

The Real Exchange Rate and Economic Growth¹
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Traditionally, the real exchange rate has not been at the center of analyses of economic growth. It featured not at all in the first generation of neoclassical growth models (starting with Solow 1957) or in their practical policy incarnations (e.g. Rostow 1960), which focused on the determinants of savings and investment. That these were closed-economy models dictated that there was no role for the real exchange rate, defined as the ratio of the relative prices of nontraded goods (all goods being nontraded in closed economies). Applications of the early neoclassical model having focused attention on the “residual” (or the large fraction of output growth not explained by the growth of observable factor inputs), subsequent treatments considered the “capability” of societies to raise the productivity of those inputs, in turn directing attention to domestic institutions (see e.g. Abramovitz 1986). Institutions being deeply embedded, it is not obvious that they are shaped by exchange rate policy, especially in the short run. The most recent generation of neoclassical growth models (reviewed in Romer 1994) can be thought of as putting flesh on these analytical bones. They consider, inter alia, the system of property rights (e.g. patent and copyright protection), the intensity of competition (e.g. the presence or absence of entry barriers), and the extent and nature of education and training as factors shaping the incentive and ability to innovate and emulate, from the theoretical point of view as a way of “endogenizing” technical change. Again it is not obvious that the real exchange rate is of first-order importance for the development of these arrangements.

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But other narratives give the real exchange rate more prominence. The literature on export-led growth is essentially about the advantages of keeping the prices of exportables high enough to make it attractive to shift resources into their production.² Historically this has meant the growth of the production for export of light manufactures.³ Using the real exchange rate to provide an incentive to shift resources into manufacturing provides a boost to national income insofar as there are conditions making for higher productivity in manufacturing than in agriculture.⁴ This process can continue for a considerable period without encountering diminishing returns like those experienced in agriculture as cultivation is expanded onto the extensive margin. It can continue without driving down prices insofar as external demand is elastic, unlike the situation with nontradables, where demand is purely domestic and therefore relatively inelastic. It thus allows the structure of production to be disconnected from the structure of consumption.⁵ If higher incomes and faster growth support higher savings, then it will become possible to finance higher levels of investment out of domestic resources. If learning-by-doing or technology transfer is relatively rapid in

² See e.g. Krueger (1998) for discussion.

³ Light manufactures at the early stages of development – subsequently export promotion may involve the production of a wider range of manufactured goods. India’s experience has raised the question of whether the pattern identified by Simon Kuznets (1966) – that modern economic growth involves first the movement of resources from agriculture to manufacturing and only subsequently to the service sector – may now be changing as countries jump directly from agriculture to services without prior growth of the manufacturing sector. In fact, any such tendency does not challenge the argument in the text insofar as the services in question are exported (as in the case of the offshored customer-service and back-office services that are so prominent in the Indian case). In particular the implications for policy – keep the exchange rate at competitive levels to stimulate the growth of the relevant exporting sectors – remain precisely unchanged. In any case, it is not clear that countries are able to short-circuit the traditional sequence and move directly to services. Even India has been able to create only limited amounts of high-productivity modern-sector employment in this way. Students of its experience suggest that sustaining economic growth will require it to remove the obstacles to the development of an export-oriented manufacturing sectors, just as in previous developing countries that have sustained growth for significant periods. See e.g. Kochhar et al. (2007).

⁴ These conditions are referred to as “domestic distortions” in the more theoretical literature.

⁵ Thus the (empirically-informed) literature on export-led growth differs from the first generation of (theoretically-informed) growth models not just by the openness of the economy but also in distinguishing two sectors (producing traded and nontraded goods, respectively) and positing a role for demand as well as supply conditions in stimulating and sustaining growth. It also tends to admit of a role for cumulative causation, as I discuss next.

sectors producing for export, then there will be additional stimulus to the overall rate of growth.⁶ That first Japan, then Hong Kong, Singapore, South Korea and Taiwan, and now China have had success with this model has directed attention to the real exchange rate as a development-relevant policy tool.⁷ Indeed, it is hard to think of many developing countries that have sustained growth accelerations in the presence of an overvalued rate.⁸ The so-called Bretton Woods II model of the world economy is essentially a story about the external consequences of the adoption of a competitive real exchange rate as a growth strategy by developing countries.⁹

But the controversy surrounding this model suggests that there may costs as well as benefits of keeping the real exchange rate low, especially if the authorities stick with the policy for too long. Sticking with the policy may fan tensions with other countries.¹⁰ It may entail the accumulation of large amounts of relatively low-yielding foreign exchange reserves, using national resources that are devoted to other purposes.¹¹ It may mean that the adjustment ultimately comes about via a costly and financially-disruptive inflation. This suggests that countries seeking to use a competitive exchange rate to jump-start growth also need to develop an exit strategy to avoid to avoid getting locked into a strategy that has outlived its usefulness.¹²

Other narratives focus not on the level of the real exchange rate but on its volatility. This literature seeks to establish that exchange rate volatility discourages trade and

⁶ There will be more discussion of these mechanisms below.

⁷ Similarly, the slower growth experienced by most of Latin America and the Caribbean over the same decades has directed attention to the propensity toward real exchange rate overvaluation in the region (see e.g. Sachs 1985, Edwards 1989).

⁸ In a statistical analysis of such episodes, Hausmann, Pritchett, and Rodrik (2004) show that growth accelerations, as they measure them, tend to be associated with real depreciations.

⁹ And about its implications for global imbalances: see Dooley, Folkerts-Landau and Garber (2003).

¹⁰ As is currently the case between China and the United States.

¹¹ Including consumption translating into higher living standards for residents.

¹² I have more to say about this in Section 4 below.

investment, which are important for growth. The literature on balance-sheet mismatches and financial fragility shows that sudden drops in the exchange rate can have disruptive financial consequences. In particular, currency crises (essentially episodes when there is a sharp increase in exchange rate volatility, which are measured in practice as a weighted average of exchange rate changes and reserves changes, with stress on the former) can have significant costs in terms of growth foregone.

That said, the idea that minimizing exchange rate volatility is an essential part of the growth recipe is disputed. The evidence linking exchange rate volatility to exports and investment is less than definitive. The implications of volatility for financial stability and growth will depend on the presence or absence of the relevant hedging markets – and on the depth and development of the financial sector generally.¹³ There is some evidence that these markets develop faster when the currency is allowed to fluctuate and that banks and firms are more likely to take precautions, hedging themselves against volatility, than when the authorities seek to minimize volatility.¹⁴ And some studies of currency crises conclude that these cause only temporary and transient disruptions to growth.¹⁵

The remainder of this paper evaluates what we know about the real exchange rate and economic growth. My reading of the evidence (both previous evidence and the new analysis presented in Appendix 1) is that the real exchange rate matters. Keeping it at competitive

¹³ The importance of financial development for the connections between volatility and growth is a message of Aghion et al. (2006), whose results are considered further in Section 2 below.

¹⁴ This is evident for example in the accelerating development of these markets and instruments following the Asian crisis. See Hohensee and Lee (2004). More generally, Duttagupta, Fernandez and Karasadag (2004) show that countries with more variable exchange rates tend to have more liquid foreign exchange markets, since it is their that banks and firms have an incentive to participate. To be sure, there are limits to this argument that price variability is conducive to the development of hedging markets and instruments: high levels of volatility will be subversive to financial development, including even the development of hedging markets and instruments, insofar as it induces capital flight and leads the authorities to resort to policies of financial repression.

¹⁵ See e.g. Calvo, Izquierdo and Talvi (2006).

levels and avoiding excessive volatility are important for growth. That said, the statistical evidence is not overwhelming. But this fact, in and of itself, conveys an important message. A stable and competitive real exchange rate should be thought of a facilitating condition. Keeping it at appropriate levels and avoiding excessive volatility enable a country to exploit its capacity for growth and development – to capitalize on a disciplined labor force, a high savings rate, or its status as attractions as a destination for foreign investment. Absent these fundamentals, policy toward the real exchange rate will accomplish nothing. In addition, there is the earlier point that a relatively undervalued real exchange rate can have costs as well as benefits and that the cost/benefit ratio will tend to rise with the general level of economic and financial development. For both reasons it is not surprising that analyses of the correlation between growth and the level or volatility of the real exchange rate produce a variety of statistical results.

1. Is the Real Exchange Rate a Policy Variable?

Before analyzing the implications of the real exchange rate for growth, it is necessary to address a prior question, namely whether the real exchange rate is a policy variable. The real exchange rate is the relative price of nontraded goods. Except in planned economies, relative prices are not controlled by policy makers directly. Rather, they are the outcome of other policies and processes influencing supply and demand.

What policies and processes? Since the world price of traded goods P_T is fixed from the point of view of a small open economy, it can be normalized to unity and the real exchange rate R can be expressed as the nominal exchange rate relative to the price of nontradables ($R = P_N/e$). The tendency for the prices of nontraded goods to move more

sluggishly than exchange rates, except in high-inflation economies, has been well known since at least Dornbusch (1976). Thus, monetary policy shifts and other disturbances that are felt mainly as shocks to financial markets will add to the volatility of the nominal exchange rate and thereby to the real exchange rate. With time, of course, inflation will react, and the prices of nontraded goods will adjust. The implication is that monetary policy cannot be used to sustain a particular real exchange rate, other than that dictated by the fundamentals, in the long run. Of course, remembering Keynes' famous dictum, policies that affect the real exchange rate even in the intermediate run may be enough to have a significant imprint on growth.¹⁶ And, in any case, repeated unpredictable shifts in the stance of monetary policy may result in instability in the real exchange rate to the detriment of investment, trade and growth.¹⁷

Fiscal policy is likely to have a more sustained impact. Consider first the case where the exchange rate is pegged (or heavily managed). Increased public spending (or increased private spending in the case where the fiscal expansion takes the form of tax cuts) falls partly on traded goods, whose prices are given, and partly on nontraded goods, whose prices consequently tend to rise. The pressure of public spending can therefore cause the real exchange rate to become overvalued. It will shift resources into the production of nontraded goods. Relatively restrictive fiscal policy thus tends to be part and parcel with the

¹⁶ This is a way of understanding the preoccupation in developing countries with the impact of capital inflows on the real exchange rate, competitiveness and growth. To the extent that monetary policy is unaffected by capital inflows and growth is unaffected by monetary policy, the capital-inflows problem disappears. But, in practice, the ability of central banks to effectively sterilize capital inflows is limited. Hence, inflows will put upward pressure on the nominal and real exchange rates, with adverse implications for growth in the intermediate run. This is why some authors (viz. Rodrik 2006) advocate the selective use of capital controls to limit inflows and why some countries have experimented with the policy.

