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Martin Rapetti
University of Massachusetts Amherst, mrapetti@econs.umass.edu

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By

Martin Rapetti

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Abstract

Recent research has documented a positive relationship between real exchange rate (RER) levels and economic growth. The literature has interpreted this correlation as causality running from RER levels to growth rates; i.e., higher, undervalued, more competitive RERs tend to favor growth. Little effort has been made, however, on the analysis of the policy instruments required to implement a successful competitive RER strategy. An exchange rate policy targeting a permanent change in the RER may run into difficulties: it is well documented that nominal and real exchange rate movements are correlated almost one for one in the short run but such co-movement slowly vanishes in the long run. Targeting instead a transitory RER undervaluation can have long-lasting effects on economic performance if RER competitiveness is stable and durable enough to provide incentives for tradable activities to expand. The ability to provide such an environment may be beyond the scope of exchange rate policy. This paper aims to shed light on the complementary policies that facilitate the success of an exchange rate policy that temporarily increases competitiveness. A formal model inspired by Ros and Skott (1998) is developed to analyze these issues. The main conclusion is that an exchange rate depreciation would more likely trigger an acceleration of growth if it is simultaneously implemented with domestic demand management policies that prevent non-tradables price inflation and wage management policies that coordinate wage increases with tradable productivity growth.

*Contact Author: Department of Economics, University of Massachusetts, Amherst, MA 01003; email: mrapetti@econs.umass.edu

1 Introduction

A competitive real exchange rate (RER) provides an environment conducive to economic growth. This has become a popular view among development economists and practitioners supported by a body of recent research which has documented a robust positive relationship between RER levels and economic growth, especially in developing countries.[1] The literature has interpreted this correlation as causality running from RER levels to economic growth -i.e., higher, undervalued, more competitive RERs tend to favor growth- but has shed little light on the mechanisms involved in such a causality.[2] Two main channels have been proposed. First, it has been indicated that competitive RERs may stimulate capital accumulation by relaxing foreign exchange (FX) constraints in countries in which capital goods are mainly imported.[3] In developing countries with substantial open or hidden unemployment, the argument goes, growth can be accelerated with policies that mobilize unemployed resources. However, the acceleration of growth and capital accumulation have an impact on the balance of payments, especially if the dependence on imported capital goods is high. In such conditions, a competitive RER would help relax foreign exchange bottlenecks that otherwise could restrain the development process. This argument highlights the notion that developing countries are capital goods importers and that current account deficits tend to adjust mostly through slower growth (i.e., quantities) than via endogenous RER depreciation (i.e., prices). A second explanation suggests that competitive RERs enhance growth by fostering productivity growth in the tradable sector. Following a long tradition in the dual economy and export-led growth literature, this view sees tradable sector as mostly comprised by "modern" manufactures and therefore "special" in the sense that it is the locus where increasing returns to scale in the form of technological spillovers and learning by doing externalities are more prevalent.[4] Importantly, both channels share the notion that the relationship between RER undervaluation and economic growth is intermediated by the expansion of the tradable sector. In the first channel, the expansion of tradable activities increases the production of exportables and import substitutes, augmenting the capacity to import capital goods and thus accelerating capital accumulation and economic growth. In the second, the expansion of the tradable sector accelerates growth due to the exploitation of increasing returns. Research has not yielded a clear answer regarding the relative importance of each channel, but both channels underscore that development and structural change are tradable-led.

If a competitive RER promotes development by helping tradable sector expand then an important question regards the policies that deliver such a relative price configuration. Exchange rate policy is a *priori* a natural candidate. A casual inspection at central banks' behavior in developing countries shows that they actively intervene in the FX market. This occurs not only in countries that adopt fixed or semi-fixed exchange rate regimes but also in those that formally implement floating regimes (Calvo and Reinhart, 2002). Moreover, in many cases

[1] See, among others, Razin and Collins (1999), Hausmann et al. (2005), Aguirre and Calderon (2005), Prasad et al. (2007), Gala (2008), Rodrik (2008) and Rapetti et al. (2011).

[2] I follow the definition of nominal exchange rate as the domestic price of a foreign currency. Consequently, a higher RER implies a more competitive, depreciated or undervalued domestic currency in real terms.

[3] See Porcile and Lima (2009) and Razmi et al. (2011).

[4] See Rodrik (2008 and 2010) and Korinek and Serven (2010).

floating cum FX intervention policies have actively been oriented to prevent RER appreciation or to preserve undervalued RER levels (Levy-Yeyati and Sturzenegger, 2009). Thus, exchange rate policy can be and is used to target competitive RERs. However, it is also known that its efficacy evaporates over time. It is well documented in the empirical literature on RER behavior that nominal and real exchange rate movements are correlated almost one for one in the short run, but such correlation gradually vanishes over time (Taylor and Taylor, 2004).

Even if exchange rate policy cannot induce permanent changes in the RER, it can still be useful. The idea that short and medium-run nominal shocks can have permanent effects on economic performance is well-established in macroeconomics. Consequently, exchange rate policy having a temporary effect on the level of the RER may have long-lasting effects on the economy. In fact, this argument has already been formalized. For instance, inspired in the British experience with Mrs. Thatcher's tight monetary policy during the early 1980s, Krugman (1987) developed a trade model showing how a transitory RER overvaluation can lead to a permanent contraction of the tradable sector. Similarly, Ros and Skott (1998) built a dual economy model to characterize the experiences of de-industrialization in Latin America during the 1990s after the implementation of trade liberalization and RER overvaluation policies. A key element in both models is the existence of dynamic increasing returns in the tradable sector due to learning by doing. Given this assumption, a transitory RER overvaluation can erode tradable profitability permanently if during the transitory period those tradable firms displaced by foreign competition worsen their ability at manufacturing goods significantly. Once the RER reverts to its long-run equilibrium level, these firms will have experienced a substantial productivity loss which makes them unable to compete internationally. The result is a permanent contraction of the tradable sector. These models focused on the case of overvaluation, but the mechanism can easily be reversed to the opposite case: a transitory RER undervaluation that leads to a substantial increase in tradable productivity, turns the sector profitable at the equilibrium RER level and thus stimulates its expansion.

The fact that a transitory RER undervaluation can expand tradable production and accelerate economic growth, however, does not imply that exchange rate policy is all that is required in a competitive RER strategy. The essence of such a strategy is to increase tradable profitability and thus provide incentives for the expansion of this sector. Thus, a RER undervaluation -although transitory- needs to be stable and durable enough to provide such incentives. Several factors influence tradable profitability, but a very important one is the set of relative prices between tradable goods and the inputs for their production; i.e., non-tradable goods and labor. The ability to provide a constellation of relative prices that stimulates tradable production may be beyond the scope of exchange rate policy. While this policy has a tight control over the *absolute* price of tradables, it does not directly determine their price *relative* to non-tradables and labor. To simultaneously influence the determination of non-tradable prices and wages other policies targeting these prices might be needed. As a result, a development strategy that intends to stimulate tradable production by generating relative price incentives may require a coordination of several policies; in particular, exchange rate policy targeting the price of tradables, domestic demand management policies influencing the evolution of non-tradable prices and wage management policies affecting the behavior of wages.

The aim of this paper is to analyze how such policies need to be coordinated. The paper falls in five sections. After this introduction, the next section describes the essence of the argument. Section 3 turns these ideas into a formal model. The framework makes the case that exchange policy itself may not be enough to induce economic development and structural change. Section 4 explores how the use of complementary policies might help exchange rate policy to achieve that goal. Section 5 offers some concluding remarks.

2 Motivation

The main goal of a competitive RER strategy for development is to promote the expansion of the tradable sector via price incentives. The incentives may not be permanent but the bet is that tradable firms will accumulate capital, technology and knowledge, which would turn them productive enough to face international competition and to sustain the accumulation process once the price incentive has disappeared. Thus, when a government carries a competitive RER strategy, it is running a race against time: tradable productivity has to grow enough before the transitory price incentive vanishes.

