How Do Trade Margins Respond to the Exchange Rate? The Case of Egypt [1]

Chahir Zaki[2], Maye Ehab[3] and Aliaa Abdallah[4]

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[1] The authors are grateful to Diaa Noureldin for his useful and constructive comments.

[2] Associate professor, Faculty of Economics and Political Science, Cairo University. Email: chahir.zaki@feps.edu.eg.

[3] Economist, Egyptian Center for Economics Studies. Email: mehab@eces.org.eg

[4] Research Analyst, Egyptian Center for Economics Studies. Email: aabdallah@eces.org.eg

Abstract

Using monthly firm-level and sector-level data for the period 2005-2016, this study tries to examine the impact of devaluation on the increase in the quantity of exports, as well as the ability to export new products and/or venture into new export markets. In other words, this paper seeks to examine how both the intensive (the quantity of exports) and the extensive (the probability of exporting a new product to a new destination, exporting a new product to an existing destination or exporting an existing product to a new destination) margins to trade are affected by the devaluation of the Egyptian pound, using firm-level data. Exchange rate is measured by the real effective exchange rate and the exchange rate misalignment. We find that while a depreciation of the real exchange rate increases the value of exports (intensive margin), the quantity of exports is not affected showing that the price effect is more significant than the quantity effect. In other words, depreciation lowers the foreign currency price of exports, but does not increase the quantity of exports. Furthermore, the number of destinations and the number of products (extensive margins) respond positively to exchange rate depreciation. At the sectoral level, the intensive margin seems to matter for some products more than others. Indeed, the most beneficial group includes products that are sensitive to real depreciations and for which Egypt has a comparative advantage. These products are fruits and vegetables, apparel and clothing, fibers, mineral fuels and oils and some chemical products. At the destination level, European countries seem to be the most sensitive.

ملخص

تتناول هذه الدراسة بالبحث والتحليل أثر تخفيض قيمة سعر الصرف على زيادة كمية الصادرات، والقدرة على تصدير منتجات جديدة و/ أو دخول أسواق تصديرية جديدة، وذلك باستخدام البيانات الشهرية للشركات والقطاعات خلال الفترة ٢٠٠٥-٢٠١٦. وبعبارة أخرى، تناقش الدراسة كيفية تأثر هوامش التجارة الكثيفة (كمية الصادرات) والواسعة (احتمالية تصدير منتج جديد إلى وجهة تصديرية جديدة، أو تصدير منتج جديد إلى وجهة تصديرية قديمة أو تصدير منتج قديم إلى وجهة تصديرية جديدة)، بتخفيض قيمة الجنيه، وذلك باستخدام بيانات الشركات المصدرة. كما تقوم بقياس سعر الصرف باستخدام سعر الصرف الحقيقي الفعال واختلال سعر الصرف. وتشير نتائج الدراسة إلى أنه في حين يعمل انخفاض سعر الصرف الحقيقي على زيادة قيمة الصادرات (الهوامش الكثيفة)، نجد أن كمية الصادرات لم تتأثر به، مما يدل على أن تأثير الأسعار ذو دلالة معنوية تفوق التأثير الكمي. وبعبارة أخرى، انخفاض سعر الصرف يؤدي إلى انخفاض أسعار الصادرات بالعملة الأجنبية ولكن لا يعمل على زيادة كميتها. كما أن عدد الوجهات التصديرية وعدد المنتجات (الهوامش الواسعة) يستجيب على نحو إيجابي لانخفاض سعر الصرف. وعلى المستوى القطاعي، كانت الهوامش الكثيفة مهمة بالنسبة لبعض المنتجات أكثر من غيرها. وتتضمن مجموعة الصادرات الأكثر استفادة المنتجات الحساسة تجاه انخفاض سعر الصرف الحقيقي والتي تتمتع مصر فيها بميزة نسبية، وتشمل الفواكه والخضروات والملابس الجاهزة والألياف والوقود المعدني والزيوت وبعض المنتجات الكيميائية. وأظهرت النتائج أنه على مستوى الوجهة التصديرية، كانت البلدان الأوروبية هي الأكثر حساسية تجاه انخفاض سعر الصرف.

J.E.L. Classification: F14, F31.

Keywords: exports, exchange rate policy, Egypt.

1. INTRODUCTION

The trade literature provides evidence on the robust correlation between exports growth and depreciated real exchange rates, especially in developing and emerging countries (Aghion et al, 2009). Hence, a depreciated currency will make exports more competitive and appear cheaper to foreigners. This will increase demand for exports as both the quantity and the value of exports are likely to be affected by exchange rate developments. Moreover, exchange rate misalignment can affect export performance since real exchange rate depreciation/undervaluation is likely to generate potential for comparative advantage potential in new and more sophisticated exportable goods and services. Indeed, countries that have managed to engineer an RER undervaluation (e.g. China, Republic of Korea, and Chile) appear to have indirectly overcome institutional constraints during the early phases of their development process (Rodrik 2008; Elbadawi and Kaltani 2016).

The case of Egypt is relevant for the study of the effect of exchange rate developments on exports. Indeed, in the aftermath of the January 25, 2011 revolution, Egypt's external accounts became more fragile for several reasons. Indeed, with lower tourism receipts, FDI outflows and less exports, the international reserves declined from US$36 billion in December 2010 to US$26.4 billion in June 2011, US$15.5 billion in June 2012 and US$15.4 billion in January 2015 (equivalent to 2.8 months of imports). This evolution reflects the Central Bank's efforts to defend the Egyptian pound, which lost only around 4 percent of its value against the dollar between January 2011 and December 2012. Yet, in December 2012, Egypt's central bank introduced a new system for buying and selling foreign currency. The system features regular currency auctions, designed to allow the Egyptian pound to float more freely, with its price more closely reflecting supply and demand. The objective was to conserve its foreign reserves that reached a critical level. Following these auctions, the Egyptian pound plummeted to an eight-year low against the US dollar, reaching EGP 6.70/US$1 in March 2013. It experienced a further depreciation in early 2015, when the CBE announced that the value of the dollar was now EGP 7.61 with a level of foreign reserves of US$15.4 billion to reach EGP 8.95 in March 2016. Lately in November 2016 the Central Bank of Egypt announced the floatation of the Egyptian pound whose value depreciated by around 45 percent to stand at EGP 13 against the US dollar after the decision and EGP 18 soon after. This would increase the availability of foreign exchange for households and businesses, strengthen competitiveness and exports and attract foreign direct

investment. Hence, it is important to examine the effect of such a depreciation on export performance in Egypt.

Using monthly firm-level and sector-level data, this study tries to examine the impact of both devaluation and exchange rate misalignment on the increase in the quantity of exports, as well as the ability to export new products and/or venture into new export markets. In other words, this paper seeks to examine how the devaluation of the Egyptian pound affects both the intensive (the quantity of exports) and the extensive (the probability of exporting a new product to a new destination, exporting a new product to an existing destination or exporting an existing product to a new destination) margins to trade. It does so using firm-level data.

At the intensive margin level, we find that while a depreciation of the real exchange rate increases the value of exports, the quantity of exports is not affected showing that the price effect is more significant than the quantity effect. This is chiefly attributed to three main reasons. First, this result depends on the price elasticity of exports. If the price-elasticity of exports in terms of a foreign currency of a country is less than unity, the value of exports in terms of a foreign currency will fall as the increase in physical volume of exports will be more than offset by the depreciation of the currency. Hence, prices will react more than quantities. Second, if the demand for imports is inelastic, they will not decrease despite devaluation, which can erode the benefits of depreciation unless the country imposes some protectionist measures. Third, as Egypt is a net importer of capital goods and raw materials used in exportables, the rise in their import prices will not only directly raise the price level, but also the inputs used in the production of other goods bringing about cost-push inflation.

For the extensive margin, the number of destinations and the number of products respond positively to exchange rate depreciation. However, at the sectoral level, the intensive margin seems to matter for some products more than others. This in line with the assumption that real exchange rate depreciation/undervaluation is likely to generate potential for comparative advantage potential in new and more sophisticated exportable goods and services. Indeed, the most beneficial group includes products that are sensitive to real depreciations and for which Egypt has a comparative advantage.[5]

[5] These products include: edible vegetables, certain roots and tubers, edible fruit and nuts, peel of citrus fruit or melons, oil seeds and oleaginous fruits; animal or vegetable fats and oils and their cleavage products, and prepared

The remainder of the paper is organized as follows. Section 2 reviews the available literature on this topic. Section 3 presents some stylized facts. Section 4 is dedicated to the methodology. Section 5 presents the empirical findings at both the intensive and the extensive levels. Section 6 concludes.

2. LITERATURE REVIEW

There is little agreement in the literature on the probable effects of exchange rate movements on trade. Some suggest strong effects while others advocate a disconnect. In this section, we particularly investigate how the literature debated the impact on export performance of exchange rate movements on both the aggregate level and the firm level.

2.1. Macroeconomic Studies

According to a recent International Monetary Fund study, IMF (2015), based on annual data for 60 economies from 1980 to 2014, exchange rate movements normally have substantial effects on export volumes. The study suggests that a 10 percent real effective depreciation in an economy's currency is associated with an average 1.5 rise in real net exports as percent of GDP. These results appear to be substantiated by a number of studies. For example, Genc and Artar (2014) show that there is a co-integrated relationship between effective exchange rates and exports of emerging countries in the long run by applying the panel cointegration method for the period of 1985-2012. Bahmani-Oskooee and Ardalanif (2006) reached similar results in their attempt to determine whether currency depreciation has favorable effects on the United States' inpayments and outpayments. Using monthly import and export data from 66 industries over the 1991- 2002 period as well as cointegration analysis, they demonstrate that in the long run real depreciation of the dollar stimulates export earnings of many U.S. industries.

Although the aforementioned studies endorse a favorable relationship between exchange rate devaluations and export performance, it is always important to think of exchange rate

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edible fats; mineral fuels, mineral oils and products of their distillation, and plastics and articles thereof; paper and paperboard, articles of paper pulp, of paper or of paperboard; cotton; man-made staple fibers, articles of apparel and clothing accessories, knitted or crocheted, other made-up textile articles, worn clothing and worn textile articles, articles of stone, plaster, cement, asbestos, mica or similar materials; glass and glassware, copper and articles thereof, lead and articles thereof.

movements effects on exports in two ways: rate depreciation and rate variability.[6] World Bank (2010) finds that in a panel of countries with GDP per capita incomes lower than $6,000, exchange rate volatility—measured as the standard deviation of RER—has a significant negative relationship with the exports-to-GDP ratio, although only large fluctuations can lead to this negative impact. Fang, Lai, and Miller (2006) argues that a depreciation raises exports, but the associated exchange rate risk could offset that positive effect. They investigate the net effect of exchange rate movements on the exports of eight Asian countries using a dynamic conditional correlation bivariate GARCH-M model that simultaneously estimates time-varying correlation and exchange rate risk. Their results show that depreciation alone stimulates exports, for most countries. However, exchange rate risk displays a negative effect for six countries, resulting in an overall negative net effect in four of the countries and zero net effect in another two.

