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**DOES EXCHANGE RATE UNDERVALUATION MATTER
FOR EXPORTS AND TRADE MARGINS?
EVIDENCE FROM FIRM-LEVEL DATA**

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Working Paper No. 1004

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Abstract

Exploiting a new dataset available for four countries (Egypt, Jordan, Kuwait and Yemen), this paper assesses the claim that real exchange rate undervaluation affects both the quantity of exports (intensive margin) and the probability of exporting a certain product to a certain destination (extensive margin) of trade in Arab countries. We find robust evidence suggesting that RER depreciation/undervaluation promotes exports at both the intensive and the extensive margins. Moreover, when financial openness is driven by FDI the latter reinforces the RER effects, but it tends to counter it when it is mainly dominated by non-FDI flows. In this case there will be even a more dire need for a higher economy-wide subsidy through an undervalued real currency in order for manufacturing exporting firms to grow at the intensive margin, and especially for overcoming the more challenging impediments of opening new markets or developing new export products.

JEL Classification: F10, F12, F14.

Keywords: real exchange rate, RER depreciation, RER undervaluation, exports, intensive margin, extensive margin, trade margin, financial openness, financial development, Arab world, Egypt, Jordan, Kuwait, Yemen.

ملخص

تقدم هذه الورقة تقييمًا للدعاء بأن القيمة البخسة لسعر الصرف الحقيقي تؤثر في كمية الصادرات (الهامش المكثف) واحتمال تصدير منتج معين إلى وجهة معينة (الهامش الواسع) من التجارة في الدول العربية وذلك باستغلال مجموعة البيانات الجديدة المتاحة لأربع دول (مصر، الأردن، الكويت واليمن). وجدنا أدلة قوية تشير إلى أن القيمة البخسة/معدل الاستهلاك لسعر الصرف الحقيقي يعزز الصادرات في كل من الهوامش المكثفة والواسعة النطاق. وعلاوة على ذلك، عندما يقوم الاستثمار الأجنبي المباشر بتوجيه الانفتاح المالي فإنه يعزز آثار سعر الصرف الحقيقي، ولكنه يميل إلى مواجهته عندما يسيطر عليه أساسًا تدفقات الاستثمارات الأجنبية غير المباشرة. في هذه الحالة سوف يكون هناك حاجة وخيمة لأعلى دعم على نطاق الاقتصاد من خلال عملة حقيقية مقومة بأقل من قيمتها لنمو الشركات المصنعة والمصدرة على الهامش المكثف، وخاصة للتغلب على العوائق الأكثر تحديًا لفتح أسواق جديدة أو تطوير منتجات جديدة للتصدير.

1. Introduction

The received macroeconomic growth literature provides ample evidence on the robust association between growth and depreciated or undervalued real exchange rates, especially in developing and emerging market economies with relatively weak institutions or low labor and total factor productivities. In particular, this literature finds that not only avoiding overvaluation is necessary for growth but a mild undervaluation may be good for growth¹. Moreover, a small but important strand of this literature also develops a theory suggesting that real exchange rate undervaluation is a growth fundamental in a second best world of market coordination failures and weak institutions². These institutional problems, it is argued, create a wedge between private and social returns, especially in the more dynamic and transaction-intensive tradable economic activities of the developing economies. The wedge between private and social returns is likely to be more severe in traded than non-traded economic activities and can lead to static misallocation of resources in favor of the latter and greater dynamic distortions in the former. When the traded-goods sector is more dynamic, as would be expected in many low-income, small economies, an increase in the relative prices of traded to non-traded goods can improve static efficiency and enhance growth in a second-best fashion.

Therefore, by providing an economy-wide subsidy to tradable sectors, real exchange rate undervaluation should at least partially ameliorate the negative by improving static efficiency and enhancing growth in a second-best fashion (Rodrik, 2008).

Another theoretical justification for engineering an RER undervaluation strategy is based on the view that traded goods (particularly new and non-traditional ones) 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 traded sectors at sub-optimal levels. Again, by raising profitability of traded sectors, an RER undervaluation can be an effective strategy for increasing growth in a second-best world.

Against this backdrop, this literature argues, an undervalued RER provides an economy-wide subsidy to economic activities that would have otherwise not materialized. As such, real exchange rate undervaluation is likely to generate potential for comparative advantage potential in new and more sophisticated exportable goods and services. Therefore, to the extent developing countries need time to address institutional weaknesses- at least long enough to master the art of first best world vertical industrial policy- RER undervaluation remains a potent strategy even after decades of sustained growth and economic diversification. In this context, this literature suggests that those countries that have managed to engineer an RER undervaluation (e.g. China, Republic of Korea, Chile) appear to have indirectly resolved (or provided a cushion against) deep institutional constraints during the early phases of their development process.

However, it is also important to note that the implications of the above theoretical justification for the role of the RER in promoting growth and export diversification is that RER undervaluation is not likely to be effective nor necessary for export promotion in economies with developed institutions, especially developed financial institutions, because first best policy options are available. The theoretical predictions were strongly corroborated by the empirical growth and export performance literature (e.g. Rodrik, 2008; Aghion et al, 2009; Elbadawi and Kaltani, 2015).

However, a recent firm level microeconomic literature questions the macroeconomic view that RER undervaluation might promote new potential comparative advantage (e.g. Berman et al,

¹ See, for example, Rodrik (2008), Aghion et al (2006), Aguirre and Calderón (2005) and Elbadawi and Kaltani (2014).

² See Rodrik (2008). Also for other work in the literature on the role of RER undervaluation in promoting growth and export diversification, see Williamson (1997) and Elbadawi and Helleiner (2004).

2012; Taglioni, 2012; Auboin and Ruta, 2011). Instead this literature argues that the relationship between the level of a currency and exports is indeterminate and depends on economy-wide conditions as well as firm-specific characteristics. This literature distinguishes between the firm-extensive margin (the probability of becoming an exporter), the product-extensive margin (the probability of exporting a new product), the market-extensive margin (the probability of exporting to a new destination) and the intensive margin (the values of exports). In this context, using a rich set of French firm level data, Berman et al (2012) find that high productivity firms tend to partially absorb exchange rate changes into their mark-up pricing rather than changing the volume of exports at the intensive margin. Instead, low productivity firms tend to increase their exports in response to depreciated RER. Moreover, at the extensive margin, depreciated real currency is also likely to incentivize mainly low productivity firms to become exporters. And since in advanced economies like that of France the export sector is dominated by high productivity firms, the aggregate impact of RER depreciation on exports is likely to be rather weak. In the same vein Taglioni (2012) finds that the intensive and extensive margins of trade are affected differently by a revaluation of the domestic currency. On the one hand a revaluation of the exchange rate tends to have a depressing effect on the volume of existing export flows - which mainly materialize through the intensive margin. On the other hand there are important pro-competitive effects associated with a strong currency. These materialize mainly through the extensive margin of trade, via a variety of channels that make the domestic economy structurally more competitive, including by forcing out less competitive firms and motivating others to more creatively exploit non-price possibilities to open new markets, produce new higher value and more sophisticated product mixes.

However, the firm level story might be different in developing and emerging market economies, where firm productivity is likely to be low and the export sector is dominated by low productivity firm. In these economies the aggregate impact on exports of an RER depreciation is likely to be much stronger. Moreover, the evidence from the empirical micro and macro strands of the literature are not necessarily incompatible, because the latter finds that, when controlling for financial development or quality of institutions and their interactions with the RER undervaluation index, the interaction effect was found to be negative and the level effect of the RER is much weaker. This implies that, in economies with good institutions or developed financial system, the growth and export promotion effect is likely to be limited or even insignificant (e.g. Rodrik, 2008; Aghion et al, 2009; Elbadawi and Kaltani, 2015).

In this paper, we contribute to the above nascent microeconomic strand of the literature by assessing the role of the RER in promoting export performance at the firm level for the case of four MENA economies: Egypt, Jordan, Kuwait and Yemen, where a rich new custom data set produced by the World Bank was made available to the ERF Research Network. Our main finding was that RER competitiveness- whether measured by RER depreciation or RER undervaluation relative to its notional equilibrium- is robustly and positively associated with firm export performance not just at the intensive margin but also at the extensive margin. Yet, when the financial openness/development level is taken into account³, we find the RER depreciation effect is more robust for the extensive margin than for the intensive margin. This result holds for exporting a new product or to a new destination, for the number of products exported or for the number of destinations. The above results are broadly robust against the choice of the exchange rate index, including the level of the RER as well as the model-based index of undervaluation. However, due to lack of data on firm characteristics, we do not control for these key variables and their interactions with the RER. Nonetheless, we don't expect this

³ In most countries in this region, financial development is intertwined with financial openness, with all four economies characterized by largely open capital accounts. Hence, for the remainder of this paper we use the two concepts interchangeably to mean the same thing.

to affect the robustness of our results, especially since the RER effect has been well established in other strands of firm literature that fully accounts for firm characteristics (e.g. Elbadawi et al, 2006).

The paper is organized as follows. Section 2 describes the data sets used in the analysis and presents preliminary evidence and stylized facts. Section 3 presents the estimation framework and discusses the empirical results. Section 4 concludes.

