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REAL EXCHANGE RATES AND EXPORT PERFORMANCE IN OIL-DEPENDENT ARAB ECONOMIES

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Abstract

Diversifying oil economies, toward manufacturing and more sophisticated products and services, is one of the most pressing public policy challenges facing these countries. This paper provides new evidence about the impact of oil rents and real exchange rate undervaluation on various measures of exports, using a global sample spanning 1980-2011. Our results suggest that RER undervaluation can ameliorate the negative impact of oil rents on exports, and that it can be particularly effective in countries with underdeveloped financial markets or low institutional development. In light of these findings the paper argues that a strategy of depreciating the real currency can be a viable, albeit a second best industrial policy choice in order to promote export diversification, technical upgrading and export sophistication in institutionally-deficient oil and mineral-dependent economies. Moreover, this type of public policy can minimize the reliance on traditional vertical industrial policy, which usually requires high initial institutional capacity in order to succeed.

JEL Classification: O1, P2

Keywords: Arab world, Oil and resource rents, Real exchange rate undervaluation, Institutions, Financial development, Export diversification, Export sophistication, Manufacturing

ملخص

تنويع الاقتصادات النفطية، نحو التصنيع والمنتجات والخدمات أكثر تطورا، هي واحدة من أكثر التحديات على السياسة العامة التي تواجه هذه البلدان. تقدم هذه الورقة أدلة جديدة حول تأثير إيرادات النفط وسعر الصرف الحقيقي (RER) على التدابير المختلفة من الصادرات، وذلك باستخدام عينة عالمية تمتد بين 1980-2011. تشير نتائجنا الى ان RER يمكن أن يخفف من الأثر السلبي للريع النفطي على الصادرات، وأنه يمكن أن يكون فعالا بشكل خاص في البلدان ذات الأسواق المالية المتخلفة أو التطوير المؤسسي المنخفض. وفي ضوء ذلك توضح النتائج أن استراتيجية خفض قيمة العملة الحقيقية يمكن أن تكون حيوية، وإن كان ثاني أفضل خيار للسياسة الصناعية من أجل تعزيز تنويع الصادرات، وتطوير التقني وتطور التصدير في الاقتصادات النفطية والتي تعتمد على المعادن المؤسسية التي تعاني من نقص . وعلاوة على ذلك، فان هذا النوع من السياسة العامة يمكن ان تقلص من الاعتماد على السياسة الصناعية العمودية التقليدية، والتي عادة ما تتطلب قدرة مؤسسية عالية من أجل تحقيق النجاح.

1. Introduction

Hydrocarbon-dependent Arab countries are characterized by disappointing growth and employment performance as well as a low degree of diversification and sophistication of exports and limited manufacturing sectors. These countries make up 11 of the 22 members of the "League of the Arab States" that constitute the Arab world. They account for approximately 55 percent of global oil reserves and 29 percent of natural gas reserves. Naturally, the hydrocarbon sector dominates these economies, where it contributes about 50 percent to GDP and 80 percent to government revenues. Moreover, the rest of the Arab economies, namely the nonoil ones, have also been substantially influenced by oil due to their strong economic linkages with the highly endowed oil economies of the Gulf Cooperation Council. The GCC has been a major source of foreign investment and tourism as well as host to large numbers of workers from these countries (Selim and Zaki, 2014).

It is not surprising, therefore, that the resource-dependency has been singled out as the main culprit behind the development problems of the region. While oil resources have provided a huge opportunity to the Arab world to finance accelerated development, it has, nevertheless, complicated the development process in the region. In particular, there appears to be a wide consensus in the received literature that oil rents impede economic diversification and penalize manufacturing growth by generating Dutch Disease and extreme volatility; promote bad governance and complicate transition to a transparent and accountable democratic rule. In addition, the oil sector tends to be located at the periphery of the product space, which makes it difficult for the economy to move into new and more sophisticated lines of products and services (e.g. Elbadawi and Gelb 2010).

However, the received literature also suggests that the role of oil wealth on an economy's performance is not predetermined and that its ultimate impact on development hinges on the underlying institutional and policy environment (e.g. Collier and Goderis 2009; Elbadawi and Soto 2012). Subscribing to this view, this paper contributes to this literature by assessing the effectiveness of competitive real exchange rates in stemming the potential negative impact of oil rents on the capacity of oil and other point source-dependent economies to diversify and modernize their exports. The literature suggests that countries that have achieved high and sustained growth, by and large, are characterized by diversified economies and are endowed with good economic governance, and most, though not all, have large and dynamic manufacturing sectors[1].

The recent growth literature already provides ample evidence of the central role of competitive real exchange rates and robust institutions in averting the resource curse, as measured by the post-boom collapse of economic growth. In particular, this literature finds that maintaining the RER close to its equilibrium level is a necessary condition for sustained growth and that countries that avoided overvaluation have been associated with sustained export-led growth and substantial export diversification (e.g. Elbadawi and Helleiner 2004). Moreover, not only avoiding overvaluation is necessary for growth but a mild undervaluation may be good for growth (e.g. Aguirre and Calderón 2005).

It has been recently argued (most notably by Rodrik 2008) that empirical findings like the ones discussed above are, in fact, a reflection of a deeper causal effect that promises to open a new set of ideas for thinking about a growth agenda in which the RER takes center stage[2]. According to Rodrik, countries that have managed to engineer an RER undervaluation appear

[1] See, for example, Imbs and Wacziarg 2003; Hausmann et al. 2006; and UNIDO 2009.

[2] For other works in the literature on the role of RER undervaluation in promoting growth and export diversification, see Williamson (1997) and Elbadawi and Helleiner (2004).

to have resolved deep institutional constraints.[3] First, “weak institutions” create a wedge between private and social returns, which is different from simply having a low endowment of an input. Second, to the extent that tradables may be more “complex” and entail more transaction-intensive activities, the wedge between private and social returns may be more severe in tradable than non-tradable economic activities and can lead to static misallocation of resources in favor of the latter and greater dynamic distortions in the former. When the tradable sector is more dynamic, as would be expected in many low-income, small economies, an increase in the relative prices of tradables to non-tradables can improve static efficiency and enhance growth in a second-best fashion.

Therefore, RER undervaluation can be the most feasible and effective approach for alleviating such institutional weaknesses. Another theoretical justification for engineering an RER undervaluation strategy is based on the view that tradables (particularly new and non-traditional tradables) are subject to a variety of market imperfections, such as information externalities (learning and cost-discovery externalities) and coordination externalities. These imperfections keep output and investment in tradable sectors at sub-optimal levels. Again, by raising profitability of tradable sectors, an RER undervaluation can be an effective strategy in a second-best world. In particular, it can be an effective substitute to traditional “industrial policy” and all the well-known limitations associated with it.

An important qualification, however, is provided by Eichengreen (2007), who argues that targeting certain sophisticated export activities by certain domestic policies, including those that promote RER undervaluation may merely play a role of a “facilitating” channel to permit the realization of certain favorable conditions. For example, he argues that to the extent that Chinese firms rely on their links to overseas Chinese or to its proximity to Japan and Korea, RER undervaluation or other domestic policies may not be enough for other countries that do not possess such advantage.

Section 2 analyzes export performance of Arab oil economies, in terms of their overall export concentration (the reverse of export diversification), the extent of the sophistication of their exports, and per capita manufacturing exports. Section 3 reports estimation results for the determinants of the RER, based on a world sample of 50 countries spanning 1980-2011. This allows us to subsequently derive measures of RER equilibrium and RER undervaluation, a key determinant of export performance as discussed above. Section 4 estimates a plethora of empirical exports performance models to assess the impact of resource rents and RER undervaluation, among other standard controls, on the above three indicators but to also investigate the channels through which undervaluation can spur export performance. The model is estimated for an extensive panel dataset (ranging from 66 to 118 countries depending on the dependent variable) spanning the period 1980-2011. Section 5 concludes.

2. Exports of Oil-dependent Arab Economies

Diversification to new products is correlated with economic development, especially sustained export-oriented growth. Imbs and Wacziarg (2003) study the patterns of sectoral concentration across countries and time and find that economies become more diversified as their income increases but eventually specialize again at high levels of incomes[4]. Moreover, successful export-oriented strategies that led to major economic transformations have been associated with significant economic diversification. For example, the empirical literature finds that non-traditional exports are characterized by higher income elasticities, less volatile terms of trade, and higher prospects of dynamic productivity gains (Elbadawi 2002; Sekkat and Varoudakis

[3] Country examples from Rodrik (2008) are China, Republic of Korea, Taiwan, Uganda, and Tanzania.

[4] They find that the diversification process goes on until countries attain the income level of Ireland. Therefore, growth is associated with a high degree of specialization only at relatively high levels of income.

1998). Also, following on the work of Hausmann, et al. (2005), Johnson et al. (2007) find that growth accelerations are associated with structural changes in manufacturing.