Governments may intervene in two fronts. One is to implement policies that complement and strengthen the incentives generated by the RER undervaluation. These includes sectoral policies such as subsidized credits, tax exceptions, direct subsidies, infrastructure building and other conventional industrial and trade policies. The other alternative is to conduct policies aiming to preserve the RER undervaluation incentive as much as possible. This would imply the coordination of exchange rate policy with fiscal, monetary and incomes policies in an attempt to moderate the rise of non-tradable prices and wages, which are key costs of production affecting tradable profitability. The first set of policies played a significant role in most successful development experiences (Rodrik, 1995). However, since the 1980s they gradually lost mainstream appeal as the critics pointed to information problems, rent-seeking and government failures. Their use has also been threatened by WTO regulations. Policies targeting the RER appear to be more market-friendly and are rarely penalized -at least in current conditions- by international trade and financial agreements. Although recent successful experiences of development appear to have relied on both strategies, targeting the RER seems to be more popular in present times. Without implying any judgment, the paper focuses on them and does not discuss the role of trade and industrial policies.

A devaluation targeting a competitive RER raises tradable sector profitability but also switches the demand for non-tradable goods against tradable goods. In a small open developing economy, with substantial unemployment and underemployment, tradable production will expand due to the undervaluation incentive, and non-tradable output will also increase due to the rise of demand generated by the positive income and substitution effects. Thus, an exchange rate policy targeting a competitive RER is likely to have a positive impact on economic activity in the short run.[5]

In the medium run, if investment is sensitive to profitability, the competitive RER generates

[5]A devaluation can certainly have contractionary effects in the short-run (Frankel, 2005). In the case they exist, once digested, the expansive effects described above are assumed to prevail.

incentives for capital accumulation in the tradable sector and accelerates economic growth.[6] The sustainability of this process depends on how the constellation of relative prices affecting tradable profitability evolves as the economy grows. To think about this, it is convenient to assume that the government performs a one-time devaluation to achieve a competitive RER and then keeps the nominal exchange rate fixed. In such scenario, if the economy is open to trade, it is not unreasonable to assume that tradable prices would remain relatively stable over time according to the law of price.[7] All the action would then rest on the evolution of non-tradable prices and nominal wages.

Non-tradable prices are determined by domestic market conditions. Since the analysis focuses on a medium run process, it may be reasonable to think of a situation in which productivity growth in the non-tradable sector is negligible, making supply conditions depend exclusively on the availability of labor, a key input of production.[8] In a developing economy, it seems reasonable to assume that the supply of non-tradable goods is quite elastic at the beginning of the development process due to the existence of substantial unemployment and underemployment. The degree of elasticity would critically depend on how scarce labor is. It is likely to observe a substantially more elastic supply of non-tradables in a low income country (e.g. China) than in a middle income country (e.g. Argentina).

Demand for non-tradables, on the other hand, depends on income and the relative price between tradables and non-tradables. If a competitive RER accelerates economic growth, the demand for non-tradables would also grow fast. Besides this income effect, it would be additionally stimulated by the substitution effect caused by the change in relative prices. It is important to notice that the pace of its growth could be influenced by the government, because it mostly spends on non-tradable goods and also can affect private demand via different policies.

Given these expected behaviors of demand and supply, as the economy grows there would be a tendency towards non-tradable price increases; i.e., towards RER appreciation.[9] The precise pace that this tendency towards RER appreciation takes would depend on the elasticity of supply and the way the government influences the evolution of the demand for non-tradables. In countries where surplus labor is less abundant and price adjustments are more prevalent,

[6]Investment is mostly dominated by expected profitability, although actual profitability may also play a relevant role when firms face credit constraints. Expectations about the future are thus crucial for investment decisions. The view I adopt about the way agents form expectations is rather “behavioralist”. Future is by its own nature unknown. On the other hand, agents face costs at gathering information and have limited cognitive abilities to process the information at their dispose. In such a context, past and present conditions could be reasonable guides to form expectations about the future. Thus, if the undervaluation incentive has been stable and lasted long enough, it would likely induce tradable firms to invest.

[7]Although empirical literature has systematically documented the violation of this “law” for non-commodity tradable goods (Goldberg and Knetter, 1997), the assumption still seems reasonable as a stylized first approximation.

[8]Certainly, labor is not the only input influencing supply conditions of non-tradables. Infrastructure, energy and land may be other relevant factors. For simplicity, I will ignore the possibility that these factors may constrain the supply of non-tradables.

[9]Given the assumptions that non-tradable productivity is constant and tradable productivity is (presumably) catching up due to the accumulation of capital, technology and knowledge, this tendency towards RER appreciation resembles the Balassa-Samuelson effect.

government policy may be crucial. If the government uses its instruments to further stimulate the demand for non-tradable goods, prices would tend to rise faster and the undervaluation incentive would tend to evaporate rapidly. On the contrary, if it uses its instruments to lower down the growth of demand for non-tradables, it may soften the appreciation trend.

Domestic demand management policies -which include monetary, fiscal and incomes policies- can be used to manage the pace of the demand for non-tradables. Given that under a competitive RER strategy exchange rate policy is actively used to target the price of tradables, a question arises regarding how effective monetary policy can be. The well-known open economy trilemma posits that in conditions of capital mobility, monetary and exchange rate policies cannot be instrumented simultaneously. Real world experience shows, however, that because financial assets are not perfect substitutes -a key assumption leading to the prediction of the trilemma- sterilized FX market interventions provide some leeway for a simultaneous use of these policies. Capital account management techniques can also be useful to gain some control over both.[10] In any case, even when these instruments are implemented, it seems clear that in a competitive RER regime since monetary policy is subordinated to exchange rate policy, the ability to simultaneously use it with domestic demand goals is reduced. The implication is that fiscal policy has a greater responsibility at managing the pace of domestic demand than in standard inflation targeting regimes, in which domestic demand management relies almost exclusively on monetary policy.[11]

The evolution of wages is affected by the conditions in the labor market. It seems natural to think that employment expands without much upward pressures on wages in countries where the elasticity of labor supply is high; the extreme case being one with constant real wages in an economy with unlimited supply of labor as in Lewis (1954). By contrast, more pronounced wage increases occur in countries where surplus labor is less abundant. To rationalize wage behavior as being determined exclusively by market conditions would be misleading. Wage determination is also affected by institutional, political, cultural/moral factors. These factors are in their very nature context-dependent, which leaves wages determination, as Rees (1993) says, within "a zone of indeterminacy" (p. 244). In this sense, the theory of wage determination is a very historical subject. These "historical factors" can be influenced by public intervention. Government have direct influence over labor market regulations and therefore over wage determination. They can affect wage determination indirectly by influencing wage-norms or establishing the rules for wage bargaining between workers and firms. They also set public wages which are in many cases a point of reference for the determination of private sector wages. Thus, the level and evolution of wages are to some extent influenced by governments through these direct and indirect instruments, which can be labeled as *wage*

[10]See, for instance, Frenkel and Rapetti (2010) who describe the experiences of Argentina during the 2000s and Chile between mid-1980s and mid-1990s in which monetary and exchange rate policies were simultaneously implemented under competitive RER regimes. See Frenkel (2007) for an analysis of the conditions under which sterilized FX interventions are sustainable. See, Ocampo (2003) on the effectiveness of capital controls in developing countries.

[11]With some ingenuity, governments could also use other instruments to target the pace of non-tradable goods demand more *directly*. For instance, taxes, subsides and credit lines may be used to influence the *composition* of aggregate expenditure; in particular, the demand for tradables relative to non-tradables. However, real world experience reveals that these instruments play a secondary role at best.

management policies.

Figure 1 may help illustrate the argument developed so far. It portraits three stylized dynamics of the RER undervaluation incentive in a developing economy. This is captured as the distance between labor productivity (Y/L) and the product wage in the tradable sector (W/P_T), which are key determinants of tradable profitability.[12] Following the discussion above, tradable production may operate with increasing returns to scale in a broad sense. Before the nominal devaluation at time t, tradable productivity and real wages are stagnant. The devaluation reduces the product wage due to the increase in the tradable price. A key issue is whether this increase in tradable profitability is stable and durable enough to trigger a sustained expansion in the tradable sector. In countries with high elasticity of labor supply, the increased tradable profitability would tend to persist: output and employment growth in this sector would not generate major increases in its costs of production. An extreme case is represented by the red line which remains flat during the transition period. The profitability incentive -i.e., the distance between the red line W/P_T and the thick solid black line Y/L- increases in time due to the productivity gains arising from the increasing returns. Eventually, wages would tend to rise as the supply of labor becomes "limited", but this would happen beyond the medium-run frame of this analysis (thus not shown in the figure).