2. Data and Preliminary Assessment

We briefly describe the firm level customs and firm invariant country-specific macro real exchange rate data sets. Also we discuss in this section the construction of the RER undervaluation index, where we derive two types of indexes, using the model-based and the HP filter-based approaches. In addition, we conclude the section by presenting the salient features of the data and present some stylized facts. The data sources and definitions of all the variables used in the analysis are contained in the Data Annex Table A.1, and the corresponding summary statistics are reported in Table A.2.

2.1 Customs data

We had access to a unique dataset of firm-level export transactions collected in four Arab countries (Egypt, Jordan, Kuwait and Yemen). The database records the annual export transactions (quantities and values) at the firm product (HS6 level except Egypt HS4) and destination country level (around 200 destinations) for 3 years in the case of Kuwait, 5 years for Egypt and Yemen and 8 years for Jordan (see Table 1). The data is part of a wider data collection project that gathered firm-level transactions data from 37 countries, mostly from the developing world. The data allows analyzing the impact of undervaluation on the intensive margin of exports (value of exports), on the probability of exporting to more than one destination (market-extensive margin) and on the probability of exporting more than one product (product-extensive margin). However, because the data do not include non-exporting firms, we cannot examine firm-extensive margin (the probability of becoming an exporter).

2.2 The exchange rate

The real effective exchange rate (REER) index are obtained from Brugel's data base (Darvas, 2012), where the REER is generically defined as the price of tradables to non-tradables; hence an increase (decrease) in the index suggests an RER depreciation (appreciation). Figure 1 depicts the evolution of the REER over time for the four countries. It shows that the REER has been relatively stable in Kuwait and Jordan compared to Egypt and Yemen whose standard deviations are greater (Figure 2). The received evidence from the literature suggests that higher volatility is likely to exert a negative impact on the quantity of exports, as will be shown later.

The indexes for the equilibrium real exchange rate (ERER) and real exchange rate undervaluation (REunderval) are obtained from Elbadawi and Kaltani (2015), who derive two measures of RERunderval: the model-based and the HP-based approaches (see Appendix A). The evidence of the RER undervaluation for the four countries is presented in Figures 3.A-3.D. We note, in general the two RERunderval measures closely track each other across the various undervaluation and overvaluation episodes that are experienced by these countries, despite that they were derived by two very different methodologies. However, the evolution as well the extent of the estimated RER undervaluation (overvaluation) differs quite considerably across the four countries. First, the spread between the RER and its (estimated) equilibrium experienced major swings for the cases of Egypt and Kuwait, ranging between -80% (overvaluation) and 60% (undervaluation) for Egypt; and between -40 to 30 for Kuwait. Second, on the other hand, the RER remained much closer to its equilibrium in Jordan, where the swings in the RERunderval were confined to a range of (-15, 15). Third, despite the volatility of the actual RER (Figure 1), the RER was kept close to its equilibrium since the turn

of the 2000 decade, though the spread was rather high and volatile in the 1990s, ranging between -125 to 50.

2.3 Preliminary assessment

Both of the MENA region and the Arab world⁴ have experienced significant export growth over the past two decades, where total trade (exports+imports) in the two regions grew faster than other developing regions (Figure 4). This increase can be chiefly attributed to higher oil production and prices, growing economic openness and the accession by most countries to the WTO and other common trading areas.

However, a closer look reveals that while most of the exports are concentrated in the hydrocarbon sector that represents 70 percent of the MENA region exports and 80 percent of the Arab region, non-oil exports growth has remained low (Figure 5). The lack of export diversification in the two regions is mirrored by the absence of a competitive industrial sector, as reflected by the limited share of manufacturing exports in their merchandise trade (Figure 6). In fact, compared to other developing regions, manufacturing exports from MENA and the Arab world account for the lowest share of merchandise exports (18.5 and 12.5 percent, respectively), much less than Subs-Saharan Africa (27 percent) and, especially Latin America (48.5 percent) and Asia (83 percent).

Zooming in to assess export performance at the country level, it is worthwhile to note that manufactures exports tends to significantly vary across countries (Figure 7). For example, the share of manufacturing in total merchandise exports vary from 2 and 7 percent in the oil-dependent economies of Yemen and Kuwait respectively to, respectively, 36 and 66 percent in the much more diversified economies of Egypt and Jordan. Moreover, manufacturing exports from the latter two countries also experienced major swings around a rising trend over time (Figure 8).

The better performance of Jordan is confirmed also by the firm-level data (Table 2) since Jordan has the highest average size of firms despite a lower number of exporters and a greater number of destinations compared to Egypt and to Kuwait. Yet, over the period of interest, it is important to note that Egypt and Jordan have experienced different trends. While both the smallest and the largest exporter's size has increased in Egypt, it decreased in Jordan. On the other hand, Kuwait's largest exporter size has tremendously increased between 2008 and 2010 (Table 3) which explains why the number of exporters has slightly declined by 5 percent over the same period (Table 4). By contrast, Yemen's has experienced both an increase in the number of exporters (up by 20 percent) and in the size of the largest exporter. Egypt has also experienced a similar decline in the number of exporting firms with the financial crisis as it decreased by 5 percent from 8521 firms in 2006 to 8034 in 2010. The number of exporting firms has, on the other hand, increased in Yemen and Jordan but remained much smaller than in Egypt.

Figure 9 shows the correlation between REER and manufactures exports in each of the four countries. While undervaluation seems to be strongly and positively correlated with Egyptian and Yemeni exports, it was only weakly correlated with exports for the case of Jordan, while it appears unrelated to exports for the case of Kuwait. This appears consistent with the evolution of the RER, relative to its model-based equilibrium. The RER remained undervalued since the second half of the 1990s in Egypt and Yemen, while it became overvalued in the other two countries since the turn of the 2000 decade (Figure 3). However, a proper assessment of the impact of RER on exports requires a more formally assessment, which we will turn to next

⁴ The Arab world includes the following countries: Algeria, Morocco, Bahrain, Oman, Comoros, Qatar, Djibouti, Saudi Arabia, Egypt, Somalia, Iraq, Sudan, Jordan, Syria, Kuwait, Tunisia, Lebanon, United Arab Emirates, Libya, West Bank and Gaza, Mauritania and Yemen; hence, despite that MENA includes most of the Arab world, the two regions are not the same.

by specifying and estimating panel data regression models of export performance for the four countries, focusing on the role of the RER.

3. Model Specification and Empirical Results

To examine the impact of RER undervaluation on trade margin, we ran several regressions. First, we estimate the determinants of the intensive margin of exports, given by the value of exports of product k from firm f in country i to country j in year t (X_{kfijt}). The primary explanatory variables are centered on the RER competitiveness. We consider two different measures of competitiveness, the log of the RER ($\ln RER$) and an undervaluation index (the model-based index). In addition to the exchange rate variables our baseline model also controls for country size and its level of development ($\ln Pop$ and $\ln GDPcap$ for both origin and destination). In the extended model we consider the hypothesis regarding the impact of financial openness on the effectiveness of the real exchange rate undervaluation (or depreciation) for promoting exports. We test this hypothesis by including three different measures of financial openness, given by the share of capital account balance to GDP (CAB/GDP), the share of foreign direct investment to GDP (FDI/DGP), and the share of international investment position to GDP (IIP/GDP). The three measures accounts for the multi-faceted implications of financial openness for growth and export performance. On one hand, the received literature suggests that FDI is likely to embody technical upgrading and, hence, promote TFP-driven exports and overall economic growth. So this aspect of capital account openness should reinforce the RER undervaluation/depreciation effect on exports. On the other hand, in investment-constrained economies, due to the low appropriability of the social returns to investment, non-FDI capital inflows might actually have perverse effects on growth and export performance. For example, Rodrik and Subramanian (2009) develop a theory to show that in such economies domestic investment would not rise in response to foreign capital inflows, as the latter simply substitute for the deficit in domestic savings now that the real interest rate is lower. However, capital inflows would also undermine the profitability of tradables through the real exchange rate appreciation channel. Therefore, to the extent that the four Arab countries are investment-constrained⁵, non-FDI capital inflows are predicted to hamper export performance as well as complicate the potential export-promoting role of the RER.

The estimating equation is succinctly stated below, where $RERunderval$ stands for the model-based measure of RER, as defined above:

$$\ln(X_{kfijt}) = \beta_0 + \beta_1 \ln(GDPcap_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 \ln(GDPcap_{jt}) + \beta_4 \ln(Pop_{jt}) + \beta_5 REER_{i,t-1} + \beta_6 (Fin.Open_{it}) + \beta_7 (Fin.Open_{it}) \times \ln(REER_{i,t-1}) + \gamma_i + \tau_t + \varepsilon_{kfijt} \quad (1)$$

Or alternatively

$$\ln(X_{kfijt}) = \beta_0 + \beta_1 \ln(GDPcap_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 \ln(GDPcap_{jt}) + \beta_4 \ln(Pop_{jt}) + \beta_5 RERunderlval_{it-1} + \beta_6 (Fin.Open_{it}) + \beta_7 (Fin.Open_{it}) \times RERunderlval_{it-1} + \gamma_i + \tau_t + \varepsilon_{kfijt} \quad (2)$$

where γ and τ country and year dummies respectively and ε_{kfijt} is a random disturbance term. All the regressions have been estimated using fixed effects to control for the unobserved heterogeneity among different firms in different countries.