On the other hand, empirical research has found that countries specialized in primary product exports tend to grow more slowly than economies with diversified export bases. Sachs and Warner (1997) have shown that the 1970 share of primary exports in GDP is negatively correlated with GDP growth in a large sample of 83 countries over the period 1965–1990. Sala-i-Martin (1997) has found a similar result for the 1970 share of primary products in total exports. In the special case of 'point-source' natural resources—those extracted from a narrow geographic or economic base such as oil and other minerals—the received literature suggests that prudent and development-oriented management of oil and mineral booms has been the exception rather than the rule, with many countries "inefficiently" specializing on the resource sector and other non-tradable activities that are likely to be dependent on it, which might lead to the collapse of output after the end of the boom—the so called 'resource curse' (e.g. Hausmann and Rigobon 2003).

Very importantly from the perspective of industrial development, Imbs and Wacziarg(2003) also find that the diversification process does not only hold when economies transform from agriculture to manufacturing but also within manufacturing[5]. This evidence is consistent with a long-held view in the development literature, which argues that enhancing the productive capabilities over a large range of manufactured goods—including the production of new ones—is an "integral" part of development (e.g. Rodrik 2006). More recently, further support to this evidence is provided by the new research pioneered by Hausmann et al. (2006), which finds a strong association between the degree of export sophistication and subsequent economic growth. In this case, however, the positive association between sophistication of exports and development is not just confined to manufacturing but also includes services.

2.1 Manufacturing and export concentration

As discussed, the hydrocarbon sector looms very largely in the oil-dependent Arab economies, especially in the export sector. It is not surprising, therefore, that exports from these countries tend to be highly concentered. For example, during 2000-2013, the degree of export concentration for the median GCC or populous oil Arab economy was close to 70% in the (0-100%) scale of the Herfindahl-Hirschman index (HHI).[6] Though this is still less than the OPEC median of about 80%, it is nevertheless, twice the median HHI for a non-oil Arab or upper middle-income country (Figure 1). In terms of individual country experiences, Saudi Arabia's exports are the most concentrated, with a staggering HHI index of more than 75%, followed by Oman, Sudan and Algeria, where all three, including the emerging oil economy of Sudan, have relatively high concentration indexes above 55%. On the other hand, the UAE has achieved a considerable degree of economic diversification, which puts it at par with Norway and close to the export diversification of Chile. This is quite impressive for a major oil-exporting economy like the UAE. Also, the two nonoil middle-income Arab countries of Egypt and Tunisia have achieved substantial degree of export diversification, with HHI well below 30%.

The export concentration story of the Arab world is mirrored by the limited role of manufacturing in the Middle Eastern economies, which are dominated by the Arab countries,

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[5] See also Klinger and Lederman (2004) and Carrere et al. (2007), who confirm Imbs and Wacziarg's pioneering work using more recent data sets.

[6] The empirical literature uses a variety of measures to capture export diversification. Elbadawi (2002) uses a measure that is the residual of exports after the ten largest three-digit commodity groups have been accounted for. Imbs and Wacziarg (2003) capture concentration (the inverse of diversification) through the use of a Herfindahl-Hirschman index (HHI), coefficients of variation of sector shares, and maximum-minimum spreads. Maloney and Lederman (2007) also make use of HHI as well as of the share of natural resources in total exports.

especially when Turkey is excluded. The UNIDO Industrial Development Report (2009) contains extensive data on five components of industrial performance: manufacturing valued added (MVA) per capita; manufactured exports per capita; share of MVA in GDP; share of medium/high technology production in MVA; manufactured exports in total exports. The evidence presented in the report indicates that for the first five indicators the Middle East and North Africa region (MENA) uniformly underperformed relative to Latin America & the Caribbean and the East Asia & the Pacific, the two regions with comparable levels of development, and only slightly overperformed relative to the vastly poorer regions of South Asia and Sub-Saharan Africa. However, for the last indicator (the share of manufactured exports in total exports), which reflects the direct impact of dependency on the hydrocarbon resource exports in the region, MENA underperformed relative to all of the four developing regions (Table 1)[7].

In addition to their failure to penetrate the global markets for low technology labor-intensive manufacturing exports, the above evidence also reveals an equally disappointing performance for the Arab countries (MENA outside Turkey) with regard to the share of medium and high technology components of manufacturing. This, we will argue, should be particularly worrisome for these countries. In fact, the MENA countries display limited comparative advantage in basic low-technology manufacturing compared to very low wage SSA, South Asia and, especially China—the latter having essentially defined the frontier for labor-intensive manufacturing.

2.2 Export sophistication

Recent new research pioneered by Hausmann et al. (2006) finds strong association between the degree of export sophistication and subsequent economic growth. This evidence, argues Rodrik (2006), suggests that "industrial upgrading is a leading indicator of economic performance" (p. 10) and that productivity levels associated with a country's exports are not fully captured by factor endowments, such as human capital or institutional quality. The new index developed by these authors ranks traded goods in terms of their implied productivity. Thus for each country j, the index is given by:

$$EXPY_j = \sum_l \frac{x_{jl}}{X_j}.PRODY_l \qquad (2.1)$$

Where x_{jl} is the exports of product l by country j; $X_j = \sum_l x_{jl}$ is the total exports of country j; and $PRODY_l$ is the weighted sum of the per capita GDP of countries exporting a given product, where the weights reflect the revealed comparative advantage of each country in that product:

$$PRODY_l = \sum_j \frac{x_{jl} / X_j}{\sum_j \left(x_{jl} / X_j \right)}.Y_j \qquad (2.2)$$

The higher this index is, the higher the content of "rich-country products" in exports. This index is motivated by the view that "not all goods are alike in terms of their consequences for economic performance," and that specializing in some products will bring higher growth than specializing in others. In this setting, government policy has a potentially important positive role to play in shaping the production structure. Everything else being the same, countries that specialize in the types of goods that rich countries export are likely to grow faster than countries

[7] However, the share manufactured to total exports for SSA reported in this table is much larger than other estimates, including those of the IMF (2009).

that specialize in other goods. Rich countries are those that have latched on to 'rich-country products', while countries that continue to produce 'poor-country' goods remain poor."

Figure 2 presents estimates of EXPY in 2007 (the last year of the more recent EXPY series calculated by Anand et al. 2012) for a few Arab countries and other comparators. Again, given its relatively high income, the above evidence makes clear that exports from the Arab world are characterized by relatively low sophistication. For example, with only slightly more than half of Saudi Arabia's income per capita, Malaysia's exports much more sophisticated products (of about 17500 units in the EXPY scale compared to about 1400 for Saudi Arabia). Moreover, China provides even more spectacular contrasts where with an income per capita of less than one fourth of Saudi Arabia's, the sophistication level of its exports was comparable to that of Malaysia; and with an income approximately equal to the median for the nonoil middle-income Arab group, China's EXPY index was 170% of the median score for that group. Finally, and despite having a 2.8 times larger income per capita, Algeria's export sophistication was only 12% higher than that of India.

At this juncture, and not notwithstanding perhaps a few notable success stories[8], we pose to ask the question as to why the Arab region's export performance has been so disappointing as captured by the various indicators discussed so far.

As a first approximation, it is natural to think that the dominance of the hydrocarbon sector must be an important explanatory factor. Controlling for income per capita and country fixed effects, the share of hydrocarbon fuels to total exports is positively associated with export concentration (HHI), while it has a robust negative impact on export sophistication (EXPY). Moreover, the residuals for large oil exporters fall above (below) the line for the case of HHI (EXPY), indicating that their performance could not be explained by their level of development and country fixed effects (Figures 2.3.a and 2.3.b).

In section 4, we assess the impact of oil rents on export performance in a more formal model that also accounts for other controls, most notably the real exchange rate undervaluation. Since the latter is a constructed variable that, in turn, requires the estimation of the equilibrium RER and the construction of the RER misalignment relative to the estimated equilibrium, we turn next to this task in the following section.

3. An Empirical Model of the Real Exchange Rate

The most popular methodologies to determine the equilibrium RER are based on a single-equation, reduced-form model that attempts to account for current-account flow variables as well as factors influencing longer-run stock equilibrium[9]. Motivated by the theoretical models of Elbadawi and Soto (2005) and Elbadawi (1998), we estimate a version of such empirical models that emphasizes the *indirect* role of resource rent—through its impact on government expenditure and the accumulation of net foreign income—in influencing the long-run path of the RER as well as its short-run dynamics. Our model predicts the equilibrium RER to be more appreciated with higher terms of trade (TOT), larger productivity in the traded-goods sector relative to the non-traded sector (PROD), lesser trade openness (OPEN), higher government consumption (GOV), higher foreign aid (AID), and larger net foreign income (NFI), or less flexible exchange rate regimes (EXRregimes). Therefore, our specification is:

[8] Tunisia, for example, has been frequently referred to as an example of successful industrial transformation in the Arab region.