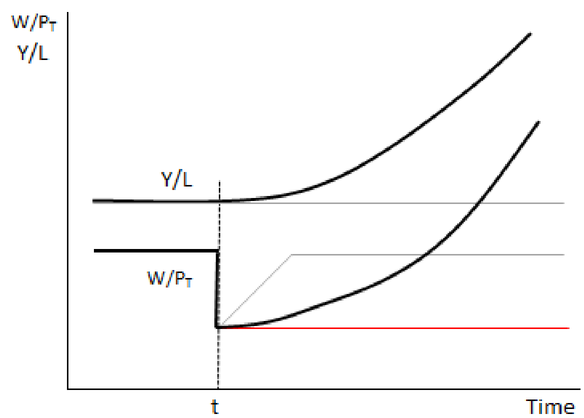

Figure 1: Three stylized dynamics

Such a scenario is less likely for developing countries with lower labor supply elasticities. The initial expansion of tradable sector would gradually generate upward pressures on non-tradable prices and wages, which would tend to erode the relative price incentive. As usual, the devil is in the details: different results can arise depending on how gradual this process is. Put differently, different results will emerge depending on the "race" between tradable productivity growth and the increase in unit costs. If the undervaluation incentive erodes relatively rapidly, investment in the tradable sector would not prosper and the virtuous effect

[12]For simplicity I use the product wage as a proxy of unit costs, which would also include non-tradable goods. Since the determination of nominal wages are arguably influenced by the evolution of non-tradable prices, as modeled in the next section, this relative price captures the set of relative prices that are relevant to determine tradable sector profitability.

of accumulation in the tradable sector would not operate. This case is represented by the gray solid lines in figure 1. The contraction of the product wage after the devaluation is rapidly reversed. This fragile investment incentives does not lead to a sustained expansion of the tradable whose productivity remains unchanged. In this case, the government could be tempted to use exchange rate policy to keep devaluing the domestic currency -as, for instance, in a passive crawling-peg regime- in an attempt to preserve the undervaluation incentive. This strategy, however, is likely to fail. A policy of continuous nominal depreciations would likely accelerate the rate of non-tradable price and wage inflation. The relative price adjustment would occur in a context of accelerating inflation as described, for instance, in Calvo et al. (1995). An inflationary environment, where relative price volatility and uncertainty are higher, would make investment in the tradable sector even less likely.

A different result may arise if, together with the exchange rate devaluation, the government implements domestic demand management policies to slow down the tendency towards non-tradable price increases and wage management policies to coordinate wages increases with productivity growth in the tradable sector. This case is illustrated by the solid black lines. After the devaluation, the rise in unit costs is steady but moderate. This evolution maintains the profitability incentives during the initial period and thus induces investment in tradable activities. As accumulation occurs, this sector becomes gradually more productive and therefore increases in unit costs do not undermine tradable profitability. As a result, the expansion of tradable sector not only comes jointly with higher economic growth but also with increasing real wages.

3 The model

In this section, I develop a dual open economy model inspired by Ros and Skott (1998) to formally address the stylized behaviors described in section 2. This setting takes the view that the tradable (T) sector is the locus of modern technology and assumes that its production operates with increasing returns to scale due to learning by doing. The tradable sector is the only one that utilizes capital, K, whose stock is given in the short run. The tradable good can be used for consumption or investment. The non-tradable (N) sector uses labor and a fixed factor. The assumption that non-tradable production does not require capital is a shortcut to represent the tradable sector as the locus of increasing returns and technological progress. The economy is characterized as developing not only because sectors operate with significantly different technologies but also because of the existence of substantial open unemployment (U). There is a single labor market with a homogeneous nominal wage rate, W, which is also given in the short run due to nominal stickiness.

3.1 Basic relationships and the behavior in the short run

The economy is small and open to trade and finance. Since the exchange rate, E, is credibly fixed, the interest parity condition imposes that

$$i = i^* \tag{1}$$

where i is the domestic cost of finance and i^* the international interest rate. Given this simplification, monetary policy is passive as suggested by the trilemma when the exchange rate is fixed and capital perfectly mobile. The assumption also implies that the capital account of the balance of payments always adjusts to accommodate the result of the current account. Therefore, balance of payments imbalances are assumed away from the analysis.

The price of tradable goods, P_T, is determined by the law of one price:

$$P_T = EP_T^* \tag{2}$$

where P_T^* is the international price of the tradable good. Thus, through exchange rate policy the government controls the *absolute* price of tradables.

The tradable sector operates with a Cobb-Douglas production function with sectoral increasing returns to scale due to to learning by doing externalities. For the representative firm this is

$$Y_T = A\tilde{K}^{\gamma}K^{\alpha}L_T^{1-\alpha} \tag{3}$$

where Y_T and L_T represent output and employment in the tradable sector and $\tilde{K}^{\gamma}$ the external effect. The average sectoral capital stock $\tilde{K}$ is exogenous to the individual firm and in equilibrium is equal to the capital stock of the representative firm, i.e., $K = \tilde{K}$. The learning by doing externality is assumed to be small so that $\alpha + \gamma < 1$. This is a plausible assumption, which will be key in the dynamic analysis of subsection 3.2.

Given the capital stock and the wage rate, firms in the tradable sector demand labor at any point in time so to maximize profits in a perfect competition environment. Hence

$$L_T = [A(1-\alpha)]^{\frac{1}{\alpha}}\omega_T^{-\frac{1}{\alpha}}K^{\frac{(\gamma+\alpha)}{\alpha}} \tag{4}$$

where $\omega_T \equiv \frac{W}{P_T}$ is the tradable product wage.

Profits in the tradable sector, Π_T, are:

$$\Pi_T \equiv rP_TK = \alpha P_TY_T = \frac{\alpha}{1-\alpha}WL_T \tag{5}$$

The non-tradable sector produces using labor and a fixed factor. The production function for the representative firm in this sector is

$$Y_N = DL_N^\beta \tag{6}$$

where D is a constant, Y_N and L_N represent non-tradable output and employment and with $0 < \beta < 1$.

The demand for labor in this sector also arises from profit maximization by the owners of the fixed factor in an atomistic and price-taking context. Thus,

$$L_N = (\frac{1}{D\beta})^{\frac{1}{\beta-1}}(\frac{P_N}{W})^{\frac{1}{1-\beta}} = (\frac{1}{D\beta})^{\frac{1}{\beta-1}}X^{\frac{1}{1-\beta}} \tag{7}$$

where P_N is the price of the non-tradable good and X expresses this price relatively to the nominal wage rate; i.e., $X \equiv \frac{P_N}{W}$. From equations 6 and 7 it is clear that the higher the value of β the more elastic non-tradable supply is.

Given that monetary policy is passive, domestic demand management policies are conducted through fiscal policy. In practice, governments mostly spend on non-tradables and the impulse of fiscal policy on domestic demand is seen through changes in the fiscal balance. Thus, increases (contractions) in the fiscal surplus tend to operate as contractionary (expansionary) impulses on the demand for non-tradables. To model this mechanism simply, I assume that the government spends only on non-tradable goods and that the amount of spending is θ times its tax collection. Tax revenues, in turn, come from an ad-valorem tax on non-tradable private consumption, t_N. Hence,

$$P_N G_N = \theta t_N P_N C_N \tag{8}$$

with $\theta > 0$, $0 < t_N < 1$ and G_N representing public spending . Public sector primary surplus is thus defined as

$$S_g = t_N(1-\theta)P_N C_N = s_g P_N C_N \tag{9}$$

where $s_g = t_N(1-\theta)$ is the primary surplus rate. It is immediate that s_g defines the situation of government sector primary balance. When $s_g = 0$, primary fiscal accounts are balanced, when $s_g > 0$ the government faces a primary surplus and when $s_g < 0$ a primary deficit.[13] For simplicity, I focus on the primary surplus and do not explore the intertemporal behavior of public debt. This omission is unlikely to hide an unsustainable behavior in the management of macroeconomic policy: the recommended fiscal policy will be contractionary in order to moderate RER appreciation forces coming from non-tradable price inflation, and thus macroeconomic policy coordination will go in the direction of reducing public debt. In any case, to

[13]This, in turn, is achieved by setting $\theta = 1$, $\theta < 1$ and $\theta > 1$, respectively

minimize the concerns about the evolution of public debt, I will assume initially that $s_g = 0$. In section 4, it will be shown that policy coordination requires a transitory increase in fiscal surplus; i.e., $s_g > 0$. Thus, along most of the analysis, fiscal policy will have a neutral effect on public sector net asset position. Only when macroeconomic policy coordination is required to maintain the undervaluation incentive, it will transitorily increase public sector net asset position.