Second, we ran a similar regression to measure the extensive margin by regressing the probability of serving a new destination j or exporting a new product k coming from firm f in country i and year t as follows:

$$Prob(X_{kfijt}) = \beta_0 + \beta_1 \ln(GDPcap_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 \ln(GDPcap_{jt}) + \beta_4 \ln(Pop_{jt}) + \beta_5 REER_{i,t-1} + \beta_6 (Fin.Open_{it}) + \beta_7 (Fin.Open_{it}) \times \ln(REER_{i,t-1}) + \gamma_i + \tau_t + \varepsilon_{kfijt} \quad (3)$$

⁵ Elbadawi (2011) suggests that this is likely to be the case for most Arab economies.

Or alternatively

$$Prob(X_{kijt}) = \beta_0 + \beta_1 \ln(GDPcap_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 \ln(GDPcap_{jt}) + \beta_4 \ln(Pop_{jt}) + \beta_5 RER_{underval_{it-1}} + \beta_6 (Fin.Open_{it}) + \beta_7 (Fin.Open_{it}) \times RER_{underval_{it-1}} + \gamma_i + \tau_t + \varepsilon_{kijt} \quad (4)$$

This regression was run using a probit model. As indicated earlier, we cannot examine the impact of undervaluation on the shift from a non-exporting firm to an exporting one since these data come from the customs and consequently include exporters only.

3.1 The real exchange rate impact on the intensive margin

Table 5 presents the empirical results of the level measure of RER competitiveness (ln REER). Regression 1 of the baseline model shows that real currency depreciation is positively associated with higher exports. Yet, a different result is obtained in the second regression of the baseline model where undervaluation is insignificant *per se*. This confirms the fact that undervaluation might not affect exports if it is not accompanied by other macroeconomic policies as it will be shown later. For this reason, competitive exchange rate and sound macroeconomic fundamentals are required in order to improve international competitiveness and greater penetration of exports into international markets. It is important to mention that GDP/capita at the origin and the destination matter for exports. Moreover, population at the destination, being a proxy for market size, has a positive impact on the quantity of exports.

In Table 6 and 7, we control for the financial openness and its interaction with the RER and RERunderval in the extended model. As it was mentioned before, we measure financial openness by three indicators. The results of the two sets of regressions lend very strong support to the role of the RER in promoting export performance at the intensive margin. The effect of both RER depreciation as well as RER undervaluation remains positive and highly significant after controlling for origin and destination country economic size as well as the financial openness in the country of origin. The results for the model-based RER undervaluation, our main RER competitiveness metric, corroborates the received macroeconomic literature, in that countries that are able to engineer extended episodes of real exchange rate undervaluation are likely to realize potential comparative advantage in new and more sophisticated exportable goods (e.g. Rodrik, 2008; Elbadawi and Kaltani, 2015). As explained by Rodrik (2008), the RER undervaluation increases the profitability of tradable sectors, which are likely to be disproportionately impacted by market imperfections and institutional weaknesses that are common features of developing economies. Moreover, to the extent that tradable economic activities are likely to be more dynamic than non-tradables, real currency undervaluation could be a viable strategic policy intervention in a second-best policy environment.

The next fundamental set of results relates to how financial openness influenced firm level performance at the intensive margin, both directly in terms of the level effects as well as through its interaction with the RER and RERunderval. First considering the level effect, we find that as predicted by theory, FDI was positively and significantly associated with exports. This result suggests, by and large, FDI generates positive externalities through technological upgrading and TFP-driven growth of exports. Instead, the other two measures of financial openness have had negative and significant effects on exports, which seem to corroborate the concern about excessive or premature capital account openness that has been discussed in the development and macroeconomic literature (e.g. Rodrik and Subramanian, 2009). However, the three financial openness indicators interact differently with the RER and the RERunderval. Firstly, the capital account negative level effect was further reinforced by a negative interaction effect for both sets of regressions. The strong negative impact of the capital account measure perhaps reflects the balance of payment identity (a surplus in the current account/trade balance is accompanied by a deficit in the capital/financial account). Secondly, the FDI does not exert significant effect through the interaction channel for the case of the RER model, while its interaction with RERunderval was negative and highly significant, albeit, with rather small

order of magnitude. Finally, like FDI, the international investment position (IIP) does not a significant interactive effect with the RER, but its interaction with RERunderval was positive and highly significant.

To summarize, FDI is likely to be complementary to the overall positive RER effect on exports, including that of the RERunderval. Instead, other non-FDI capital account openness will likely hinder the effectiveness of the RER-based export promotion strategy. Our results, therefore, cohere with panel growth studies, which find that, controlling for standard growth fundamentals, no statistically significant causal link between financial globalization and growth or between the former and domestic investment could be established (e.g. Rodrik and Subramanian, 2009; and Elbadawi, 2011). This evidence, therefore, makes clear that not only financial globalization does not spur growth but also that financial globalization has no impact on growth because it fails to influence investment.

However, the interpretation of the results in Tables 5, 6 and 7 as reflecting the intensive margin could be criticized on the account that we do not control for sample selection (the probability that exports are positive). Normally this is done through a Heckman procedure that allows the integration of the intensive and extensive margin analysis. Instead, we opt for an alternative estimation strategy that explains the intensive margin equation through the average level of exports across products and destinations for each firm in each year; and the extensive margin via equations: one that explains the average number of products exported by each firm across markets, and the other one the average number of destinations to which each firm exports each product in each year⁶. The results of this estimation strategy are contained in Tables 8-10.

Again we are able to broadly corroborate the previous results, which suggest that our original interpretation of the results as pertaining to the intensive margin remains intact.

3.2 The real exchange rate impact on the extensive margin

Following the analysis of the impact of exchange rate undervaluation on the intensive margin of exports, we now ask the question as to how the extensive margin might be affected by the exchange rate undervaluation. The evidence for the extensive margin of exports suggests several conclusions, which substantially overlap with the results for export performance at the intensive margin.

In broad agreement with the results for the intensive margin of exports, we find the model-based RERunderval to be robustly and highly significantly associated with the export performance at the extensive margin. Very importantly this result holds in the baseline regressions of Table 11 as well as all three regressions of Tables 12 and 13, which control for the three financial development measures and their interactions with REER (Table 12) or RERunderval (Table 13). These findings lends strong support to Rodrik's theoretical framework, because, to the extent that firms attempting to open new export markets or develop new export products are likely to be more impacted by market imperfections and institutional weakness than those operating at the intensive margin of exports, the need for higher economy-wide subsidy through an undervalued real currency will also likely to be more, and even in more financially open economies. Instead, our results do not lend support to the other strand of the firm level literature (e.g. Taglioni, 201; Li et al, 2012).

We also consider two more measures for the extensive margin, namely the number of products and the number of destinations by firm and by year. In line with our previous findings, we find that undervaluation and RER depreciation exert a positive and significant impact on the number of products in the baseline model (Table 14) as well as in the extended one (Tables 15 and 16) when the RER and RERunderval are interacted with different measures of financial

⁶ We are grateful to an anonymous referee for suggesting the alternative estimation strategy.

development. Furthermore, when the extensive margin to trade is measured by the number of markets served by each firm, we also find a strongly positive and significant impact of RER depreciation and undervaluation in the baseline model (Table 17) or in the extended one (Tables 18 and 19). These findings confirm our previous results according to which undervaluation, financial openness and their interaction matter for the extensive margin more than the intensive margin.

4. Conclusion

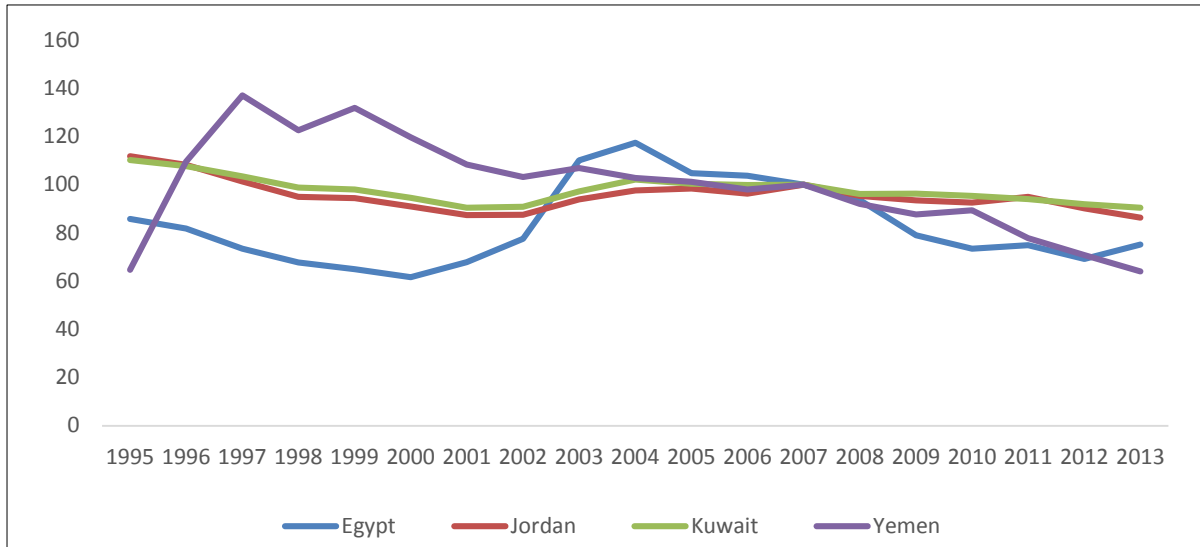
This paper contributes to the nascent firm level-based literature that assesses the impact of the real exchange rate on export performance, both AT the extensive and intensive margins. We estimate a standard baseline model of export performance that also accounts for country size and level of development, in addition to the primary explanatory variables associated with absolute RER depreciation and RER undervaluation relative to a model-based notional equilibrium path. An extended version of the model also accounts for the extent of financial development/openness and its interaction with the index of RER competitiveness. . We estimate these models using a unique panel data set, drawn from the World Bank and the Economic Research Forum data bases on firm surveys. Even though the data do not include non-exporting firms, we could still analyze the impact of RER undervaluation on the intensive margin of exports (value of exports), on the probability of exporting to more than one destination (market-extensive margin) and on the probability of exporting more than one product (product-extensive margin).