[9] The underlying notion of equilibrium is essentially intertemporal as the path of the equilibrium RER is assumed to be influenced not only by the current value of the fundamentals, but also by anticipations regarding the future evolution of these variables (Edwards (1989) and Elbadawi (1994) provide pioneering analysis of theoretical and empirical equilibrium RER models, respectively.)

$$\log(RER)_{it} = \beta_{0i} + \beta_1 \log(TOT)_{it} + \beta_2 \log(PROD)_{it} + \beta_3 OPEN_{it} + \beta_4 \log(GOV)_{it} + \beta_5 NFI_{it} + \beta_6 AID_{it} + \beta_7^{'} \text{EXRregimes}_{it} + \varepsilon_{it} \quad (1)$$

Where subscripts *i* and *t* represent country and time indexes, respectively, and β_{0i} and ε_{it} are country-specific intercepts and disturbance terms.[10]

We estimate an error-correction model accounting for the above fundamentals for a world panel comprised by annual data for 50 countries for 1980-2011. We use three econometric estimation methods appropriate for an error-correction specification of equation (1) applied to panel data. The pooled mean group (PMG) estimator, which imposes the restriction that all countries share the long-run coefficients; the more general mean group (MG) estimator, which assumes that the economies differ in their short and long-run parameters; and the dynamic fixed-effects (DFE) estimator, which assumes that all parameters are constant across countries, except for the intercept which is allowed to vary across countries. The choice between the three estimators entails a trade-off between consistency and efficiency. The DFE estimator dominates the other two in terms of efficiency if the restrictions of equality of short and long-run parameters are valid. If they are false, however, the DFE will generate inconsistent estimates. The MG estimator imposes no cross-country parameter restrictions and can be estimated on a country-by-country basis, provided that the time-series dimension of the data is sufficiently large. For our purposes, the PMG offers the best compromise between consistency and efficiency: we expect the long-run path of the RER to be driven by a similar process across countries, while the short-run dynamics around the long-run equilibrium path may differ from one country to another because it is likely to be driven by idiosyncratic news and shocks to the fundamentals.

Table 2 reports the results for the three estimation methods. The restriction of the PMG against the MG model can be tested using Hausman tests. The null hypothesis of equality of coefficients cannot be rejected at 10% level for six out of nine regressors, while it can be rejected at 1 or 5% levels for the remaining three regressors, namely terms of trade, government consumption and net foreign income. We, therefore, favor the PMG model against the MG and DFE estimators.

The results of the PMG regression are consistent with the theoretical and empirical literature for all of the RER fundamentals (Table 2).[11] Save for the dummy for the free floating exchange rate regime all long-run coefficient estimates are highly significant (at significance levels of 1% and 5% for all and less than 10% for the crawling peg regime). Moreover, all coefficients enter with the expected signs according to theory, except for the effect due to foreign aid, which was found to have promoted RER depreciation rather than appreciation[12]. In particular, these results show that fundamentals associated with natural resource rents (government consumption, net foreign income and to a lesser extent TOT) contribute significantly to RER appreciation. Regarding the short-term, the PMG results suggest that productivity, openness and government consumption have had significant effects that are also consistent with the direction of their long-run impact. Moreover, unlike its long-run effect, the crawling peg regime was found to promote real depreciation in the short-run. The two pieces of evidence combined suggests that a crawling peg regime is not necessarily an effective monetary institution for the promotion of long-term real exchange rate competitiveness. The estimated

[10] See appendix A for data definitions and sources and appendix B for the country list.

[11] Comparable findings in the literature include Chinn (2000) for productivity; Elbadawi and Soto (1997) and Drine and Rault (2004) for terms of trade; Maeso-Fernandez et al. (2002) for government consumption; and Elbadawi and Soto (2008) for the other variables.

[12] However, even when found to be associated with real exchange rate appreciation, the effect of foreign aid was minuscule and, hence, has no economic significance (Elbadawi et al. 2008).

average adjustment parameter is -0.165, about 80% of the absolute value of the one obtained by

Edwards (1989) using a partial adjustment model for a group of 12 developing countries.

3.1 RER undervaluation in oil Arab economies and comparators

Using the estimation results of Table 2 and the methodology described in Appendix C, we construct indexes for the equilibrium real exchange rate (ERER) and real exchange rate misalignment (MIS). The ERER is obtained by feeding the estimated model with the permanent components of the fundamentals (estimated with the Hodrick-Prescott filter). These permanent components are characterized as sustainable levels and are therefore consistent with the concept of equilibrium. The ERER is normalized (through the country-specific intercept) so that the long-run misalignment for each country is set equal to zero. This imposes the plausible identification condition that no country can be overvalued (or undervalued) on a sustained basis for the full estimation period. The log of the resulting normalized ERER is then subtracted from the log of the actual RER to obtain the RER undervaluation (RERundval) time-series measures for each country. The analysis can be developed using the three pivotal equations from Appendix C:

$$e_t^i = \hat{\beta}' F_t^i + \hat{\varepsilon}_t^i \tag{2}$$

$$\tilde{e}_t^i = \bar{e}^i + \hat{\beta}'(\tilde{F}_t^i - \bar{\tilde{F}}^i) \tag{3}$$

$$RERunderval_t^i = (e_t^i - \tilde{e}_t^i) = \hat{\beta}'(\tilde{F}_t^i - \bar{\tilde{F}}^i) - (e_t^i - \bar{e}^i) \tag{4}$$

where e_t^i is the log of the real exchange rate for any given country *i* at time *t* ; F_t^i and $\tilde{F}_t^i$ are the vector of current and sustainable fundamentals, respectively; β is a vector of long-run coefficients; and a bar over a variable indicates the mean over time. Equation (2) expresses the log of the RER in terms of current fundamentals and a residual term, while equation (3) specifies the log of the equilibrium RER that satisfies the above normalization condition. The equilibrium RER is expressed as the sum of the mean of the observed RER and a term that depends on the difference between the sustainable fundamentals and their mean values ($\hat{\beta}'(\tilde{F}_t^i - \bar{\tilde{F}}^i)$).

Equations (2) and (3) allow us to derive the expression for the RER undervaluation in equation (4), which comprises two components. The first term on the right hand side is the fundamentals effect, which measures the contribution to undervaluation due to the divergence between the current fundamentals and their long-term sustainable path. The second right hand side term is the error-correction effect, which accounts for the short-run divergence between the actual RER and the RER path associated with the fundamentals.

We present the evidence of the RER undervaluation for three types of country groupings: oil exporting vs middle-income non-oil (Figure 4); Arab oil economies vs non-Arab oil (Figure 5); and, GCC vs populous Arab oil economies (Figure 6). The figures highlight that oil economies, both globally and in the Arab world, have experienced major RER volatilities, while the non-oil economies have been much more stable. Moreover, at the global level, non-oil middle-income economies have managed to keep their RERs close to their equilibrium values, while the RERs in oil exporting economies have been overvalued since the mid-1990s (Figure 4). Although, like their non-Arab counterparts, the oil Arab countries failed to stabilize their RERs prior to the mid-1990s, they have, nevertheless, managed to keep their RERs more stable as well as undervalued for the entire period since 1995 (Figure 5). This suggests that the median oil exporting country in the Arab world has learned from the painful lessons of the mid-1980s, following the collapse of oil prices. Zooming into the evidence, however, it is possible to conclude that the GCC was responsible for the better performance in terms of RER stability and RER undervaluation (Figure 6). The evidence suggests that these countries' RERs were relatively stable and undervalued since prior to the turn of the 1990s decade until the recent global economic crisis. Instead, the populous oil Arab economies experienced very high RER volatility and only became competitive much later in the late 1990s. Nonetheless, compared to their non-Arab counterparts, it seems that the oil exporting Arab countries have internalized the lessons of the 1980s much faster.

4. An Empirical Model of Export Performance

As discussed, export-orientation has been credited as a successful development strategy leading to economic transformation. Furthermore, sustained export-oriented policies have been associated with significant export diversification, as countries initially limited to exploiting their endowments in natural resources have sought to avoid abrupt sector-specific shocks by moving into the production of non-traditional exports, such as manufacturing.

However, according to the evidence of section two the oil Arab group exhibits the lowest level of export diversification, as suggested by the HHI for export concentration. Moreover, despite its relatively high income levels, it has relatively low shares of manufacturing exports, especially for knowledge- and skill-intensive types of manufacturing. Also, in addition to the failure to achieve technical upgrading in manufacturing, these countries were not able to produce and export more sophisticated exports, commensurate with their level of development. The export sophistication indexes for this group (EXPY) have been comparable or lower than those of much poorer emerging economies. Therefore, studying what fosters or hinders export diversification is crucial for a region like the Arab world. Moreover, the ability to study the determinants of various diversification measures that go beyond manufacturing exports allows us to capture the experiences of various resource-dependent countries such as Chile and Malaysia that have made substantial strides in diversifying their production and export structures by moving not just into manufacturing but also into high-value added agricultural products. Unlike manufacturing exports per capita, one of our three export performance variables, the HHI and EXPY measures would allow us to capture such successful diversifications.

Previous literature studying the determinants of export diversification has focused on countries' factors of production (i.e. population, land per worker, natural resources) and/or geographic factors. Here we account for such factors but we focus on the role of resource rents and the real exchange rate.