¹⁷ That greater volatility of the nominal exchange rate is associated with greater volatility of the real exchange rate was one of the famous findings of Mussa (1986), confirmed by a long list of subsequent studies. Of course, whether the volatility of the nominal rate also has first-order implications for trade, investment and growth is disputed, as made evident by subsequent research (an influential early statement of the point being Baxter and Stockman 1988).

maintenance of a competitive real exchange rate and encouragement of export-led growth. This is an implication of basic models of the two-sector open economy.¹⁸

How restrictive depends on how much pressure is placed on the market for nontraded goods by other forms of spending. If household and corporate savings are high, as in China, then the government can undertake additional spending without placing undue pressure on the prices of nontraded goods. If investment spending is relatively weak, as it has been in much of Asia since the crisis in 1997-8, then a given level of public spending will be associated with a more competitive real exchange rate. We see here how it is that Asian countries experienced substantial real exchange rate depreciation following their crises despite the fact that fiscal policy did not become strongly contractionary except for a short period (see Figure 1, Panel A). Similarly, the weakness of private demand explains how Argentina could have experienced a sustained real depreciation following the crisis of 2001-2 (see Figure 1, Panel B). The (relative) weakness of investment spending is also presumably how India has been able to maintain a competitive real exchange rate since the 1990s despite running substantial budget deficits.¹⁹

This framework can be extended in various directions.²⁰ But it suffices for analyzing a number of cases of contemporary and historical interest. For example, consider China, its strategy of export-led growth, and its current account surplus. A competitive real exchange rate is at the heart of the authorities' development strategy (see Figure 2, Panel A). In conjunction with the priority they attach to creating employment opportunities for the

¹⁸ See inter alia Dornbusch (1980).

¹⁹ By implication, reforms that boost investment will require the authorities to modify the prevailing real exchange rate policy – absent tax reforms and other developments leading to the endogenous strengthening of the fiscal accounts.

²⁰ See e.g. Edwards (1989).

roughly ten million individuals migrating from the countryside to the cities each year, this explains their reluctance to allow the exchange rate to rise.

Imagine now that the Chinese authorities are prepared to allow the real exchange rate to rise in order to limit the growth of net exports and to address the problem of global imbalances but that they also wish to avoid a slowdown in employment growth. Blanchard and Giavazzi (2006) describe the appropriate policy adjustments. First, a tighter monetary policy would cause the nominal exchange rate to appreciate faster.²¹ Second, increased public spending would support employment growth.²² Third, the liberalization and development of financial markets would encourage additional private spending.²³ Demand would remain the same overall, but its composition would shift toward nontraded goods. We see here how different policy mixes can produce different real exchange rates, subject to the influence of other conditions.²⁴

Or consider Korea in the 1960s. Before 1964 the real exchange rate was kept at a relatively high level. The pressure of public spending was strong, as the Park regime sought to buy support following student demonstrations that had overthrown a previous government in 1960, and the capacity of the economy to supply goods and services was still limited, reflecting lingering disruptions from the end of the Japanese occupation and the Korean War. The tendency for the excess demand for traded goods to create an unsustainable external

²¹ In the Chinese context, this would mean not only higher rediscount rates at the People's Bank of China and tighter credit ceilings on bank lending but also less intervention in the foreign exchange market and therefore slowing reserve accumulation.

²² The effects of slower export growth would be offset by the government's additional demand for nontraded goods, "services" for short.

²³ The notion that high savings rates are partly a consequence of financial underdevelopment that prevents households from borrowing against higher future incomes and using financial markets to insure against risk – and therefore that financial development would lower savings – is not uncontroversial. A systematic analysis of the evidence, with some support for the hypothesis, is Chinn and Ito (2005).

²⁴ That the Chinese authorities hesitate to go down this road reflects their judgment that the consequences for growth are more favorable when incremental employment is in traded manufactures rather than nontraded services – or perhaps simply their reluctance to tamper with success..

deficit was contained by a system of multiple exchange rates, which acted as de facto taxes on imported goods. Since Lerner it has been understood that import taxes are equivalent to export taxes; they discourage the allocation of resources to the production of exportables.²⁵ So it was in Korea.

An increase in export incentives starting in 1958 led to significant depreciation of the real exchange rate, but this change in relative prices was quickly eroded by inflation.²⁶ By 1964 it had become clear that U.S. aid was winding down and that it would be necessary to find other ways of financing essential imports and sustaining employment growth. In May of that year the country's multiple exchange rates were unified at a level that constituted a significant devaluation. In 1965 exporters were given priority in securing import licenses. And this time the authorities undertook a significant fiscal consolidation: the ratio of general government revenue to expenditure rose from 0.91 in 1963 to 0.99 in 1964, 1.13 in 1965 and 1.24 in 1966.²⁷ This time the real depreciation was not eroded by inflation as it had been in the late 1950s.

Rodrik (1993) observes that real depreciation in 1957-9 was in fact slightly larger than in 1962-4 and questions on these grounds whether the 1962-64 change in relative prices can explain the economy's subsequent growth spurt.²⁸ What this observation overlooks is that, as just noted, the real depreciation of 1957-9 was temporary – it was eroded by inflation, returning relative prices to earlier levels – whereas the real depreciation of 1962-4 was enduring – the real exchange rate stayed at its new level. If the level of the real exchange

²⁵ This equivalence is known as the Lerner Symmetry Theorem.

²⁶ Reflecting the aforementioned policies of the Park Government and its predecessors.

²⁷ From where it continued to rise. Kim and Romer (1981), p.54.

²⁸ As in many of the empirical studies that follow, he measures the real exchange rate as the effective price of exports relative to the domestic price level. Rodrik also questions whether an observed real depreciation of 20 per cent was large enough to stimulate significant export growth, given low estimated contemporary export supply elasticities. On the other hand, subsequent research has suggested that contemporary estimates of export supply elasticities tended to be biased downward.

rate has to endure in order to have a sustained effect on export supply, then there is no inconsistency between the fact that the real exchange rate was temporarily depreciated in 1957-59 but no surge in export supply occurred on this earlier occasion.

The valid aspect of Rodrik's critique is that Korean development depended on more than just the level of the real exchange rate. There is no disputing this point: it reflected, among other things, high levels of human capital, proximity to a rapidly growing Japanese economy, and the Park Government's preoccupation with stimulating industrial growth. One can make similar observations about China today, where a variety of factors besides export orientation (a disciplined labor force, large inflows of foreign direct investment, and a Korea-like preoccupation with growth on the part of officials) have surely contributed to the economy's sterling performance. This suggests thinking about the real exchange rate as a facilitating condition: it cannot sustain economic growth in and of itself, but appropriate real exchange rate policy can be an important enabling condition for a country seeking to capitalize on opportunities for growth.

These examples also remind us that the real exchange rate is a relative price and that, as such, it is not under direct control of the authorities. But it can be influenced by policy. For those who believe that the most effective way of jump-starting growth is by encouraging the growth of light manufacturing, much of whose output must be exported initially, it is a useful summary indicator of the growth-friendly or unfriendly stance of economic policy. In addition, the Korean case reminds us that it is not just the level of the exchange rate but also the maintenance of that level -- Korea specialists like Frank et al. 1975 would say the stability of the rate -- that matters for growth.

2. Maintaining Stability

The counter to these arguments is that markets know better than governments and that the role for policy should be limited to fostering an environment of stability, including exchange rate stability. The authorities should prioritize stable monetary and fiscal policies. They should intervene in the foreign exchange market as needed to prevent spikes (excessive volatility) in the nominal and hence the real exchange rate, but they should not attempt to influence its level.

This presumption that the role for policy is to create an environment of stability is inspired by popular interpretation of two sorts of episodes. First, the slowing of global growth that accompanied the breakdown of the exchange rate stability in the 1930s and again in the 1970s. Second, the high levels of exchange rate volatility typically accompanying country-specific growth collapses.²⁹ The problem is that there are other plausible candidates for explaining the productivity slowdown of the 1970s and the collapse of the Bretton Woods System that imply no causal connection between the first two factors.³⁰ And reverse causality may also be present: even if there is a connection between growth collapses and exchange rate volatility, it may reflect causality running from the former to the latter.

In fact, evidence of the link from exchange rate volatility to growth is less than definitive. While Ghosh et al. (1997) found no relationship between observed exchange rate variability and economic growth for a sample of 136 countries over the period 1960-1989, Bailliu et al. (2001) reported a positive association between the degree of exchange rate flexibility and economic growth. That this association is positive rather than negative leads one to suspect that this result reflects the influence of other factors correlated with both

²⁹ Periods when growth decelerates significantly and ultimately turns negative, as in Hausmann, Rodriguez and Wagner (2006).

³⁰ Declining scope for catch-up growth, for example.

exchange rate flexibility and growth: political stability, institutional strength, financial market development, for example.³¹ A further problem with much of this literature is that it focuses on the nominal rather than the real exchange rate. Dollar (1992) does report evidence of a negative OLS relationship between real exchange rate variability and growth in a sample of 95 developing countries covering the period 1976-85.³² Using different measures and country samples, Bosworth et al. (1995) and Hausmann et al. (1995) report similar results. Belke and Kaas (2004) find the same thing focusing on employment growth, the Central and Eastern European transition economies, and a subsequent period. But two other studies exploring the relationship between real exchange rate variability and growth in different developing country samples (Ghura and Grennes 1993 and Bleaney and Greenaway 2001) find little evidence of a relationship. Potential explanations include different country samples, different periods, different controls, different ways of measuring the real exchange rate, and different degrees of omitted-variables and simultaneity bias. But if contributions this large literature have something in common, it is that few results are consistent across studies and that the causality issue is rarely addressed systematically, there being few convincing instruments for exchange rate variability.