The estimation results allow us to glean some important conclusions. First, RER depreciation as well as RER undervaluation promotes exports performance at both the intensive and extensive margins, where the latter relates to the probability of firms opening new markets or exporting new products. Second, the RER effect remains strong even in economies with relatively developed or open financial sectors. . Third, when financial openness is driven by FDI, it tends to reinforce the export promotion effect of the RER undervaluation/depreciation, because as the literature suggests, FDI is likely to induce technological development and, hence, enhance productivity of exporting firms. Fourth, instead, when financial openness is not associated with FDI, it acts as a countervailing force militating against export competitiveness. In this case there will be even a more dire need for a higher economy-wide subsidy through an undervalued real currency in order for manufacturing exporting firms to grow at the intensive margin, and especially for overcoming the more challenging impediments of opening new markets or developing new export products.

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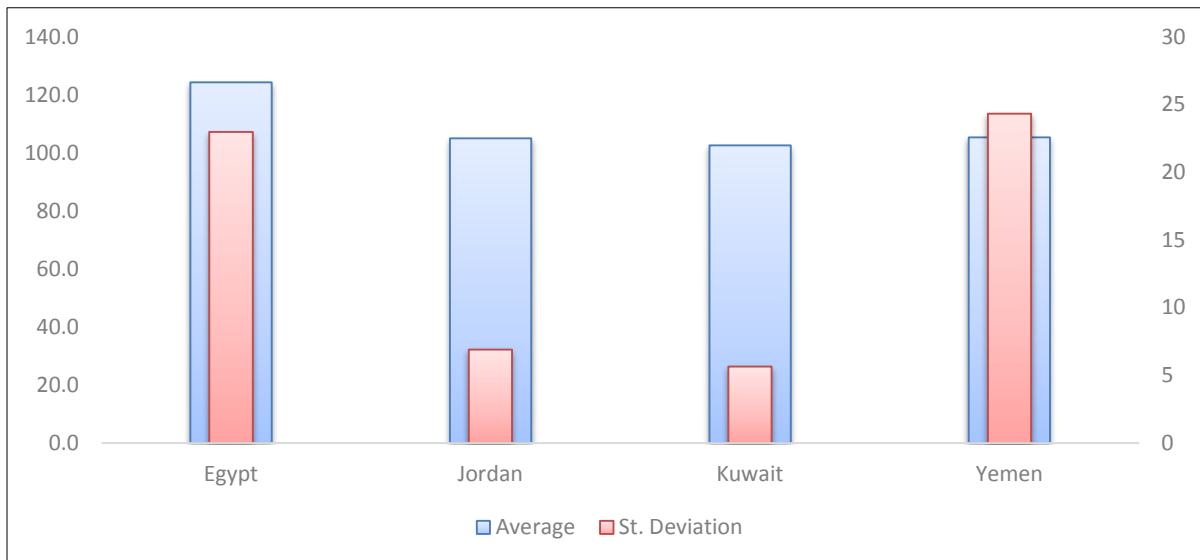
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Figure 1: REER



Notes: An increase in the index indicates depreciation of the home currency against the basket of currencies of trading partners.
 Source: Constructed by the authors using Brugel's data base (Darvas, 2012).

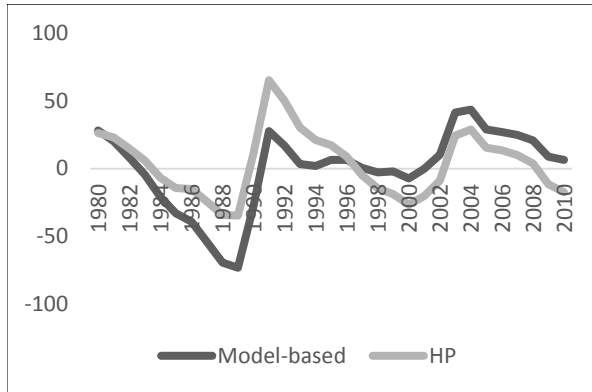
Figure 2: Average and Standard Deviation of REER



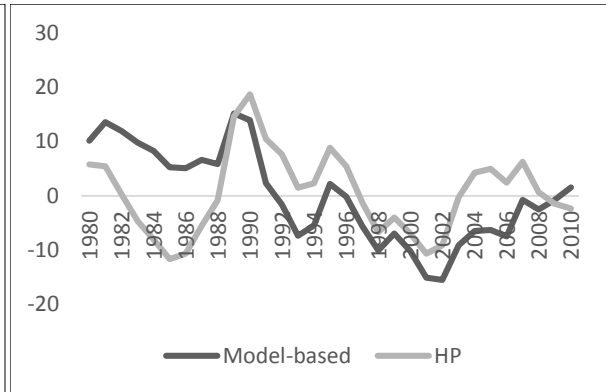
Source: Constructed by the authors using Brugel's data base (Darvas, 2012)

Figure 3: RER Undervaluation in Four Arab Countries

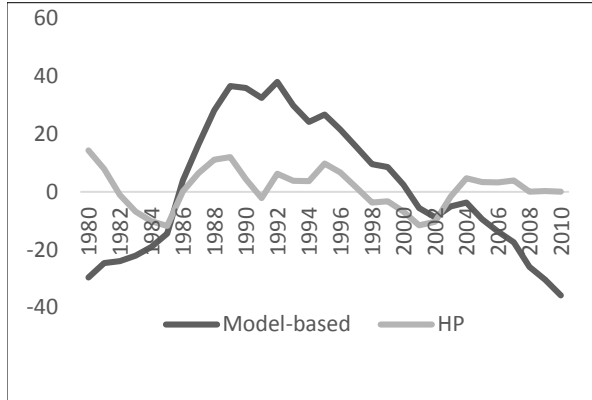
a. Egypt



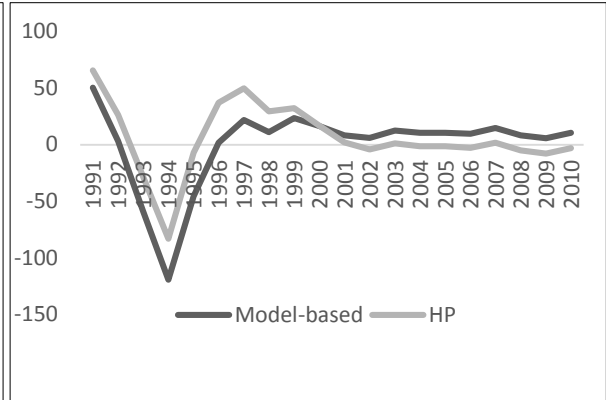
b. Jordan



c. Kuwait



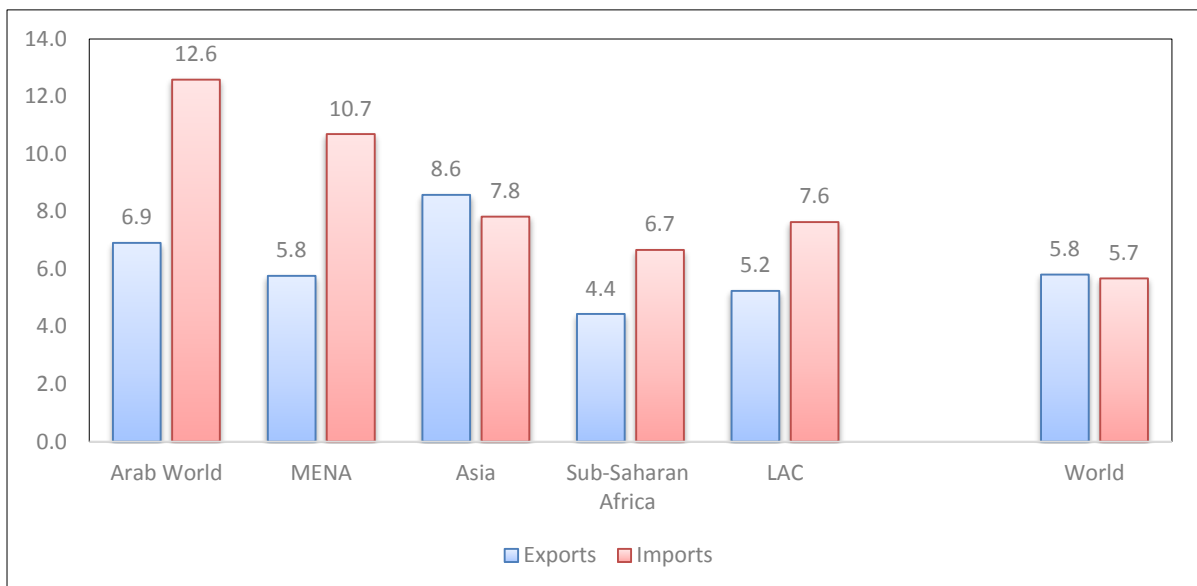
d. Yemen



Notes: The two measures of RER undervaluation are the model-based and the HP-based approaches. In both measures, while a positive value means undervaluation, a negative value means overvaluation.