Our main empirical results focus on a panel dataset that spans the period 1980 to 2011. The methodology employs the two step Generalized Method of Moments (GMM) estimator. The baseline model that we estimate is:

$$E_{it} = \beta_0 + \beta_1 E_{it-1} + \beta_2 LnPop_{it} + \beta_3 LnGDPPC_{it} + \beta_4 Credit_{it}$$

$$+ \beta_5 Agric_{it} + \beta_6 Rentpc_{it} + \beta_7 Crisis_{it-1} + \mu_t + \varepsilon_{it} \qquad (5)$$

where E is one of the three export-performance indicators, namely manufacturing exports per capita, export sophistication (in turn this is captured by three separate sophistication indices for goods, manufactures, and services exports), and concentration of exports; *LnPoP* is the log of population size; *LnGDPPC* is the log of real per capita GDP; *Credit* is private credit to GDP; *Agric* is value added from agriculture as a share of GDP; *Rentpc* is the log of oil rents per capita; *Crisis* is the lagged indicator of currency crises as suggested by Freund and Pierola (2012), and μ , ε are time the error term.

The baseline model is extended in several directions. First of all, given our intuition that oil rents per capita affect export performance, we test for the effectiveness of RER undervaluation (*RERund*) in stemming the negative impact of resource rents.

$$E_{it} = \beta_0 + \beta_1 E_{it-1} + \beta_2 LnPop_{it} + \beta_3 LnGDPPC_{it} + \beta_4 Credit_{it}$$

$$+ \beta_5 Agric_{it} + \beta_6 \operatorname{Re} ntpc_{it} + \beta_7 Crisis_{it-1} + \beta_8 RERund_{it} + \mu_t + \varepsilon_{it} \quad (6)$$

Subsequently we augment our model to test for the role RER undervaluation in stemming financial underdevelopment and institutional weaknesses. In addition, we also test whether or not RER undervaluation has a non-monotonic effect on the dependent variable by including the squared term of the RER undervaluation (*RERund²)* in an expanded model laid out below. The latter is motivated by the notion that RER undervaluation can only improve export performance up to a certain threshold as no tradable exporting activity could be sustained without backward and forward linkages to non-tradable sectors.

The empirical results are presented in Tables 4.1-4.3, and they confirm the positive role of RER undervaluation on manufacturing exports and exports sophistication and its negative impact on export concentration. For all dependent variables their past values are highly significant confirming that all three measures tend to exhibit path dependency. The undervaluation variable exhibits the expected sign and is significant in all three regressions implying that an undervalued exchange rate would foster greater manufactured exports, lead to lower export concentration, and would support the venture into more sophisticated products. A number of other controls are also significant, namely oil rents undermine export performance and diversification and, to a lesser extent, sophistication, but higher incomes per capita have the reverse effect. Other controls exhibit the expected signs but are not significant and some exhibit conventional significance levels such as financial development, agriculture value added, and a crises indicator.

Alternative specifications suggest that the positive role of undervaluation is smaller in countries with sufficient financial development, at least for the case when this is proxied by the share of M2 in GDP. Given that the coefficient for undervaluation is smaller than in the baseline, this suggests that financial intermediation is one of the channels through which undervaluation contributes to higher manufacturing exports as it essentially constitutes a subsidy for the tradable sector. This finding corroborates similar evidence found for economic growth (e.g. Aghion et al. 2009). A similar intuition can be provided for the specifications where measures of poor institutional quality are interacted with the undervaluation variable. The results seem to suggest that an undervalued exchange rate can make up for institutional weaknesses that would undermine manufacturing exports. This finding lends support to Rodrik's (2008) thesis that RER undervaluation can be a second-best approach to averting the negative role of bad institutions on growth performance. On view of their weak institutions, the oil dependent Arab countries stand to gain the most by engineering real exchange rate undervaluation or at least avoiding extended overvaluation episodes (Figures 4.1 and 4.2).

In order to test for the robustness of our results, we repeated our key empirical specifications using an alternative, albeit much more rudimentary, measure of undervaluation. This measure was constructed from running an HP filter on the REER series and then extracting its temporary component. The results (see Table 6) corroborate our findings that the RER undervaluation is conducive to greater manufactures exports, higher export sophistication, and lower export concentration and that it should be an effective policy response to the corrosive effects of oil rents on non-resource export performance.

5. Conclusions

The real exchange rate has played a central role in the development strategy of most countries, in particular when their ability to foster rapid productivity-driven growth is limited. This paper develops RER misalignment series for a large panel of countries and studies the empirical link between RER undervaluation and export diversification and sophistication while also exploring possible interaction effects between RER undervaluation and the level of institutional and financial development. The paper makes a number of important contributions. At the empirical level, though the evidence produced has wider applicability, we emphasize the implications of our findings for the resource-dependent economies in general, and Arab oil exporters in particular, given their diversity of exchange rate regimes and their high dependence on the resource rents.

This paper builds model-consistent RER misalignment series for a large panel of countries. The RER misalignment series are generated from error-correction estimations for the equilibrium RER, based on structural determinants. The empirical results—based on a world sample of annual 1980-2011 data for 50 countries—show that long-run coefficients of all structural variables and short-run coefficients of some structural variables are significant and display expected signs according to theory. In particular, we find the long-run fundamentals that are highly important in resource-dependent economies—such as government expenditure, terms of trade, net foreign income, and pegged exchange rate regimes—to have exerted a considerable appreciating impact on the RER. Subsequently, we used the long-run regression results to compute RER undervaluation series for each country.

The preliminary evidence on the tendency of oil economies to exhibit more volatile and overvalued (or less undervalued) RERs coheres with the estimated econometric effects of the above RER fundamentals that are likely to be strongly associated with oil rents. However, it seems that the Arab oil countries, especially the GCC, have managed to keep these fundamentals closer to their sustainable long-term path for most of the post-1995 period until the onset of the recent global economic recession in 2008.

The paper finds that those countries that have experienced a good measure of export diversification, increasing degree of export sophistication, and higher manufacturing per capita were also likely to have been able to avoid disequilibrium real exchange rate overvaluation. In fact the evidence suggests an even stronger implication regarding exchange rate policy in that, not only overvaluation is bad for these export performance indicators, but that *undervaluation is good for all*. Therefore, the recent experiences of these countries should provide important lessons regarding the need to avoid high disequilibrium RER appreciation.

The additional and main contribution of this paper is based on specifying several comprehensive export performance models that nest the above variables within a standard specification, controlling for basic export performance fundamentals that are robustly identified in the empirical literature. The models are estimated with a dynamic system GMM estimator, using a global panel dataset that spans the period 1980 to 2011 and includes a large number of countries, ranging from 66 to 118 countries depending on the dependent variable. The results confirm the important positive role of RER undervaluation on export diversification, sophistication as well in promoting a dynamic manufacturing sector. Instead, as expected, we find oil rent to have impeded export diversification, manufacturing sector growth, and, to a lesser extent, export sophistication as well. Moreover, our results also show that RER undervaluation can be particularly effective in ameliorating the negative impact of oil rents on exports when financial markets are not sufficiently developed or when economies are characterized by underdeveloped institutions.

To the extent that oil and other resource-dependent economies are likely to be characterized by large institutional deficits and in some case underdeveloped financial markets, the evidence from this paper suggests that a strategy to depreciate the real currency can be a viable industrial policy for promoting export diversification, technical upgrading and export sophistication. Moreover, this type of public policy can be used to minimize the need for excessive reliance on traditional vertical industrial policy, which usually requires high initial institutional capacity in order to succeed.

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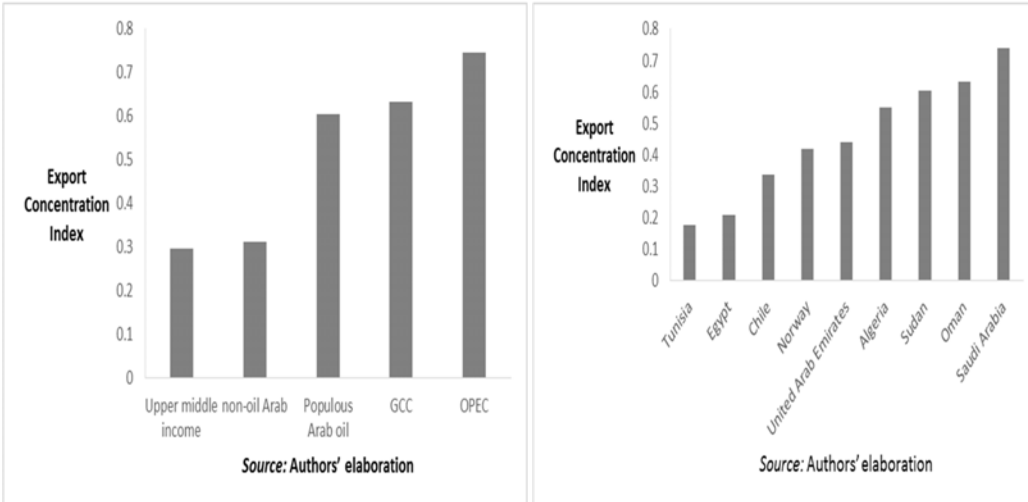
Figure 1: Export Concentration Index (HHI) (2000-2013)



Note: Each bar represents average values.