Further light on why the previous literature has been less than conclusive is shed by the scatter plots in Figure 3-4. The figures juxtapose growth with three measures of real exchange rate volatility: the standard deviation of the first difference of the log of the effective exchange rate (Volatility 1), the standard deviation of the absolute value of the first difference of logs (Volatility 2), and the absolute value of the percentage change of the

³¹ Some of the authors' further results point in this same direction.

³² Rodriguez and Rodrik (1999), in their well-known critique, caution that the behavior of this variable is dominated by the anomalous behavior of a few outliers, giving one reason to worry about the generality of the finding.

exchange rate over the preceding year (Volatility 3). Growth rates and real exchange rate volatilities are calculated over the period 1991-2005.³³ Figure 3 shows that there is a negative relationship between real exchange rate volatility and growth but that this is heavily driven by a small number of extreme values (four or five slowly growing countries with very volatile exchange rates). More generally, it is apparent that a wide variety of growth rates are compatible with a given level of exchange rate volatility.

Figure 4 disaggregates emerging markets, other developing countries, and advanced economies.³⁴ (The vertical scales differ because growth rates are faster in a few emerging markets.) The key point is that the inclusion of the advanced industrial countries is not obviously disguising an underlying relationship in the other countries. Moreover, the slope coefficients are not significantly larger in absolute-value terms outside the advanced industrial countries. Again the appearance of a negative relationship is driven by a few outliers, China and Argentina in the emerging-market subsample, Ukraine and the Baltics in the developing country subsample.

The subsequent literature has sought to recover the underlying relationship by focusing on specific determinants of growth that are likely to be particularly responsive to exchange rate variability rather than on growth itself. One strand considers the impact of real exchange rate variability on investment. Thus, while Ghura and Grennes (1993) and Bleaney and Greenaway (2001) find no impact on growth (see above), they do detect an impact on investment for a sample of African countries. Serven (2002) constructs a GARCH-based measure of real exchange rate volatility and finds that it has a strong negative impact on

³³ Data are from IFS, using the BIS data base to fill in some gaps. I have also done the same analysis using monthly data for exchange rates on the grounds that annual data may be missing out important volatility spikes; if anything that strengthens the conclusions to follow.

³⁴ I follow convention by defining emerging markets as developing countries with significant links to international capital markets.

investment. However, this variable only matters when it exceeds a threshold level, and it appears to matter more in economies that are relatively open and that have less developed financial systems. But, using industry-level data for the U.S., Goldberg (1993) finds an unstable relationship between real exchange rate variability and investment, positive in some periods and negative in others. Using data for a sample of developing countries, Bleaney (1996) finds neither linear nor nonlinear effects of real exchange rate variability in his investment equations. That these empirics are inconclusive is not surprising, given that the predictions of theoretical models of the impact of uncertainty on investment are ambiguous as well.³⁵

Most recently, Aghion et al. (2006) have examined the impact of real exchange rate variability not on factor accumulation but on factor productivity. They find that a more variable exchange rate is negatively associated with productivity growth in financially-underdeveloped economies but not in countries with deep financial markets. The implication is that financial development provides hedging instruments and opportunities enabling firms to guard against this risk. This result is consistent with the intuition that less developed economies find it more difficult to embrace greater exchange rate flexibility because firms and households lack the instruments needed to manage risks. Whether this result is robust to alternative definitions of real exchange rate volatility is yet to be seen.³⁶ But the larger point,

³⁵ If investors are risk neutral, then greater uncertainty will raise investment, given the convexity of the profit function and Jensen's inequality. Of course, the assumption that positive and negative deviations are valued symmetrically that underlies this result is inconsistent with the observation that there exist in practice irreversible fixed costs of bankruptcy when the shock is negative. Hence the ambiguity.

³⁶ The authors themselves measure real exchange rate volatility as the five-year standard deviation of annual log differences in the effective real exchange rate, as the five-year average deviation from a predicted real effective exchange rate (constructed as in Dollar 1992), and by the Reinhart-Rogoff nominal exchange rate classification. Results differ somewhat with the measure.

that any effect of real exchange rate volatility on investment and growth is likely to be contingent on circumstances, is surely valid.³⁷

3. Maintaining competitiveness

The alternative view is that it is not simply the stability of the real exchange rate but its average level that matters importantly for growth. If the exchange rate becomes significantly overvalued, then the right approach to fostering growth and development is to realign it. This can be accomplished by nominal depreciation, ideally in conjunction with policies of wage restraint designed to prevent the real effects from being dissipated by inflation, and appropriate adjustments of monetary and fiscal policies, as described above.

Admittedly, this simple set of statements raises as many questions as it answers. A first question, implicit in the term “competitive real exchange rate,” is: competitive relative to what? The simplest answer is: competitive relative to the actual exchange rate maintained by a variety of low-growth economies.

A second question is: if a competitive real exchange rate helps to foster growth and development, then why isn't it automatically delivered by market forces and policy choices? One answer invokes Mancur Olson's theory of collective decision making: while the benefits of a competitively valued real exchange rate are diffuse, the costs are concentrated; hence the incentive to engage in self-interested lobbying is stronger for those who favor overvaluation; conversely, the incentive to free ride – to leave to someone else the choice of making a costly investing in influencing policy – is stronger for those who benefit from avoiding

³⁷ The same conclusion applies to the literature on the impact of the exchange rate regime (which, as noted above, is sometimes used as a stand-in for real exchange rate volatility). Thus, Eichengreen and Leblang (2003) report that the effects of this variable are similarly contingent on circumstances, both domestic and international.

overvaluation. Appendix 2 reports some preliminary explorations of the political economy of real exchange rate determination.

A third is: what exactly is the mechanism through which a competitive real exchange rate fosters growth? Avoiding real overvaluation may simply encourage the optimally balanced growth of traded- and nontraded-goods producing sectors. Alternatively, there may be nonpecuniary externalities associated with the production of exportables (learning by doing effects external to the firm) that do not exist to the same degree in other activities – meaning that market forces, left to their own devices, may produce a real exchange rate that is too high.

There is now a substantial literature, as noted above, linking the level of the real exchange rate to output and employment growth. Galindo, Izquierdo and Montero (2006) show that real overvaluation slows the growth of industrial employment for a sample of 9 Latin American countries. Marquez and Pages (1997) find the same thing for 18 countries in Latin America and the Caribbean in an earlier period. Hausmann, Pritchett and Rodrik (2004) examine episodes when growth accelerates by at least two percentage points and that acceleration lasts for at least eight years. Considering 80 some episodes, they find that real depreciation is among the factors that are significantly associated with their incidence. Aghion et al. (2006) find that countries suffering from real overvaluation experience slower productivity growth. This effect shrinks in magnitude, as noted above, as countries become financially more developed.

All this takes the real exchange rate as exogenous. In practice it is not clear which way the simultaneity bias cuts. If one thinks that rapidly growing countries are more likely to experience real appreciations, either through the operation of market forces (the Balassa-

Samuelson effect) or because in an environment of rapid productivity growth it is less pressing to use macroeconomic policy to support the competitiveness of exporters, then simultaneity works against our preferred hypothesis. Alternatively, if one believes that success breeds reluctance to abandon prevailing policies, then rapid growth will encourage the maintenance of a competitive real exchange rate (the Chinese case), which means that regressions “explaining” growth in terms of the real exchange rate will be contaminated by reverse causation. The appropriate treatment is instrumental variables: application of an instrument that is correlated with the real exchange rate but that does not also help to explain growth.

We thus come to the second question, namely, why some countries have tended to maintain more competitive real exchange rates than others. The obvious candidates here are political variables: for example, while the literature on economic growth is inconclusive on the question of whether democracies or dictatorships grow faster (think China versus India), a growing body of evidence suggests that variables like democracy are important for real exchange rate determination.³⁸

None of this addresses the \$64,000 question, namely, the mechanism through which the real exchange rate affects economic growth. This is symptomatic of the state of the literature, which has invested more in documenting the growth-real exchange rate correlation than in identifying channels of influence. Here there are two distinct but compatible interpretations, as noted above. First, distortions in the political market, of the sort just analyzed, that give concentrated interests disproportionate sway may allow them to influence policy in ways that produce a real exchange rate outcome that is detrimental for the nation as a whole. Left to its own devices, the market will presumably produce a real exchange rate

³⁸ This is what we find in Appendix 2 when we analyze annual data with panel estimators.

that encourages resources to flow into sectors producing traded and nontraded goods just to the point where their marginal returns is equalized, and their contribution to growth is maximized. In contrast, political pressures that result in strong favoritism for one sector (in the canonical case the sector producing nontradables) may cause the real exchange rate to become misaligned (to become overvalued) and the marginal return on capital and the productivity of labor in that sector to diminish sharply and aggregate growth to suffer. This points to pro-growth political reforms, or at least to political obstacles that need to be overcome in order to sustain a real exchange rate conducive to steady growth: land reform that empowers rural – and, in many countries, export-oriented – interests, more constraints on the executive, and so forth.

In addition, there may exist positive externalities associated with export-linked activities that are not equally prevalent in other sectors. Learning and demonstration effects external to the firm may be more pronounced in export-oriented sectors. Complementarities between activities that cannot be encompassed within the same firm may be more pronounced in export-oriented sectors; this is the premise of the literature on backward and forward linkages. Because these additional positive effects are external to the firm or industry, market forces left to their own devices will not allocate sufficient resources to their pursuit. In addition, it is necessary to have a strong government or a political system that endows exporters with disproportionate influence in order to ensure the maintenance of a real exchange rate that does as much as possible to foster growth.