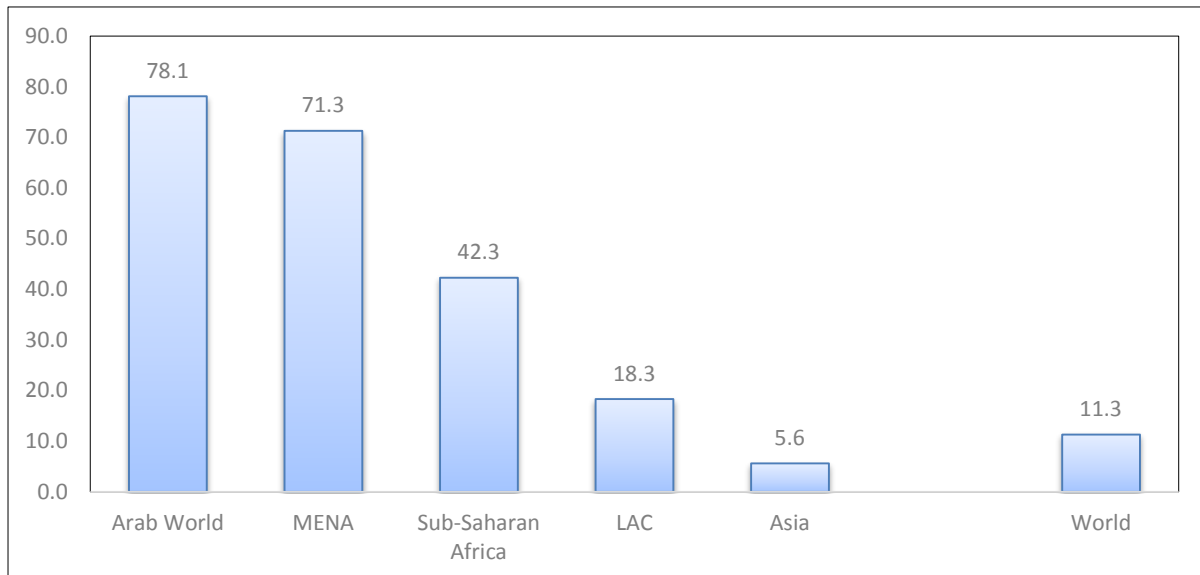
Source: Constructed by the authors using Elbadawi and Kaltani (2015)'s dataset.

Figure 4: Exports and Imports of Goods and Services (Annual % Growth)



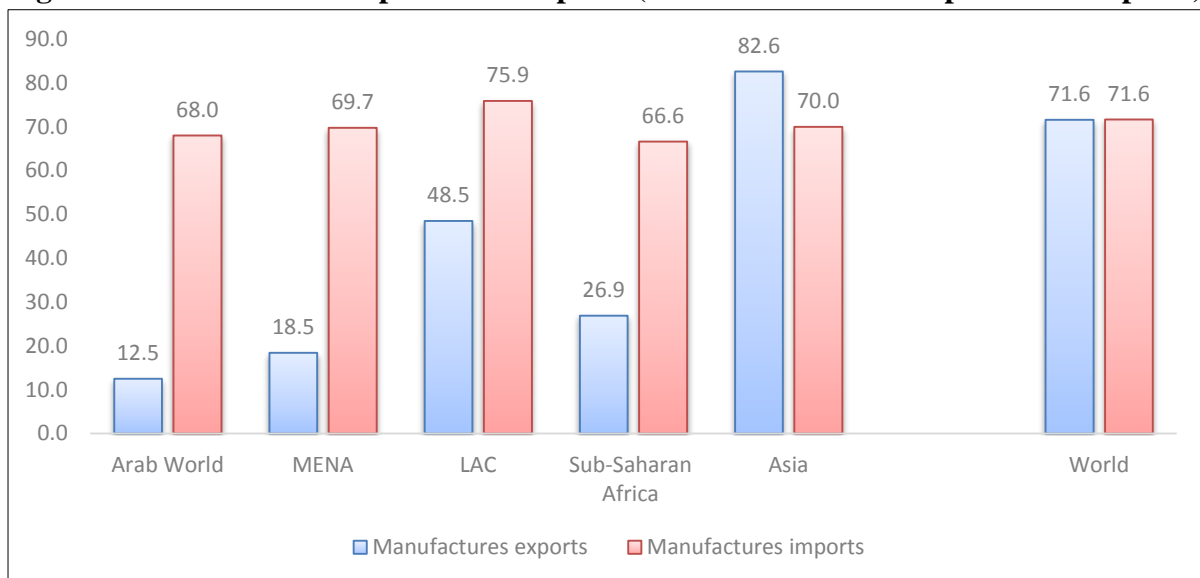
Source: World Development Indicators.

Figure 5: Fuel Exports (% of Merchandise Exports)



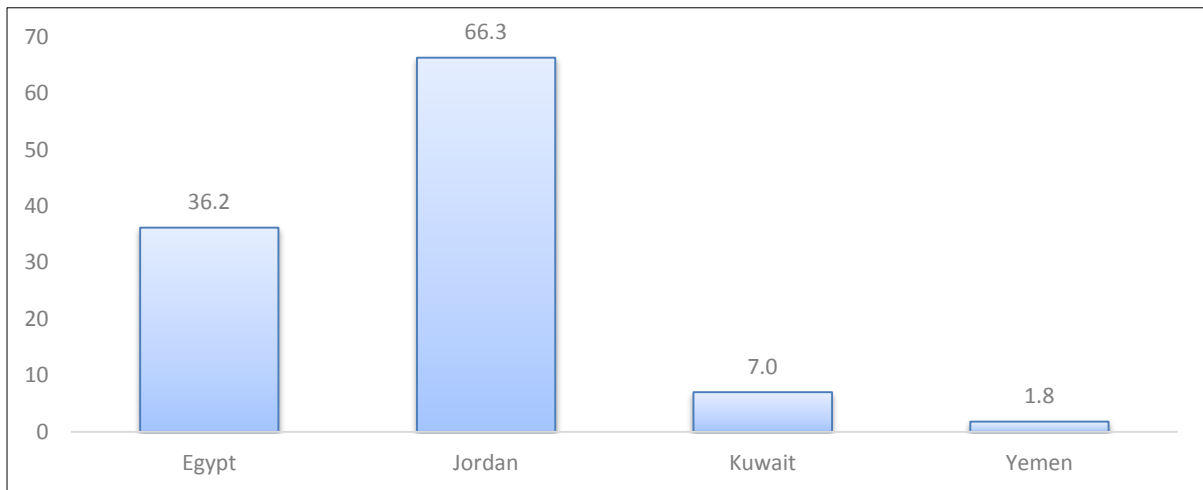
Source: World Development Indicators.

Figure 6: Manufactures Exports and Imports (% of Merchandise Exports and Imports)



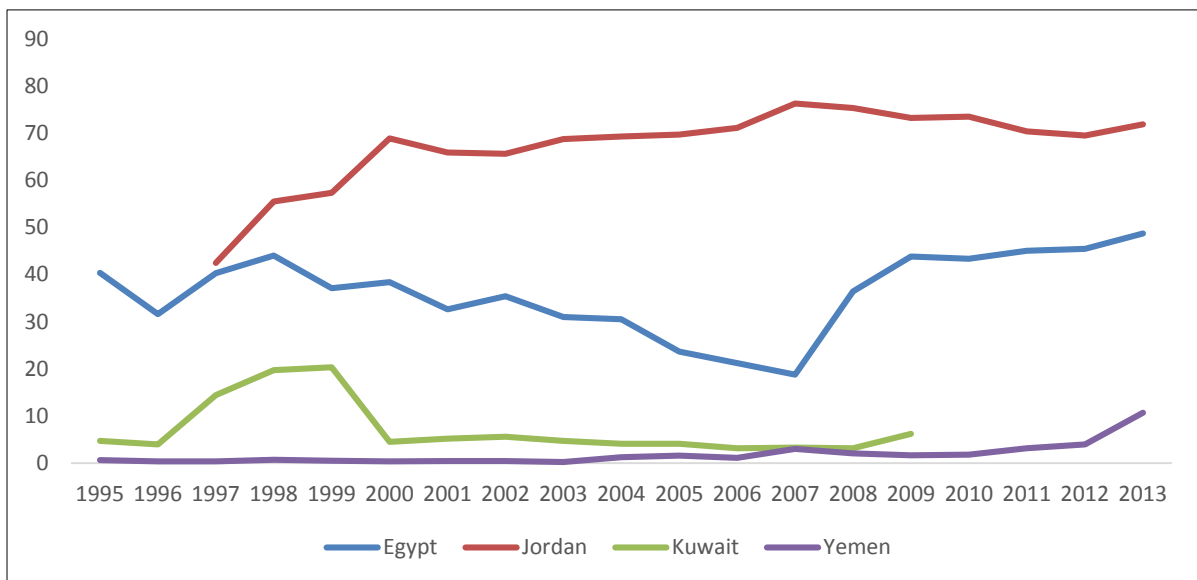
Source: World Development Indicators.