Other studies have pointed to the limited changes in export performance following exchange rate movements in some economies. Rowbotham et al. (2014) examine the impact of exchange rate on export performance in a sample of nine efficiency-driven economies over the period 1990 to 2009. These economies include Brazil, the Dominican Republic, Malaysia, Mauritius, Mexico, Peru, South Africa, Thailand and Turkey, which all have floating exchange rate regimes. Using panel data models and fixed-effects, it was found that a weaker exchange rate does not necessarily improve export performance. To the contrary, export growth seems to be associated with stronger exchange rates. Previous findings from Loto (2011) suggests that devaluation/depreciation can only benefit countries that are originally export based before the movement of the currency and that economies that are import dependent can hardy benefit from these currency movements. Loto adopts the elasticity approach to investigate the effect of devaluation of the Nigerian naira on the country's trade balance for the period 1986 - 2008. The main objective of his paper was to test the Marshal-Lerner condition. The Marshall Lerner condition stipulates that for devaluation of a country's currency to improve the balance of trade the sum of the price elasticities of the import and that of the export demand functions must be greater than one. Using the ordinary least square (OLS) method to estimate the import and export demand functions, the empirical results showed that the absolute sum of the price elasticities of the import and export demand functions is less than one = 0.7851 < 1, concluding that the

[6] See also Clark (1973) and Hooper and Kohlhagen (1978).

devaluation of the Nigerian naira does not guarantee an improvement in the Nigerian trade balance.

A prominent example also is the case of Japan. For the past 30 years, there have been some fierce vicissitudes between the Japanese yen and other currencies' exchange rate. In 1985, the world's major western economies and Japan decided to devalue the dollar against the Japanese yen and German Deutsche Mark under the Plaza Accord agreement. This set out a trend of the yen strengthening over three years. Later, the yen experienced a prolonged depreciation between the periods 1988 to 1990 and 1995 to 1997. Klitgaard (1999) examines how Japanese firms—in four industries that made up approximately 75 percent of Japanese exports in 1997—respond to the conflicting objectives of maintaining stable profit margins and stable export sales when the value of the yen fluctuates. Klitgaard shows that Japanese exporters of electrical machinery, industrial machinery, transportation equipment, and precision equipment respond in the same manner regardless of the yen's direction. Klitgaard argues that Japanese exporters absorb part of the yen's movement into their profit margins, an action that reduces the profit on each item sold when the yen appreciates and raises the profit margin when the yen depreciates. Although firms' foreign consumers do see exchange-rate-driven changes in prices, Japanese firms moderate the extent of these changes by altering their profit margins. Firms try to stabilize prices as seen by their customers in both foreign and domestic markets, which means that their relative profit margins rise and fall with the yen.

Current research in international trade literature centers on the importance of both the intensive and extensive margins to model exports behavior. Besedes and Prusa (2011), on geographical diversification, investigate and compare countries' export growth based on their performance at the extensive margin-defined as establishing new partners and markets- and intensive margin- having relationships survive or persist and deepening existing relationships. Using disaggregated bilateral manufacturing exports of 46 countries between 1975 and 2003 and focusing primarily on developing countries of Latin America, Africa and East Asia, Besedes and Prusa suggest that across countries, developed countries and more successful developing countries have higher survival and greater deepening (intensive margin). On the other hand, developing countries are able to form new export relationships and find new markets, but are much less successful in maintaining those relationships. A similar conclusion was reached by Cadot, Carrère and Strauss-Kahn (2011) who explore the relationship between export

diversification and the level of income among 159 countries over 17 years at the HS6 level of disaggregation using various export concentration indices. They argue that Low and Middle income countries diversify mostly along the extensive margin that is, addition of new product lines, whereas high-income countries diversify along the intensive margin and ultimately re-concentrate their exports towards fewer products. Cooke (2014) recently links countries' trade margins of exports to its real exchange rates by developing a two-country dynamic general equilibrium model. His results propose that a favorable movement in the real exchange rate increases export participation and expands its extensive margin of exports. Likewise, Colacelli (2010) who empirically study the behavior of the intensive (the volume of exports) and the extensive margin (new exporters) among a sample of 136 countries, finds that the extensive margin of trade has a significant role in overall yearly export responses to real exchange rate fluctuations.

2.2. Firm level

Until mid-2000s most of the trade literature looked at the impact of exchange rate changes on aggregate imports and exports. Thereafter, progress has been made in collecting information on the firm level. The focus on firms rather than aggregate variables has widened the literature prospects to understand firms' reactions to exchange rate movements and further explain the aggregate level results. These response variations could be in the form of a change in the traded goods' prices, volume, destination country, the variety of goods that are traded or the likelihood of introducing new exporters to the market.

Speaking of traded goods prices, firms' heterogeneity has contributed to clarifying the aggregate pass-through in different countries. Chen and Juvenal (2016) recently investigate theoretically and empirically the effects of real exchange rate changes on the pricing response of Argentinean firms exporting multiple products with heterogeneous levels of quality. The model predicts more pricing-to-market (adjusting markups) following a real depreciation for higher quality goods. These theoretical predictions were strongly supported by the empirical testing using combination of firm-level data set of wine export values and volumes between 2002 and 2009 and a data set on experts' wine ratings to measure the quality. Li, Hong Ma and Yuan Xu (2015) provide evidence on Chinese exporters' reaction to Renminbi movements from 2000 to 2007. Their study suggests price response to exchange rate changes to be very small. Amiti,

Itskhoki and Konings (2014) similarly suggest a low aggregate pass-through for Belgian exporters, especially for large exporters who tend to have lower pass-through. Amiti, Itskhoki and Konings (2014) explain that the low pass-through for larger firms occurs due to two main reasons: the first is that large exporters happen to be import intensive firms. In addition, they also offset almost half of the exchange rate movement by active markup adjustment, which eventually justifies the low aggregate pass-through. On the other hand, small non-importing firms barely adjust their producer prices and fully pass on the exchange rate movements to foreign consumers. Likewise, Berman, Martin, and Mayer (2012), using French firm-level data, suggests that firm heterogeneity can help explain the low aggregate elasticity of exports to exchange rate movements in industrialized countries. High-productivity firms—usually larger firms—choose to partially absorb exchange rate fluctuations by increasing their markups, leading to a relatively muted response of aggregate exports to exchange rates. These results again were corroborated by Cheung and Sengupta (2013) who use detailed firm-level data from a sample of Indian non-financial sector firms to empirically investigate the real effective exchange rate (REER) effect on firms' exporting behavior for the period 2000–2010. Their empirical analysis reveals that Indian firms that have smaller export shares tend to have a stronger negative response to both REER change and volatility. Besides, firms that export services are more vulnerable to exchange rate fluctuations compared to those exporting goods. Earlier findings from Campos (2010) suggest that new and incumbent Brazilian firms—who happen to have lower productivity—tend to charge higher prices, which is consistent with most of the above firm-level literature. While the majority of the literature linked the price adjustment to the firm size/productivity, Chatterjee, Dix-Carneiro and Vichyanond (2013) explain that firms in Brazil raise their markups for all products in response to a real exchange rate depreciation, although the increase in producer prices is stronger for products closer to the core products—products that the firm is most efficient at producing.

The quantity of traded exports was found to have a moderate response to currency devaluation, according to Chen and Juvenal (2016) and Li et al (2015) who find a smaller response of export volumes to an exchange rate depreciation.

On the extensive and intensive margins, Li, Hong Ma and Yuan Xu 2015 (2015) find that Renminbi appreciation reduces both the extensive margin—the probability that a firm exports to a new market—and the intensive margin—the probability that a firm survives in the existing

market. In other words, a 10 percent appreciation reduces the probability of new entry by 0.6 percent and the probability of continuing in the export market by 1.1 percent. These results are consistent with Tang and Zhan (2012) who find that, over the same period, a 10 percent real appreciation of the Renminbi is associated with a one percentage point decline in the probability of entry, and a 0.2 percentage point increase in the probability of exit. What's more, a real exchange rate appreciation of the Chinese currency also lowers the firm's likelihood of adding a new product to a market, and raises its likelihood of dropping a product, which resembles Chatterjee, Dix-Carneiro and Vichyanond's (2013) findings in Brazil, that is in response to a real exchange rate depreciation, firms increase their product range.

According to Berman, Martin, and Mayer (2012), exchange rate depreciation tends to have a positive impact on export probability. A 10 percent depreciation increases the probability of exporting by around 1.8 percentage points. The effect is significant on both the extensive margin (the entry probability), which increases by around 1.4 percentage points, and on the intensive margin (probability of remaining an exporter), which increases by a range between 1.3 and 2.1 percentage points. These results are more or less identical to some preliminary work carried out in 2004 by Jose Campa who, similar to the former studies, breaks down export adjustments between changes in output levels by existing exporters (intensive margin) and movements due to changes in the number of exporters (extensive margin), using data on a sample of Spanish manufacturing firms. Campa (2004) endorses the positive significance of exchange rate depreciation for both the extensive and intensive margins, although his findings suggest that most of the change in export volume is not due to changes in the number of exporters but to the intensive margin. Conversely, Eaton et al. (2007) who use Colombian firm data over the period 1996-2005 to track firms' entry and exit into and out of certain destination markets, suggest that, in a typical year, nearly half of all Colombian exporters tend to be extremely small exporters who were not exporters in the previous year, and most do not continue exporting in the following year. However, out of each group of new exporters, a number of firms continue expanding their foreign sales very rapidly, and over the period of less than a decade they account for almost half of the total export expansion. Their paper argue that these new exporters begin in a single foreign market and, if they survive, they gradually expand into additional destinations. The geographic expansion paths they follow, and their likelihood of survival as exporters, depend on their initial destination market.

2.3. MENA economies and Egypt

Previous research about MENA economies and Egypt tended to mainly rely on aggregate level data rather than firm level, focusing primarily on how currency misalignment might affect both output and export performance.