Figure 2: Degree of Export Sophistication (EXPY 2007)

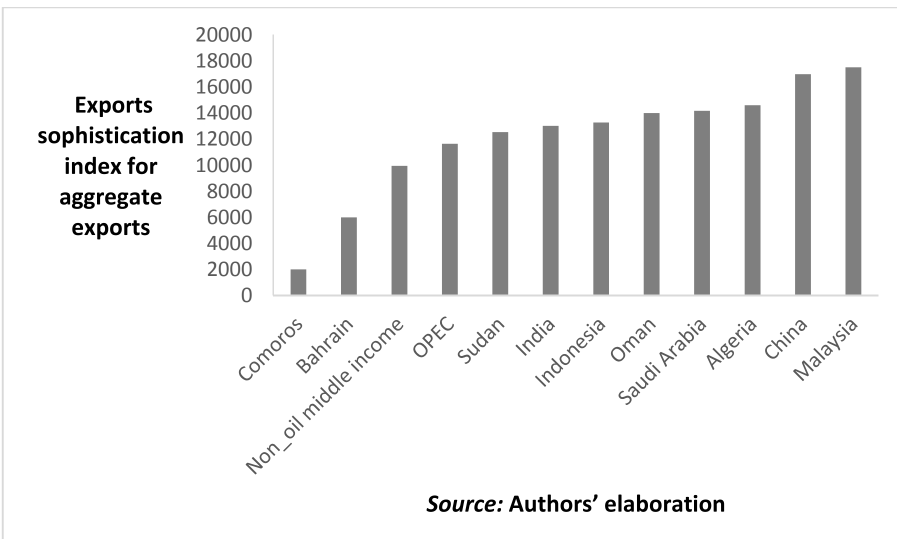
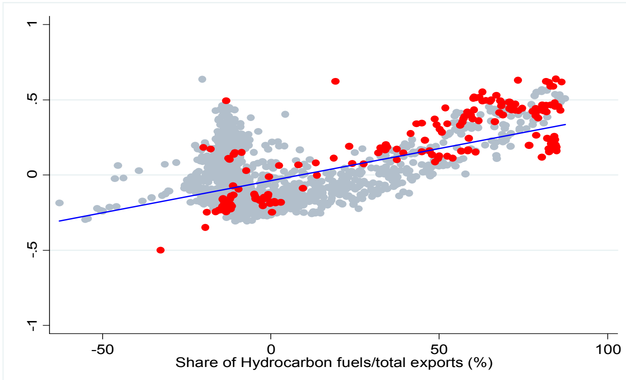
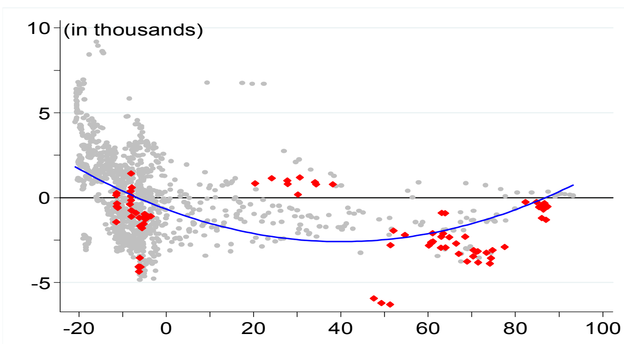


Figure 3a: Export Concentration (HHI) and the Share of Hydrocarbon Fuel Exports



Note: Data points in red refer to oil and mineral-dependent countries.
Source: Authors' elaboration using EXPY data from Anand et al. (2012).

Figure 3b: Export Sophistication (EXPY) and the Share of Hydrocarbon Fuel Exports



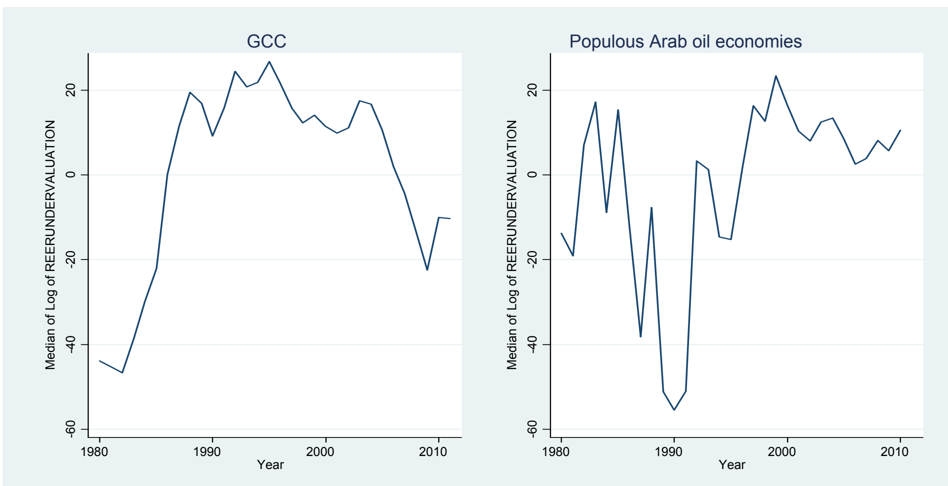
Share of Hydrocarbon Fuels/Total Exports (%)

Notes:
The scatter is based on the fixed-effects regression: Export Sophistication (EXPY)= 293.6556*** Per Capita GDP(PPP)+ -3.2801*** Per Capita GDP^2+ -13.5386 Share of Hydrocarbon fuels/total exports+ 0.0912 Share of Hydrocarbon fuels/total $exports^2$+ 5574.5618*** Const; Where *** indicates significance at1% level. No. of observations= 1214; and No. of countries= 142.
Data points in red refer to oil and mineral-dependent countries.
Source: Figure 3b of Elbadawi and Gelb (2010).

Figure 4: RER Undervaluation-Oil Exporting vs Non-Oil Middle-Income

Figure 5: RER Undervaluation- Arab Oil Economies

Figure 6: RER Undervaluation-GCC vs Populous Arab Oil Economies



Notes: Oil exporting: all oil exporting countries in the sample (Appendix B). Non-oil Middle-income: all non-oil middle-income countries in the sample (Appendix B). Oil Arab economies: GCC, Algeria, Sudan, Yemen. Non-oil Arab: Morocco, Tunisia, Egypt, Lebanon, Jordan. GCC: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia (UAE is excluded for lack of data). Populous Arab oil economies: Algeria, Sudan, Yemen.
Source: Authors' elaboration using the regression results of Table 2 and Appendix C.

Figure 7: Government Effectiveness in Arab Oil and Comparator Countries

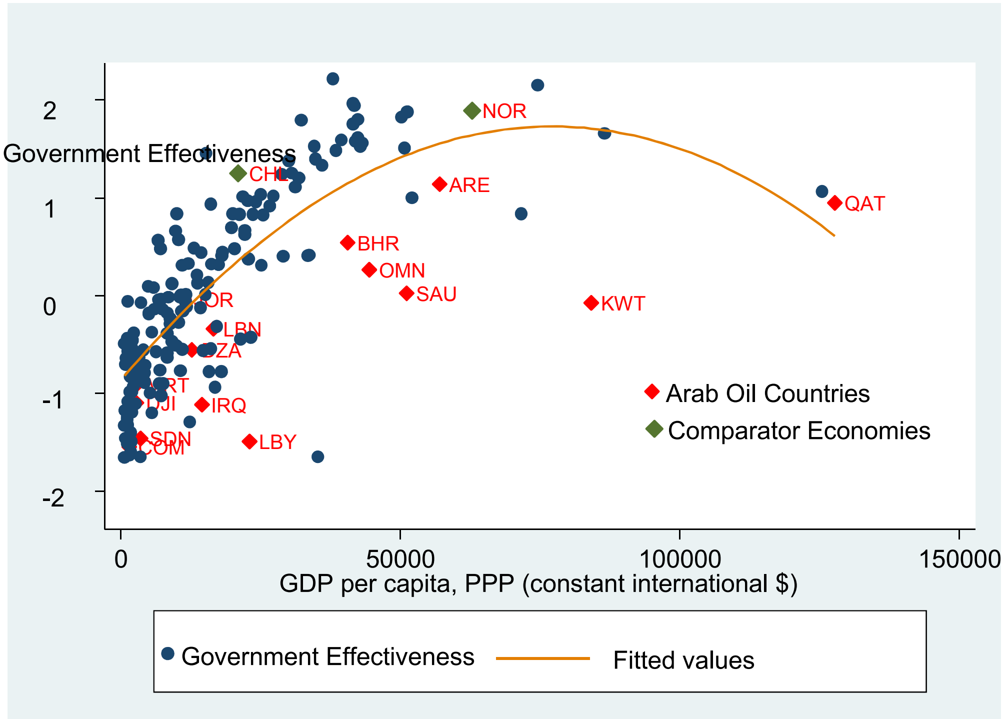
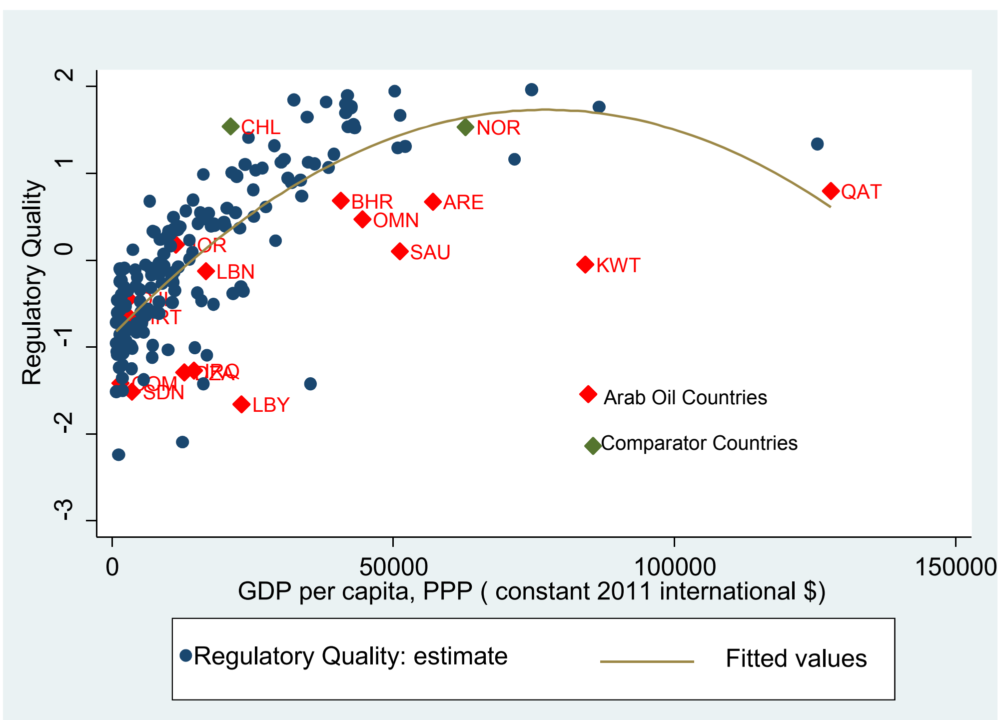