This is the presumption in much of the literature on export-led growth, but it is also where empirical work falls down. There is little systematic evidence on the nature and prevalence of such externalities, and much of what exists is indirect. Jones and Olken (2005)

document the significant reallocation of resources toward manufacturing around the time of growth upturns. Johnson, Ostry and Subramanian (2006) find that nearly all developing countries that experience sustained growth also witness a rapid increase in their shares of manufacturing exports. Rodrik (2006) finds that rapidly growing developing countries tend to have unusually large manufacturing sectors and that growth accelerations are associated with structural shifts in the direction of manufacturing. These findings are cited as evidence of the positive externalities associated with manufacturing exports.³⁹ But the nature of the externality remains obscure. Indeed, it could be that all we are seeing is the elimination of other distortions, not the operation of positive externalities.

Similarly, the literature attempting to document spillovers from exporting is less than conclusive. While a number of studies report that proximity to other exporting firms increases the likelihood that a subject firm will itself export – and that profits and productivity will develop favorably – other studies fail to find similar evidence.⁴⁰ Thus, Lin (2004) finds that the propensity for Taiwanese firms to export is positively affected by the propensity to export of other firms in the same industry in its geographic vicinity. Koenig (2005) reports similar results for a sample of French firms, while Alvarez and Lopez (2006) report evidence of horizontal productivity spillovers from exporting for a sample of Chilean firms. But Aitken, Hanson and Harrison (1997) find that the tendency for Mexican plants to export is not affected by their proximity to other exporters. Barrios, Gorg and Strobl (2003) find no evidence that Spanish firms are more likely to export when there are other exporters in the vicinity. Bernard and Jensen (2004) find no evidence of export spillovers for a panel

³⁹ Again see e.g. Rodrik (2006).

⁴⁰ Here, proximity should be defined in economic rather than simply spatial terms – that is, closeness in terms of choice of technology or managerial strategy rather than simply spatial proximity, although the tendency for information to dissipate as distance increases suggests that the two may coincide.

of U.S. manufacturing firms from other exporters in the same industry or other exporters in the same geographic vicinity. Lawless (2005) detects little evidence of export spillovers among Irish firms.

A charitable interpretation is that spillovers are contingent on the presence of facilitating conditions. The potential beneficiaries must be close to a port or land border. Or they must possess the organizational flexibility needed to assimilate new technology and adjust their labor force appropriately. Thus, Kokko, Zejan and Tansini (2001) find that firms in Uruguay experience productivity spillovers from other exporters only when the technology gap is not too large and the trade regime is relatively open. Hale and Long (2006) find that proximity to other exporters increases the likelihood that a neighboring Chinese firm will export only when the subject firm is privately owned and hence has the flexibility to adjust its labor force and methods of production.

A less charitable interpretation is that the thought experiment is poorly designed and empirical results are contaminated by omitted variables bias.⁴¹ If firms from a given neighborhood all have a disproportionate tendency to export, this may simply reflect the operation of an unobservable determinant that is common to the firms in question, say that they all have links to the same overseas immigrant network. If one firm starts exporting this year and others follow next year, this may simply reflect that they make contact with members of that overseas network at different times, rather than any tendency for the latecomers to learn from the pioneers. The standard methodology does not provide a convincing way of discriminating between demonstration effects specific to export sectors and omitted variables. And if all that we are observing is the effect of omitted variables, then there is no reason for policy makers to favor exports.

⁴¹ Which is stronger in some data sets than others – hence the varying results.

Methodological fashion would recommend finding a “natural experiment” – that is, an exogenous reason unrelated to the state of the domestic economy for why a particular firm or firms begins to export – and analyzing its impact on other firms. The popular strategy here is to take inward foreign direct investment as exogenous and to test for spillovers to the export performance of domestically-owned firms. Results of such studies are broadly consistent with the spillover hypothesis. Aitken, Hanson and Harrison (1997), Kokko, Zejan and Tansin (2001), Greenaway, Sousa and Wakelin (2004), and Ruane and Sutherland (2005) all find that the presence of foreign-owned enterprises contributes to the export propensity of host-country enterprises.

The problems with this approach will be apparent. Foreign investment enterprises differ from domestic firms by more than just their propensity to export; in addition they tend to be more sophisticated technologically and organizationally. Using the real exchange rate to encourage domestic firms to enter the export sector will not generate spillovers to other domestic firms if it is the technological and organization knowledge of foreign multinationals that is the source of the spillovers rather than the exporting per se.⁴²

Moreover, the maintained assumption that FDI can be taken as exogenous is dubious. A difficult-to-observe-and-quantify improvement in the economic climate can both enhance the capacity to export of domestic firms and to attract foreign investors. As before, there is the danger that all we may be observing is the effect of common omitted variables, not learning or demonstration effects.

⁴² Of course, it can be argued that export orientation and inward FDI go hand in hand; both are consequences of the maintenance of a competitive real exchange rate. Real depreciation not only raises the price of exportables but makes the acquisition of domestic assets cheaper for foreign firms. Thus, cases of successful export-led growth are almost always also cases where industrial development involved substantial amounts of inward foreign investment (think, again, of Korea in the 1960s or China in the 1990s). From this perspective, the channels through which a competitive real exchange rate generates demonstration and learning effects differ, but the implications for policy do not.

One can imagine solutions to this problem. The literature on mergers and acquisitions (a form of FDI) suggests that such activity depends on the internal resources of firms in the acquiring countries.⁴³ Thus, when asset markets in the United States boom, they have a greater tendency to use the resulting resources to undertake mergers and acquisitions abroad. Hence there will be a component of FDI in emerging markets that is exogenous with respect to economic conditions there – that will depend on interest rates and other measures of financial market conditions in the advanced economies. Using those measures as instruments for FDI in emerging markets would be a step more toward convincingly identifying the associated spillover effects.⁴⁴

4. Implications for Policy and Research

When asked about the fundamental determinants of growth, economists tend to focus on, inter alia, education and training, savings and investment, and the institutional capacity to assimilate and generate organizational and technological knowledge. The real exchange rate

⁴³ See di Giovanni (2005).

⁴⁴ It is also worth devoting a few words to the Hausmann-Huang-Rodrik (2006) work on this problem. While there tends to be a predictable relationship between a country's per capita income and the composition of its exports, they show that some countries stand out as having export baskets that are associated with higher per capita incomes than actually observed. Their concentration on relative advanced exports appears to be a leading indicator of subsequent growth. These results are suggestive of learning effects and other positive externalities associated with specific industries and export activities. The question is whether the authors' evidence should be used to guide policy. The implication is not just to foster exports through the maintenance of a competitive real exchange rate but to target specific kinds of export activities through the use of selective subsidies or, effectively, multiple exchange rates. But the composition of India's exports may be more typical for a higher income country not because the authorities have successfully targeted software development and call centers but because it has a large English speaking population and links with expatriate entrepreneurs. China may rely more on exports of relatively sophisticated consumer electronics not so much because of domestic targeting but because it possesses links with overseas Chinese or proximity to Japan and Taiwan. If so, targeting the same industries will not have the same effects in, say, Latin America or Africa. While it may make more sense to encourage only slightly more sophisticated exports than those currently produced rather than attempting to leap directly to software development, the question then becomes: what exports exactly? In the presence of learning effects external to the firm, markets left to their own devices will not provide the optimal allocation of resources. But selective subsidies will do better only if policy makers can locate the relevant externalities. And historical evidence will be an accurate guide only if the underlying structure remains stable.

is best thought of as a facilitating condition: keeping it at competitive levels and avoiding excessive volatility facilitate efforts to capitalize on these fundamentals.

Even a facilitating condition can be important. Development experience – first and foremost that of the high-growth economies of East Asia but also development experience generally – shows that keeping the real exchange rate at competitive levels can be critical for jump-starting growth. Experience also shows that high levels of exchange rate volatility can be disruptive to exports and investment. This is *not* the same as saying that real exchange rate policy can substitute for the presence of a disciplined labor force, high savings, or a foreign-investment-friendly climate. But it can help to jump-start growth by encouraging the redeployment of resources into manufacturing and reaping immediate productivity gains. This way of thinking about the issue has the merit, as noted, of explaining why the simple correlation between growth and the level and volatility of the real exchange rate is weak, since that relationship will depend on the presence or absence of other fundamentals.

This way of framing the issue also points to the question of how long to stick with the policy. If keeping the exchange rate competitively valued and limiting volatility are mainly useful for jump-starting growth, then the case for doing so will become less compelling once growth has successfully started. As domestic demand for the products of the modern sector develops, it will no longer be necessary to rely on export demand to the same extent. Resisting may mean that the adjustment ultimately comes about via a costly and financially-disruptive inflation. Similarly, limiting exchange rate variability limits the incentive to invest in the relevant hedging markets and instruments, leaving banks and firms defenseless in the face of a spike in volatility. This is just to restate the obvious, that policies useful for jump-starting growth will not remain useful forever.

China is the obvious poster boy for these dilemmas. It has utilized a low and stable real exchange rate to move resources into manufacturing. The Chinese authorities are reluctant to see the real exchange rate rise because there are still hundreds of millions of workers to be redeployed out of low-productivity agriculture. They hesitate to permit greater exchange rate variability, since banks and firms lack markets and instruments on which to hedge exposures. But they also appreciate the risks of sticking too long with present policies. A real exchange rate that continues to favor export-oriented manufacturing along the coasts stunts the development of the service sector and heightens inequality with other regions. It encourages large-scale migration between regions and the associated stresses. Sooner or later excessive concentration on this sector will translate into declining efficiency of investment. Resisting market pressures for currency appreciation and better balanced growth means that adjustment may come about through inflation. Resisting a significant increase in exchange rate variability until hedging markets and instruments develop, where the development of hedging instruments and markets depends in turn on the existence of exchange rate variability, may mean that those markets fail to develop in appropriate time.⁴⁵ And of course reluctance to exit from this policy regime contributes to global imbalances, creating financial risks and fanning trade tensions with the United States. Policy makers are aware of these issues, but they are uncertain about the appropriate strategy for exiting from the prevailing regime.