Figure 7: Average Manufactures Exports in Four Arab Countries (% of Merchandise Exports)



Source: The World Development Indicators.

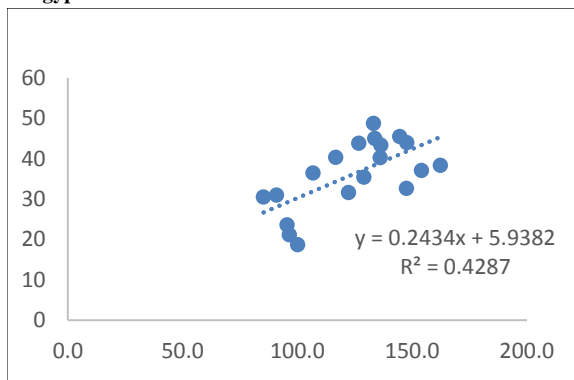
Figure 8: Evolution of Manufactures Exports in Four Arab Countries (% of Merchandise Exports)



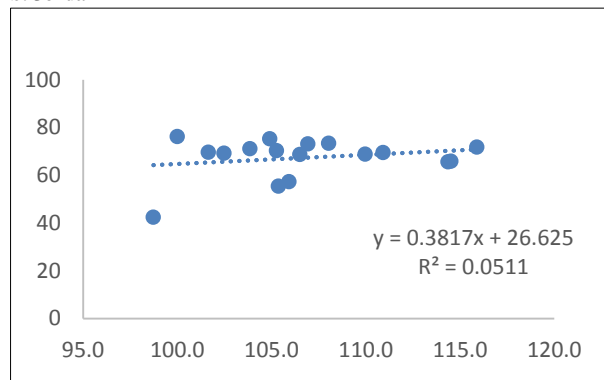
Source: The World Development Indicators.

Figure 9: REER and Manufactures Exports (% of Merchandise Exports)

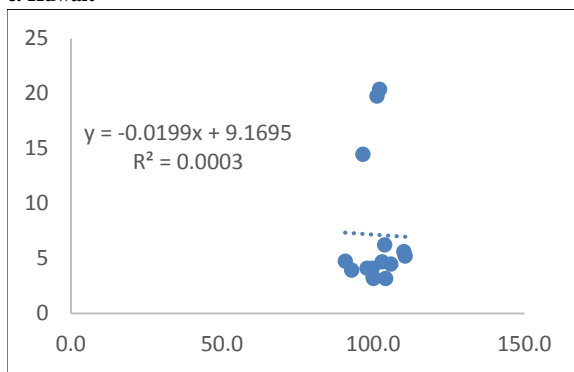
a. Egypt



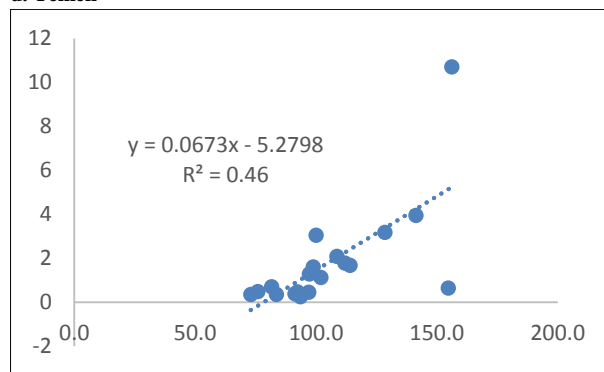
b. Jordan



c. Kuwait



d. Yemen



Source: Constructed by the authors.

Table 1: Number of Observation of Annual Firms Exports from Four Arab Countries (by Year, Destination and Product)

Year	EGY	JOR	Origin KWT	YEM	Total
2003	0	5,139	0	0	5,139
2004	0	5,240	0	0	5,240
2005	0	6,664	0	0	6,664
2006	51,222	8,280	0	2,438	61,940
2007	49,401	9,228	0	2,534	61,163
2008	44,362	10,276	18,358	3,197	76,193
2009	42,298	10,476	16,106	3,719	72,599
2010	41,505	11,053	16,466	3,608	72,632
Total	228,788	66,356	50,930	15,496	361,570

Source: Constructed by the authors using the customs datasets

Table 2: Average Exporting Firm Performance by Country

	Number of firms	Avg firm size (mn USD)	Share of top 5% firm in annual trade	Avg number of product per firm	Avg number of dest. per firm
EGY	8294	1.8	0.8	4	2.6
JOR	1953	1.9	0.8	2.8	3.1
KWT	3323	0.9	0.9	4.4	1.9
YEM	512	0.8	0.6	4.7	2.4

Source: Constructed by the authors using the customs datasets

Table 3: Minimum and Maximum Size of Exporters by Country and by Year (in million USD)

	Minimum				Maximum			
	EGY	JOR	KWT	YEM	EGY	JOR	KWT	YEM
2003	-	5.0	-	-	-	7.2E+07	-	-
2004	-	0.4	-	-	-	9.8E+07	-	-
2005	-	5.0	-	-	-	1.1E+08	-	-
2006	0.3	1.0	-	0.3	1.9E+08	1.3E+08	-	2.2E+07
2007	0.5	12.0	-	0.0	2.0E+08	1.1E+08	-	2.6E+07
2008	0.2	10.0	1.0	0.5	5.7E+08	3.8E+08	2.3E+09	2.3E+07
2009	0.2	1.4	1.0	0.0	3.7E+08	3.0E+08	2.8E+07	3.8E+07
2010	0.4	8.5	0.0	0.0	3.5E+08	2.3E+08	9.9E+07	4.3E+07

Source: Constructed by the authors using the customs datasets,

Table 4: Number of Firms Per Country and Per Year

	EGY	JOR	KWT	YEM
2003	-	1,443	-	-
2004	-	1,368	-	-
2005	-	1,580	-	-
2006	8,521	1,893	-	487
2007	8,544	1,997	-	474
2008	8,325	2,167	3,531	571
2009	8,200	2,339	3,370	589
2010	8,134	2,477	3,367	580

Source: Constructed by the authors using the customs datasets

Table 5: The Effect of Real Exchange Rate on the Intensive Margin – Baseline Model

	Ln(Exp)	Ln(Exp)
Ln(GDP/cap)o	2.886*** (0.658)	3.310*** (0.674)
Ln(Pop)o	-0.119 (2.808)	2.651 (2.608)
Ln(GDP/cap)d	0.809*** (0.0832)	0.812*** (0.0833)
Ln(Pop)d	0.844*** (0.104)	0.848*** (0.104)
Ln(REER)-1	0.445*** (0.167)	
RERunderval		0.00246 (0.00163)
Constant	-32.34 (52.67)	-82.95* (49.39)
Origin dummies	YES	YES
Year dummies	YES	YES
Observations	339589	339589
R-squared	0.019	0.019
Number of id	229043	229043

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

Table 6: The Effect of Real Exchange Rate on the Intensive Margin – Extended Model

	Ln(Exp)	Ln(Exp)	Ln(Exp)
Ln(GDP/cap)o	2.828*** (0.658)	2.669*** (0.826)	3.401*** (0.690)
Ln(Pop)o	-0.300 (2.810)	-6.498* (3.490)	3.172 (3.102)
Ln(GDP/cap)d	0.933*** (0.0875)	1.234*** (0.118)	0.824*** (0.0840)
Ln(Pop)d	0.925*** (0.105)	1.094*** (0.231)	0.871*** (0.104)
Ln(REER)-1	0.408** (0.169)	1.007*** (0.203)	1.182*** (0.205)
FDI/GDP	0.00361*** (0.000839)		
FD/GDP*Ln(REER)(-1)	0.00747 (0.00630)		
Cap/GDP		-0.205** (0.0973)	
Cap/GDP*Ln(REER)-1		-3.297** (1.616)	
IIP/GDP			-0.372*** (0.0559)
IIP/GDP*Ln(REER)-1			1.396 (0.913)
Constant	-31.34 (52.71)	72.17 (66.34)	-93.06 (57.79)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	338987	216451	327702
R-squared	0.020	0.018	0.020
Number of id	228772	144481	219950

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

Table 7: The Effect of Real Exchange Rate Undervaluation on the Intensive Margin – Extended Model