Private consumption derives from consumers' utility maximization of a Cobb-Douglas function. Hence,

$$\frac{C_T}{C_N} = \frac{\mu(1+t_N)}{1-\mu}\frac{P_N}{P_T} \tag{10}$$

where μ and $1-\mu$ are the shares of consumers income spent on tradable and non-tradable goods, respectively.

I follow a standard practice and assume that workers do not save, while capitalists in the tradable sector and owners of the fixed factor in the non-tradable sector save a fraction s of their profits and rents. Evidence systematically shows that the saving rate out of wages is substantially smaller than that resulting from corporate profits. If workers were allowed to save in the model, they would be owners of part of the capital stock in the tradable sector - probably indirectly through financial claims- making them receivers of part of tradable profits. Even under the simplest assumption that all classes have the same propensity to save, allowing workers to save would complicate the algebra. Since the incidence of income distribution on consumption is not at the center of the argument addressed in this paper, I opt for the simplified specification.[14] Hence,

$$P_T C_T + (1+t_N)P_N C_N = W(L_T + L_N) + (1-s)(\Pi_N + \Pi_T) \tag{11}$$

Since non-tradables are used only for domestic consumption, the market equilibrium condition requires that output equals expenditure

$$Y_N = C_N + G_N = (1+\theta t_N)C_N \tag{12}$$

[14] The domestic interest rate, i, could influence the behavior of private savings. However, since it is given by the international interest rate, s appears in the model as a parameter. As discussed in section 2, the government could use sterilized interventions and capital management techniques to regain some control over monetary policy. In that case, it could manage i within a certain range and thus influence the evolution of the price of non-tradables through s. In other words, demand management policies would also include monetary policy. Although governments targeting a competitive RER actually use a combination of policies to have some autonomy in conducting monetary policy, I will ignore this possibility to keep the algebra simple. However, s could be thought as a variable potentially influenced by monetary policy and other saving incentives offered by the government.

Finally, there is a fixed labor force L, which is either unemployed or employed in one of the two sectors. Thus

$$L = L_T + L_N + U \tag{13}$$

Equations 1 to 13 define the behavior of the economy in the short run; i.e., for given values of K and W. The subsystem defined by equations 6 to 12 determines the short-run equilibrium conditions for the non-tradable goods markets. The equilibrium value of the non-tradable price relative to the nominal wage rate, $X \equiv \frac{P_N}{W}$, results

$$X = [\delta \frac{(1-s_g)(1-\mu)}{s(1-\beta)+[1-s(1-\beta)][\mu+s_g(1-\mu)]} \omega_T^{-\frac{1}{\alpha}} K^{\frac{\gamma+\alpha}{\alpha}}]^{1-\beta} \tag{14}$$

with $\delta = \frac{[1+(1-s)\alpha/(1-\alpha)][A(1-\alpha)]^{\frac{1}{\alpha}}(D\beta)^{\frac{\beta}{\beta-1}}}{D}$, and partial derivatives $X_K > 0$, $X_{\omega_T} < 0$, and $X_{s_g} < 0$. A rise in K increases the demand for non-tradable goods raising employment, output and prices in the non-tradable sector (i.e., $\uparrow X$). An increase in ω_T reduces profitability in this sector contracting tradable output and thus reducing private consumption. The result is a reduction in the demand for non-tradables and in its price (i.e., $\downarrow X$). Domestic demand management policies through s_g can affect the behavior of the price of non-tradables. A rise of s_g reduces the aggregate expenditure on non-tradables and thus lowers the price of non-tradable goods (i.e., $\downarrow X$). This is easy to see: the government spends less in non-tradables than the amount of resources that absorbs in form of taxes, which otherwise would go to private consumption of non-tradables.[15] Finally, an increase in E is equivalent to a reduction in ω_T (given that $\omega_T \equiv \frac{W}{EP_T^*}$). Thus, by lowering the product wage in the tradable sector as characterized in the stylized behaviors of figure 1, an exchange rate policy targeting a more competitive RER (i.e., a higher E) leads in the short run to an increase in employment and output in both sectors and a rise in the price of non-tradable goods (i.e., $\uparrow X$). To assess whether it also triggers a sustained expansion of the tradable sector and whether other policies are needed to complement it, we have to characterize the dynamic behavior of the system and analyze the "race" between productivity and the product wage in the tradable sector.

3.2 Dynamic behavior

By assumption, the system has K and W predetermined at any given point in time. The rate of capital accumulation $\hat{K}$ is assumed to be a positive function of tradable profitability r relative to the cost of finance, i. Hence

[15] The price of non-tradables also falls when private saving rate, s, rises; i.e., $X_s < 0$. Thus, in cases in which governments have some autonomy to conduct monetary policy, a rise in the domestic interest rate would increase s and thus reduce the price of non-tradables (i.e., $\downarrow X$).

$$\hat{K} \;=\; f(r-i) \tag{15}$$

with the partial derivative $f' > 0$ and $f(0) = 0$.

From equations 2 to 5, the profit rate in the tradable sector is

$$r \;=\; A^{\frac{1}{\alpha}} \alpha (1-\alpha)^{\frac{1-\alpha}{\alpha}} \omega_T^{\frac{\alpha-1}{\alpha}} K^{\frac{\gamma}{\alpha}} \tag{16}$$

The profit rate in the tradable sector is thus a positive function of K and negative of ω_T. Capital accumulation has a self-sustained effect resulting from the expansion of the tradable sector that operates under increasing returns. In other words, since increases in K lead to increases in r due to the learning externalities, K has a positive feedback effect on $\hat{K}$. The sustainability of the capital accumulation/economic growth process would then depend on a "race" between the productivity gains in this sector and the evolution of the product wage ω_T. Given that P_T is fixed, the latter would depend on the dynamic evolution of W.

Variations in W are assumed to be determined in the bargaining process between workers and firms. On the one hand, wages adjust according to the gap between the actual real wage rate, $\frac{W}{P}$, and the real wage rate that workers demand given their bargaining power and the set of institutional, political and moral/cultural factors that influence wage determination. I call the latter the "bargained" real wage rate, ω. The other component influencing nominal wage determination is expected price inflation $\hat{P}^E$. Hence

$$\hat{W} \;=\; \lambda(z)[\frac{\omega(l,z)}{W/P} - 1] + \hat{P}^E \tag{17}$$

Workers bargaining power is captured in equation 17 through the employment rate, $l \equiv L_T + L_N$, where the labor force has been normalized to unity (i.e., $L = 1$). It seems reasonable to think that as the economy grows and the employment rate increases, workers gain bargaining power and demand -and firms are more willing to give- nominal wages that imply higher real wages; i.e., a partial derivative $\omega_l > 0$. On the theoretical side, this assumption is in line with efficiency wage models and the literature of wage bargaining.[16] The assumption is also supported by empirical evidence. In their influential work on the "wage curve", Blanchflower and Oswald (1994 and 2005) have established the existence of a negative relationship between wage levels and regional/sectoral unemployment. They interpret this stylized fact as indicating that workers in labor markets with lower unemployment rates have greater bargaining power and consequently obtain higher real wages. Based on these theoretical and empirical grounds, it seems safe to posit that in a development process in which the employment rate is increasing real wages also increase.

[16] See Akerlof and Yellen (1986) and Farber (1986) for relevant surveys.

The discussion in section 2 suggests, however, that wage determination is also influenced by institutional, political, cultural/moral elements, which are context-dependent and can be influenced by government intervention. z is the variable condensing these factors, which is subject to government influence via wage management policies. A rise in z indicates the case when the government uses its wage management policies to induce an increase in the real wage for a given rate of employment. This could be, for instance, the decision to raise the real value of the minimum wage rate or a generous public sector wage settlement. Wage management policies conducted through z can affect not only the steady state value of the real wage, but also the speed at which wages change over time. Governments, for instance, can regulate the duration of labor contracts between unions and firms or implement temporary incomes policies (e.g., wage freezes) and thus influence the lifetime of wage rigidity. This effect is captured in the the speed of wage adjustment $\lambda(z)$. Thus, the government can use the wage management policy instrument z to increase or decrease the length of the period during which a wage contract lasts, according to the partial derivative $\lambda_z > 0$.