Figure 8: Regulatory Quality in the Arab Oil and Comparator Economies (2012)



Source: Worldwide Governance Indicators, World Bank, 2014.

Table 1: Industrial Performance in Developing Regions (2005)

Region/ Components	Manufacturing value added (MVA) per capita*	Manufactured exports per capita*	Share of MVA in GDP (percentage)	Share of manufactured exports in total exports	Share of medium/high-technology production in MVA (percentage)	Share of medium/high-technology exports in manufactured exports (percentage)
Industrialized economies	4,771.0	5,428.2	16.8	85.7	75.2	66.1
Sub-Saharan Africa	63.6	81.2	10.9	62.0	41.3	32.4
excluding South Africa	29.2	38.5	7.6	54.9	17.5	13.3
South Asia	82.1	74.3	14.5	86.3	18.3	20.2
excluding India	79.6	51.9	15.9	84.6	5.2	8.0
Middle East and North Africa	398.1	474.7	12.5	31.7	33.3	27.9
excluding Turkey	381.4	367.1	12.1	22.7	19.2	20.0
Latin America and the Caribbean	761.2	642.2	18.2	63.4	47.2	55.9
excluding Mexico	703.2	400.2	18.8	51.9	20.9	36.8
East Asia and the Pacific	582.3	885.6	29.5	91.9	97.5	64.1
excluding China	750.0	1,524.9	25.2	89.9	32.8	68.6

Note: * MVA is in constant 2000 dollars.
Source: Table 2.1 of Elbadawi and Gelb (2010)

Table 2: The Long-and Short-Run Determinants of the Real Exchange Rate

	Pooled Mean Group Estimation	Mean Group		Hausman Tests		Dynamic Fixed Effect	
Long Run Coefficients							
Terms of Trade	0.089*	-0.730		-0.819	**	0.180	***
(in logs)	1.76	-0.49		2.44		2.90	
Productivity	0.391***	1.167	*	0.776		0.452	***
(in logs)	24.23	1.79		1.07		12.60	
Trade Openness	-0.217***	-0.327		-0.062		-0.376	***
	-10.8	-0.57		0.93		-7.51	
Government Consumption/GDP	0.283***	1.435		1.151	**	0.199	***
(in logs)	6.05	1.13		2.09		3.13	
Net Foreign Income/GDP	1.128***	-0.095		-1.223	***	1.243	***
	4.45	-0.02		6.23		2.90	
Foreign Aid Net of Int'l Reserve	0.000***	0.000	**	0.000		0.000	***
Accumulation/GDP)	-5.83	-1.97		0.00		-3.57	
Exchange Rate Regime-Crawl	0.044*	0.108		0.064		0.082	
	1.72	0.41		0.42		1.57	
Exchange Rate Regime-Free Fall	0.289***	0.056		-0.233		0.354	***
	4.17	0.79		0.09		4.03	
Exchange Rate Regime-Floating	-0.128	0.060		0.188		0.155	
	-1.55	1.00		0.05		1.00	
Error Correction Coefficient	-0.165***	-0.471	***			-0.198	
	-5.54	-9.62				-14.01	
Short-Run Coefficients							
D (Terms of Trade, logs)	0.0411	0.066				-0.005	***
	0.94	1.26				-0.25	
D (Productivity, logs)	0.444***	0.463	***			0.550	
	18.32	15.26				30.59	
D(Trade Openness)	-0.13***	-0.136	***			-0.150	***
	-5.17	-4.19				-7.81	
D(Government Consumption/GDP, logs)	0.096***	0.062				0.142	***
	3.37	1.53				6.34	
D (Net Foreign Income/GDP)	0.218	-0.143				-0.001	***
	0.56	-0.36				-0.01	
D(Foreign Aid Net of Int'l Reserve	0.000	0.000				0.000	
Accumulation/GDP)	1.08	-0.67				-1.09	
D(Exchange Rate Regime-Crawl)	-0.018***	-0.001				-0.030	***
	-2.83	-0.06				-2.92	
D(Exchange Rate Regime-Free Fall)	-0.0168	-0.013				-0.081	***
	-1.53	-0.96				-4.92	
D(Exchange Rate Regime-Floating)	-0.004	-0.006				-0.068	**
	-1.12	-1.10				-2.23	
Intercept	1.836	4.929	***			2.340	***
	5.34	6.15				10.37	
No. Countries / No. Observations	50/1647	50/1647		50/1647		50/1647	

Notes: Numbers below coefficients correspond to z statistics. ***, **, * stand for significance at the 1, 5, and 10 percent.
Source: Authors' calculations

Table 3: Resource Rents, RER Undervaluation and Manufacturing Exports (1980-2011)

Dependent variable: log manuf exprts per capita	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Manuf. exports per capita (-1) (in logs)	0.749***	0.759***	0.792***	0.792***	0.833***	0.695***	0.759***	0.824***
	(0.07)	(0.06)	(0.07)	(0.08)	(0.08)	(0.11)	(0.10)	(0.07)
Population (in logs)	0.029	0.0641*	0.0774*	0.106**	-0.034	-0.025	-0.036	0.0974**
	(0.02)	(0.04)	(0.04)	(0.05)	(0.03)	(0.03)	(0.03)	(0.04)
GDP per capita (in logs)	0.248*	0.432***	0.472***	0.526***				0.468***
	(0.15)	(0.13)	(0.16)	(0.17)				(0.16)
Domestic credit to private sector	0.00109		-0.00206					
	(0.00)		(0.00)					
Agricultural value added	-0.0148							
	(0.02)							
Oil rent per capita(in logs)	-0.00810**	-0.0122*	-0.0178**	-0.0200**	0.00613	0.0097	0.00818	-0.0181**
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Crisis (-1)	-0.042	0.0477	-0.042	-0.0346	-0.198	-0.0798	-0.152	-0.0205
	(0.05)	(0.06)	(0.05)	(0.05)	(0.12)	(0.16)	(0.13)	(0.04)
Reer undervaluation(-1)		0.00391**	0.00699***	0.00877**	-0.0147	-0.0263	-0.0211	0.0125***
		(0.00)	(0.00)	(0.00)	(0.01)	(0.02)	(0.01)	(0.00)
Domestic credit to private sector* Reer undervaluation			-0.0000251					
			(0.00)					
M2				-0.00259*				
				(0.00)				
Government Effectiveness* Reer undervaluation					0.00307			
					(0.00)			
Government Effectiveness					-0.113*			
					(0.07)			
Regulatory Quality* Reer undervaluation						0.00503*		
						-0.00283		
Regulatory Quality						-0.290**		
						(0.12)		
Institutions * Reer undervaluation							0.00404*	
							(0.00)	
Institutions							-0.193**	
							(0.09)	
Dummy p50*Reer undervaluation(1 if Reer undervaluation >median)								-0.00165
								(0.01)
Dummy p75* Reer undervaluation (1 if Reer undervaluation>75th percentile)								-0.00735
								(0.01)
Constant	2.68	0.207	-0.857	-1.788	4.303**	7.465***	6.075**	-1.758
	(2.02)	(1.47)	(1.24)	(1.51)	(1.98)	(2.76)	(2.37)	(1.15)
No of Observations	1,954	2,147	2,131	2,027	1,081	1,081	1,081	2,147
No of countries	118	118	118	118	113	113	113	118
First order serial correlation p-value	0.001	0.000	0.000	0.000				0
Second order serial correlation p-value	0.744	0.745	0.73	0.724				0.717
Hansen OID test p-value	0.834	0.949	0.692	0.568				0.786
No instruments	50	46	50	50				50