Following the devaluation of the Egyptian pound in 2003, a considerable amount of literature was concerned about assessing its impact on Egyptian output. Bahmani-Oskooe and Kandil (2009) evaluate the short and long-run effects of anticipated and unanticipated exchange rate depreciation for a sample of MENA countries. The authors suggested that anticipated exchange rate depreciation may induce long-run expansionary or contractionary effects on output supply. If the cost channel dominates, producers shrink output growth in anticipation of a higher cost of imported goods, as evident in Lebanon and Libya. If the competitiveness channel dominates, anticipated exchange rate depreciation is evident to be expansionary in the long-run as producers increase the output supply in anticipation of a higher demand. This is consistent with Arab countries that have been launching export-led strategies to stimulate growth, including Egypt, and several oil-producing countries, including Bahrain, Oman and Saudi Arabia. On the other hand, unanticipated exchange rate depreciation increases the cost of imported goods, leading to a long-run contractionary effect and a transitory improvement in competitiveness. El-Ramly and Abdel-Haleim (2008) likewise analyze the relationship between exchange rate changes and output in the Egyptian economy by employing a vector autoregression model. The results of El-Ramly and Abdel-Haleim coincide with those of Bahmani-Oskooe and Kandil (2009) that the positive effect of devaluation on output starts to materialize only in the long run.

Several studies pointed to the significant impact of currency misalignment on export performance. For example, Brixiova et al. (2014) observe whether the real exchange rate misalignment contribute to weak export competitiveness, namely in Egypt, Morocco and Tunisia from 1980 to 2009. The authors argue that Egypt experienced protracted periods of misalignment both in the past and in recent years—the REER of Egypt was overvalued from the mid-1990s until mid-2000, close to its equilibrium value in the 2006 and 2007, and was once again notably overvalued in the late 2000s—highlighting the importance of exchange rate management.[7] In contrast, the relative flexibility of the exchange rate regime in Morocco and Tunisia resulted in a

[7] Hosni and Rofael (2015) further discuss exchange rate misalignment in Egypt.

depreciating trend for the REER that reinforced the price competitiveness of exports. Consistent with the aforementioned results, Nouira et al. (2011) suggest that over the period 1990-2005 Morocco and Tunisia were choosing the proactive exchange rate strategy that consists of deliberate real exchange rate depreciation, while Egypt and Jordan were not, which fits with the observation that the former were doing much better than the latter in terms of export diversification. Likewise, Nabli and Véganzonès-Varoudakis (2002) tried to determine currency overvaluation and its impact on the competitiveness of manufactured exports for a panel of 53 countries, 10 of which are MENA economies, covering the 70s, 80s and 90s periods. The paper shows that during the three decades MENA countries experienced substantial real exchange rate misalignment, with a net tendency toward overvaluation of their RER, which have negatively affected manufactured exports.

Few studies have addressed the relation between exchange rate risk and Egypt's trade. Bahmani-Oskooee et al. (2015a) examine the exchange rate's risk effect on Egypt's trade with the European Union by applying cointegration analysis to data over 1994Q1-2007Q4 for 59 industries' export and import flows. The authors find that relatively few trade flows respond to increased risk in the short run. In the long run, however, a large proportion (24 of 59 import industries and 28 of 59 export industries) see their trade flows reduced by increased risk, particularly oil and gas industries and largest industries. Although the authors of this study recommended the need for quick actions to stabilize the Egyptian pound vis-a`-vis the Euro, Bahmani-Oskooee et al. (2015b) examined the same relation with the United States and concluded that neither oil exports nor exports of other types of products stand to benefit from a stable pound.

3. STYLIZED FACTS

3.1. A Macroeconomic Overview

Egypt's exports have experienced a modest growth after the financial crisis in 2008 and after the political turmoil in 2011 since they increased by 19% between 2009 and 2013. As it is shown in Table 1, the competitiveness of Egyptian exports declined significantly contributing by -32% to exports growth, but it was counterbalanced by two factors, namely increase in world trade (+49%) and growth in product specialization (+8%).

Table 1. Factors behind marginal growth of Egypt's exports (2014)

Marginal Growth due to	US$ change	% change
World's trade growth[1]	11,797,832.8	48.8
Product specialization[2]	1,925,387.8	8.0
Geographic specialization[3]	-1,390,742.0	-5.8
Competitiveness[4]	-7,735,189.6	-32.0
Sum of marginal growths	4,597,289.0	19.0

Source: International Trade Center online dataset.

Note:

1) This index was calculated based on growth rates of product exports at the world level.
2) Product specialization is measured using a Herfindahl index.
3) Geographic specialization is measured using a Herfindahl index.
4) Competitiveness is measured by the change in the exporting country's share in destination markets' imports times the initial share of partner countries' imports in world trade (weighted average of the variation in the country's position on elementary markets.

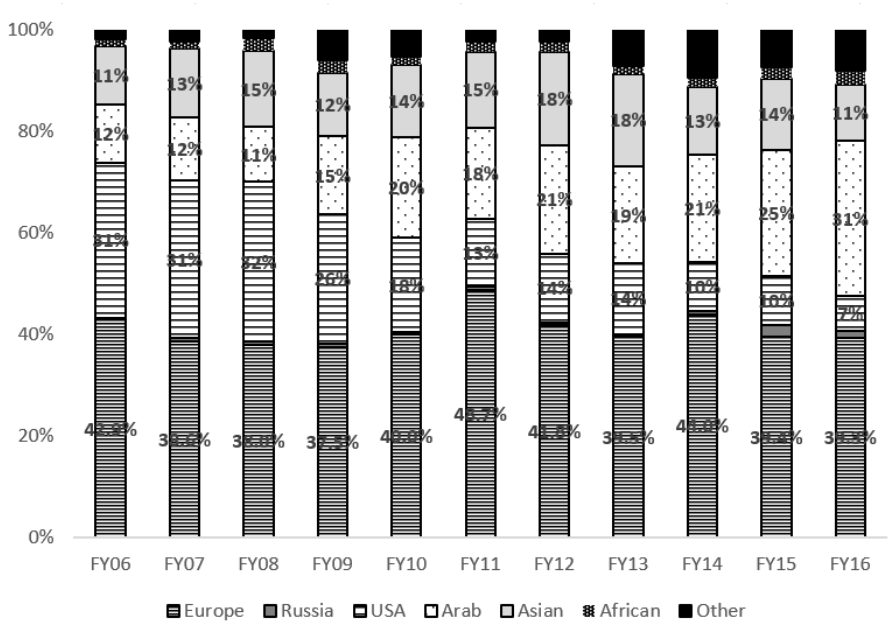
Figure 1 shows how intensive and extensive margins explain exports growth in Egypt. Indeed, this 19 percent increase can be decomposed as follows: 51.5 percent decrease in traditional markets' exports, 70 percent increase in traditional products in traditional markets, 1.5 percent increase in new products to traditional markets and 0.1 percent increase traditional products in new markets. This shows how exports are relatively rigid since Egyptian exporters were not able to enter new markets nor to export new products (Figure 1).

Figure 1. Factors behind growth of Egypt's exports

Source: International Trade Center online dataset.

In terms of export destination, Figure 2 shows that OECD economies and Arab countries mainly account for more than 2/3 of Egypt's exports. It is worthy of note that the geographical distribution has also changed after the financial crisis as Egypt shifted its exports from USA to Arab countries.

Figure 2. Egypt's exports by region of destination



Source: Constructed by the authors using the Central Bank of Egypt dataset.

Table 2 shows that the share of oil exports has declined to 30 percent in 2016 while raw materials and finished goods have increased to reach 9 percent and 50 percent, respectively. The latter are chiefly dominated by fertilizers, garments and textiles. Yet, based on the ITC calculations, Egypt needs to have a better specialization to meet the international demand in growing sectors as most of the sectors where Egypt is specialized are not matching international demand except essential oils, furniture and edible vegetables. Hence, in order to overcome such lost opportunities (due to specialization in resource-based and low-technology exports), a greater focus on growing sectors at the world level is a must (especially in equipment, electronics and high-technology exports).

Table 2. Structure of Egypt's exports

	FY11	FY12	FY13	FY14	FY15	FY16
Fuel, Min Oils, of which	46.7%	46.3%	48.8%	47.9%	40.6%	30.8%
Crude oil	21.0%	20.8%	27.1%	29.6%	27.7%	19.0%
Petroleum products x	24.0%	24.0%	21.2%	17.8%	12.3%	11.3%
Coal & types thereof	0.2%	0.2%	0.1%	0.1%	0.2%	0.2%
Raw Materials, of which	5.2%	4.7%	5.0%	5.7%	7.8%	9.8%
Cotton	0.8%	0.5%	0.4%	0.3%	0.2%	0.3%
Potatoes	0.2%	0.2%	0.3%	0.6%	0.6%	1.0%
Citrus fruits	0.1%	0.3%	0.2%	0.4%	0.7%	1.1%
Medicinal plants	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%
Spices & vanilla	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%
Dairy products, eggs and honey	0.6%	0.7%	0.7%	0.9%	1.2%	1.1%
Flax, raw	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Semi-finished goods, of which	7.7%	7.8%	7.4%	8.5%	8.8%	9.0%
Carbon	0.4%	0.7%	0.7%	0.5%	0.6%	0.5%
Essential oils & resins	0.1%	0.2%	0.1%	0.1%	0.2%	0.3%
Aluminum, unalloyed	0.3%	0.4%	0.4%	0.1%	0.1%	0.3%
Cotton yarn	0.8%	0.4%	0.3%	0.5%	0.4%	0.4%
Organic & inorganic chemicals	2.2%	2.3%	1.9%	2.1%	2.5%	1.9%
Finished goods, of which	40.2%	41.3%	38.8%	37.8%	42.8%	50.4%
Rice	0.1%	0.1%	0.2%	0.2%	0.5%	0.2%
Soap, washing prep. & artificial waxes	1.2%	1.6%	1.3%	1.0%	0.9%	1.3%
Dried onion	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%
Pharmaceuticals	1.7%	1.5%	1.4%	1.1%	1.2%	1.2%

Fertilizers	4.2%	3.4%	3.1%	2.7%	1.6%	2.8%
Carpets & other floor coverings	0.7%	0.7%	0.6%	0.7%	0.9%	0.9%
Articles of iron and steel	2.0%	1.1%	1.4%	1.3%	1.1%	1.1%
Aluminium articles	1.2%	1.2%	0.8%	1.0%	1.3%	1.1%
Ready-made clothes	2.9%	2.9%	2.7%	3.0%	3.6%	3.7%
Cotton textiles	2.3%	2.3%	2.9%	2.9%	3.3%	3.7%
Undistributed Exports	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Total Exports	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Constructed by the authors using the Central Bank of Egypt dataset.

