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A REVIEW ON THE RELATIONSHIP BETWEEN REAL EXCHANGE RATE, PRODUCTIVITY, AND GROWTH

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ABSTRACT This article aims to review some of the findings in the literature on the relationship between the real exchange rate, productivity, and growth. A minimal recapitulation of the concepts that are necessary to be able to read through this literature is also provided. The article tries to reflect on studies focusing on various directions within the complicated feedback mechanisms between the real exchange rate, and productivity and growth. The primary intention is to represent the mixed evidence on the relationship provided by the literature and the resulting inconclusiveness, as well as to emphasize certain channels offered previously which are thought to be operating on the backdrop.
JEL: F30, F31, F41, F43
Keywords Real exchange rate, Productivity, Growth, Exchange rate misalignment

ÖZ Bu makale reel döviz kuru, verimlilik ve büyüme arasındaki ilişkiye dair ekonomi yazınındaki bazı bulguları özetlemeye çalışmaktadır. Söz konusu yazını okumak için gerekli kavramların okuyucuya hatırlatılması da amaçlanmaktadır. Makale reel döviz kuru, verimlilik ve büyüme arasındaki karmaşık etkileşim mekanizmalarının çeşitli yönlerine odaklanan çalışmalar hakkında düşündürmeyi denemektedir. Aslî amaç bulguların çeşitliliğini ve bunun sonucu yazında ortaya çıkan uzlaşmazlığı bu özette yansıtmak ve arka planda çalıştığı düşünülen kimi kanallara dikkat çekmektir.
REEL DÖVİZ KURU, VERİMLİLİK VE BÜYÜME İLİŞKİSİ ÜZERİNE BİR DEĞERLENDİRME
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Anahtar Kelimeler Reel döviz kuru, Verimlilik, Büyüme, Döviz kuru uyumsuzluğu

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1. Introduction

This article aims to review some of the findings in the macroeconomics literature on the relationship between productivity, growth, and the real exchange rate. This linkage is of utmost importance, but very complicated. The complexity follows from the fact that the movements in the real exchange rate by definition involve many important variations such as swings in the competitiveness of the economy, the impact of short term shocks such as monetary policy actions, and the variations related to the sectoral distribution of productive inputs like skilled labor. As a result, the theoretical side of the literature is not very rich, at least not on par with the relevance and the popularity of the subject in the world economy and the policy circles.

The empirical strand of the literature seems richer with studies inspecting the relationship and various directions of causality. However, as expected, the findings are various, and not close to offering concluding evidence. The current study tries to remind the reader about the relevant concepts that may be necessary for reading through this literature, and attempts to summarize the findings of certain prominent papers from various strands of the literature on the feedback mechanisms between real exchange rate, productivity, and growth.

2. A Quick Recapitulation of the Relevant Concepts

It may be beneficial to briefly review some of the concepts that are going to be used in the rest of this article.

2.1. Real Exchange Rate

The real exchange rate (RER) between the currencies of two countries is defined as the ratio of the general price levels of the countries converted to the same unit of measure:

$$RER = \frac{P_d}{E_{d/f} P_f}$$

Above, P_d and P_f denote the price levels in the domestic and foreign economy respectively. $E_{d/f}$ stands for the nominal exchange rate defined as the units of domestic currency in terms of one unit of foreign currency. According to the definition above, an increase (decrease) in the RER means

an appreciation (depreciation) in the real exchange rate from the perspective of the domestic economy.

2.2. Law of One Price

The Law of One Price (LOP) states that the price of the same good (say good i) in the domestic and foreign economies will be equalized if there are no barriers to trade and the transportation costs are negligible. Accordingly,

$$P_d^i = E_{d/f} P_f^i$$

2.3. Purchasing Power Parity

Purchasing power parity (PPP) holds if the price level is calculated according to the same basket and the LOP is valid for each underlying good. *Absolute PPP* is a stronger condition that states that the nominal exchange rate between the currencies of any two countries is equal to the ratio of the price levels of each country, regardless of the LOP. According to the absolute PPP, we have that,

$$E_{d/f} = \frac{P_d}{P_f}$$

In other words, RER is equal to one according to the absolute PPP.

The condition that is called the *relative PPP* on the other hand, states that the RER is a constant, but not necessarily equal to one. Therefore, under the relative PPP we have the following relationship:[1]

$$\pi_d - \pi_f - \frac{\Delta E_{d/f}}{E_{d/f}} = 0$$

In other words, under the relative PPP, the changes in the nominal exchange rate will just be as much as the inflation rate differentials between the two countries.