Here the literature on exit strategies (Eichengreen and Masson 1998, Eichengreen 1999) points to the advantages of exiting while growth is still rapid and confidence is strong. Similarly, altering the exchange rate regime – allowing for a significant increase in volatility – will do less to weaken confidence when the authorities undertake it voluntarily than when

⁴⁵ Notwithstanding regulatory reform designed to promote their growth.

the change is implemented under duress. This literature also points to the existence of status quo bias. Interest groups benefiting from prevailing policies are in an increasingly strong position to resist change with the passage of time. The authorities, for their part, will be understandably reluctant to abandon a tried-and-true strategy for an untested alternative. These arguments suggest that policy makers need to be proactive in the pursuit of adjustment.

How long it pays to stick with a policy mix favoring export-oriented manufacturing depends on the prevalence of nonpecuniary externalities and on whether learning spillovers and other externalities are also present in other sectors. And here, as earlier discussion has emphasized, the evidentiary base is limited. Better documenting the presence or absence of the relevant externalities should be the priority for research. What form do the relevant externalities take – demonstration effects, other learning effects, labor market effects, improvements in the supply of inputs? In what activities specifically are they concentrated? Better answers to these questions are valuable in general, but they also will help to inform decisions regarding the exit problem in particular.

Appendix 1.

Industry-Level Analysis of Real Exchange Rates and Employment Growth

Not everyone will be convinced by cross-country evidence on the connections between the real exchange rate and economic growth. There are many reasons to be skeptical of aggregate cross-country analyses, including the joint determination of the real exchange rate and output growth and the difficulty of developing a convincing instrumental-variables strategy that helps one to isolate the causality running from the real exchange rate to growth. One way around this is to disaggregate by sector or industry and examine the impact on industry output or employment growth of changes in the real exchange rate. The real exchange rate is largely exogenous to developments in an individual industry.⁴⁶ Disaggregation thus provides a measure of identification. In addition, for those who believe that industry must provide the main source of employment growth in emerging markets going forward, restricting the analysis to industry facilitates a direct test of the hypothesis that the level of the real exchange rate matters for the development of industrial employment. A number of authors (Branson and Love 1988, Rodrik 2006b, Galindo, Izquierdo and Montero 2006) have taken this approach.

The specification here follows this last trio of authors, regressing the growth of employment in country i in industry j in year t on the percentage change in the real exchange rate and controls. Controls include, following Galindo, Izquierdo and Montero, the change in the log of industry value added, the industry-specific import share, and the percentage change in GDP lagged one period. To test for differences in real exchange rate sensitivity in industries more exposed to import competition or with more access to foreign markets, the

⁴⁶ Especially when the number of sectors into which GDP is disaggregated in order to construct units of observation is sufficiently large.

real-exchange-rate measure is also interacted with the industry-specific import and export shares lagged one period.

The model is estimated on a sample of 28 industries for 40 emerging market countries using annual data covering the period 1985-2003.⁴⁷ Time fixed effects are included throughout.⁴⁸ The dependent variable, employment growth, together with industry value added, is obtained from the United Nations Industrial Development organization (UNIDO) Industrial Statistics Data Base. Trade flows are from the UN Comtrade Data Base. Other data are from standard IMF and World Bank sources.

The most basic regression, in column 1 of Table A.1.1, includes only the real exchange rate along with industry value added as a control. The real exchange rate terms are positive, indicating that a real depreciation (here an increase denotes a depreciation) fosters the growth of industry employment; the point estimates are small but highly significant. This remains the case with the addition of more controls. It is not possible to assert on the basis of these regressions that the effect is stronger in countries and industries that are more exposed to international competition (with higher levels of import penetration or that export more); if this is the case, then the data and model are not strong enough to establish this.

Table A1.2 adds the volatility of the real exchange rate, defined as the standard deviation of the real exchange rate over the current and preceding two years. The other results remain the same; now, in addition, volatility appears to have a significantly negative impact on employment growth. This result is, of course, subject to the caveats in the text –

⁴⁷ The actual number of observations is smaller than the product of years, industries and countries due to data gaps.

⁴⁸ Including also country-time fixed effects would prevent one from using the real exchange rate, which is country and time specific, as an explanatory variable.

although the fact that the dependent variable is defined as employment growth at the industry level goes some way toward defusing concerns about simultaneity.

Table A1.1
The Real Exchange Rate and Employment Growth at the Industry Level
(dependent variable is rate of growth of industry employment)

	(1)	(2)	(3)	(4)	(5)
$\Delta \log(\text{Value Added}_{ijt-1})$	-0.005 (0.007)	0.0707 (0.009)***	0.0704 (0.009)***	0.0646 (0.009)***	0.0642 (0.008)***
$\Delta \log(\text{Real Bilateral Exchange Rate}_{it})$	0.0128 (0.006)**	0.0128 (0.006)**	0.0119 (0.006)**	0.0111 (0.006)**	
$\Delta \log(\text{Bilateral Exchange Rate}_{it}) * \text{Export Share}_{ijt-1}$		0.0100 (0.009)	0.0093 (0.010)	0.009 (0.0104)	-0.007 (0.009)
$\text{Export Share}_{ijt-1}$		-0.0003 (0.0005)	-0.0013 (0.0008)*	-0.0014 (0.0007)*	-0.002 (0.001)***
$\Delta \log(\text{Bilateral Exchange Rate}_{it}) * \text{Import Share}_{ijt-1}$			-0.0002 (0.003)	-0.0002 (0.003)	-0.0013 (0.002)
$\text{Import Share}_{ijt-1}$			0.0005 (0.0003)*	0.0006 (0.0003)**	0.0005 (0.0003)**
$\Delta \log(\text{GDP}_{it-1})$				0.1734 (0.061)***	
Observations	7367	5385	5385	5385	5385
No. of country-industries	640	640	640	640	640
R-squared	0.0292	0.0627	0.0636	0.0650	0.3161
Year Dummies	Yes	Yes	Yes	Yes	No
Country-Year Dummies	No	No	No	No	Yes

*** denotes significance at the 1% level, ** at 5%, and * at 10%.

The first regression includes data through 2003; the others are through 1999.

The regression in the fifth column includes a constant that is not listed because it is not possible to have a regression in Stata through the origin with fixed effects.

Table A1.2
The Real Exchange Rate and Employment Growth at the Industry Level
(dependent variable is rate of growth of industry employment)

	(1)	(2)	(3)	(4)	(5)
$\Delta \log(\text{Value Added}_{ijt-1})$	-0.016 (0.008)**	0.0647 (0.009)***	0.0647 (0.009)***	0.0650 (0.009)***	0.0642 (0.008)***
$\Delta \log(\text{Real Bilateral Exchange Rate}_{it})$	0.0128 (0.006)**	0.0159 (0.006)**	0.0175 (0.007)***	0.0178 (0.006)***	
Volatility of Real Bilateral Exchange Rate $_{it}$	-0.0372 (0.009)***	-0.0180 (0.008)**	-0.0158 (0.011)*	-0.0170 (0.009)*	
$\Delta \log(\text{Bilateral Exchange Rate}_{it}) * \text{Export Share}_{ijt-1}$		0.0134 (0.009)	-0.0227 (0.011)**	-0.0226 (0.0112)**	-0.007 (0.009)
Export Share $_{ijt-1}$		-0.00007 (0.0005)	-0.0094 (0.0011)***	-0.0094 (0.0011)***	-0.002 (0.001)***
$\Delta \log(\text{Bilateral Exchange Rate}_{it}) * \text{Import Share}_{ijt-1}$			0.0194 (0.003)***	0.0194 (0.003)***	-0.0013 (0.002)
Import Share $_{ijt-1}$			0.0050 (0.0005)***	0.0050 (0.0005)***	0.0005 (0.0003)**
$\Delta \log(\text{GDP}_{it-1})$				-0.0200 (0.077)	
Observations	6675	4826	4826	4826	5385
No. of country-industries	640	640	640	640	640
R-squared	0.0357	0.0697	0.0697	0.0878	0.3161
Year Dummies	Yes	Yes	Yes	Yes	No
Country-Year Dummies	No	No	No	No	Yes

*** denotes significance at the 1% level, ** at 5%, and * at 10%.

The first regression includes data through 2003; the rest are through 1999.

The regression in the fifth column includes a constant that is not listed because it is not possible to have a regression in Stata through the origin with fixed effects.

Appendix 2

Real Exchange Rate Determination

This appendix offers some preliminary explorations in real exchange rate determination. This has also been done recently by Prasad, Rajan and Subramanian (2006). The authors construct a measure of real overvaluation using data on the price level in a country and the level of per capital GDP at purchasing power parity. Pooling data for their sample of countries and years, they regress the log price level relative to the U.S. on a constant term and log per capita income. Overvaluation is then the difference between the actual log price level and the fitted value. Real exchange rate overvaluation is calculated analogously here.⁴⁹

Prasad et al. then regress real overvaluation on the share of working-age persons in the population and various alternative measures of capital inflows, using a sample of 22 advanced countries and 61 emerging and developing countries.⁵⁰ The authors argue that a rapidly growing labor force should lead to undervaluation. One interpretation is that there is pressure on policy makers in such countries to maintain a competitive real exchange rate in order to absorb additional workers into employment. Another interpretation consistent with the life-cycle model is that savings are high in countries with a high share of working-age individuals, which means low pressure of demand for nontraded goods and a current account surplus, which is delivered by a competitive real rate. They also suggest that foreign capital inflows will tend to push up the real rate, resulting in overvaluation, other things equal.

⁴⁹ The authors kindly provided their data set, but not their estimated value of overvaluation, which was therefore calculated separately here.

⁵⁰ Preliminary tests suggested, not surprisingly, significant differences in the behavior of the two subsamples. The 61 countries are the same as in Bosworth and Collins (2003), with the omission of Taiwan, for which some of the requisite data are missing.