In terms of comparative advantage,[8] Table 3 identifies three groups of products: those having an increasing revealed comparative advantage between 2001 and 2015, those with a decreasing one (and thus declining market shares) and those that were not characterized by a comparative advantage in 2001 but Egypt managed to specialize in their export and gained some market shares. The first group includes traditional exports by Egypt such as articles of apparel and clothing accessories, articles of stone, plaster, cement, edible fruit and nuts, edible vegetables and certain roots, glass and glassware, oil seeds and oleaginous fruits; preparations of vegetables, fruit, nuts, products of the milling industry and soap. The main products where Egypt lost comparative advantage are aluminum and articles, animal or vegetable fats and oils, articles of apparel and clothing, ceramic products, cereals, cotton, fertilizers, iron and steel, mineral fuels, mineral oils and rubber and articles. By contrast, Egyptian exports gained some comparative advantage in the following products: articles of iron or steel, carpets and other textile floor covering, cocoa and cocoa preparations, copper and articles thereof, dairy produce, birds' eggs; natural honey, essential oils and resinoids; perfumery, furniture, lead and articles thereof, live trees and other plants, man-made filaments, paper and paperboard; articles of paper, plastics and articles thereof, preparations of cereals, flour, starch, tanning or dyeing extracts; tannins and wool, fine or coarse animal hair.

[8] The revealed comparative advantage index of country i for product j is often measured by the product's share in the country's exports in relation to its share in world trade: $RCA_{ij} = (x_{ij}/X_{it}) / (x_{wj}/X_{wt})$ where x_{ij} and x_{wj} are the values of country i's exports of product j and world exports of product j and where X_{it} and X_{wt} refer to the country's total exports and world total exports. A value less than unity implies that the country has a revealed comparative disadvantage in the product. Similarly, if the index exceeds unity, the country is said to have a revealed comparative advantage in the product.

Table 3. Evolution of RCA between 2001 and 2015

RCA in 2001 and increased in 2015	RCA in 2001 and decreased in 2015	No RCA in 2001 and RCA in 2015
Articles of apparel and clothing access	Aluminum and articles thereof	Albuminoidal substances;
Articles of stone, plaster, cement	Animal or vegetable fats and oils	Articles of iron or steel
Edible fruit and nuts; peel of citrus fruits	Articles of apparel and clothing access	Carpets and other textile floor covering
Edible vegetables and certain roots and	Ceramic products	Cocoa and cocoa preparations
Glass and glassware	Cereals	Copper and articles thereof
Oil seeds and oleaginous fruits; miscel.	Coffee, tea, spices	Dairy produce; birds' eggs; natural honey
Preparations of vegetables, fruit, nuts	Commodities not elsewhere specified	Essential oils and resinoids; perfumery
Products of the milling industry; malt;	Cotton	Furniture; bedding, mattresses, mattress
Raw hides and skins (other than furskin)	Fertilizers	Lac; gums, resins and other vegetables
Salt; Sulphur; earths and stone; plaster	Inorganic chemicals; organic or inorganic	Lead and articles thereof
Soap, organic surface-active agents	Iron and steel	Live trees and other plants; bulbs.
Sugars and sugar confectionery	Mineral fuels, mineral oils and product	Man-made filaments; strip and the like
	Other made-up textile articles; sets	Man-made staple fibers
	Other vegetable textile fibers; paper	Miscellaneous chemical products
	Rubber and articles thereof	Miscellaneous edible preparations
	Vegetable plaiting materials; vegetable	Miscellaneous manufactured articles
		Paper and paperboard; articles of paper
		Plastics and articles thereof
		Preparations of cereals, flour, starch
		Products of animal origin, not elsewhere
		Special woven fabrics; tufted textile f
		Tanning or dyeing extracts; tannins and
		Tobacco and manufactured tobacco
		Wadding, felt and nonwovens;
		Wool, fine or coarse animal hair; horse

Source: Constructed by the authors using the International Trade Center database.

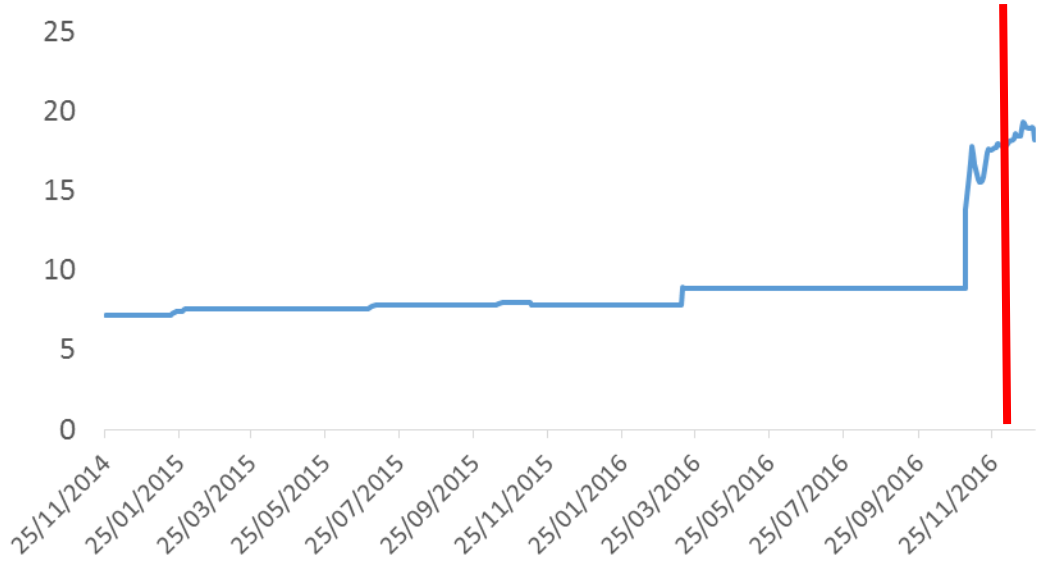
3.2. Exchange Rate Developments

Egypt maintained a peg of its currency to the US dollar for over forty years, since the sixties until 2003. With the adoption of the Economic Reform and Structural Adjustment Program (ERSAP) in the early 1990s, the multiple exchange rate system was replaced by two exchange markets, a primary restricted market and a secondary free market. These two markets were later unified, following which the exchange rate stabilized and was maintained within an implicit band around US$1=LE 3.33. Sterilized intervention was successful and the nominal exchange rate remained stable between 1991 and 2000. For this reason, the government announced the abandonment of the exchange rate peg in January 2003. Because the exchange rate was still far from its market-clearing equilibrium, expectations resulted in an immediate fall in the Egyptian pound's value. The establishment of a foreign exchange interbank market in December 2004 eliminated the parallel foreign exchange market and stabilized the nominal exchange rate starting December 2005. Following these measures, the nominal exchange rate started appreciating in December 2004 and stabilized around LE 5.7/US$1 until June 2006. Strong capital inflows subsequently helped boost the pound further against the US dollar. The appreciation trend was mild at first but increasingly strengthened, reflecting increased capital inflows. Consequently, the IMF has reclassified Egypt's exchange rate regime into a "managed float".

Yet, in the wake of the political turmoil in 2011, international reserves declined rapidly from US$36 billion in December 2010 to US$26.4 billion in June 2011, US$15.5 billion in June 2012 and US$15.4 billion in January 2015 (equivalent to 2.8 months of projected imports of goods and services). This evolution reflects the Central Bank's efforts to defend the Egyptian pound, which lost only around 4 per cent of its value against the dollar between January 2011 and December 2012. Yet, in December 2012, Egypt's central bank introduced a new system for buying and selling foreign currency. The system featured regular currency auctions, designed to allow the Egyptian pound to float more freely, with its price more closely reflecting supply and demand. The objective was to conserve its foreign reserves, which have fallen to a critical level. Following these auctions, the Egyptian pound plummeted to an eight-year low against the US dollar, reaching EGP 6.70/US$1 in March 2013. The Egyptian pound experienced further depreciation in early 2015, when the CBE announced that the value of the dollar was now EGP 7.61 with a level of foreign reserves of US$15.4 billion. While the dollar reached an official rate

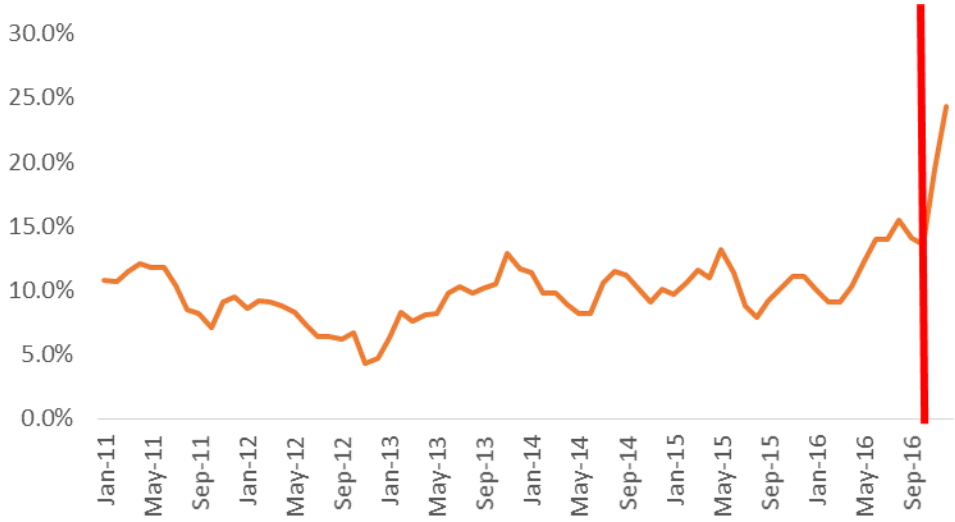
of EGP 8.88, on the parallel market it reached EGP 18. The CBE hereby announced its decision to move, with immediate effect, to a liberalized exchange rate regime in order to quell any distortions in the domestic foreign currency market. By the end of 2016, the Egyptian pound was floated against the US dollar to EGP 13.00 per USD. By early 2017, the exchange rate reached 18 EGP/USD (Figure 3) leading to soaring inflation rates (Figure 4).

Figure 3. Exchange rate developments (EGP)



Source: The Central Bank of Egypt.

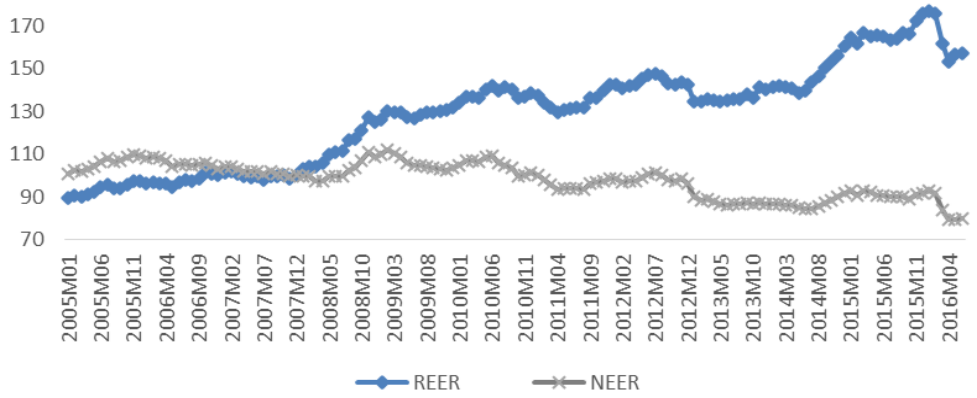
Figure 4.Inflation rate development (%)



Source: The Central Bank of Egypt.