To facilitate the mathematical exposition, I give the "bargained" real wage rate a specific and plausible form

$$\omega = \bar{\omega}(z)(1-l)^{-\tau} \tag{18}$$

where $\bar{\omega}(z)$ represents a real wage rate that prevails in conditions of very low employment levels (or a minimum real wage rate), with a partial derivative $\bar{\omega}_z > 0$. Labor market conditions, in turn, affect the determination of the real wage bargained by workers via the employment rate l and the parameter $\tau > 0$. One important characteristic of the specific form in 18 is that the elasticity of the bargained real wage with respect to the employment rate is variable. The impact of changes in the employment rate on the real wage is lower (higher) for lower (higher) levels of employment. This seems a plausible description of the influence of labor market conditions on the determination of wages.

Expectation formation can be critical for macroeconomic outcome, but given our focus on medium-run behavior, it is reasonable to assume that workers manage to adjust nominal wages to the actual evolution of the price level, P. The adjustment process may not work smoothly in the short run but it is likely to do it in longer spans of time. Therefore, I follow a standard practice and assume that workers form expectations rationally.[17] Hence

$$\hat{P}^E = \hat{P} = \mu\hat{P}_T + (1-\mu)\hat{P}_N \tag{19}$$

where μ and $1-\mu$ are the weights of tradable and non-tradable prices in the private consumption basket.

Since P_T is given by exchange rate policy at any point in time, expected inflation is equivalent to non-tradable price inflation

[17] Assuming adaptive expectations would not change the results.

$$\hat{P}^E = (1-\mu)\hat{P}_N \tag{20}$$

By definition $P_N \equiv XW$. Thus, using equation 14 we get:

$$\hat{P}_N = -\frac{(1-\beta)}{\alpha}\hat{\omega}_T + \frac{(\gamma+\alpha)(1-\beta)}{\alpha}\hat{K} + \hat{W} \tag{21}$$

Since P_T is given at any point in time $\hat{W} = \hat{\omega}_T$. Thus, using equations 17 to 21, we get an expression for the dynamic behavior of ω_T

$$\hat{\omega}_T \quad = \quad \eta\{\lambda(z)[\omega_T^{-\mu}X^{1-\mu}\bar{\omega}(z)(1-l)^{-\tau} - 1] + \frac{(1-\mu)(\gamma+\alpha)(1-\beta)}{\alpha}\hat{K}\} \tag{22}$$

with $\eta = \frac{\alpha}{[\alpha\mu+(1-\mu)(1-\beta)]} > 0$.

Expressions 15 and 16 describe the evolution of the capital stock over time: it increases with K and shrinks with ω_T. The dynamic behavior of ω_T is more involved to derive. Appendix A gives a formal derivation, but intuitively it can be seen that $\hat{\omega}_T$ increases with K and declines with ω_T. When K increases, the employment rate expands and the price of the non-tradable good goes up. Conversely, increases in ω_T -by reducing tradable profitability- lead to a contraction in the employment rate and in the price of the non-tradable good. In the former case, the rise in the employment rate increases workers bargaining power and the rise of the price of non-tradable reduces the actual real wage rate. Thus, both effects associated with the increase in K generate pressures for rises in ω_T. In the latter case, the effects go in the opposite direction: a fall in K leads to a fall in ω_T.

Formally, we get a dynamic system for K and ω_T defined by the following reduced form:

$$\hat{K} \quad = \quad F(K, \omega_T) \tag{23}$$

$$\hat{\omega}_T \quad = \quad G(K, \omega_T; s_g, z) \tag{24}$$

with partial derivatives $F_K > 0$, $F_{\omega_T} < 0$, $G_K > 0$, $G_{\omega_T} < 0$ (see appendix A for details).

The nullclines of equations 23 and 24 are positively sloped. The $\hat{K} = 0$ locus is defined by the combinations of K and ω_T for which the capital stock is stationary. Given the increasing returns in the tradable sector, a rise in K augments tradable profitability inducing more investment and capital accumulation as described by equation 16. Only a rise in ω_T restores the profit rate to a level that keeps K constant. The $\hat{\omega}_T = 0$ locus describes the "equilibrium" in the labor market in the sense that the resulting value of ω_T is stationary. An increase in K raises the employment rate and the price of non-tradables. The first effect enhances workers bargaining power and the second reduces actual real wages. Both lead to demands for higher wages. A rise in the nominal wage rate consistent with the stationary tradable product wage rate ω_T restrains workers from demanding further increases. The required reaction of wages to keep the labor market in "equilibrium", however, is not uniform along the $\hat{\omega}_T = 0$ locus, but becomes more pronounced with higher levels of K. This feature results from the fact that the behavior of the bargained real wage -specified in equation 18- is more sensitive to changes in the employment rate as the latter increases. A given variation in the employment rate would derive in higher changes in wages the higher the employment rate is. This particular aspect of the $\hat{\omega}_T = 0$ locus -i.e., a variable elasticity of ω_T with respect to K along the locus- is key for the possibility of multiple equilibria in the model.

Appendix B shows the conditions under which multiple equilibria arise. A critical condition for the possibility of multiple equilibria is that the positive externality in the production of tradable goods, γ, has to be moderate; more precisely: $\gamma + \alpha < 1$. If this condition is not fulfilled, the productivity gains arising from learning by doing would be so large that the resulting profitability incentives for capital accumulation would be unbounded. Assuming that the not very restrictive conditions specified in appendix B are met, the only interesting case involves two intersections between the $\hat{\omega}_T = 0$ and $\hat{K} = 0$ loci; one at low levels of K and another at high levels of K.[18] The low-K intersection would be a saddle point and the high-K intersection a spiral or a node. Depending on the speeds of adjustment of K and ω_T, the system would show different dynamic behaviors. A key aspect dominating the dynamic behavior of the system is that the effect of K on $\hat{K}$ is positive (i.e., $F_K > 0$) and the effect of ω_T on $\hat{\omega}_T$ is negative (i.e., $G_{\omega_T} < 0$). This implies that capital accumulation is a destabilizing force in the system while the product wage represents a stabilizing one. Because of this, the speeds of adjustment of K and ω_T would play a critical role defining the stability or lack of it at the high-K equilibrium. The higher the speed of adjustment of K (ω_T), the more likely that the high-K equilibrium becomes unstable (stable). Since I am interested in the case in which the high-K equilibrium is locally stable, I will assume that the speed of adjustment of K is low enough and the speed of adjustment of ω_T high enough to guarantee such an outcome.

Figure 2 describes the benchmark phase diagram. Point C represents the high-K locally stable equilibrium (i.e., the"development" equilibrium) and B the low-K saddle point. A is another locally stable equilibrium that represents the extreme case of complete underdevelopment. The saddle path divides the phase diagrams in two regions. The region on the left is the basin of attraction of A, whereas that on the right the basin of attraction of C. Thus, if the economy is initially located to the left of the saddle path, the dynamic behavior would gradually take it towards the complete underdevelopment equilibrium A. If it begins to the right of the saddle path, the dynamic behavior would take it to the development equilibrium C. Only in the case that the economy is initially situated on the saddle path, it would end up at the saddle point B. Importantly, the location of the saddle path would depend on the speeds of adjustment. This issue is further discussed in section 4.

[18] Two other alternatives are possible. In one case the nullclines do not intersect and in the other they are tangential to each other at a single point. None of these cases are of economic interest.

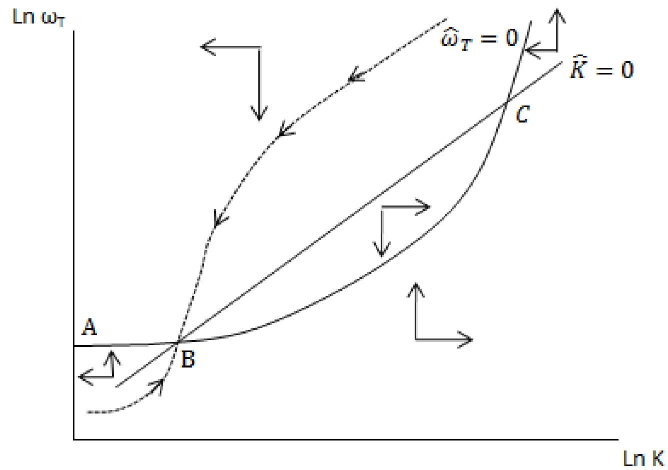

Figure 2: Benchmark phase diagram

3.3 The role of exchange rate policy

A rise in the nominal exchange rate E -i.e., a devaluation- reduces the product wage in the tradable sector ω_T and leads in the short run to an expansion of output and employment in both sectors. In the medium run, the increase in tradable profitability would induce higher investment in the tradable sector. This would imply an increase in K, which in turn would have a positive feedback effect on $\hat{K}$ due to the learning externalities in the production of tradables. On the other hand, the process of capital accumulation would also lead to the absorption of unemployed workers by both sectors and an increase in total income and aggregate demand. As a result, both the employment rate and the price of non-tradables would increase leading to demands for higher wages. The subsequent rise in ω_T would have a negative impact on $\hat{K}$. Thus, the possibility of a virtuous dynamic of development and structural change would depend on the "race" between productivity gains in the tradable sector and the increments in the labor costs.