2.4. Tradable and Non-tradable Goods

In actual economies, there are certain goods that cannot be traded either due to their very own nature, or because of external factors such as highly binding barriers to free trade. Let us group the tradable and non-tradable goods under T and N, respectively. Let us further assume that the price index, P, includes the both groups of goods in the form of a Cobb-Douglas function, and the weight of T goods is α:

[1] Obviously this relationship assumes that the inflation rates are low.

$$P^j = \left(P_j^T\right)^{\alpha_j}\left(P_j^N\right)^{1-\alpha_j}, \qquad j = d, f$$

In this case, through basic algebra, one can reach the following definition of the RER in terms of the tradable and the non-tradable goods:

$$RER = \left(\frac{P_d^T}{E_{d/f}P_f^T}\right)\frac{\left(P_d^N/P_d^T\right)^{1-\alpha_d}}{\left(P_f^N/P_f^T\right)^{1-\alpha_f}} \tag{1}$$

As we can observe from the equation above, the real exchange rate depends on the relative price of tradable goods, the domestic relative price of non-tradable goods in each country, and the composition of the consumption basket (α). Any macroeconomic development that impacts on any of the ingredients in the formula above will affect the real exchange rate. Hence, it is virtually impossible for the absolute PPP to hold in reality. Relative PPP on the other hand would hold if the relative price of the tradable goods, domestic relative price of non-tradable goods, and the weight of the each group of goods in each country are all constant.

2.5. Balassa-Samuelson Theorem

Let us assume that the production of the tradable (T) and the non-tradable (N) goods, Y^T and Y^N, takes place under a constant-returns-to-scale, in particular, Cobb- Douglas production function:

$$Y_j^T = A_j^T\left(L_j^T\right)^{\mu}\left(K_j^T\right)^{1-\mu}, \;\; j = d, f$$

$$Y_j^N = A_j^N\left(L_j^N\right)^{\mu}\left(K_j^N\right)^{1-\mu}, \;\; j = d, f$$

Above, A, K, and L denote the total factor productivity, capital, and labor. Under perfect competition, the workers in T and N sectors are paid as much as their marginal productivity:

$$\frac{w_j^i}{P_j^i} = \mu A_j^i\left(\frac{K_j^i}{L_j^i}\right)^{1-\mu}, \;\; j = d, f. i = T, N$$

If the labor is perfectly mobile between sectors, wages in sectors T and N will be equalized. Hence:

$$P_j^T \mu A_j^T\left(\frac{K_j^T}{L_j^T}\right)^{1-\mu} = P_j^N \mu A_j^N\left(\frac{K_j^N}{L_j^N}\right)^{1-\mu}, \;\; j = d, f$$

If we use the definition of the RER in Equation 1 together with the wage-equality equation above, we can reach the equation that summarizes the fundamental implication of the Balassa-Samuelson theorem:

$$RER = \left(\frac{\left[A_d^T \left(\frac{K_d^T}{L_d^T} \right)^{1-\mu} \right] \Big/ \left[A_d^N \left(\frac{K_d^N}{L_d^N} \right)^{1-\mu} \right]}{\left[A_f^T \left(\frac{K_f^T}{L_f^T} \right)^{1-\mu} \right] \Big/ \left[A_f^N \left(\frac{K_f^N}{L_f^N} \right)^{1-\mu} \right]} \right)^{1-\alpha} \quad (2)$$

Above, it is assumed that the LOP is valid for the tradable goods, and the baskets used for the calculation of the price indices are the same. As can be observed from Equation 2, if the productivity of a country in sector T relative to sector N is higher than the other countries, RER will increase. That is, a real appreciation in the exchange rate will take place.[2] We can also observe from Equation 2 that the Balassa-Samuelson effect will get larger the greater is the relative labor intensiveness in sector N.

2.6. Penn Effect

It seems conceivable to claim that the wealthy countries are more productive compared to the less wealthy, underdeveloped countries. Actually, they have become wealthier by being able to generate more value from a given amount of the factors of production. Furthermore, the intrinsic characteristics of many non-tradable goods preclude significant differences in productivity in the production of such goods across countries. Hence, it can be comfortably argued that the productivity differences between countries stem from the productivity differences in the tradable goods sector. Under this argument, the Balassa-Samuelson theorem indicates that price level in high-income countries should be higher than the price level in the lower income countries. This phenomenon is called the "Penn Effect" and its validity can be easily supported using the Penn World Tables database.