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4: Resource Rents, RER Undervaluation and Exports Sophistication of Goods (1980-2011)

Dependent variable: Sophistication of exports (in logs)	**(1)**	**(2)**	**(3)**	**(4)**
Sophistication of Goods exports (-1) (in logs)	0.875***	0.933***	0.857***	0.852***
	(0.216)	(0.116)	(0.264)	(0.0740)
Population (in logs)	0.00364	-0.00771	-0.00113	0.00670
	(0.00982)	(0.00635)	(0.00775)	(0.00474)
GDP per capita (in logs)	0.0160	-0.0365		0.0267
	(0.0363)	(0.0272)		(0.0174)
Private credit to GDP		9.70e-05		
		(0.000311)		
Resource rents to GDP	-0.00137	-0.00243*	-0.00147	-0.000142
	(0.00118)	(0.00138)	(0.00266)	(0.000736)
Reer undervaluation	0.000721*	0.00122*	-0.00132	0.000482**
	(0.000401)	(0.000727)	(0.00290)	(0.000241)
Private credit to GDP capita* Reer undervaluation		-0.00249*		
		(0.00129)		
Bad Institutions * Reer undervaluation			0.000107	
			(0.000487)	
Bad Institutions			0.0117	
			(0.0259)	
Resource Rents to GDP* Reer undervaluation				-0.00241
				(0.00188)
Constant	1.002	-0.212	1.324	1.070**
	(1.596)	(0.857)	(2.396)	(0.511)
No of Observations	1,087	1,000	593	1,087
No of countries	72	71	72	72
First order serial correlation p-value	0.020	0.004	0.107	0.006
Second order serial correlation p-value	0.105	0.077	0.765	0.105
Hansen OID test p-value	0.333	0.896	0.891	0.636
No instruments	14	13	12	11

Notes: Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 5: Resource Rents, RER undervaluation and Exports Concentration (1980-2011)

Dependent variable: export HHI concentration index	**(1)**	**(2)**	**(3)**	**(4)**
Concentration exports (-1)	0.779***	0.786***	0.738***	0.581***
	(0.0589)	(0.0588)	(0.0865)	(0.0826)
Population (logs)	-0.0180	-0.128	-0.102	-0.574
	(0.175)	(0.183)	(0.197)	(0.447)
GDP per capita(logs)	0.428	0.396		0.282
	(0.414)	(0.371)		(1.114)
Private Credit to GDP	-0.0188	-0.0181		-0.0389**
	(0.0135)	(0.0110)		(0.0171)
Reer undervaluation	-0.0234**	-0.0225**	0.179*	0.0253
	(0.0116)	(0.0114)	(0.0999)	(0.0252)
Resource rents to GDP	0.197***	0.191***	0.119**	0.158**
	(0.0558)	(0.0597)	(0.0581)	(0.0749)
Resource Rents* Reer undervaluation				-0.417*
				(0.251)
Private Credit to GDP * Reer undervaluation		0.0104		
		(0.0339)		
Bad Institutions* Reer undervaluation			-0.0374*	
			(0.0192)	
Bad Institutions			-0.540	
			(0.755)	
Constant	-0.617	1.056	7.273	20.12
	(5.950)	(6.085)	(4.475)	(16.60)
No of Observations	1,604	1,684	891	1,684
No of countries	91	96	92	96
First order serial correlation p-value	0.000	0.000	0.003	0.000
Second order serial correlation p-value	0.780	0.832	0.629	0.836
Hansen OID test p-value	0.490	0.104	0.509	0.705
No instruments	13	15	34	44

Notes: Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 6: HP-Gap RER Undervaluation and Export Performance (1980-2011)

Variables	**Manuf. exports per capita (in logs)**	**Sophistication of Goods exports (in logs)**	**Concentration exports**
	(1)	**(2)**	**(5)**
Manuf. exports per capita (in logs-1)	0.756***		
	(0.0670)		
Sophistication of Goods exports (in logs) (-1)		0.632***	
		(0.0897)	
Concentration exports (-1)			0.784***
			(0.0775)
Population (in logs)	0.0482**	0.0136	-0.293
	(0.0245)	(0.00925)	(0.296)
GDP per capita (in logs)	0.381***	0.0546***	-0.547*
	(0.121)	(0.0179)	(0.317)
Crisis (-1)	-0.237		
	(0.172)		
Oil per capita (-1)	-0.00902**		
	(0.00428)		
L.gaphp_REER	0.00852**		
	(0.00368)		
Oil rents to GDP		-0.00246	0.148***
		(0.00159)	(0.0488)
gaphp_REER		0.000873***	-0.0355**
		(0.000331)	(0.0146)
Constant	0.965	2.804***	14.85*
	(1.045)	(0.656)	(7.862)
Number of Observations	2,147	1,087	1,816
Number of countries	118	72	99
First order serial correlation p-value	0.000	0.008	0.000
Second order serial correlation p-value	0.760	0.103	0.547
Hansen OID test p-value	0.949	0.642	0.095
No instruments	46	18	18

Notes: Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Appendix A

Definitions and Sources of Variables Used in Regression Analysis

Variable	Definition	Source
ERER Regressions		
Real effective exchange rate	An increase in the index reflects an appreciation. In logs.	International Monetary Fund International Financial Statistics
Government consumption expenditure	Ln(1+government consumption/GDP).	World Bank World Development Indicators
Official development assistance net of international reserves	Official development assistance - change in gross international reserves.	World Bank World Development Indicators
Terms of trade	In logs.	World Bank World Development Indicators
Productivity	Ratio of per capita GDP over average per capita GDP in industrial countries.	World Bank World Development Indicators
Openness	Residual of a regression of the log of the ratio of exports and imports as a share of GDP on the logs of area, population, and dummies for oil exporting and landlocked countries.	World Bank World Development Indicators
Net foreign income	As a share of GDP.	World Bank World Development Indicators
Exchange rate regime	Three different variables that classify the exchange rate regime as pegged and crawling; free fall; and managed and free floating.	International Monetary Fund de facto classification of exchange rate regimes
Export Regressions		
Manufacturing exports	As a share of population. In logs.	World Bank World Development Indicators
Herfindahl-Hirschman index	Concentration index based on SITC 2-4 data. In logs.	UN COMTRADE
EXPY	Three indexes capturing export sophistication in goods, services, and manufacturing. The variables are constructed as the GDP per capita of countries exporting a particular good weighted by the value of exports summer over a country's export basket. In logs.	From Anand, Mishra, and Spatafora (2012)
REER undervaluation	Linear transformation of the REER misalignment series estimated in the ERER regression.	Authors' calculation
GDP per capita	Real GDP as a share of population. In logs.	World Bank World Development Indicators
Population	In logs.	World Bank World Development Indicators
Currency crisis	Dummy variable indicating a currency crisis episode when it take a value of 1.	Laeven and Valencia (2008)
Resource rents	Rents (net of extraction costs) from hydrocarbon sources as a share of GDP.	World Bank World Development Indicators
Agricultural value added	As a share of GDP.	World Bank World Development Indicators
Private credit	As a share of GDP.	World Bank World Development Indicators
Money supply (M2)	As a share of GDP.	World Bank World Development Indicators
Institutional quality	Measures of government effectiveness and regulatory quality.	World Bank Worldwide Governance Indicators
Oil rent	As a share of population. In logs.	World Bank World Development Indicators

Appendix B

Country List

	Equilibrium RER Regression	Exports Regressions with Dependent Variable:		
		Manufacturing Exports	HHI	EXPY
Albania		√	√	
Argentina	√	√	√	√
Armenia		√	√	
Australia	√	√	√	√
Austria	√	√	√	√
Azerbaijan		√	√	
Bahamas		√		
Bahrain		√		
Bangladesh	√	√	√	√
Barbados		√	√	
Belgium		√	√	
Belarus		√	√	
Belize	√	√	√	√
Benin		√		√
Bolivia	√	√		√
Bosnia Herzegovina		√		
Botswana	√	√	√	
Brazil	√	√	√	√
Bulgaria		√	√	
Burkina Faso	√	√	√	√
Burundi		√	√	√
Buthan		√	√	
Cambodia		√	√	
Cameroon	√	√	√	√
Canada		√	√	√
Central African Republic		√		√
Chile		√	√	√
Colombia	√	√	√	√
Comoros		√	√	
Costa Rica	√	√	√	√
Croatia		√	√	
Cyprus	√	√	√	√
Czech Republic		√		
Denmark		√	√	√
Dominican Republic	√	√		
Ecuador	√	√	√	√
Egypt	√	√		√
El Salvador		√	√	√
Estonia		√	√	
Ethiopia	√	√	√	√
Fiji		√	√	
Finland	√	√	√	√
France	√	√	√	√
Germany	√	√	√	√
Ghana		√	√	√
Great Britain	√	√	√	√
Greece	√	√	√	√
Guatemala		√	√	√
Guinea		√	√	
Honduras	√	√	√	√
Hong Kong		√		√
Hungary		√	√	
Iceland	√	√	√	√
India	√	√	√	√
Ireland		√	√	√
Italy	√	√	√	√
Jamaica		√	√	√
Japan		√	√	√
Jordan	√	√	√	√
Kazakhstan		√	√	
Kenya	√	√	√	√
Korea	√	√		√
Kyrgyz Republic		√		
Laos				√
Latvia		√	√	
Lebanon		√	√	
Lithuania		√	√	
Luxembourg		√	√	
Macedonia		√		
Madagascar	√	√	√	√