A devaluation may trigger a process of capital accumulation that leads to a sufficiently rapid productivity growth that offsets the gradual increments in labor costs. In such a case, exchange rate policy could be sufficient to generate a self-sustained dynamics of capital accumulation and structural change. This case is illustrated in figure 3. The nominal devaluation moves the economy trapped in underdevelopment region represented by point A to B_1, which is to the right of the saddle path. At this point the positive feedback effects of K on $\hat{K}$ more than compensate the increases in ω_T associated with higher employment rate and non-tradable prices. The economy would gradually move towards the equilibrium point C, where the economy would eventually reach higher capital per capita ratio and real wages.

A relevant question is whether a devaluation would always be enough to sustain the price incentive for capital accumulation as in point B_1. If not, the question is whether the coordination of exchange rate policy with domestic demand management and wage management policies may contribute to such a goal. Next section analyzes this issue.

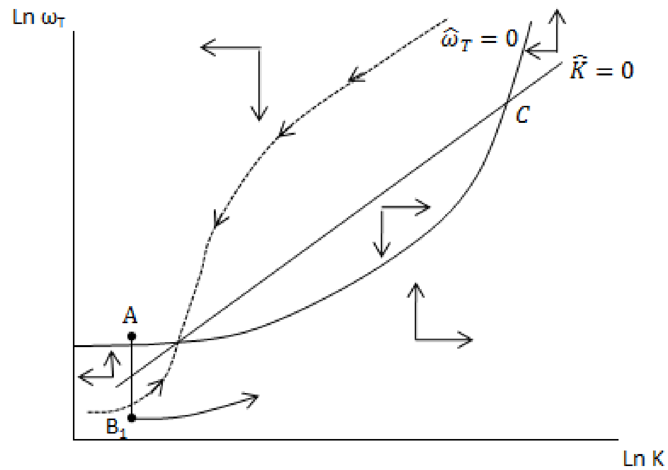

Figure 3: A “successful” devaluation

4 The case for policy coordination

Figure 3 illustrates the case in which a devaluation generates by itself the profitability required to trigger a sustained process of capital accumulation in the tradable sector. Graphically, the economy moves from A to B_1. It is important to notice that at B_1 tradable productivity is low because of the low level of K. Thus, the high profitability in the tradable sector at B_1 derives mostly from the very low value of ω_T achieved by the devaluation. One cannot always expect that exchange rate policy would be able to provide such a high level of profitability to tradable firms. A relative price incentive generated by a large devaluation may be rapidly reversed due to a high pass-through on non-tradable prices or to real wage resistance by workers. Such outcomes are actually in line with the evidence from time series econometrics, which has documented that the responses of the RER to changes in the nominal exchange rate are not linear: the speed of reversion is higher for larger depreciations (Taylor et al., 2001). A quick erosion of tradable profitability would undermine the incentives to investment and capital accumulation in the tradable sector would not result. The likelihood of an outcome like this one increases with the size of the required depreciation to move the economy from one state to another. In terms of the model, the larger the distance between A and B_1, the less likely that a devaluation can trigger a virtuous dynamics by itself. One could consider to offset the erosion of tradable profitability caused by higher prices with further devaluations. As discussed above, such a policy response may do more harm than good. In a context in which nominal devaluations instead of generating a RER depreciation lead to rises in domestic prices, engaging in further devaluations is likely to accelerate the rate of inflation. Experience in developing countries has shown that devaluation-inflation spirals are not rare events. It would be harder to argue that the incentives of a competitive RER on investment would be unaffected by a context of high and accelerating inflation. The discussion suggests that exchange rate policy may face a limit in its ability to achieve RER levels that are

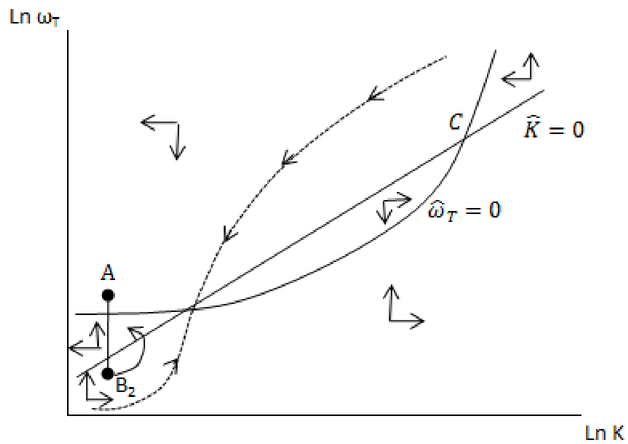

Figure 4: An "unsuccessful" devaluation

both competitive and stable to induce investment in the tradable sector, while preserving macroeconomic stability. In terms of the model, it implies that reaching a situation like B_1 may be not feasible.

Figure 4 shows the case of a devaluation in which the maximum "feasible" RER (i.e., the lowest "feasible" ω_T) is located on the left of the saddle path. The economy moves from A to B_2, the latter representing a point with the same K but a higher ω_T than the point B_1 in figure 3. After the devaluation, the economy is still trapped in the underdevelopment zone. The RER undervaluation incentive would initially induce tradable firms to invest. However, capital accumulation would be short-lived and would not generate productivity gains high enough to compensate for the increase in ω_T. The economy would rapidly cross the $\hat{K} = 0$ locus and incentives to invest would disappear. This dynamic behavior corresponds to that illustrated with gray lines in figure 1. In that case, the undervaluation incentive vanished so quickly that capital accumulation in the tradable sector was virtually nil and led to no significant improvement in productivity.

In a case like the one discussed above, the undervaluation incentive does not last long enough to induce tradable firms to invest and thus to experience structural change. When capital initially accumulates, unemployed workers are absorbed by the two sectors and aggregate output, income and demand expands. The resulting rise in the employment rate and the price of non-tradables derive in demands for higher wages, which reduces tradable profitability and the incentives to invest. Since tradable cost rise faster than productivity, incentives to invest end up disappearing. As discussed in section 2, the government has instruments to moderate these tendencies. To restrain inflationary pressures in non-tradables prices -and thus preserve the real wage in terms of non-tradables and avoid demands for wage increases- the government may attempt to moderate the pace of non-tradable demand. An increase in the fiscal surplus (i.e., $\uparrow s_g$) would accomplish that goal. The government may also want to coordinate the pace of real wage increases with the rate of productivity growth in the tradable sector. This may be especially important at the beginning of the development process in which tradable profitability depends heavily on price competitiveness. The positive external effects due to learning arise as the process of accumulation gains momentum. Wage management policies -captured in the policy variable z- may be used for such a purpose.

In the model, the values of the demand management policy parameter s_g and the wage management policy parameter z determine the location of the $\hat{\omega}_T = 0$ locus. An increase in s_g reduces the equilibrium value of the non-tradable price and raises the actual real wage rate, W/P. At any level of K, this implies that actual real wages are higher than the bargained real wage. Equilibrium in the labor market requires a contraction of W, which lowers ω_t down to a new stationary level. This is represented with a downward shift of the $\hat{\omega}_T = 0$ locus. Similarly, a contraction of z reduces the bargained real wage at any level of K. Equilibrium in the labor market requires a reduction of W, which shifts the $\hat{\omega}_T = 0$ locus down.

Figure 5 illustrates the case when the coordination of exchange rate policy with domestic demand and wage management policies is successful at triggering capital accumulation and structural change. The figure zooms in the low-K intersection leaving the high-K equilibrium out of sight. The thin $\hat{\omega}_T = 0$ locus and saddle path correspond to the case of no policy coordination. As in the case of figure 4, an exchange rate depreciation would move the economy from A to the same point B_2. As before, at B_2, the economy would be on the region on the left of the saddle path, trapped in the underdevelopment zone. The dynamic behavior would be the same as in figure 4. However, if the same depreciation is coordinated with complementary policies that aim to preserve the RER undervaluation incentive longer, B_2 would be on the right of the saddle path. This happens because the use of complementary policies (i.e., a rise in s_g, a reduction in z or a combination of both) is now represented by the thick $\hat{\omega}_T = 0$ locus and saddle path. In this new context, the the economy would experience a sustained process of capital accumulation that would eventually take it to the development equilibrium represented by C, which is not shown in the figure.