	Ln(Exp)	Ln(Exp)	Ln(Exp)
Ln(GDP/cap)o	3.310*** (0.674)	3.198*** (0.846)	2.612*** (0.751)
Ln(Pop)o	2.929 (2.612)	-1.891 (3.268)	4.530 (2.762)
Ln(GDP/cap)d	0.924*** (0.0875)	1.233*** (0.118)	0.826*** (0.0840)
Ln(Pop)d	0.939*** (0.105)	1.098*** (0.231)	0.874*** (0.104)
RERunderval	0.00336** (0.00167)	0.00760*** (0.00200)	0.0114*** (0.00195)
FDI/GDP	0.00639*** (0.00128)		
FDI/GDP*RERunderval	-0.000164*** (5.51e-05)		
Cap/GDP		-0.239** (0.0936)	
Cap/GDP*RERunderval		-0.0265*** (0.0102)	
IIP/GDP			-0.309*** (0.0605)
IIP/GDP*RERunderval			0.0151*** (0.00485)
Constant	-90.29* (49.47)	-11.68 (62.67)	-110.4** (52.31)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	338987	216451	327702
R-squared	0.020	0.018	0.020
Number of id	228772	144481	219950

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

Table 8: The Exchange Rate Effect on Average Exports – Baseline Model

	Ln(Avg. Exp)	Ln(Avg. Exp)
Ln(GDP/cap)o	0.446 (0.418)	0.857** (0.428)
Ln(Pop)o	-9.634*** (1.786)	-6.233*** (1.658)
Ln(GDP/cap)d	0.613*** (0.0529)	0.616*** (0.0529)
Ln(Pop)d	0.728*** (0.0658)	0.732*** (0.0659)
Ln(REER)-1	0.731*** (0.106)	
RERunderval		0.00514*** (0.00104)
Constant	153.3*** (33.49)	91.99*** (31.40)
Origin dummies	YES	YES
Year dummies	YES	YES
Observations	69072	69072
R-squared	0.063	0.062
Number of id	229151	229151

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

Table 9: The Effect of the Real Exchange Rate on Average Exports – Extended Model

	Ln(Avg. Exp)	Ln(Avg. Exp)	Ln(Avg. Exp)
Ln(GDP/cap)o	0.418 (0.418)	1.221** (0.521)	0.395 (0.439)
Ln(Pop)o	-9.716*** (1.786)	-9.706*** (2.202)	-11.15*** (1.975)
Ln(GDP/cap)d	0.707*** (0.0556)	0.784*** (0.0746)	0.629*** (0.0535)
Ln(Pop)d	0.791*** (0.0667)	1.419*** (0.146)	0.757*** (0.0663)
Ln(REER)-1	0.708*** (0.107)	0.974*** (0.128)	0.896*** (0.130)
FDI/GDP	0.00221*** (0.000533)		
FD/GDP*Ln(REER)(-1)	0.00442 (0.00400)		
Cap/GDP		-1.13e-05 (0.0614)	
Cap/GDP*Ln(REER)-1		0.189 (1.019)	
IIP/GDP			-0.134*** (0.0356)
IIP/GDP*Ln(REER)-1			-1.319** (0.582)
Constant	153.0*** (33.50)	138.4*** (41.85)	179.2*** (36.80)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	69072	69072	69072
R-squared	0.063	0.055	0.065
Number of id	228878	144553	220058

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

Table 10: The Effect of the Real Exchange Rate Undervaluation on Average Exports – Extended Model

	Ln(Avg. Exp)	Ln(Avg. Exp)	Ln(Avg. Exp)
Ln(GDP/cap)o	0.861** (0.428)	1.500*** (0.534)	0.335 (0.478)
Ln(Pop)o	-6.075*** (1.660)	-6.189*** (2.061)	-7.148*** (1.759)
Ln(GDP/cap)d	0.704*** (0.0556)	0.786*** (0.0747)	0.630*** (0.0535)
Ln(Pop)d	0.801*** (0.0668)	1.425*** (0.146)	0.758*** (0.0663)
RERunderval	0.00558*** (0.00106)	0.00767*** (0.00126)	0.00962*** (0.00124)
FDI/GDP	0.00361*** (0.000814)		
FDI/GDP*RERunderval	-8.34e-05** (3.50e-05)		
Cap/GDP		-0.0609 (0.0591)	
Cap/GDP*RERunderval		-0.00689 (0.00642)	
IIP/GDP			-0.146*** (0.0385)
IIP/GDP*RERunderval			0.00156 (0.00309)
Constant	87.31*** (31.44)	75.23* (39.53)	111.1*** (33.31)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	69072	69072	69072
R-squared	0.063	0.055	0.065
Number of id	228878	144553	220058

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

Table 11: The Effect of Real Exchange Rate on the Extensive Margin: New Markets - Baseline Model

	Prob(Exp)	Prob(Exp)
Ln(GDP/cap)o	6.481*** (0.365)	4.512*** (0.349)
Ln(Pop)o	22.43*** (1.595)	17.11*** (1.367)
Ln(GDP/cap)d	1.097*** (0.0392)	1.066*** (0.0392)
Ln(Pop)d	0.863*** (0.0471)	0.838*** (0.0471)
Ln(REER)-1	1.129*** (0.0965)	
RERunderval		0.0187*** (0.000860)
Origin dummies	YES	YES
Year dummies	YES	YES
Observations	1109751	1109751
Number of id	221254	221254

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

Table 12: The Effect of Real Exchange Rate on the Extensive Margin: New Markets – Extended Model

	Prob. Exp.	Prob. Exp.	Prob. Exp.
Ln(GDP/cap)o	6.508*** (0.366)	6.177*** (0.478)	7.944*** (0.402)
Ln(Pop)o	22.58*** (1.597)	20.87*** (2.068)	31.77*** (1.791)
Ln(GDP/cap)d	1.168*** (0.0407)	1.520*** (0.0591)	1.049*** (0.0401)
Ln(Pop)d	0.902*** (0.0477)	1.431*** (0.112)	0.844*** (0.0477)
Ln(REER)-1	1.091*** (0.0981)	1.290*** (0.121)	0.569*** (0.117)
FDI/GDP	0.00306*** (0.000463)		
FD/GDP*Ln(REER)(-1)	0.00560 (0.00381)		
Cap/GDP		-0.996*** (0.0525)	
Cap/GDP*Ln(REER)-1		-10.29*** (0.896)	
IIP/GDP			0.412*** (0.0306)
IIP/GDP*Ln(REER)-1			3.641*** (0.558)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	1103404	654246	1053153
Number of id	220880	137843	209817

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

Table 13: The Effect of Exchange Rate Undervaluation on the Extensive Margin: New Markets – Extended Model

	Prob. Exp.	Prob. Exp.	Prob. Exp.
Ln(GDP/cap)o	4.563*** (0.349)	4.931*** (0.465)	7.310*** (0.454)
Ln(Pop)o	17.34*** (1.370)	18.75*** (1.815)	27.67*** (1.600)
Ln(GDP/cap)d	1.131*** (0.0407)	1.484*** (0.0592)	1.047*** (0.0401)
Ln(Pop)d	0.879*** (0.0477)	1.414*** (0.112)	0.842*** (0.0477)
RERunderval	0.0186*** (0.000876)	0.0187*** (0.00110)	0.00456*** (0.00113)
FDI/GDP	0.00318*** (0.000681)		
FDI/GDP*RERunderval	-1.18e-05 (2.71e-05)		
Cap/GDP		-0.684*** (0.0492)	
Cap/GDP*RERunderval		-0.0254*** (0.00547)	
IIP/GDP			0.428*** (0.0376)
IIP/GDP*RERunderval			0.00737*** (0.00277)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	1103404	654246	1053153
Number of id	220880	137843	209817

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

Table 14: The Effect of the Real Exchange Rate on Number of Products - Baseline Model

	Ln(Num. Prod)	Ln(Num. Prod)
Ln(GDP/cap)o	1.972*** (0.134)	1.842*** (0.136)
Ln(Pop)o	5.943*** (0.575)	5.740*** (0.527)
Ln(GDP/cap)d	0.0143*** (0.00134)	0.0143*** (0.00134)
Ln(Pop)d	-0.0514*** (0.00126)	-0.0514*** (0.00126)
Ln(REER)-1	0.134*** (0.0340)	
RERunderval		0.00175*** (0.000329)
Constant	-118.8*** (11.28)	-114.2*** (10.44)
Sigma_u	0.847*** (0.00140)	0.847*** (0.00140)
Sigma_e	0.306*** (0.000652)	0.306*** (0.000652)
Origin dummies	YES	YES
Year dummies	YES	YES
Observations	182327	182327
Number of id	95623	95623

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

Table 15: The Effect of the Real Exchange Rate on Number of Products - Extended Model

	Ln(Num. Prod)	Ln(Num. Prod)	Ln(Num. Prod)
Ln(GDP/cap)o	1.975*** (0.134)	2.017*** (0.160)	1.822*** (0.140)
Ln(Pop)o	5.940*** (0.575)	4.667*** (0.679)	5.788*** (0.630)
Ln(GDP/cap)d	0.0147*** (0.00135)	-0.0111*** (0.00138)	0.00936*** (0.00136)
Ln(Pop)d	-0.0526*** (0.00127)	-0.0519*** (0.00130)	-0.0523*** (0.00128)
Ln(REER)-1	0.138*** (0.0345)	0.206*** (0.0394)	0.342*** (0.0413)
FDI/GDP	-0.00134*** (0.000151)		
FD/GDP*Ln(REER)(-1)	-0.000802 (0.00125)		
Cap/GDP		-0.0850*** (0.0188)	
Cap/GDP*Ln(REER)-1		-1.097*** (0.314)	
IIP/GDP			-0.0365*** (0.0112)
IIP/GDP*Ln(REER)-1			0.754*** (0.187)
Constant	-118.7*** (11.30)	-97.22*** (13.48)	-114.9*** (12.29)
Sigma_u	0.847*** (0.00140)	0.757*** (0.00160)	0.834*** (0.00141)
Sigma_e	0.306*** (0.000654)	0.291*** (0.000767)	0.304*** (0.000657)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	182327	182327	182327
Number of id	95623	95623	95623