Another well-known explanation to the Penn Effect was provided by Kravis and Lipsey (1983) and Bhagwati (1984). Kravis-Lipsey-Bhagwati (KLB) argument rests on the differences in factor endowments across countries. If the high-income countries are considered to be capital-rich, and the low-income countries to be labor-rich, the non-tradable goods (N) sector in the high-income countries will have a higher capital/labor ratio compared to the poor countries. This in turn would cause the marginal productivity of labor in the N sector of the high-income countries to be higher than that of the low-income countries. As a result, given that the prices in the tradable goods sector will be equalized across countries, the general price level will

[2] Another plausible assumption is made at this point, namely, it is assumed that the *T* sector is at least as capital-intensive as the *N* sector.

be higher in rich countries because they have higher prices for the non-tradable goods.[3] In other words, as the capital-intensity of the nations increase, their real exchange rate appreciates according to the KLB view.

3. Impact of Productivity Differences on the Real Exchange Rate

Having been equipped with the relevant concepts, we start our discussion about the relationship between the productivity and the real exchange rate in this section. It seems natural to start with a discussion about the empirical support for the famous Balassa-Samuelson theorem that provides a plausible explanation as to the effect of the productivity of the nations in producing the tradable and the non-tradable goods on the real exchange rate.

3.1. Empirical Support to Balassa-Samuelson Theorem

Validity of the Balassa-Samuelson (BS) theorem is a much probed topic in international economics literature. One of the most prominent papers on this issue is Conzoneri et.al. (1999). The authors show through a graphical analysis that the BS theorem is not capable of explaining short-term movements in the real exchange rate. This finding is not that surprising, because the short-term movements in the real exchange rate are dominated by the variation in the nominal exchange rates which are prone to highly volatile global financial shocks.[4] The real important result of the article was achieved by examining the BS effect in the long-run (20-30 years). The authors find that the theorem lacks empirical support even in this horizon. But a much more important contribution is the finding that the implications of the theorem are not observed because LOP does not hold for the tradable goods. Hence, the BS effect fails to account for the movements in the real exchange rate, although the domestic relative prices of the non-tradable goods in each country move in proportion with the relative productivity of labor across sectors and countries.

Lothian and Taylor (2008) examine the BS effect for the sterling/dollar real exchange rate for even larger time horizons. Their research contributes in favor of the view that the BS model is not very successful in explaining the real exchange rate movements except in the very long run. The authors find that 40 percent of the movements in the real exchange rate are accounted for by the BS effect in a sample of 180 years. The rest is argued

[3] On the contrary to the Balassa-Samuelson theorem, for the KLB argument to be valid it has to be assumed that the wage-equality across N and T sectors is impossible due to significant differences in factor endowments.

[4] With the presumption that prices exhibit some degree of stickiness and cannot react to the shocks as rapidly as the nominal exchange rate.

to be caused by the nominal factors. However, when the BS effect is examined within shorter time horizons ranging from one year to ten years, its impact is much smaller. According to the paper, the BS effect explains only as little as 0.1 percent of the real exchange rate movements in a one year horizon, and reaches its maximum at 9 percent in a seven year horizon.

In line with the findings of Conzoneri et.al. (1999), there seems to be a consensus in the literature that the differences in sectoral productivities do better in accounting for the relative price movements than for the real exchange rate movements. Berka and Devereux (2010) is a recent prominent example in this direction. For a group of European countries, they establish that there are significant deviations from the PPP. Further, they find that the movements in the real exchange rates and the internal relative prices of non-traded goods are highly correlated, again suggesting that the failure of the BS effect can be empirically linked to the failure of PPP. Finally they establish that the Penn effect is valid for their sample.

In another paper that can be regarded as an extension of the one above, Berka, Devereux, and Engel (2014) examine the BS effect for a group of Eurozone countries. Their starting point is the argument that the nominal exchange rate movements hinder a true examination of the BS effect, in the spirit of Conzoneri et.al. (1999). Therefore they opt to work on a sample where nominal exchange rate movements are practically non-existent. A further important innovation put forward by the authors is to include unit labor costs in the analysis in order to control for factors that impact on factor prices other than sectoral productivities and terms of trade differences. They find that the productivity increases in the tradable sector relative to the non-tradable sector is positively related to real exchange rate appreciations, lending significant support to the Balassa-Samuelson theorem.