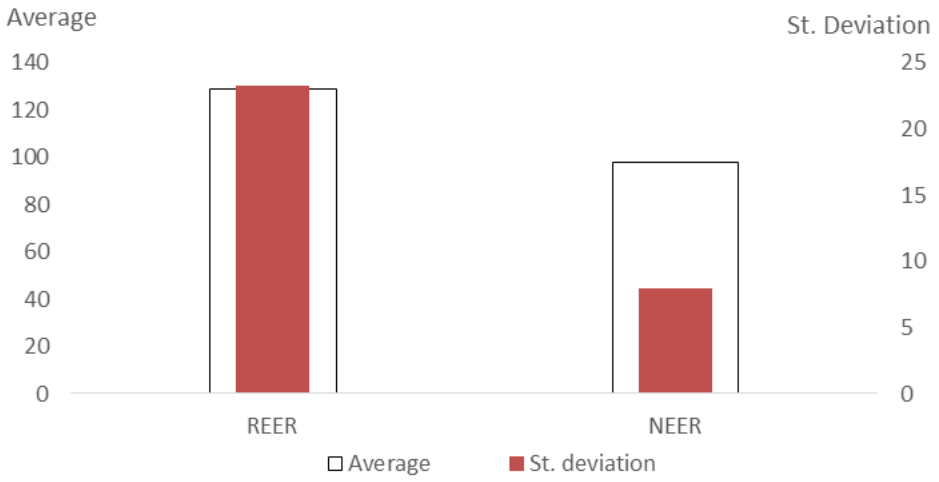
The real effective exchange rate (REER) and the nominal effective exchange rate (NEER) indices are sourced from Brugel's database (Darvas 2012). The NEER is defined the value of a currency against a weighted average of several foreign currencies. An increase in NEER indicates an appreciation of a currency against the weighted basket of currencies of its trading partners. While the REER is the NEER adjusted for inflation differentials. An increase in REER shows that exports become costly and imports become cheaper. Figure 5 shows the evolution of Egypt's REER and NEER over the period January 2005 till June 2016 and Figure 6 depicts the average and standard deviation for both indices. It can be seen that the NEER has shown a downward trend with a lower standard deviation while the REER has witnessed an upward trend with a high standard deviation. Moreover, Figure 5 delineates the movement of both the REER and the NEER showing that the NEER is steadily declining over the sample period, while the REER follows a steadily upward trend. Thus, an appreciation of the REER indicates that the domestic price level in Egypt is rising over the reported period compared to its trading partner countries. Figure 7 shows two other measures for the exchange rate development which are the REER (REER2) and exchange rate misalignment (Misal) estimated by Noureldin (2017). It is clear that the two measures of REER exhibit the same pattern between 2005 and 2016. Furthermore, the Egyptian pound was overvalued during the period under study. Table 4 shows also a strong correlation (0.99) between the two measures of REER and a significantly negative correlation between the three measures of exchange rate and exports proving that a real appreciation or an overvaluation of the Egyptian pound are negatively correlated to exports.

Figure 5: Egypt's REER and NEER for the period January 2005 till June 2016



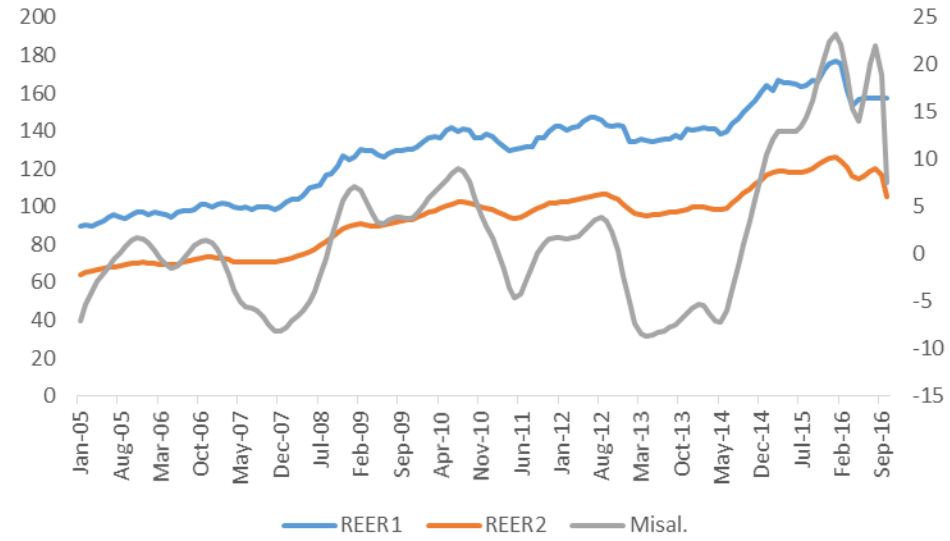
Source: Constructed by the authors using Brugel's database (Darvas 2012).
Note: An increase in the REER index indicates an appreciation (in real terms) of the home currency against the basket of currencies of trading partners.

Figure 6. Average and standard deviation for the REER and NEER



Source: Constructed by the authors using Brugel's database (Darvas 2012).

Figure 7. Different measures of REER and exchange rate misalignment



Source: Constructed by the authors using Darvas (2012) and Noureldin (2017).

Note: (i) REER1 is the real effective exchange rate estimated by Darvas (2012), REER2 is the real effective exchange rate estimated by Noureldin (2017), both on the left-hand side axis and Misal is the exchange rate misalignment estimated by Noureldin (2017) on the right-hand side axis.

(ii) An increase in REER1 or REER2 means an appreciation. Positive value for Misal means overvaluation.

Table 4. Correlation between exports and exchange rate measures

	Ln(Value)	Ln(REER1)	Misal.	Ln(REER2)
Ln(Value)	1			
Ln(REER1)	-0.035***	1		
	(0.000)			
Misal.	-0.019***	0.593***	1	
	(0.000)	(0.000)		
Ln(REER2)	-0.031***	0.996***	0.635***	1
	(0.000)	(0.000)	(0.000)	

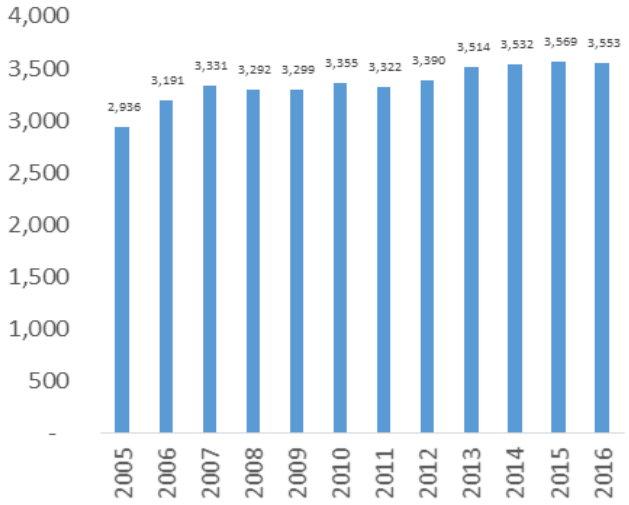
Source: Constructed by the authors using Darvas (2012) and Noureldin (2017).

Note: P-values between brackets.

3.3. Firm Dynamics

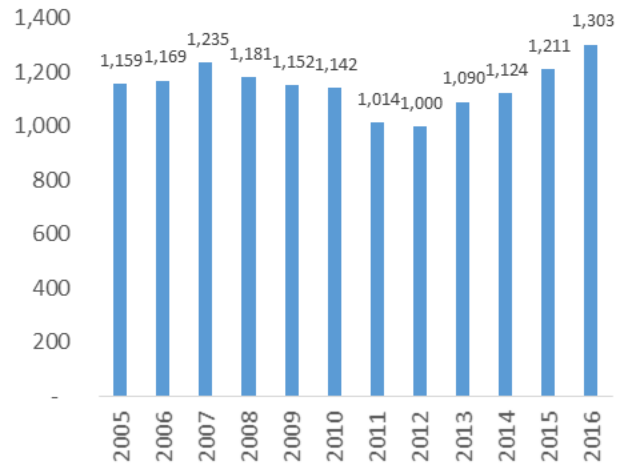
On average, the number of exporting firms have increased over the period 2005 till 2016 to reach 11550 firms in 2016 (Figure 8). The number of continuing firms have decreased over the period 2007 till 2012 and then witnessed an increasing trend over the period 2013 till 2016 (Figure 9).

Figure 8. Average number of firms per year



Source: Constructed by the authors using the General Organization for Import and Export Control (GOEIC) dataset.

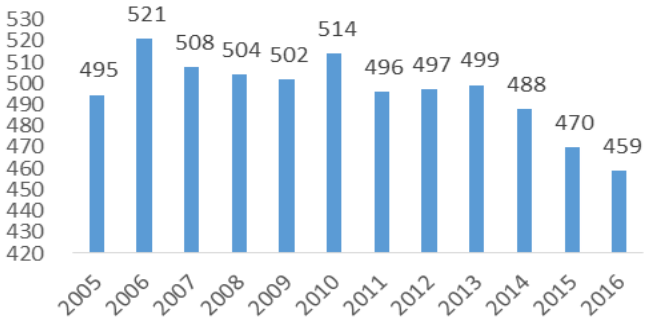
Figure 9. Average number of continuing firms per year



Source: Constructed by the authors using the GOEIC dataset.

The number of exported products have seen an opposite trend to the increase in the number of firms. The number of products has declined over the whole period with an exceptional increase in 2010 (Figure 10).

Figure 10. Average number of exported products per year



Source: Constructed by the authors using the GOEIC dataset.

4. DATA AND METHODOLOGY

To measure the intensive margin of exports, our dependent variable is the value of trade between firm i in Egypt and country j at month t (X_{kijt}) for product k. Our explanatory variables are GDP of partner j, several variables measuring transaction costs that include transport costs measured by the bilateral distance between Egypt and its partner j (d_{ij}), some dummies capturing whether

one country was a colony of the other at some point in time (Col_{ij}), whether the two countries share a common border ($Cont_{ij}$) or share common language ($Lang_{ij}$). To examine the impact of exchange rate devaluation ($REER_t$), we run the following regression:

$$Ln(X_{ijkt}) = \beta_0 + \beta_1 \ln(GDP_{jt}) + \beta_2 \ln(d_{ij}) + \beta_3 Col_{ij} + \beta_4 Comcol_{ij} + \beta_5 Conti_{ij} + \beta_6 Lang_{ij} + \beta_7 \ln(REER_t) + f + y_t + \varepsilon_{ijkt} \quad (1)$$

where f is firm fixed effect, y_t month and year fixed effects and ε_{ijkt} is the discrepancy term. It is worthy to note that Egypt's GDP is not included since it is perfectly correlated to year dummies.