	Equilibrium RER Regression	Exports Regressions with Dependent Variable:		
		Manufacturing Exports	HHI	EXPY
Malaysia		√	√	√
Malawi		√	√	√
Maldives		√	√	
Mali	√	√	√	√
Malta	√	√	√	√
Mauritania		√	√	√
Mauritius		√	√	√
Mexico	√	√	√	√
Moldova		√	√	
Mongolia		√	√	√
Morocco	√	√	√	√
Nambia		√	√	
Nepal		√		√
Netherlands	√	√	√	
New Zealand	√	√	√	√
Norway	√			
Pakistan	√	√	√	√
Panama	√	√	√	√
Paraguay		√	√	√
Peru		√	√	√
Philippines	√	√	√	√
Poland		√	√	√
Portugal	√	√	√	√
Russia		√	√	
Senegal	√	√	√	√
Serbia		√	√	
Sierra Leone	√	√		√
Singapore		√	√	√
Slovakia		√		
Slovenia		√	√	
South Africa		√	√	√
Spain	√	√	√	√
Sri Lanka	√	√	√	√
Sudan	√	√		√
Swaziland		√	√	
Sweden	√	√	√	√
Switzerland	√	√	√	√
Syria		√		√
Tanzania		√		√
Thailand		√	√	√
Trinidad & Tobago		√	√	√
Tunisia	√	√	√	√
Turkey		√	√	√
Turkmenistan		√	√	
Uganda		√	√	√
Ukraine		√	√	
Uruguay		√	√	√
Venezuela	√	√		√
Vietnam		√		√
Yemen		√		√
Zambia	√	√	√	√

Notes: A check mark indicates that the country was included in the baseline regression estimation specified as the column heading under which the check mark is placed. For those cases when a country does not get a check mark for the equilibrium RER estimation but is included in the growth or export regressions, this implies that its RER misalignment series was obtained by applying the out of sample coefficients.

Appendix C: Computing the Equilibrium Real Exchange Rate and RER Misalignment Indexes[13]

In order to determine the equilibrium RER it is useful to collapse all of its determinants into a category we call *fundamentals*. Let e_{it} be the log of the observed real exchange rate for country *i* in time *t*. Then we can write the equilibrium RER equation as:

$$e_t^i = \hat{\delta}_0^i + \hat{\beta}' F_t^i + \hat{\varepsilon}_t^i \quad (1)$$

Where, *i* denotes a country and ε_t^i is a stochastic innovation or short-term fluctuation. Note that the intercept varies across countries. Let the equilibrium RER be as follows:

$$\tilde{e}_t^i = \tilde{\delta}_o^i + \hat{\beta}' \tilde{F}_t^i \quad (2)$$

where $\tilde{F}_t^i$ refers to sustainable fundamentals, given by the permanent components of the fundamentals and $\tilde{\delta}_0^i$ is a scaled country-specific intercept to be identified below.

Under the assumption that the model is correctly specified, the real exchange rate undervaluation (RERund) is simply given by subtracting the observed RER from its equilibrium vakue:

$$RERund_{it} = \tilde{e}_t^i - e_t^i = (\tilde{\delta}_0^i - \hat{\delta}_0^i) + \hat{\beta}'(\tilde{F}_t^i - F_t^i) - \hat{\varepsilon}_t^i \quad (3)$$

The scaled intercept of the equilibrium RER ($\tilde{\delta}_0^i$) must satisfy the following identification condition:

$$E_t(RERund_{it}) = E_t\left[(\tilde{\delta}_0^i - \hat{\delta}_0^i) + \hat{\beta}'(\tilde{F}_t^i - F_t^i) - \hat{\varepsilon}_t^i\right] = 0 \quad (4)$$

This condition requires that, for any given country, the expected value of the misalignment across time must be equal to zero. This is because eventually the RER must revert to it equilibrium level; otherwise it will not be a "misalignment" but a permanent phenomenon. Though the expected value of the transitory components of the fundamentals (second right hand side term) should be zero, we do not make that restriction to allow for potential misspecification of the decomposition procedure[14].

Noting that the first right hand side term is time-invariant, we have the following sample estimate for the equilibrium intercept term:

$$\tilde{\delta}_0^i = \hat{\delta}_0^i + \hat{\beta}'[\frac{1}{n}\sum_t (F_t^i - \tilde{F}_t^i)] + \bar{\hat{\varepsilon}}_t^i \quad (5)$$

Note that though the panel estimation requires that $E_{t,i}\left[\hat{\varepsilon}_t^i\right] = 0$, $E_t\left[\hat{\varepsilon}_t^i\right]$ is not, in general, equal to zero and can be estimated by the mean of the residuals $\bar{\hat{\varepsilon}}^i = \frac{1}{n}\sum_t \hat{\varepsilon}_t^i = \frac{1}{n}\sum_t e_t^i - \hat{\delta}_0^i - \hat{\beta}'(\frac{1}{n}\sum_t F_t^i)$ (from equation 1). Substituting for the mean residual in equation (5), we have the final expression for the equilibrium intercept:

$$\tilde{\delta}_0^i = \bar{e}^i + \hat{\beta}'(\bar{F}^i - \bar{\tilde{F}}^i) - \hat{\beta}'\bar{F}^i = \bar{e}^i - \hat{\beta}'\bar{\tilde{F}}^i, \quad (6)$$

[13] This appendix is a modified version of the appendix in Elbadawi et al. (2012).

[14] We show below that the expression for the equilibrium RER is the same whether or not we assume the expected values of the transitory fundamentals to be zero. Moreover, under the general case, the equation for misalignment generates the one with the expected value equal to zero as a special case.

where, $\bar{e}^i, \bar{F}^i$ *and* $\bar{\tilde{F}}^i$, respectively, denote the mean values (over time) of the actual RER, the fundamentals, and their corresponding permanent components.

Using equations (6) and (2) gives us the ultimate expression for the equilibrium RER index:

$$\tilde{e}_t^i = \bar{e}^i + \hat{\beta}'(\tilde{F}_t^i - \bar{\tilde{F}}^i) \qquad (7)$$

This expression states that, for any given country *i*, the RER equilibrium index must be equal to the average of the observed RER over the estimation period plus (minus) a component reflecting equilibrium appreciation (depreciation), where an equilibrium appreciation (depreciation) is required when the weighted permanent component of the fundamentals in time t is larger (smaller) than the corresponding average over the estimation period (second right hand side term).

Subtracting the observed log RER from the above index gives the corresponding expression for misalignment[15]:

$$RERund_t^i = \hat{\beta}'(\tilde{F}_t^i - \bar{\tilde{F}}^i) - (e_t^i - \bar{e}^i) \qquad (8)$$

Like the equilibrium RER index, the expression for undervaluation is also very intuitive. It suggests that, at any point in time, if the difference between the RER at time *t* and the average RER is in excess of the equilibrium depreciation component the exchange rate is overvalued at time *t*, and the extent of the overvaluation is given by the net difference. This expression also suggests that depending on the size of the equilibrium depreciation component, a higher than average real exchange rate is compatible with overvaluation (RERund<0), undervaluation (RERund>0) or equilibrium (*MIS*=0).

If the permanent components of the fundamentals are time-invariant, the second term in the RHS of equations 7 and 8 will be zero. The equilibrium RER will, therefore, be equal to the mean of the observed RER and the misalignment will be given by the deviation from the mean RER. This will be consistent with a variant of the PPP model. However, the PPP restriction is neither corroborated by theory nor the time series characteristics of the fundamentals, especially for the case of developing countries.

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[15] Under the assumption that $E_t\left[\hat{\beta}'\left(F_t^i - \tilde{F}_t^i\right)\right] = 0$, the corresponding expression for the equilibrium intercept is given by $\tilde{\delta}_0^i = \bar{e}^i - \hat{\beta}'\bar{F}^i$. However, since $\bar{F}^i = \bar{\tilde{F}}^i + \frac{1}{n}\sum(F_t^i - \tilde{F}_t^i)$ and the second RHS term is equal to zero by assumption/construction, the expression for the intercept is the same under both cases. Therefore, the expressions for the equilibrium RER (equation 7) as well as the misalignment (equation 8) also remain the same.