In a recent paper, Peltonen and Sager (2009) found that the real exchange rate depreciations and productivity gains in the tradable sector go hand in hand for a sample of developing countries, on the contrary to what is anticipated in light of the BS theorem. The authors tie this finding to the pricing behavior of developing countries that aims to attract foreign demand.

3.2. A Demand Side Explanation to Penn Effect: Fiscal Policy and the Real Exchange Rate

As can be observed from the discussion so far, the BS and the KLB views hold that the differences in the price levels of different countries can be predicted without any reference to any specification or development on the demand side of the economy. In this sense, the two views provide a supply-side explanation to the Penn effect. As well, there exist some demand-side

explanations to the Penn effect in the literature. Note that these explanations have no reference to productivity developments, and thus hold that real exchange rates movements may have no story on the backdrop related to productivity. The most important demand-side explanation is linked to the impact of government expenditures on the real exchange rates. The work of Froot and Rogoff (1991) is the pioneering example in this direction. According to the theoretical framework put forward by this article, a continuous fiscal policy action aiming to boost domestic demand will lead to a real exchange rate appreciation by driving up the relative price of non-tradable goods, as long as the central bank is independent and does not monetize fiscal deficits. Froot and Rogoff (1991) also provide empirical support to their theoretical predictions. The findings of some later important papers such as DeGregorio and Wolf (1994), Chinn and Johnston (1996), and Clarida and Prendergast (1999) also point to the conclusion that increases in the weight of fiscal expenditures in the economy lead to real exchange rate appreciations.

In another interesting paper within this strand of the literature, Balvers and Bergstrand (2002) build a theoretical model[5] which they utilize to decompose the impact of fiscal expenditures on the real exchange rate into two parts; the impact through the “resource withdrawal channel”, and the impact through the “consumption-tilting channel”. The former refers to the mechanism in Froot and Rogoff (1991), namely the argument that an increase in the government expenditures translates into a negative supply shock on the non-tradable goods. The latter is related to the complementarity of government expenditures with private consumption. The authors find that both channels contribute equally to the positive relationship between government expenditures and the real exchange rate.[6]

4. Overvaluation and Undervalution

As discussed above, it is impossible that the absolute PPP is valid, in other words it is impossible that the real exchange rate is equal to one for every country at all times. Relative PPP on the other hand maintains that the real exchange rate is constant but does not tell anything about its level. Edwards (1988) and Williamson (1990) define the equilibrium real

[5] The authors mention that their model is inspired by Frenkel and Razin’s (1996) book, "Fiscal Policies and Growth in the World Economy".

[6] Another demand-side explanation is given by Fischer (2004) through articulation of an investment demand channel. According to this paper, a productivity increase in the tradable goods or the non-tradable goods sector leads to an increase in the investment demand in the economy, driving the overall price level up. The author argues that this channel is relevant in explaining the real exchange rate appreciations experienced by the transition economies together with the traditional BS channel.

exchange rate (ERER) as the level of the real exchange rate at which the economy attains its internal and external equilibria simultaneously. In other words, ERER is regarded as the value of the real exchange rate, at which both the tradable and the non-tradable goods sectors clear today and in the future, and the intertemporal budget constraint of the economy is balanced.

According to Edwards (1988), ERER is influenced by many factors such as global shocks, productivity developments, the degree of bindingness of the barriers to trade, and the tax policies and other fiscal policies, and thus varies through time. The deviation of RER from ERER is called the "exchange rate misalignment (ERM)" in the literature. In empirical studies, there are a few prominent methods that have been used to measure the ERM.[7]

One measure of ERM is the deviations from the Behavioral Equilibrium Exchange Rate (BEER), which was first devised by Clark and McDonald (1997). BEER can be regarded as the real exchange rate that enables the relative prices to be consistent with the economic fundamentals. A short-cut that is thought to more or less approximate the deviations from BEER is to use the deviations of RER from its long-term average, or filtered values. Nevertheless, this is hardly justified given the short-sample related problems, as well as more general problems related to filtering and other conceptual issues. Hence, more vigorous studies strive to check whether the internal and external relative prices are consistent with a benchmark level of current account, starting from the definition of RER given in Equation 1. As can be observed from Equation 1, the changes in the real exchange rate is the sum of the changes in the terms of trade (tot) and the changes in the *relative internal exchange rate (rier)*, which is defined as the domestic relative price between tradable and non-tradable goods relative to the foreign country. The current account (ca) by definition is the sum of the trade balance (tb) and the interest (i) income from the net foreign assets (nfa). The trade balance can be regarded as a function of tot.