Table A2.1 shows analogous regressions, estimated on cross section data for the period 1975-2000, on the 61 emerging and developing countries. Two alternative measures of capital inflows are considered: gross cumulated FDI liabilities as a percentage of GDP, and gross foreign liabilities (direct and portfolio) as a share of GDP. The cross-section regressions reproduce the Prasad et al. results: a higher share of working-age population reduces the likelihood of real overvaluation, while cumulative capital inflows increase that likelihood. These results are robust to the inclusion of additional political and economic variables. Of the latter, oil-exporting countries (denoted by a dummy variable) are more prone to overvaluation, other things equal, as are Sub Sahara African countries in the sample period. In contrast, neither the savings rate nor a measure of democracy (drawn from the Polity data set) is significantly associated with the extent of over- or undervaluation. This last result is consistent with casual observation – contrast for example the success of democratic India in avoiding real overvaluation in the second half of the 1990s with the failure of democratic Argentina to do the same.

Table A.2.2 reports in addition a set of panel regressions pooling the annual observations and 61 countries.⁵¹ The share of the population that is working age and capital inflows continue to enter before, although they are sometimes sensitive to specification and estimator. The tendency for oil exports and Sub Sahara African countries to have overvalued rates is again evident. In addition, a high savings rate and low investment rate are now negatively and positively associated with real overvaluation, respectively, consistent with the current account logic of the preceding paragraph. There is now also some indication that democratic institutions are associated with overvaluation, as if they give voice to special

⁵¹ More observations in this case make it possible to consider a few additional explanatory variables. The regressions are estimated using fixed or random effects, depending on what is dictated by the Hausman and Brauch-Pagan tests.

interest groups that benefit from a strong real rate. And a high ratio of M2 to GDP, which can be interpreted as a credit boom (given the presence of fixed effects), displays a plausible positive association with real overvaluation.

Table A2.1: Determinants of Overvaluation

	I	II	III	IV	V	VI	VII	VIII
Ratio of working-age population to total population	-2.12**	-1.57	-1.82*	-2.05**	-2.71***	-2.63**	-2.61**	-2.74***
Ratio of gross stock of FDI liabilities to GDP	0.87	1.23	1.07	0.93	0.93	1.22	1.09	0.99
Ratio of gross stock of foreign liabilities to GDP	50.43**	51.50**	51.26**	50.40**				
Savings to GDP	23.96	24.38	24.19	24.17	460.96**	462.92**	462.50**	462.19**
Polity		-0.39	-0.29	-0.18	193.52	197.61	195.41	195.80
Sub-Saharan African Countries		0.64	0.60	0.74		0.60	-0.10	
Oil Exporting Countries		-0.35				0.03	0.57	
Constant		0.79				0.75		0.06
	19.83**	17.54*	18.69**	19.45**	19.53**	19.17**	19.08**	19.68**
	8.83	9.63	9.20	9.05	8.45	9.34	8.88	8.70
	21.84*	24.40**	24.08*	21.60*	24.50**	25.30**	25.32**	24.58**
	11.33	12.43	12.31	11.47	11.02	12.15	12.03	11.16
	102.86**	78.96	91.03	98.87*	132.23**	129.18**	128.34**	133.68**
	49.62	62.43	55.60	52.79	51.61	62.23	56.48	54.81
Adjusted R-squared	0.29	0.27	0.28	0.28	0.31	0.28	0.29	0.29
F-statistic	6.92	4.55	5.51	5.45	7.59	4.89	5.98	5.97
Number of Observations	59	59	59	59	61	61	61	61

Notes: Standard errors in parentheses, * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level and *** denotes significance at the 5 percent level

Table A2.2: Determinants of Overvaluation

	I	II	III	IV	V	VI
Ratio of working-age population to total population	-0.50**	-0.38	0.84**	-0.18	0.68**	-0.81***
	0.23	0.28	0.33	0.25	0.32	0.25
Ratio of gross stock of FDI liabilities to GDP	6.89	16.93*	1.91	4.78	-13.25	5.06
	7.19	8.78	9.78	7.89	9.05	7.56
Ratio of gross stock of foreign liabilities to GDP						
Savings to GDP		-0.44***	-0.78***			
		0.12	0.13			
Investment to GDP				-0.60***	-0.58***	-0.59***
				0.13	0.15	0.13
Polity		0.62				0.82***
		0.16				0.14
Ratio of M2 to GDP			12.84**		11.32**	
			6.10		5.58	
Sub-Saharan African Countries	26.48***	26.07***				23.61***
	7.53	7.88				7.57
Oil Exporting Countries	24.84**	27.59**				27.68**
	11.33	11.80				11.37
Constant	15.48	13.45	-41.81	19.78	-30.66*	45.32***
	13.94	16.11	17.74**	13.40	17.71	14.55
Fixed Effects	No	No	Yes	Yes	Yes	No
Random Effects	Yes	Yes	No	No	No	Yes
Number of Observations	1793	1501	1025	1674	1091	1647

Notes: Standard errors in parentheses, * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level and *** denotes significance at the 1 percent level

References

- Abramovitz, Moses (1986), "Catching Up, Forging Ahead, and Falling Behind," *Journal of Economic History* 46, pp. 385-406.
- Aghion, Philippe, Philippe Bacchetta, Romain Ranciere and Kenneth Rogoff (2006), "Exchange Rate Volatility and Productivity Growth: The Role of Financial Development," NBER Working Paper no. 12117 (March).
- Aitken, Brian, Gordon Hanson and Ann Harrison (1997), "Spillovers, Foreign Investment and Export Behavior," *Journal of International Economics* 43, pp.103-142.
- Alvarez, Roberto and Ricardo Lopez (2006), "Is Exporting a Source of Productivity Spillovers?" unpublished manuscript, Central Bank of Chile and Indiana University.
- Bagella, Michele, Leonardo Becchetti and Iftekhar Hasan (2006), "Real Effective Exchange Rate Volatility and Growth: A Framework to Measure the Advantages of Flexibility Versus the Costs of Volatility," *Journal of Banking and Finance* 4, pp.1149-1169.
- Bailliu, Jeannine., Robert Lafrance and Jean-Francois Perrault (2001), "Exchange Rate Regimes and Economic Growth in Emerging Markets," in *Revisiting the Case for Flexible Exchange Rates*, Proceedings of a Conference of the Bank of Canada, Ottawa: Bank of Canada.
- Barrios, S., H. Gorg and G. Strobl (2003), "Explaining Firms' Export Behaviour: R&D, Spillovers, and the Export Market," *Oxford Bulletin of Economics and Statistics* 65.
- Baxter, Marianne and Alan C. Stockman (1988), "Business Cycles and the Exchange Rate System: International Evidence," NBER Working Paper no.2689 (August).
- Belke, Ansgar and Leo Kaas (2004), "Exchange Rate Movements and Employment Growth: An OCA Assessment of the CEE Economies," *Empirica* 31, pp.247-280.
- Bernard, A.B. and J.B. Jensen (2004), "Why Some Firms Export," *Review of Economics and Statistics* 96, pp.561-569.
- Blanchard, Olivier and Francesco Giavazzi (2006), "Rebalancing China: A Three Handed Approach," CEPR Discussion Paper no.5403 (January).
- Bleaney, Michael (1996), "Macroeconomic Stability, Investment and Growth in Developing Economies," *Journal of Development Economics* 48, pp.461-477.
- Bleaney, Michael and David Greenaway (2001), "The Impact of Terms of Trade and Real Exchange Rate Volatility on Investment and Growth in Sub-Saharan Africa," *Journal of Development Economics* 65, pp.491-500.

Bosworth, Barry and Susan Collins (2003), "The Empirics of Growth: An Update," *Brookings Papers on Economic Activity* 2, pp.113-179.

Bosworth, Barry, Susan Collins and Yu-chin Chen (1995), "Accounting for Differences in Economic Growth," unpublished manuscript, the Brookings Institution.

Branson, William and James Love (1988), "United States Manufacturing and the Real Exchange Rate," in Richard Marston (ed.), *Misalignment of Exchange Rates*, Chicago: University of Chicago Press.

Bravo-Ortega, Claudio and Julian di Giovanni (2005), "Remoteness and Real Exchange Rate Volatility," IMF Working Paper no.05/01 (January).

Broda, Christian (2002), "Terms of Trade and Exchange Rate Regimes in Developing Countries," unpublished manuscript, Federal Reserve Bank of New York (January).

Bubula, Andrea and Inci Otker-Robe (2002), "The Evolution of Exchange Rate Regimes since 1990: Evidence from De Facto Policies," IMF Working Paper no.02/155 (September).

Calvo, Guillermo, Alejandro Izquierdo and Ernesto Talvi (2006), "Phoenix Miracles: Recovering without Credit from Systemic Financial Crises," NBER Working Paper no. 12101.

Chinn, Menzie and Hiro Ito (2005), "Current Account Balances, Financial Development and Institutions: Assaying the World Saving Glut," NBER Working Paper no.11761 (December).

Cote, Agnes (1994), "Exchange Rate Volatility and Trade: A Survey," Working Paper no.95/04, Ottawa: Bank of Canada (May).

De Grauwe, Paul and Gunther Schabl (2003), "Exchange Rate Regimes and Macroeconomic Stability in Central and Eastern Europe," unpublished manuscript, Catholic University of Leuven and Tubingen University.

Di Giovanni, Julian (2005), "What Drives Capital Flows? The Case of Cross-Border M&A Activity and Financial Deepening," *Journal of International Economics* 65, pp.127-149.

Dollar, David (1992), "Outward Oriented Developing Countries Really Do Grow More Rapidly," *Economic Development and Cultural Change* 4, pp..523-554.

Dooley, Michael, David Folkerts-Landau and Peter Garber (2003), "An Essay on the Revived Bretton Woods System," NBER Working Paper no. 9971 (September).

Dornbusch, Rudiger (1976), "Expectations and Exchange Rate Dynamics," *Journal of Political Economy* 84, pp.1161-1176.

Dornbusch, Rudiger (1980), *Open Economy Macroeconomics*, New York: Basic Books.
Duttgupta, Rupa, Gilda Fernandez, and Cem Karasadag (2004), "From Fixed to Float: Operational Aspects of Moving Toward Exchange Rate Flexibility," IMF Working Paper no.04/126 (July).