We also examine the effect of exchange rate misalignment (*Misal*) on exports as follows:

$$Ln(X_{ijkt}) = \alpha_0 + \alpha_1 \ln(GDP_{jt}) + \alpha_2 \ln(d_{ij}) + \alpha_3 Col_{ij} + \alpha_4 Comcol_{ij} + \alpha_5 Conti_{ij} + \alpha_6 Lang_{ij} + \alpha_7 Misal_t + f + y_t + \omega_{ijkt} \quad (2)$$

where ω_{ijkt} is the discrepancy term.

As per the extensive margin, we run the same regressions and include the number of products by firm i to destination j in month-year t:

$$Ln(Num.prod_{ijt}) = \sigma_0 + \sigma_1 \ln(GDP_{jt}) + \sigma_2 \ln(d_{ij}) + \sigma_3 Col_{ij} + \sigma_4 Comcol_{ij} + \sigma_5 Conti_{ij} + \sigma_6 Lang_{ij} + \sigma_7 \ln(REER_t) + f + y_t + \eta_{ijt} \quad (3)$$

where η_{ijt} is the discrepancy term.

Finally, we examine also the effect of exchange rate developments on the extensive margin measured by the number of destinations by firm i in month-year t:

$$Ln(Num.dest_{it}) = \rho_0 + \rho_1 \ln(GDP_{jt}) + \rho_2 \ln(d_{ij}) + \rho_3 \ln(REER_t) + f + y_t + \varsigma_{it}$$

where ς_{it} is the discrepancy term.[9]

Sectoral regressions at HS4 level and country regressions at the destination level are also run to determine which products and which markets are more sensitive to exchange rate developments.

[9] In order to determine the number of destinations, we counted the number of destinations by firm, month and year. Moreover, it is important to note that both GDP and distance have been averaged across destinations. Other gravity variables were not included as this regression does not have a bilateral dimension.

Trade data comes from the General Organization for Export and Import Control (GOEIC), the Ministry of Industry and Foreign Trade in Egypt (monthly data, between 2005 and 2016, at the HS4 level, both quantities and values of exports). Other variables come from the Doing Business dataset, the World Development Indicators and the CEPII gravity dataset.

Real effective exchange rate comes from two sources (Darvas 2012; and Noureldin 2017) that have been used to check the robustness of our results. Exchange rate misalignment comes also from Noureldin (2017).

5. EMPIRICAL FINDINGS

5.1. Intensive Margin

Table 5 shows the impact of the exchange rate on the value of exports (whether measured by USD or EGP). In terms of the classical gravity variables, while distance has a significant negative impact on bilateral trade flow, common language and colonial links have a significant positive impact. Moreover, a greater GDP increases the value of exports. A depreciation of the real exchange rate (*REER 1* measured by Darvas (2012) and *REER2* by Noureldin (2017)) increases the value of exports (intensive margin). By contrast, Table 6 exhibits an insignificant impact of REER on the quantity of exports. This is chiefly attributed to two main reasons. First, this result depends on the price elasticity of exports. If the price-elasticity of exports in terms of a foreign currency of a country is less than unity, the value of exports in terms of a foreign currency will fall as increase in physical volume of exports will be more than offset by the depreciation of the currency. Hence, prices will react more than quantities. Second, as Egypt is a net importer of capital goods and raw materials used in exportables, the rise in their import prices will not solely directly raise the price level. As they are used as inputs in the production of other goods, a rise in their import prices will also push up the cost of production of these other goods. In other words, this will bring about cost-push inflation, especially if the demand for imports is inelastic, which can erode the benefits of depreciation unless the country imposes some protectionist measures. This result is in line with Chen and Juvenal (2016) and Li, Hong Ma and Yuan Xu (2015) who find a smaller response of export volumes to a deprecation. Indeed, the quantity of traded exports, contrary to prices, was found to have a moderate response to currency devaluation.

Table 5. Results of the intensive margin – value of exports

	Ln(Value EGP)			Ln(Value USD)		
Ln(GDP imp)	0.103***	0.103***	0.103***	0.0686***	0.0686***	0.0686***
	(0.00129)	(0.00129)	(0.00129)	(0.00218)	(0.00218)	(0.00218)
Ln(Dist.)	-0.0624***	-0.0624***	-0.0624***	0.00204	0.00205	0.00200
	(0.00295)	(0.00295)	(0.00295)	(0.00511)	(0.00511)	(0.00511)
Contig.	0.0379***	0.0379***	0.0378***	0.00292	0.00290	0.00291
	(0.00830)	(0.00830)	(0.00830)	(0.0140)	(0.0140)	(0.0140)
Com. Lang.	0.0602***	0.0602***	0.0602***	0.0804***	0.0804***	0.0803***
	(0.00513)	(0.00513)	(0.00512)	(0.0101)	(0.0101)	(0.0101)
Colony	0.0190***	0.0189***	0.0190***	0.00405	0.00405	0.00402
	(0.00558)	(0.00558)	(0.00558)	(0.00987)	(0.00987)	(0.00987)
Ln(REER1)	-0.195***			-0.200**		
	(0.0610)			(0.0984)		
Ln(REER2)		-0.227***			-0.198*	
		(0.0664)			(0.112)	
Misalig.			-0.174***			-0.197**
			(0.0510)			(0.0848)
Constant	-1.045***	-0.973***	-1.929***	-0.823*	-0.895*	-1.729***
	(0.280)	(0.283)	(0.0320)	(0.455)	(0.479)	(0.0630)
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Month FE	YES	YES	YES	YES	YES	YES
Observations	320496	320496	320496	320496	320496	320496
R-squared	0.394	0.394	0.394	0.433	0.433	0.433

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Results of the intensive margin – quantity of exports

	Ln(Quantity)		
Ln(GDP imp)	0.110***	0.110***	0.110***
	(0.00224)	(0.00224)	(0.00224)
Ln(Dist.)	-0.0905***	-0.0905***	-0.0904***
	(0.00434)	(0.00434)	(0.00434)
Contig.	0.141***	0.141***	0.141***
	(0.0124)	(0.0124)	(0.0124)
Com. Lang.	0.179***	0.179***	0.179***
	(0.00659)	(0.00659)	(0.00658)
Colony	0.0417***	0.0417***	0.0417***
	(0.00894)	(0.00894)	(0.00894)
Ln(REER)	0.141		
	(0.156)		
Ln(REER2)		0.122	
		(0.155)	
Misalig.			-0.0200
			(0.124)
Constant	-0.198	-0.0716	0.439***
	(0.709)	(0.657)	(0.0651)
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
Month FE	YES	YES	YES
Observations	1493001	1493001	1493001
R-squared	0.569	0.569	0.569

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.2. Extensive Margin

As per the extensive margin, we found that a higher GDP at the destination lead to a lower number of destinations as exporters tend to concentrate their exports in large markets (Table 7). The higher the distance, the more destinations will be served as exporters will seek closer partners. Table 7 shows a negative association between REER (and misalignment) and exports. Indeed, a depreciation is likely to increase the number of destination at the extensive margin since developing countries are able to form new export relationships and find new market, but are much less successful in maintaining those relationships. Consequently, Egypt is likely to witness a higher diversification at the destination level with a more depreciated (or undervalued) currency.

Table 7. Results of the extensive margin

	Ln(Dest.)		
Ln(GDP imp)	-0.0380***	-0.0380***	-0.0389***
	(0.00128)	(0.00128)	(0.00128)
Ln(Dist.)	0.0371***	0.0373***	0.0364***
	(0.00320)	(0.00320)	(0.00322)
Ln(REER)	-0.130***		
	(0.0273)		
Ln(REER2)		-0.138***	
		(0.0272)	
Misalig.			-0.128*
			(0.0654)
Constant	2.196***	2.188***	1.598***
	(0.132)	(0.122)	(0.0336)
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
Month FE	YES	YES	YES
Observations	423482	423482	423482
R-squared	0.673	0.673	0.673

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

At the number of products level, Table 8 shows that a higher GDP is associated to a higher number of products since larger countries have a stronger demand. Other classical gravity variables have the expected sign and are statistically significant. Our results show that changes in the exchange rate (which lead to changes in trade costs) have a significant impact on the range of products exported by firms as a higher depreciation (or undervaluation) is likely to increase the number of products exported to a certain destination. Indeed, recent trade models introduce the possibility for firms to choose endogenously between the range of products that they sell in the domestic market and/or export. Cadot et al (2011) found similar results since they argued that low and middle-income countries diversify mostly along the extensive margin that is, addition of new product lines, whereas high-income countries diversify along the intensive margin.

Table 8. Results of the extensive margin

	Ln(Product)		
Ln(GDP imp)	0.0207***	0.0207***	0.0205***
	(0.000300)	(0.000300)	(0.000308)
Ln(Dist.)	-0.0138***	-0.0137***	-0.0140***
	(0.000558)	(0.000559)	(0.000567)
Contig.	0.0218***	0.0218***	0.0244***
	(0.00191)	(0.00190)	(0.00181)
Com. Lang.	0.0706***	0.0706***	0.0698***
	(0.00123)	(0.00123)	(0.00124)
Colony	0.00919***	0.00920***	0.00827***
	(0.00138)	(0.00138)	(0.00137)
Ln(REER)	-0.0853***		
	(0.00540)		
Ln(REER2)		-0.0843***	
		(0.00539)	
Misalig.			-0.0519***
			(0.0196)
Constant	0.127***	0.0944***	-0.277***
	(0.0288)	(0.0270)	(0.00778)
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
Month FE	YES	YES	YES
Observations	1073476	1073476	1073476
R-squared	0.377	0.377	0.376

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.3. Sectoral Results

We run the regressions at the HS4 level and kept the products for which the coefficient of the real effective exchange rate is negative and significant showing that exports are sensitive to a real depreciation of the Egyptian pound (using our two measures of REER and the exchange rate misalignment). In general, these products that are affected by the exchange rate depreciation are edible vegetables and certain roots and tubers, edible fruit and nuts, peel of citrus fruit or melons, oil seeds and oleaginous fruits; animal or vegetable fats and oils and their cleavage products, prepared edible fats; mineral fuels, mineral oils and products of their distillation, plastics and articles thereof; paper and paperboard, articles of paper pulp, of paper or of paperboard; cotton; man-made staple fibers, articles of apparel and clothing accessories, knitted or crocheted, other made-up textile articles, worn clothing and worn textile articles, articles of stone, plaster, cement, asbestos, mica or similar materials; glass and glassware, copper and articles thereof, lead and articles thereof, cereals, residues and waste from the food industries, ores, organic chemicals,

rubber and articles thereof, iron and steel; electrical machinery and equipment. Yet, it is important to note that some of these products are not characterized by a comparative advantage in Egypt. This is why it is crucial to examine the link between specialization and REER sensitivity. Hence, we identify four groups of products at the HS2[1] (whether they are sensitive to REER or no and whether Egypt has a comparative advantage in them or no) as it is shown in Table 9.