$$ca = tb(tot) + i.nfa$$

One can solve for tot from above and use it in Equation 1 to reach the following equation:

$$BEER = tb^{-1}(\overline{ca} - i.nfa) + (1 - \alpha).rier$$

Above, $\overline{ca}$ is a reference level of the current account. In practice, BEER is estimated econometrically using the variables that represent the equation above.

[7] Salto and Turrini (2010) provide a decent summary of the literature on this issue.

Another method that is as common as the BEER approach is the PPP based ERM criterion popularized by Dani Rodrik (Rodrik, 2008). Under this method, which is called the PPP approach, the nominal exchange rates ($XRAT$) and the PPP conversion rates (PPP) from the Penn World Tables (PWT) are used to calculate the real exchange rate for each country i at each time period t:[8]

$$lnRER_{it} = ln(XRAT_{it}/PPP_{it})$$

Taking into account the observation that non-tradable goods prices are lower in low-income countries in line with the BS theorem, Rodrik undertakes a correction via the regression below:

$$lnRER_{it} = \alpha + \beta lnRGDPCH_{it} + f_t + u_{it}$$

Above, $RGDPCH$ is the per-capita GDP from PWT, f_t is the time fixed effect, and u_{it} is the error term. In the final step, the fitted values from the above regression are used to calculate the undervaluation index as below:

$$lnUNDERVAL_{it} = lnRER_{it} - \widehat{lnRER}_{it}$$

An index value lower than one indicates an overvaluation of the exchange rate.[9]

5. The Impact of Real Exchange Rate Misalignment on Productivity and Growth

In terms of the causality running from productivity to the real exchange rate, the mechanism implied by the BS theorem provides theoretical framework. For the opposite direction of causality, that is, for the direction of the impact of the real exchange rate on productivity, there does not exist a consensus in the theoretical side of the international economics literature. Nevertheless, there exist an ample number of empirical studies on this issue, with a variety of findings. In general, exchange rate misalignments, be it overvaluation or undervaluation, are regarded to be harmful to growth. But there are also other studies that find all kinds of relationships between such a misalignment and productivity, and thus growth. All in all, although the empirical studies are far from reaching a convincing agreement, certain suggestions that they make about the channels through which exchange rate misalignments could affect growth are noteworthy.

[8] Rodrik's definition is inverse of the real exchange rate definition in this note. In other words, a RER bigger than one means that the exchange rate is undervalued relative to PPP.

[9] Another widely used method is the Fundamental Equilibrium Exchange Rate (FEER) approach introduced by Williamson (1994). FEER can be regarded as the value of the exchange rate that is needed for the current account/GDP ratio to approach its equilibrium value.

5.1. On the Negative Impact of Undervaluation on Growth

The view that real exchange rate undervaluation can harm growth can be traced back to Porter (1990). Porter argued that real exchange rate overvaluation provides opportunities for the industries to renew themselves and increase their competitiveness. Porter does not suggest that countries should deliberately pursue strong-currency policies. Instead, he argues that it can be harmful for countries if they insistently try to keep their currencies weak.

In his widely cited article, Harris (2001) improved upon Porter's ideas and examined their validity. In particular, his article inspects whether the undervaluation in the Canadian dollar played a role in the backwardness of the Canadian productivity gains compared to the US economy in the 1990s. Harris offers three mechanisms that can support this kind of causality in the real exchange rate-productivity relationship. First mechanism is labeled as the *Relative Factor-Cost Hypothesis (RFCH)*. According to RFCH, significant losses in total factor productivity could take place because the undervaluation in the real exchange rate drives up the prices of all imported inputs including the ones that are particularly potent of bringing about investment-specific technological progress. Harris claims that investment on machine and equipment per hours worked in Canadian manufacturing sector is significantly below the corresponding figure for the US economy. Given that 80 percent of such goods are imported, and considering that a big portion of those imports is from the US, the low performance of Canada in investment on machinery and equipment can be linked to the depreciations in its real exchange rate.