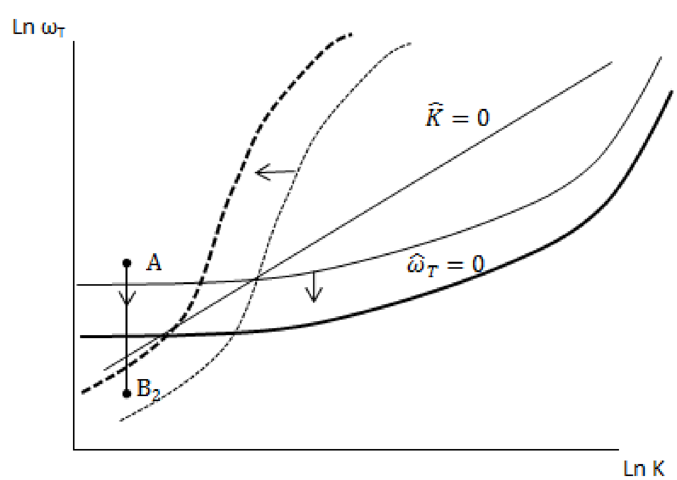

Figure 5: The policy coordination case

It is worth noting that the implementation of the complementary policies need not be permanent. Their implementation is critical at the beginning of the accumulation process, but they could be softened gradually. As the tradable sector becomes more mature (i.e., with higher capital-labor ratios and higher productivity), it can resists higher increases in real wages. Thus, if the government decides to gradually increase their spending ($\downarrow s_g$) or implement measures to induce higher wages ($\uparrow z$), the accumulated gains in tradable productivity would tolerate the rises in costs without severely compromising profitability. In terms of figure 5, the government can reverse the policies and return the $\hat{\omega}_T = 0$ locus and saddle path to their original location provided the economy remains to the right of the saddle path. Thus, as mentioned in section 3, during the period of policy coordination, the government would experience a transitory primary surplus and then return to a permanent situation of balanced primary budget.

The critical role of policy coordination can be illustrated in the model in another way. Recall that wage management policies may not only affect the equilibrium *level* of wages, but also the *speed* at which the actual wage rate converges to its equilibrium value. This was captured by making the policy variable z affect the speed of wage adjustment λ. Figure 6 illustrates the effect of a reduction on the speed of wage adjustment by lowering z. For expositive purposes, the graph assumes that movements in z have no effect on the $\hat{\omega}_T = 0$ locus (i.e., z is not an argument of the function characterizing the behavior of the bargained real wage rate, ω). A change in the speed of adjustment does not have an effect on the location of the the nullclines but changes the position of the saddle path. Particularly for our interest, a lower speed of wage adjustment shifts the saddle path closer to the $\hat{K} = 0$ locus, which is represented in figure 6 as a move from the thin to the thick saddle path.

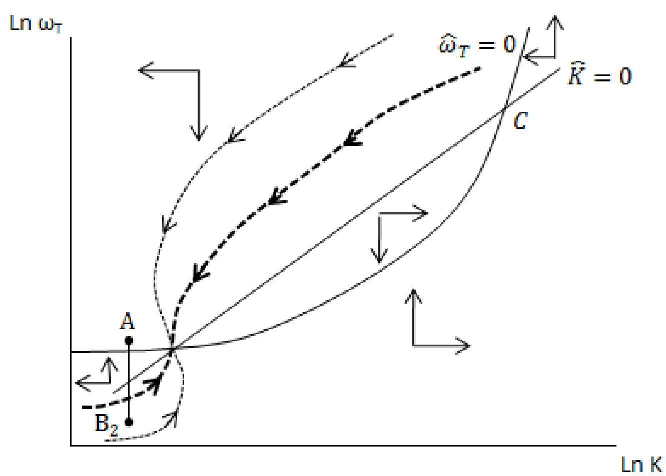

Figure 6:

The intuition is straightforward: a lower speed of wage adjustment makes the horizontal movements (i.e., K adjustments) relatively stronger, thus making the stability regions more fragile (i.e., the saddle path is easier to cross). Important for the argument, the fact that the government can make the periods in which wages are sticky longer gives tradable firm more time to take advantage of the RER undervaluation incentive. Investment in the tradable sector after a devaluation is more likely to accelerate when the incentives are perceived to last longer. This element aims to be captured by the location of B_2 on the right of the thick saddle path as opposed to being on the left of the thin saddle path. In the latter case, the economy would remain trapped in the underdevelopment zone (gradually moving to the complete underdevelopment equilibrium), whereas in the former the economy would expand towards C. It is an empirical question the extent to which this kind of policy can help the purpose of maintaining a competitive RER. In any event, the case points to the existence of an additional instrument that could play at least some role in helping manage a competitive RER strategy.

5 Conclusions

Economic development is a complex process that blends several social, political and economic elements. According to recent research, the level of the RER might be one of these important factors. In particular, a competitive RER seems to provide an environment conducive to economic development and structural change. The positive effect of competitive RERs appears to be mediated by the expansion of tradable production. On the one hand, this relaxes the foreign exchange constraint allowing for a greater capacity to import capital goods that are required by domestic firms to expand their production capacity. On the other hand, the expansion of tradable production benefits the economy as a whole because of the technological and learning externalities that are prevalent in this sector. Because of economic development appears to be tradable-led, there is room for government intervention to provide incentives to induce capital accumulation in these activities.

Incentives for investment typically take the form of higher profitability. There is not one but many ways to foster tradable profitability. Several instruments can be used for such a purpose under the label of trade and industrial policies, including subsidized credits, tax exceptions, direct subsidies, tariff, taxes and quotas on competing goods. Using exchange rate policy is another viable alternative. One limitation is that while this policy controls the absolute price of tradables tightly it faces more difficulties when it comes to affect its relative price against non-tradables and labor. It is a controversial issue the extent to which governments can permanently influence relative prices in an economy. But even accepting that in the long run relative prices are determined by economic fundamentals, it seems widely recognized that a policy affecting relative prices for a relevant transitory period can have a substantial effect on long-term economic performance.

The contribution of this paper is simple. It indicates that exchange rate policy can better accomplish the task of managing relative prices to foster tradable profitability when is coordinated with other policies. Because non-tradable prices and wages might tend to increase relatively to the price of tradables along the development process, policy coordination may help retard these tendencies, preserving tradable profitability and thus giving this sector time to augment its productivity. In particular, it seems appropriate to conduct exchange rate policy simultaneously with domestic demand management policies that contain non-tradable price inflation and wage management policies that coordinate the pace of wage increases with growth in tradable productivity. Policy coordination might be especially important in the early stages of development, during which the expansion of tradable firms is more sensitive to price incentives.

Macroeconomic policy coordination under a competitive RER strategy represents an alternative to the in-vogue floating cum inflation targeting (FIT) policy framework. Under this framework, central banks follow a mandate that focuses exclusively on inflation and ignores other policy objectives as employment or the RER. To achieve the inflation target, domestic demand management is carried through monetary policy using a reference interest rate as the main instrument. The suitability of this strategy for developing countries has recently been object of controversy. Since in developing countries credit markets are shallow and therefore the sensitivity of aggregate demand to interest movements low, central banks may need to raise interest rates excessively to achieve the inflation target. Inflation is typically reduced but mostly as a result of the appreciation of the exchange rate generated by inflows of capital attracted by the higher interest rate. For this reason, many have argued that this policy framework has a RER appreciation-bias and thus is not development-friendly.[19]

Macroeconomic policy under a competitive RER strategy is more complex precisely because it requires the coordination of several policies. As discussed in section 2, having some room for monetary policy may require the implementation of sterilized foreign interventions and capital account management techniques. Although there are examples of successful implementations, these policies may face difficulties. Sterilization may run in significant quasi-fiscal costs and capital inflows may find ways to circumvent regulations. In any case, financial integration implies that monetary policy is not completely autonomous when exchange rate policy is trying to target a competitive RER. For this reason, the role of fiscal policy in managing aggregate demand is substantially more preponderant than in a FIT framework. In particular, fiscal policy has a contractive-bias under a competitive RER regime, because it has to prevent real appreciation coming from non-tradable price inflation. This aspect has already been highlighted by other authors.[20]

The role of wage management policies in a competitive RER strategy might appear more controversial. The policy prescription that derives from my analysis may result somewhat unappealing, especially to policymakers. It suggest that they should attempt to persuade workers and their leaders that it is in their own benefit to accept real wage increases that do not hurt tradable sector profitability severely. However, if economic development depends on the expansion of the tradable sector as the research surveyed in this paper seems to suggest and if tradable expansion depends to a great extent on its profitability, it seems hard not to conclude that the pace of real wage increases cannot substantially outpace the rate of tradable productivity growth, especially during the early stages of development. The conclusion might have a sour taste in the sense that wage aspirations appear as a threat to the health of the chicken of the golden eggs. However, as the model in the previous sections

[19]See, for instance, the contributions in the volume edited by Epstein and Yeldan (2009).