Edwards, Sebastian (1988), "Real and Monetary Determinants of Real Exchange Rate Behavior: Theory and Evidence from Developing Countries," *Journal of Development Economics* 29, pp.311-341.

Edwards, Sebastian (1989), *Real Exchange Rates, Devaluation and Adjustment in Developing Countries*, Cambridge, Mass.: MIT Press.

Edwards, Sebastian and Eduardo Levy Yeyati (2003), "Flexible Exchange Rates as Shock Absorbers," NBER Working Paper no. 9867 (July).

Eichengreen, Barry (1999), "Kicking the Habit: Strategies for Attaining Greater Exchange Rate Flexibility," *Economic Journal* 109, pp.C1-14.

Eichengreen, Barry and David Leblang (2003) "Exchange Rates and Cohesion: Historical Perspectives and Political Economy Considerations," *Journal of Common Market Studies* 41, pp.797-822.

Eichengreen, Barry and Paul Masson (1998), "Exit Strategies: Policy Options for Countries Seeking Greater Exchange Rate Flexibility," IMF Occasional Paper No. 168, August

Frank, Charles R., Kwang Suk Kim and Larry Westphal (1975), *Trade Regimes and Economic Development: South Korea*, New York: Columbia University Press.

Galindo, Arturo, Alejandro Izquierdo and Jose Manuel Montero (2006), "Real Exchange Rates, Dollarization, and Industrial Employment in Latin America," Working Paper no. 575, Washington, D.C.: Interamerican Development Bank (November).

Ghosh, Anna-Marie Gulde and Holger Wolf (1997), "Does the Nominal Exchange Rate Regime Matter?" NBER Working Paper no.5874.

Ghura, Dhaneshwar and Thomas J. Grennes (1993), "The Real Exchange Rate and Macroeconomic Performance in Sub-Saharan Africa," *Journal of Development Economics* 42, pp.155-174.

Goldberg, Linda (1993), "Exchange Rates and Investment in United States Industry," *Review of Economics and Statistics* 75, pp.575-587.

Greenaway, David, N. Sousa and K. Wakelin (2004), "Do Domestic Firms Learn to Export from Multinationals?" *European Journal of Political Economy* 20, pp.1027-1043.

Hale, Galina and Cheryl Long (2006), "Firm Ownership and FDI Spillovers in China," unpublished manuscript, Federal Reserve Bank of San Francisco and Colgate University (April).

Hau, Harald (2002), "Real Exchange Rate Variability and Economic Openness: Theory and Evidence," *Journal of Money, Credit and Banking* 34, pp.611-630.

Hausmann, Ricardo et al. (1995), "Overcoming Volatility in Latin America," in *Report on Economic and Social Progress in Latin America*, Washington, D.C.: Interamerican Development Bank.

Hausmann, Ricardo, Jason Huang and Dani Rodrik (2006), "What You Export Matters," CEPR Discussion Paper no.5444 (January).

Hausmann, Ricardo, Lant Pritchett and Dani Rodrik (2004), "Growth Accelerations," NBER Working Paper no.10566 (June).

Hausmann, Ricardo, Francisco Rodriguez and Rodrigo Wagner (2006), "Growth Collapses," CID Working Paper no. 136 (October).

Hohensee, Martin and Kyungjik Lee (2004), "A Survey of Hedging Instruments in Asia," BIS Paper no. 30.

Johnson, Simon, Jonathan Ostry and Arvind Subramanian (2005), "Africa's Growth Prospects: Benchmarking the Constraints," IMF Working Paper (forthcoming).

Jones, Benjamin F. and Benjamin A. Olken (2005), "The Anatomy of Start-Stop Growth," NBER Working Paper no. 11528.

Kim, Kwang Suk and Michael Romer (1981), *Growth and Structural Transformation, Studies in the Modernization of the Republic of Korea: 1945-1975*, Cambridge, Mass.: Harvard University Press for the Council on East Asian Studies of Harvard University.

Kochhar, Kalpana, Utsav Kumar, Raghuram Rajan and Arvind Subramanian (2007), "India's Patterns of Development: What Happened? What Follows?" NBER Working Paper no.12023 (February).

Koenig, P. (2005), "Agglomeration and the Export Decision of French Firms," CREST Working Paper no. 2005-01.

Kokko, A., M. Zejan and R. Tansini (2001), "Trade Regimes and Spillover Effects of FDIs: Evidence from Uruguay," *Weltwirtschaftliches Archiv* 137, pp.124-149.

Krueger, Anne (1998), "Why Trade Liberalization is Good for Growth," *Economic Journal* 108, pp.1513-1522.

Kuznets, Simon (1966), *Modern Economic Growth: Rate, Structure and Spread*, New Haven: Yale University Press.

Lawless, Martina (2005), "Firm Export Participation: Entry, Spillovers and Tradability," unpublished manuscript, Central Bank and Financial Services Authority of Ireland (November).

Levy Yeyati, Eduardo, Federico Sturzenegger and I. Reggio (2003), "On the Endogeneity of Exchange Rate Regimes," unpublished manuscript, Universidad di Tella.

Lin, Jane C. (2004), "General Agglomeration Externalities, Export Spillovers, and Firm Behavior: A Study of the Electronics Industry in Taiwan over the 1986-96 Period," unpublished Ph.D. dissertation, Columbia University.

Marquez, G. and Carmen Pages (1998), "Trade and Employment: Evidence from Latin America and the Caribbean," Interamerican Development Bank Working Paper no. 336.

McKinnon, Ronald and Gunther Schnabl (2004), "The East Asian Dollar Standard, Fear of Floating and Original Sin," *Review of Development Economics* 8, pp.331-360.

Mundell, Robert (1968), *International Economics*, New York: Macmillan.

Mussa, Michael (1986), "Nominal Exchange Rate Regimes and the Behavior of the Real Exchange Rate," *Carnegie Rochester Series on Public Policy* 25, pp.117-213.

Nurkse, Ragnar (1944), *International Currency Experience*, Geneva: League of Nations.

Prasad, Eswar, Raghuram Rajan and Arvind Subramanian (2006), "Foreign Capital and Economic Growth," unpublished manuscript, IMF.

Rodrik, Dani (1993), "Getting Interventions Right: How South Korea and Taiwan Grew Rich," NBER Working Paper no.4964 (December).

Rodrik, Dani (2006), "Industrial Development: Stylized Facts and Policies," unpublished manuscript, Kennedy School of Government (August).

Rodrik, Dani (2006b), "Understanding South Africa's Economic Puzzles," CID Working Paper no. 130, Cambridge: Center for International Development, Harvard University (August).

Romer, Paul (1994), "The Origins of Endogenous Growth," *Journal of Economic Perspectives* 8, pp.3-22.

Rostow, Walt Whitman (1960), *The Stages of Economic Growth: A Noncommunist Manifesto*, Cambridge: Cambridge University Press.

Ruane, Francis and Julie Sutherland (2005), "Foreign Direct Investment and Export Spillovers: How Do Export Platforms Fare?" Institute for International Integration Studies Working Paper no. 58 (January).

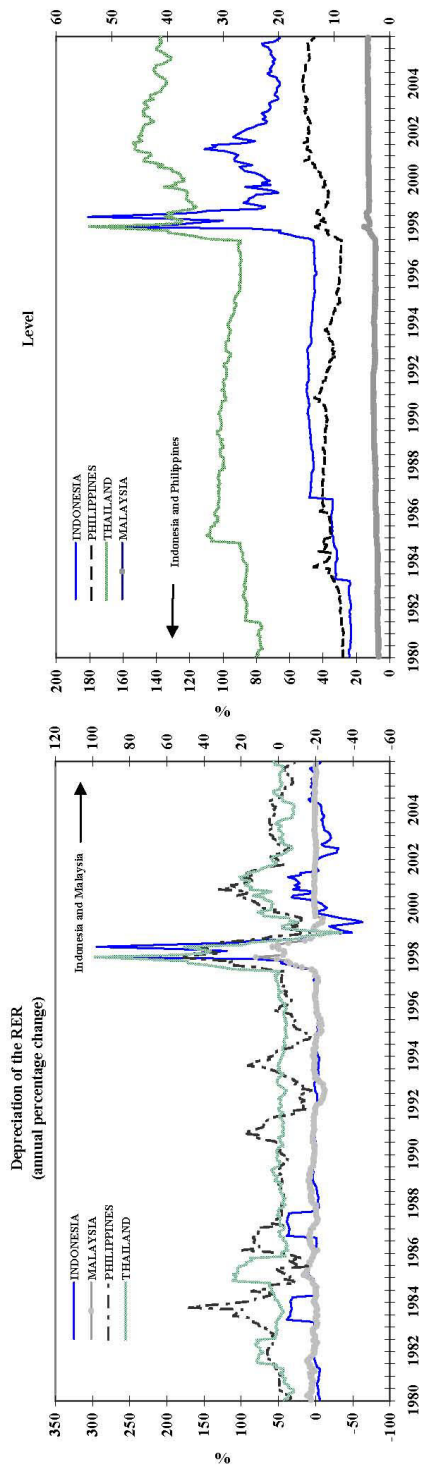
Serven, Luis (2002), "Real Exchange Rate Uncertainty and Private Investment in Developing Countries," Policy Research Paper no.2823, Washington, D.C.: The World Bank (April).

Singh, Anoop (2006), "Macroeconomic Volatility: The Policy Lessons from Latin America," IMF Working Paper no. 166 (July).

Solow, Robert (1957), "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics* 39, pp.312-320.

Zettelmeyer, Jeromin (2006), "Growth and Reforms in Latin America: A Survey of Facts and Arguments," IMF Working Paper no. WP/06/210 (September).

