rate will improve the

[6] On the one hand, to have a development strategy that works is indeed a positive fact. On the other hand, such a strategy might be rightly viewed as a beggar-thy-neighbor policy. Indeed, not only it can impose costs on others (the debt-exhaustion of those countries running the external deficits), but also it is an exclusive strategy, as not every country can pursue it at the same time.

[7] *"An nescis, mi fili, quantilla prudentia mundus regatur?"* A quote attributed to the Swedish statesman Axel Oxenstierna, in a letter to his son Johan, written in 1648.

trade balance as well: trade surpluses as a byproduct of a development strategy—an idea that could shed some light to the currently debated issue of global imbalances.

As a final remark, we must acknowledge that economic development is not exclusively related to the undervaluation of the real exchange rate, but it depends on many other factors: human capital, institutional factors, critical infrastructures and investments, technological progress, and so forth. In other words, a development strategy that forces the real exchange rate to be a policy variable may indeed be successful and have positive long-term consequences, but it might still remain only a facilitating condition. In the words of Eichengreen (2008), *"the real exchange rate cannot sustain economic growth in and of itself, but appropriate real exchange rate policy can be an important enabling condition for a country seeking to capitalize on opportunities for growth."*

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