The second mechanism put forward by Harris (2001) is called the *Innovation Gap Hypothesis (IGH)*. Harris first cites earlier work in the literature to argue that Canada lags behind the US in producing innovations and technology, and not surprisingly the productivity differences between the two countries root from the productivity differences in sectors that are characterized by a significant amount of high-tech content. Harris proposes three channels through which real depreciations can contribute to this weakness of the Canadian economy. Firstly, the cost channel can play a role as Canada is an importer of technological inputs that are ingredients to most of the innovation creating activities. The second channel is related to the human capital flight. The depreciation of the Canadian dollar can diminish the US dollar converted salaries of the workers in domestic high-tech firms, leading to a brain drain in favor of the US economy. This not only can cause the innovations that could potentially have taken place in Canada to happen in the US, but also makes the technology transfer from the US to Canada

harder. The third channel that Harris (2001) offers by which the real depreciation can negatively influence the innovation performance relies on the endogenous growth model laid out by Saint-Paul (1993). According to this model, the firms make a choice between increases in productivity and increases in output. If a continuous occurrence of real exchange rate depreciations each of which are deemed transitory takes place, then firms can opt for output increasing activities more and downplay productivity increasing activities such as research and development.

The undervaluation of the real exchange rate can influence productivity negatively also by a third mechanism that Harris (2001) calls the *Slowdown in Creative Destruction (SCD)*. According to the "creative destruction" concept that is traced to Joseph Schumpeter, the old, outdated, and unproductive structures are replaced by the new ones through innovation and discovery, enabling sustained development and growth in the economy. Harris argues that this kind of a creative destruction can be slowed down by real exchange rate depreciations. For this argument one has to presume that the creative destruction in Canada is done mostly by small size firms, with significant cash-flow constraints. According to SCD hypothesis, such a decrease in the pace of creative destruction can happen through three channels. First, the depreciation of the real exchange rate can impede the entry of new and creative firms by raising the fixed entry costs through more expensive imported inputs. The depreciation can also increase profitability of the incumbent, lower-productivity firms in the tradable sector by raising the domestic relative price of the goods that they produce. This way, SCD hypothesis may become a reality. Second, the higher profitability in the tradable goods sector following the real exchange rate depreciations can cause marginal firms to enter the industries with easy-entry, pulling down the overall productivity in the sector. The last effect relies on the Stolper-Samuelson theorem, according to which an increase in the relative price of a good leads to an increase in the relative price of the factor that is used more intensively in its production. Accordingly, given that tradable goods are more human-capital intensive and call for better entrepreneurship activity, an undervaluation in the real exchange rate puts an extra pressure on the upside on the returns to such activities making it harder for the creative destruction to keep pace.

In the same article Harris performs a panel data econometric analysis and reaches the conclusion that an undervalued currency can bring about productivity increases in the short-run. However, he finds that in the long-run, possibly through the workings of the mechanisms above at the backdrop, undervaluation harms productivity gains.

In line with the work of Harris, Guillaumont-Jeanneney and Hua (2011) found that the real exchange rate appreciation China experienced after 1994 contributed positively to labor productivity growth. In addition to the "brain drain" and the "creative destruction" channels proposed by Harris (2001), the authors suggest an additional reason as to why real exchange rate overvaluation can boost productivity. The argument follows from the fact that real appreciations raise the domestic relative price of non-tradable goods, driving up the real wages of the workers in terms of tradable goods. According to the *X-efficiency* argument put forward by Leibenstein (1966), an increase in wages can raise workers' efficiency if the wages are below a certain threshold. Such a mechanism was at play in China according to Guillaumont-Jeanneney and Hua.

5.2. On the Positive Impact of Undervaluation on Growth

The literature on the positive impact of undervaluation on productivity growth is more popular than the literature that argues for the opposite direction. The underlying reason may be the bad reputation that overvaluation has, which is not based on a solid theoretical background, but rather originates from the individual country experiences on balance of payment and currency crises that are thought to be triggered in part by the overvaluation and the resulting loss in competitiveness.