[20]See, for instance, Eichengreen (2007) and Frenkel (2008).

illustrates, moderation in wage demands during the transition period has a reward: in the development equilibrium real wages and employment are higher. This outcome is welfare-enhancing. This result should not be surprising. In a developed economy, tradable activities can afford substantially higher wages because they are substantially more productive.

Appendix

A Derivation of the $\hat{\omega}_T = 0$ locus

From 22, there would be no tendency towards changes in wages and therefore $\hat{\omega}_T = 0$ (i.e., the labor market would be in "equilibrium") when:

$$\lambda(z)[\frac{\omega}{W/P} - 1] + \frac{(1-\mu)(\gamma+\alpha)(1-\beta)}{\alpha}\hat{K} \quad = \quad 0 \tag{25}$$

We know that $\frac{\partial \omega_T}{\partial K}_{|\hat{K}=0} > 0$, thus to derive the shape of $\hat{\omega}_T = 0$, we need first to obtain that of the $\omega = \frac{W}{P}$ locus. This requires that

$$\frac{\omega}{W/P} \quad = \quad \omega_T^{-\mu} X^{1-\mu}\omega = 1 \tag{26}$$

Equation 14 establishes that X depends positively on K and negatively on ω_T. Equation 18 states that the "bargained" real wage rate is a positive function of the employment rate $l \equiv L_T + L_N$. Equation 4 indicates that L_T increases with K and diminishes with ω_T. Similarly, equations 7 and 14 imply that L_N increases with K and shrinks with ω_T. As a result, the "bargained" real wage varies positively with K and negatively with ω_T; i.e., $\omega_K \equiv {}^{\partial\omega}/_{\partial K} > 0$ and $\omega_{\omega_T} \equiv {}^{\partial\omega}/_{\partial\omega_T} < 0$. Equation 26 can thus be expressed as an implicit function on K, ω_T and the policy variables s_g and i

$$J(\omega_T, K, s_g, z) \quad = \quad \omega_T^{-\mu} X^{1-\mu}\omega - 1 = 0 \tag{27}$$

Given that $X_K > 0$, $X_{\omega_T} < 0$, $\omega_K > 0$ and $\omega_{\omega_T} < 0$, then the $\omega = \frac{W}{P}$ locus is positively sloped in the ω_T-K space

$$\frac{\partial \omega_T}{\partial K}_{|\omega=\frac{W}{P}} = -\frac{(1-\mu)X^{-\mu}\omega X_K + X^{1-\mu}\omega_K}{[-\mu\omega_T^{-1}X^{1-\mu} + (1-\mu)X^{-\mu}X_{\omega_T}]\omega + X^{1-\mu}\omega_{\omega_T}} > 0 \tag{28}$$

Therefore, the $\hat{\omega}_T = 0$ locus is also positively sloped in the ω_T-K space. In the important case of multiple equilibria -whose conditions are derived in appendix B- it is straightforward to see that the $\hat{\omega}_T = 0$ locus lies in between of the $\omega = \frac{W}{P}$ and $\hat{K} = 0$ loci as described in figure 7.

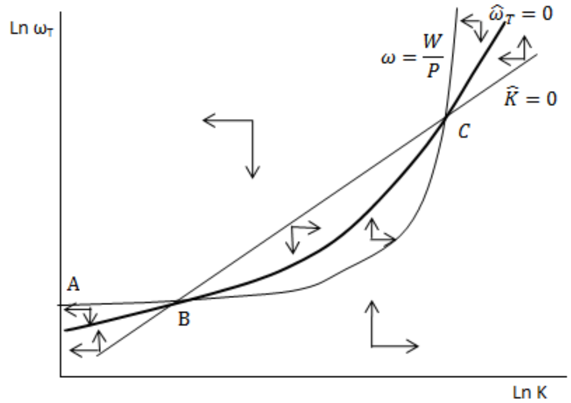

Figure 7: Benchmark phase diagram

B Existence of multiple equilibria

The existence of multiple equilibria occurs when the $\omega = \frac{W}{P}$ and $\hat{K} = 0$ loci intersect more than once. The $\hat{K} = 0$ locus is obtained by setting r defined by equation 16 equal to i. Taking natural logs and differentiating totally yields

$$\frac{d \ln \omega_T}{d \ln K}_{|\hat{K}=0} = \frac{\gamma}{1-\alpha} \tag{29}$$

Equation 29 indicates that the $\hat{K} = 0$ locus is a positively sloped straight line in the $\ln \omega_T$-$\ln K$ space.

A necessary condition for the multiple intersections of the two loci is that the $\omega = \frac{W}{P}$ locus in the $\ln \omega_T$-$\ln K$ space has a lower slope than the $\hat{K} = 0$ locus for some values of K and a higher one for some other set of values of K.

To obtain the slope of the $\omega = \frac{W}{P}$ locus in the $\ln \omega_T$-$\ln K$ space, we need to substitute equations 14 and 18 into expression 26, take natural log to the resulting expression and differentiate it totally. With a little of algebra manipulation this yields

$$\frac{d \ln \omega_T}{d \ln K}_{|\omega=\frac{W}{P}} = (\gamma + \alpha) \frac{(1-\mu)(1-\beta) + \tau \frac{l}{1-l}}{\mu\alpha + (1-\mu)(1-\beta) + \tau \frac{l}{1-l}} \quad > \quad 0 \tag{30}$$

As with expression 28, the one above is also positive. Its value, however, is not constant but critically depends on the evolution of $l/(1-l)$ as K varies. Using equations 4, 7 and 14, it is clear that $l/(1-l) \to \infty$ as $K \to \infty$ and $l/(1-l) \to 0$ as $K \to 0$.

When $K \to \infty$,

$$\frac{d\ln\omega_T}{d\ln K}_{|\omega=\frac{W}{P}} \rightarrow (\gamma+\alpha) \tag{31}$$

The slope of the $\omega = \frac{W}{P}$ locus is greater than that of the $\hat{K} = 0$ locus if only if

$$\gamma + \alpha \quad < \quad 1 \tag{32}$$

When $K \rightarrow 0$

$$\frac{d\ln\omega_T}{d\ln K}_{|\omega=\frac{W}{P}} \rightarrow (\gamma+\alpha)\frac{(1-\mu)(1-\beta)}{\mu\alpha+(1-\mu)(1-\beta)} \tag{33}$$

Given condition 32, the slope of the $\omega = \frac{W}{P}$ locus is lower than that of the $\hat{K} = 0$ locus if

$$\frac{\gamma}{(1-\alpha)} \quad > \quad \frac{(1-\mu)(1-\beta)}{\mu+(1-\mu)(1-\beta)} \tag{34}$$

The existence of multiple equilibria requires condition 32 to hold. This implies that the positive external effects in the production tradables need to be moderate, otherwise the productivity gains arising from learning by doing would be so large that the resulting profitability incentives for capital accumulation would be unbounded. The left-hand side of condition 34 is the slope of the $\hat{K} = 0$ locus (i.e., equation 29). This condition thus implies that for the two loci to intersect at low levels of K, the required reaction of ω_T to changes in K to reach a stationary level of K has to be higher than the rises of ω_T associated to the increases in the price of non-tradables when K expands. Condition 34 is more likely to hold the higher the values of α, β and μ; i.e. the more capital intensive the tradable production, the more elastic the supply of non-tradables and the higher the share of tradables in private consumption. Conditions 32 and 34 are empirically plausible and can both hold simultaneously. Assuming such a case implies that, similarly to Ros and Skott (1998), the two loci intersect twice, none or once when they are tangent one to another.

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