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

Table 16: The Effect of the Real Exchange Rate Undervaluation on Number of Products - Extended Model

	Ln(Num. Prod)	Ln(Num. Prod)	Ln(Num. Prod)
Ln(GDP/cap)o	1.843*** (0.136)	2.072*** (0.163)	1.544*** (0.154)
Ln(Pop)o	5.734*** (0.529)	5.374*** (0.630)	5.569*** (0.561)
Ln(GDP/cap)d	0.0147*** (0.00135)	-0.0112*** (0.00138)	0.00936*** (0.00136)
Ln(Pop)d	-0.0526*** (0.00127)	-0.0518*** (0.00130)	-0.0523*** (0.00128)
RERunderval	0.00178*** (0.000334)	0.00187*** (0.000383)	0.00315*** (0.000395)
FDI/GDP	-0.00127*** (0.000220)		
FDI/GDP*RERunderval	-3.88e-06 (9.26e-06)		
Cap/GDP		-0.0880*** (0.0168)	
Cap/GDP*RERunderval		-0.00788*** (0.00181)	
IIP/GDP			-0.0166 (0.0124)
IIP/GDP*RERunderval			0.00452*** (0.000977)
Constant	-114.1*** (10.46)	-110.5*** (12.61)	-109.0*** (11.11)
Sigma_u	0.847*** (0.00140)	0.757*** (0.00160)	0.834*** (0.00141)
Sigma_e	0.306*** (0.000654)	0.291*** (0.000767)	0.304*** (0.000657)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	182327	182327	182327
Number of id	95623	95623	95623

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

Table 17: The Effect of the Real Exchange Rate on Number of Destination - Baseline Model

	Ln(Dest.)	Ln(Dest.)
Ln(GDP/cap)o	3.490*** (0.167)	3.109*** (0.169)
Ln(Pop)o	12.55*** (0.715)	11.53*** (0.657)
Ln(GDP/cap)d	-0.0143*** (0.00175)	-0.0143*** (0.00175)
Ln(Pop)d	-0.0746*** (0.00164)	-0.0746*** (0.00164)
Ln(REER)-1	0.220*** (0.0423)	
RERnderval		0.00350*** (0.000410)
Constant	-246.9*** (14.04)	-226.0*** (13.00)
Sigma_u	1.108*** (0.00181)	1.108*** (0.00181)
Sigma_e	0.379*** (0.000807)	0.379*** (0.000807)
Origin dummies	YES	YES
Year dummies	YES	YES
Observations	69072	69072
Number of id	27427	27427

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

Table 18: The Effect of the Real Exchange Rate on Number of Destinations - Extended Model

	Ln(Dest.)	Ln(Dest.)	Ln(Dest.)
Ln(GDP/cap)o	3.472*** (0.167)	3.253*** (0.207)	3.205*** (0.175)
Ln(Pop)o	12.47*** (0.716)	10.82*** (0.879)	13.26*** (0.787)
Ln(GDP/cap)d	-0.0147*** (0.00175)	-0.00104 (0.00195)	-0.0149*** (0.00178)
Ln(Pop)d	-0.0747*** (0.00165)	-0.0710*** (0.00184)	-0.0752*** (0.00168)
Ln(REER)-1	0.213*** (0.0429)	0.271*** (0.0510)	0.365*** (0.0516)
FDI/GDP	-0.000188 (0.000189)		
FD/GDP*Ln(REER)(-1)	0.00171 (0.00156)		
Cap/GDP		-0.124*** (0.0244)	
Cap/GDP*Ln(REER)-1		-1.392*** (0.407)	
IIP/GDP			0.0967*** (0.0140)
IIP/GDP*Ln(REER)-1			2.161*** (0.234)
Constant	-245.4*** (14.05)	-216.7*** (17.45)	-257.9*** (15.34)
Sigma_u	1.108*** (0.00181)	1.083*** (0.00223)	1.103*** (0.00184)
Sigma_e	0.379*** (0.000809)	0.372*** (0.000983)	0.378*** (0.000816)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	69072	69072	69072
Number of id	27427	27427	27427

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

Table 19: The Effect of the Real Exchange Rate Undervaluation on Number of Products - Extended Model

	Ln(Dest.)	Ln(Dest.)	Ln(Dest.)
Ln(GDP/cap)o	3.097*** (0.169)	3.104*** (0.211)	2.627*** (0.193)
Ln(Pop)o	11.50*** (0.658)	10.84*** (0.816)	11.21*** (0.701)
Ln(GDP/cap)d	-0.0147*** (0.00175)	-0.00108 (0.00195)	-0.0149*** (0.00178)
Ln(Pop)d	-0.0747*** (0.00165)	-0.0708*** (0.00184)	-0.0752*** (0.00168)
RERunderval	0.00356*** (0.000416)	0.00328*** (0.000497)	0.00278*** (0.000493)
FDI/GDP	-5.85e-05 (0.000277)		
FDI/GDP*RERunderval	-9.20e-06 (1.17e-05)		
Cap/GDP		-0.109*** (0.0220)	
Cap/GDP*RERunderval		-0.00749*** (0.00238)	
IIP/GDP			0.146*** (0.0155)
IIP/GDP*RERunderval			0.00948*** (0.00122)
Constant	-225.3*** (13.02)	-216.1*** (16.34)	-216.8*** (13.87)
sigma_u	1.108*** (0.00181)	1.083*** (0.00223)	1.103*** (0.00184)
sigma_e	0.379*** (0.000809)	0.372*** (0.000983)	0.378*** (0.000816)
Origin dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	69072	69072	69072
Number of id	27427	27427	27427

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

Appendix A: The Real Exchange Rate Undervaluation Index

The model-based ERER is obtained by plugging the permanent components of the fundamentals (estimated with the Hodrick-Prescott filter) in the estimated RER model. 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:

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

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

$$RERunderval_t^i = (e_t^i - \tilde{e}_t^i) = \hat{\beta}'(\tilde{F}_t^i - \bar{F}^i) - (e_t^i - \bar{e}^i) \quad (3)$$

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 fundamentals⁷, respectively; β is a vector of long-run coefficients; and a bar over a variable indicates the mean over time. Equation (1) expresses the log of the RER in terms of current fundamentals and a residual term, while equation (2) 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 ($\hat{\beta}'(\tilde{F}_t^i - \bar{F}^i)$).

Equations (1) and (2) allow the derivation of the expression for the RER undervaluation in equation (3), 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.

Finally the HP-based $RERunderval_{hp}$ is obtained by simply replacing the model-based ERER by the HP-based ERER as the above equations:

$$\hat{hp}_t^i = \text{Permanent component of } \log e_t^i, \text{ using HP filter} \quad (4)$$

$$\tilde{e}hp_t^i = \text{normalized } \hat{hp}_t^i, \text{ such that } \sum_t (\hat{hp}_t^i - e_t^i) \text{ is equal to zero.} \quad (5)$$

$$RERunderval_{hp}_t^i = (e_t^i - \tilde{e}hp_t^i). \quad (6)$$

⁷ The vector of F variables in Elbadawi and Kaltani's model are predicted to influence the equilibrium RER as follows: an appreciated equilibrium RER is positively influenced by 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).

Table A1: Variables Description

Variable	Definition
Ln(Exp)	This variable reports the value of exports in current USD by firm, destination, year and product.
Ln(GDP/cap)o	GDP per capita for the origin country
Ln(Pop)o	Population at the origin country
Ln(GDP/cap)d	GDP per capita for the destination country
Ln(Pop)d	Population at the destination country
Underval	Undervaluation index (see appendix A.1 for further details)
Ln(REER)(-1)	Real Effective Exchange Rate
FDI/GDP	Share of Foreign Direct Investment to GDP
Net. Cap/GDP	Share of Net Capital Flows to GDP
IIP/GDP	International Investment Position (inclusive of gold holdings) as reported by national authorities as share to GDP

Table A2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Ln(Exp)	1235372	9.24	1.02	-0.01	17.04
Ln(GDP/cap)o	1235372	7.71	0.96	6.73	10.46
Ln(Pop)o	1235372	17.10	1.33	14.81	18.17
Ln(GDP/cap)d	1837535	9.17	1.46	4.90	11.97
Ln(Pop)d	1865480	16.53	1.55	10.26	21.01
Underval	1235372	9.28	18.29	-30.31	28.97
Ln(REER)(-1)	1235372	-0.05	0.09	-0.25	0.05
FDI/GDP	1830827	4.80	6.52	-57.43	466.56
Net. Cap/GDP	734229	0.02	0.16	-0.98	1.63
IIP/GDP	1890960	-0.14	0.52	-1.58	0.96