Table 9. RCA vs. REER Sensitivity

	Not Sensitive	Sensitive
No RCA	41	8
	9%	9%
RCA	30	18
	26%	56%

Source: Constructed by the authors.
Note: The upper number shows the number of products at the HS2 level and the lower number shows the share of these products in the value of total exports.

The first group includes products for which Egypt does not have a comparative advantage and that are not sensitive to a real effective exchange rate depreciation. In our dataset, they represent 41 products, accounting for 9 percent of total exports and include mainly products of the printing industry, silk, precious or semi-precious stones, artificial flowers, cork, base metals, musical instruments, impregnated, coated, covered or laminated textile fabrics, vehicles other than railway or tramway, toys, games and sports requisites, pharmaceutical products, articles of leather, saddlery and harness, explosives, aircraft, knitted or crocheted fabrics, arms and ammunition, machinery, mechanical appliances, nuclear reactors, meat and edible meat offal, coffee, tea and spices, nickel and articles thereof, wood and articles of wood, beverages, spirits and vinegar (see Table 10 for more details). These products face mainly two difficulties. First, some of them are subject to several technical barriers to trade and sanitary and phyto-sanitary measures that negatively affect their exports. Second, some of them are intensive in high-technology techniques, which are relatively scarce in Egypt compared to other Arab countries (see Figure 11). These products are not likely to be boosted by a real depreciation as they are not sensitive and Egypt does not have a comparative advantage in their production.

[1] This mapping was done at the HS2 level as the revealed comparative advantage index is available at the HS2 only.

The second group includes products that are sensitive to real depreciation but Egypt does not have a comparative advantage in their production. They are 8 products whose share is 9 percent in total exports. These products are mainly cereals, residues and waste from the food industries, ores, organic chemicals, rubber and articles thereof, iron and steel; electrical machinery and equipment. If Egypt manages to gain a higher comparative advantage in such products, they are likely to yield positive gains from a real depreciation. This group represents the extensive margin of trade from which Egypt can benefit more with a real depreciation of the Egyptian pound.

Third, we identified products in which Egypt has a comparative advantage but are not sensitive to real depreciation (30 products with a share of 26 percent in total exports). This group encompasses: articles of apparel and clothing accessories, not knitted or crocheted, albuminoidal substances, soap and washing preparations, tobacco, cocoa and cocoa preparations, edible products of animal origin, paper yarn and woven fabrics of paper yarn, articles of iron or steel, carpets and other textile floor coverings, ceramic products, sugars and sugar confectionery, essential oils and resinoids, perfumery, fertilizers, preparations of vegetables, fruit, nuts or other parts of plants, inorganic chemicals, organic or inorganic compounds of precious metals, man-made filaments, live trees and other plants, bulbs, roots and the like, cut flowers and ornamental foliage, aluminum and articles thereof and wool, fine or coarse animal hair. As this group is not likely to be affected by the recent developments in the exchange rate, one cannot expect higher exports thanks to more depreciation. This is why it is important to maintain their competitiveness despite an insensitivity with respect to exchange rate, especially products that are highly demanded by the rest of the world.

Fourth, at the sectoral level, the intensive margin seems to matter for some products more than others. Indeed, the most beneficial group includes products that are sensitive to real depreciations and in which Egypt has a comparative advantage (18 products and a share of 56 percent in the value of total exports. These products are edible vegetables and certain roots and tubers; edible fruit and nuts, peel of citrus fruit or melons, oil seeds and oleaginous fruits; animal or vegetable fats and oils and their cleavage products, prepared edible fats; mineral fuels, mineral oils and products of their distillation, miscellaneous chemical products, plastics and articles thereof; paper and paperboard, articles of paper pulp, of paper or of paperboard; cotton; man-made staple fibers, articles of apparel and clothing accessories, knitted or crocheted, other made-

up textile articles, worn clothing and worn textile articles, articles of stone, plaster, cement, asbestos, mica or similar materials; glass and glassware, copper and articles thereof; lead and articles thereof; miscellaneous manufactured articles. Our findings are relatively in line with Bahmani-Oskooee and Hosny (2012) who found that some industries will benefit from real depreciation of the Egyptian pound, which are live animals other than animals, dairy products, birds eggs, vegetables, fruit, coffee, tea, cocoa, spices, manuf.; Miscellaneous edible prod. and preparations; oil seeds, oleaginous fruits; crude fertilizers and crude minerals, fixed veg. fats, oils crude refined, inorganic chemicals, medicinal, pharmaceutical products, paper, paperboard, articles of paper pulp; non-metallic mineral; electrical machinery, prefabricated-buildings-sanitary plumbing heating and furniture and parts thereof; bedding, mattresses. This group represents mainly the intensive margin of trade as they are traditional exports in Egypt.

Table 10. Comparative advantage and exchange rate sensitivity

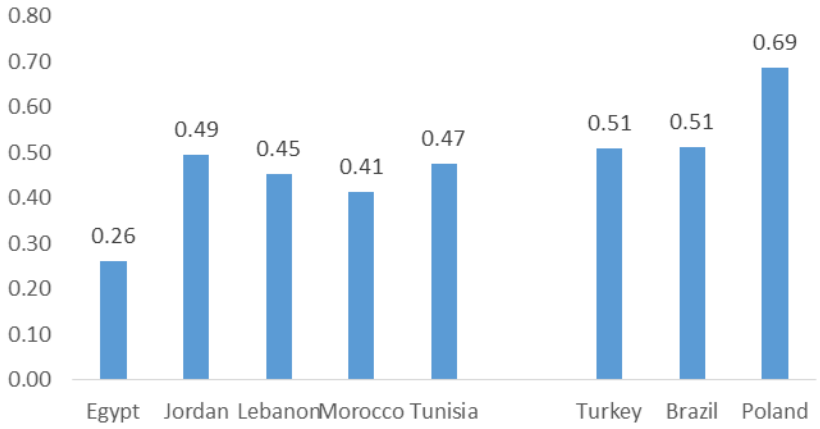
	Not sensitive	Sensitive
No RCA	(41 products) Printed books, newspapers, pictures and other products of the printing industry; manuscripts; silk; natural or cultured pearls, precious or semi-precious stones, precious metals; prepared feathers and down and articles made of feathers or of down, artificial flowers; pulp of wood or of other fibrous cellulosic material; cork and articles of cork; headgear and parts thereof; other base metals, cermets; musical instruments, parts and accessories of such articles; impregnated, coated, covered or laminated textile fabrics; vehicles other than railway or tramway rolling stock, and parts and accessories thereof; tin and articles thereof; optical, photographic, cinematographic, measuring, checking, precision, medical or surgical; toys, games and sports requisites; pharmaceutical products; zinc and articles thereof; furskins and artificial fur; articles of leather, saddlery and harness, travel goods, handbags and similar containers; preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates; explosives, pyrotechnic products, matches, pyrophoric alloys; manufactures of straw, of esparto or of other plaiting materials; photographic or cinematographic goods; aircraft, spacecraft, and parts thereof; clocks and watches and parts thereof; tools, implements, cutlery, spoons and forks, of base metal; knitted or crocheted fabrics; arms and ammunition; parts and accessories thereof; machinery, mechanical appliances, nuclear reactors, boilers; parts thereof; live animals; meat and edible meat offal; works of	(8 products) Cereals; residues and waste from the food industries, prepared animal fodder; ores, slag and ash; organic chemicals; rubber and articles thereof; umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof; iron and steel; electrical machinery and equipment and parts thereof; sound recorders and reproducers, television.

	art, collectors' pieces and antiques; miscellaneous articles of base metal; coffee, tea and spices; nickel and articles thereof; footwear, gaiters and the like; parts of such articles; wood and articles of wood, wood charcoal; fish and crustaceans, molluscs and other aquatic invertebrates; beverages, spirits and vinegar; railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures; commodities not elsewhere specified; ships, boats and floating structures.	
RCA	(30 products) Miscellaneous manufactured articles; articles of apparel and clothing accessories, not knitted or crocheted; Albuminoidal substances, modified starches; soap, organic surface-active agents, washing preparations, lubricating preparations, artificial; tobacco and manufactured tobacco substitutes; cocoa and cocoa preparations; dairy produce, birds' eggs, natural honey, edible products of animal origin, not elsewhere; other vegetable textile fibres, paper yarn and woven fabrics of paper yarn; articles of iron or steel; special woven	(18 products) Edible vegetables and certain roots and tubers; edible fruit and nuts, peel of citrus fruit or melons; oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; animal or vegetable fats and oils and their cleavage products; prepared edible fats; mineral fuels, mineral oils and products of their distillation, bituminous substances; tanning or dyeing extracts, tannins and their derivatives, pigments and other coloring; miscellaneous chemical products; plastics and articles

	fabrics, tufted textile fabrics, lace, tapestries, trimmings, embroidery; carpets and other textile floor coverings; ceramic products; products of the milling industry, malt, starches, inulin; furniture, bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; sugars and sugar confectionery; preparations of cereals, flour, starch or milk; essential oils and resinoids; perfumery, cosmetic or toilet preparations; fertilizers; products of animal origin, not elsewhere specified or included; salt, sulphur, earths and stone; plastering materials, lime and cement; wadding, felt and nonwovens, special yarns, twine, cordage, ropes and cables and articles thereof; preparations of vegetables, fruit, nuts or other parts of plants; vegetable plaiting materials, vegetable products not elsewhere specified or included; inorganic chemicals;, organic or inorganic compounds of precious metals, of rare-earth metals; man-made filaments, strip and the like of man-made textile materials; raw hides and skins (other than furskins) and leather; live trees and other plants, bulbs, roots and the like, cut flowers and ornamental foliage; miscellaneous edible preparations; aluminum and articles thereof; lac, gums, resins and other vegetable saps and extracts; wool, fine or coarse animal hair; horsehair yarn and woven fabric.	thereof; paper and paperboard; articles of paper pulp, of paper or of paperboard; cotton; man-made staple fibers; articles of apparel and clothing accessories, knitted or crocheted; other made-up textile articles, worn clothing and worn textile articles; articles of stone, plaster, cement, asbestos, mica or similar materials; glass and glassware; copper and articles thereof; lead and articles thereof; miscellaneous manufactured articles.