Figure 1
Real Exchange Rate (CPI-Based)
Panel A: Asian Countries



Panel B: Argentina

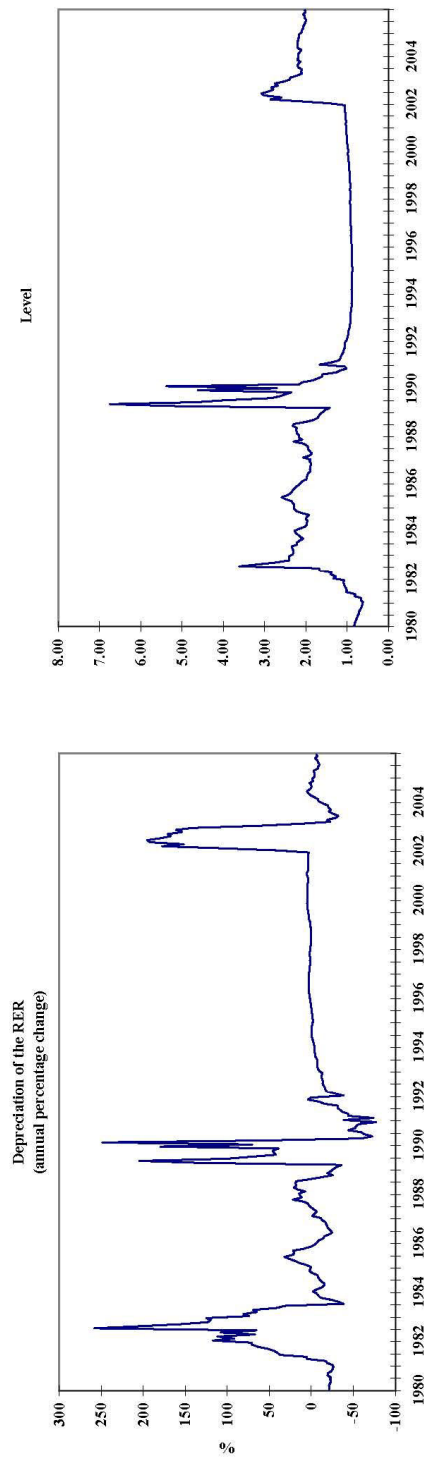
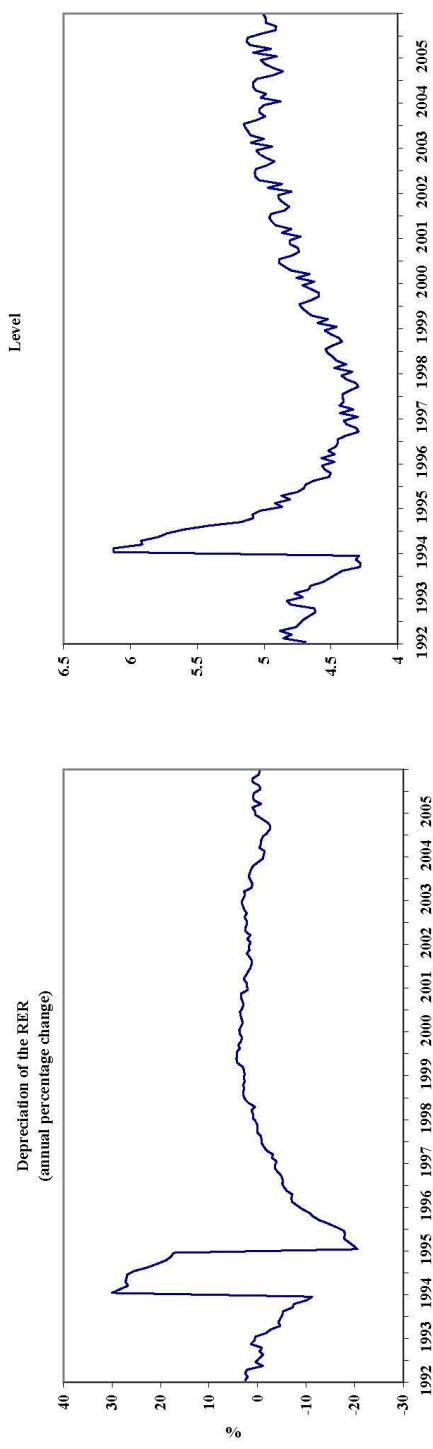


Figure 2
Real Exchange Rate (CPI-Based)
Panel A: China



Panel B: Korea

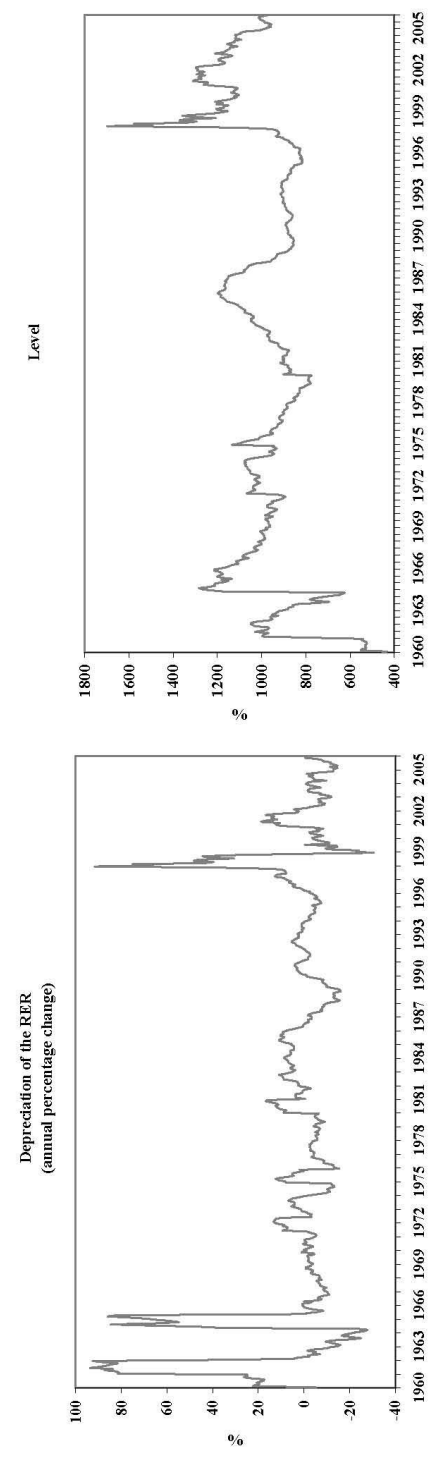


Figure 3
All Countries Real Effective Exchange Rate Volatility

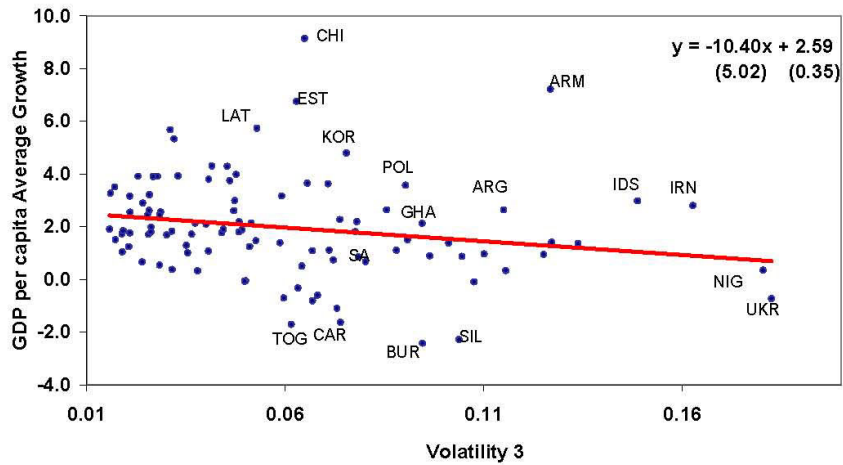
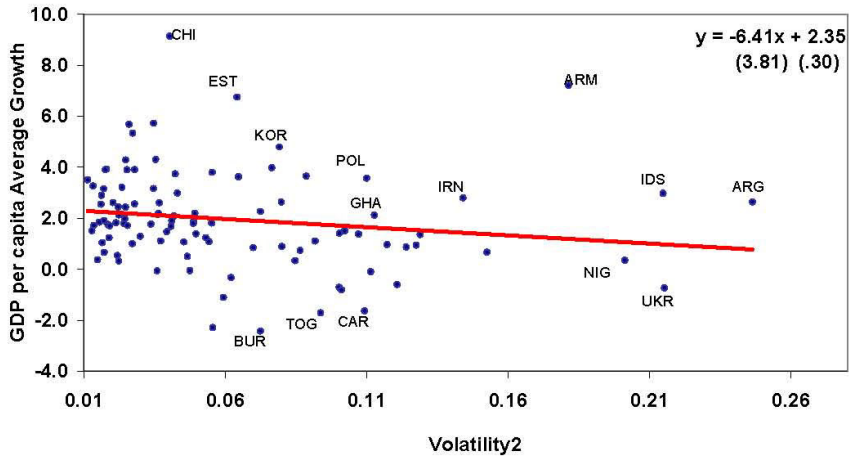
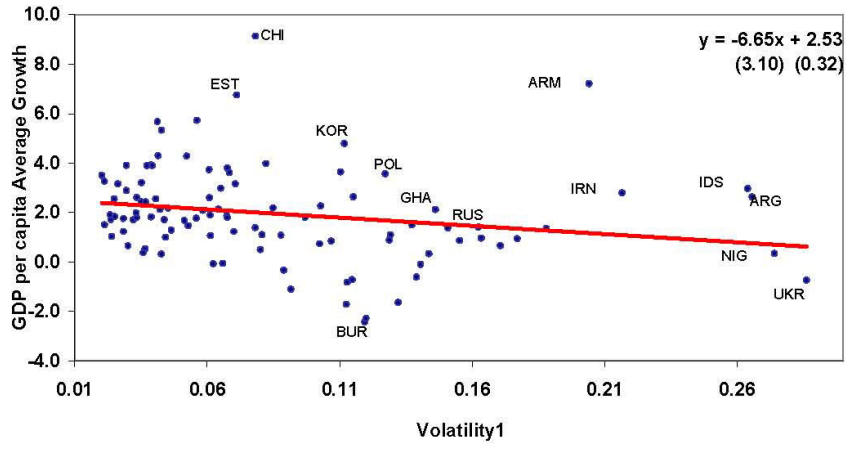


Figure 4

Panel A: Advanced Countries