One of the most prominent articles within this strand of the literature is Rodrik (2008), which finds that undervaluation affects growth positively, and this effect is bigger for low income countries.[10] The positive impact of undervaluation on growth takes place through an increased weight of tradable goods sector in the economy, which Rodrik thinks can be based on two theories. According to the first, the tradable goods sector is more prone to institutional weaknesses[11] that the economy has. In other words, weak institutional structure acts as a tax on the tradable goods sector. The second theory holds that market failures such as knowledge and coordination externalities, wage premium, frictions in the credit market are more prevalent in the tradable goods sector. Under both theories, depreciation in the real exchange rate plays the role of a second-best mechanism by increasing the relative price of tradable goods, boosting growth by attracting more investment in this sector, and facilitating structural transformation. Rodrik finds that the positive impact of undervaluation on growth is bigger

[10] In a later study, Rapetti et.al. (2012) repeat Rodrik's exercise for country sub-groups with respect to income to find that the positive relationship between undervaluation and growth is only valid for lowest and highest income groups, and not for middle-income group.

[11] According to Rodrik, among these weaknesses are problems related to contract enforceability, protection of property rights, and corruption.

in countries with relatively weak institutions, which he regards as a finding in favor of the first theorem.[12]

Another study that supports a positive relationship between undervaluation and growth is Levy-Yeyati and Sturzenegger (2007). According to this article, the positive impact of undervaluation policies on growth does not occur through new-mercantilist arguments like the protection of domestic industries, import substitution, or export booms. Rather, the impact operates through increasing savings and capital accumulation. In their sample, the authors found that the saving rate increases by 5 percentage points, and investment ratio increases by 2.5 percentage points when the reserves/M2 ratio doubles. The authors argue that the underlying mechanism is related to the Stolper-Samuelson theorem in that the labor costs are decreased by the depreciation in the real exchange rate and the firms under financial constraints channel the resulting funds on savings and investment. The article also questions whether the positive impact of depreciation is undone by a balance sheet effect on the opposite direction, given that dollarization is widespread in developing economies. Their response is that undervaluation policies are mostly pursued in countries where dollarization is insignificant.

Eichengreen (2007) argues that the undervaluation in the real exchange rate would support a shift to the manufacturing sector by driving up the prices of tradable goods. Assuming that this sector is characterized by a higher productivity, the economy-wide productivity would increase and growth can be positively influenced by real exchange rate deprecations. Besides, the author criticizes the literature by claiming that the efforts put in documenting the real exchange rate-growth relationship are much greater than the efforts toward discussing, clarifying, and inspecting the underlying channels. Eichengreen offers two channels by which exchange rate misalignment can affect growth. First, the political pressures and the lobbying power of certain sectors on influencing policy makers bring about undue policy actions causing the real exchange rate to deviate from its fundamental value. For example, if the non-tradable goods sectors have more influence on policy makers, the real exchange rate may become overvalued, affecting the growth negatively.[13] The second channel articulated by Eichengreen is that certain positive externalities like learning

[12] Woodford (2009) provides a serious criticism to Rodrik (2008) through solid arguments that certainly need to be addressed. The author argues that the relationship between undervaluation and growth is overstated in Rodrik (2008) because of the lack of robustness of the methodology as well as structural and conceptual problems. He further claims that even if one accepts such a relationship, the arguments about causality are unsatisfactory.

[13] In my opinion, this channel rather answers the question of why real exchange rate becomes misaligned.

and demonstration are more prevalent and effective in export oriented sectors. As resources will not be allocated to activities that are beneficial but external to the firms, growth can be increased by keeping the exchange rate undervalued.

6. Conclusion and Discussion

It may be beneficial to conclude this short review article by drawing attention to the important remarks made by Eichengreen (2007). The fundamental determinants of growth are education, saving and investment, and the institutional capacity that can facilitate the creation and absorption of organizational and technological knowledge. Keeping real exchange rate at a competitive and a stable level can at best be regarded as a facilitating factor in achieving the necessary improvements in the fundamental determinants of growth.

Further, the policy makers should keep in mind both the pros and cons of a weak and a strong currency. It may be important to remind that the findings in the literature are inconclusive in this area, and many ramifications of each policy may involve channels which are not articulated as of yet or not fully formalized. It would undoubtedly be more beneficial if policy makers focus on structural reforms that aim to improve upon the fundamental determinants of sustained productivity increases and growth.

The relative position of the country on the sectoral productivity levels vis a vis the rest of the world on the other hand is important, in order to judge in a more healthy manner the misalignment in the real exchange rate. In other words, it may be beneficial to sort out the role of policy actions, the impact of fundamentals, and the role of financial shocks in better assessing the level of the real exchange rate and the articulation of the necessary policy stance accordingly.

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