Source: Constructed by the authors.

Figure 11. Share of medium and high-tech activities in total value-added



Source: Competitive Industrial Performance Index, UNIDO.

5.4. Country Regressions

In order to determine which destinations respond more to the exchange rate developments, we run regressions at the country level. Table 11 shows our main findings. Four groups of countries can be identified. First, traditional markets, such as Spain and Italy, which have a large share in Egypt's exports and are highly sensitive regardless of the exchange rate measure we use. For this group, Egypt should take advantage of its presence in those markets and their sensitivity to the pound depreciation to increase its exports.

Second, other European countries that have a lower sensitivity but a large share in Egypt's trade such as Germany, France and Netherlands. These destinations are not likely to be affected by the recent developments of the exchange rate. Hence, Egypt's exports to these destinations should remain high, though constant. The same analysis applies to some Arab countries such as Lebanon and Jordan.

Third, some African and Asian countries are highly sensitive to the exchange rate even though their share is relatively low such as Pakistan, Burkina Faso, Guinea and Zambia. Obviously, these countries represent potential markets, as their demand is sensitive to Egypt's exchange rate. This potential increase is related to the extensive margin mentioned above.

Finally, the last group includes countries that have a low share in Egypt's exports and that are not sensitive to exchange rate such as Portugal and Sri-Lanka. In general, sensitive markets represent 36 percent of Egypt's total exports as shown in Table 11.

Table 11. Destinations ranking and exchange rate sensitivity

	REER2		REER		Misal	
Rank	Country	Share	Country	Share	Country	Share
1	ITA	7.28%	ITA	7.28%	ITA	7.28%
2	ESP	3.20%	ESP	3.20%	ESP	3.20%
3	RUS	1.29%	RUS	1.29%	BFA	0.04%
4	ZMB	0.08%	ZMB	0.08%	SWE	0.14%
5	BFA	0.04%	GBR	4.43%	TTO	0.00%
6	GIN	0.05%	PAK	0.70%	PAK	0.70%
7	GBR	4.43%	BDI	0.04%	RUS	1.29%
8	PAK	0.70%	BEL	1.74%	BDI	0.04%
9	MUS	0.10%	TUR	5.80%	GIN	0.05%
10	NOR	0.06%	LTU	0.06%	NOR	0.06%
11	BDI	0.04%	UKR	0.34%	MOZ	0.03%
12	MOZ	0.03%	CZE	0.10%	GBR	4.43%
13	UKR	0.34%	MLI	0.04%	MUS	0.10%
14	LTU	0.06%	MOZ	0.03%	LBN	2.93%
15	MLI	0.04%	GIN	0.05%	LBR	0.03%
16	CIV	0.14%	CIV	0.14%	LVA	0.03%
17	PRT	0.44%	BFA	0.04%	MDV	0.01%
18	BEL	1.74%	IRN	0.27%	ZMB	0.08%
19	CZE	0.10%	DEU	2.70%		
20	DEU	2.70%	NLD	2.46%		
21	SWE	0.14%	MDV	0.01%		
22	FRA	3.31%	CMR	0.13%		
23	IRL	0.14%	PRT	0.44%		
24	LBN	2.93%	LKA	0.09%		
25	QAT	1.09%	ZAF	1.37%		
26	MDV	0.01%	IND	1.49%		
27	HUN	0.05%	JOR	2.31%		
28	COG	0.08%				
29	TUR	5.80%				
Total	36.40%		36.65%		20.44%	

Source: Constructed by the authors.

For country code, see Appendix 1.

6. CONCLUSION AND POLICY IMPLICATIONS

Using monthly firm-level and sector-level data, this study tries to examine the impact of both devaluation and exchange rate misalignment on the increase in the quantity of exports, as well as the ability to export new products and/or venture into new export markets. In other words, this paper seeks to examine: first, how both the intensive (the quantity of exports) and the extensive (the probability of exporting a new product to a new destination, exporting a new product to an existing destination or exporting an existing product to a new destination) margins to trade are affected by the devaluation of the Egyptian pound using firm-level data. At the intensive margin level, we find that while a depreciation of the real exchange rate increases the value of exports, the quantity of exports is not affected showing that the price effect is more significant than the quantity effect. For the extensive margin, the number of destinations and the number of products respond positively to exchange rate depreciation. However, at the sectoral level, the intensive margin seems to matter for some products more than others. This in line with the assumption that real exchange rate depreciation/undervaluation is likely to generate potential for comparative advantage potential in new and more sophisticated exportable goods and services.

The estimation results allow us to draw some important conclusions and policy implications. First, in a period where the Egyptian pound is experiencing a serious devaluation, it is worth to examining how the latter should promote export 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 first important finding of the paper is that the value, not the quantity of exports, is positively affected by a real depreciation of the pound. In other words, the effect on quantity is insignificant. Several factors might explain why the pound depreciation might have a limited effect on Egypt's exports and trade balance:

- In fact, as a rough rule of thumb, a 10 percent devaluation may increase prices by 2-3 percent. Moreover, imports are inelastic as 75 percent of imported goods are either intermediate, investment, raw materials and fuel «necessary» for both production and export. Therefore, since devaluation leads to higher import prices, raw materials used in production increase in price and contribute to cost-push inflation. To some extent, higher

raw material costs offset the lower export prices. Ahmed, Appendino and Ruta (2015) argue that as countries are more integrated in global production processes, a currency depreciation only improves the competitiveness of a fraction of the value of final commodity exports. In line with this intuition, the analysis finds evidence that the rise of participation in global value chains explains on average 40 percent of the fall in elasticity, and that corrections of the real effective exchange rate for participation in global value chains do not present the same decreasing pattern in elasticity. This is why Hummels, Ishii and Yi. (2001) found also that the use of imported inputs in producing goods that are exported (vertical specialization) accounts for 21 percent of OECD countries' exports, and grew almost 30 percent between 1970 and 1990. They also find that growth in vertical specialization accounts for 30 percent of the growth in these countries' exports.

- Second, a devaluation might have a limited effect if the country's main export partners are in a recession. Indeed, the Eurozone, Egypt's main trade partner, has a weak growth. Thus, more competitive Egyptian exports might be insufficient to boost export demand.
- Third, Egyptian firms shall pass on the effects of devaluation. Indeed, while devaluation leads to a lower price of exports, firms may choose to keep foreign currency prices as they are to increase their profit margins.
- Fourth, since depreciation affects demand, supply is not concerned. Hence, some studies argue that depreciation can reduce the incentive to be efficient because firms can become competitive without the effort of increasing productivity, which might make depreciation inefficient.

Third, two other important findings are related to the extensive margin. Indeed, a stronger depreciation leads to an increase in the number of products exported and the number of destinations. Thus, real depreciation can be perceived as a tool to promote export diversification at both the product and the market levels and to reduce the dependence of Egypt on specific products or destinations.

Fourth, at the sectoral level, the most beneficial group includes products that are sensitive to real depreciations and for which Egypt has a comparative advantage. These products are edible vegetables and certain roots and tubers, edible fruit and nuts, peel of citrus fruit or melons, oil seeds and oleaginous fruits; animal or vegetable fats and oils and their cleavage products,

prepared edible fats; mineral fuels, mineral oils and products of their distillation, plastics and articles thereof; paper and paperboard, articles of paper pulp, of paper or of paperboard; cotton; man-made staple fibers, articles of apparel and clothing accessories, knitted or crocheted, other made-up textile articles, worn clothing and worn textile articles, articles of stone, plaster, cement, asbestos, mica or similar materials; glass and glassware, copper and articles thereof, lead and articles thereof. Some of these products are already included in the Industrial Development Strategy announced by the Ministry of Trade and Industry (MoTI) in 2016, especially textile and clothing industries and construction industries.

Fifth, as mentioned before, some products are sensitive to exchange rate developments but Egypt does not have a comparative advantage in their production such as organic chemicals, iron and steel, electrical machinery and equipment and parts thereof, sound recorders and reproducers and television. As both chemical and engineering industries are also included in the Industrial Development Strategy, it will be an opportunity for Egypt to develop these products and benefit from their sensitivity to exchange rate developments. These products represent the extensive margin previously explained.

Sixth, as mentioned before, the products that are not sensitive to the exchange rate but efficiently produced are chiefly articles of apparel and clothing accessories, soap and washing preparations, tobacco, cocoa and cocoa preparations, articles of iron or steel, carpets and other textile floor coverings, ceramic products, essential oils and resinoids, perfumery, fertilizers, inorganic chemicals, organic or inorganic compounds of precious metals and man-made filaments. As most of these products belong to sectors included in the MoTI, it is crucial to develop them to overcome their insensitivity to exchange rate and to boost them by deepening the comparative advantage of Egypt in their production.

Seventh, Egypt must avoid the products that are not characterized by a comparative advantage and that are not sensitive to the exchange rate, mainly toys, some textile products and artificial flowers. Clearly, the three previous groups will have a greater impact on exports as they are either sensitive or efficiently produced.

Eighth, and more generally, the depreciation of the Egyptian pound per se is not sufficient to boost Egyptian exports. This policy must be accompanied by other measures to guarantee an increase in exports.

- *At the trade policy level*, first, it is important to improve the quality of Egyptian exports. In fact, with low quality products and significantly depreciated pound, exports might not find large markets. Second, taking advantage of preferential trade agreements between Egypt and the countries of the world is a must to have a greater access to various foreign markets and amplify the benefits of a high depreciation. Third, improving the administrative procedures and reducing bureaucracy and red tape cost shall increase incentives for producers and improve export competitiveness as such barriers are a deadweight loss for the economy.
- *At the monetary policy level*, reducing the inflation rate in Egypt compared to the inflation rate among its partners is crucial to benefit from a lower nominal exchange rate of the pound to improve the trade balance. This shows that monetary policy has an important role in promoting exports.
- *As per industrial policy*, incentives are an important determinant of firms' export performance. As argued by El Haddad (2016), incentives should be performance-based, finite, pre-announced and enforced along with constant independent monitoring and evaluation. Along the same lines, as also suggested by El Haddad (2016), it is crucial to improve the economy's competitive environment and accentuate equality of opportunity between all market players.
- *For labor policies*, providing an educated workforce and improving the matching between the education system and the labor market requirements. More productive labor will obviously improve the export competitiveness.
- Finally, in terms of *investment policy*, depreciation makes the foreign currency more flexible, which reduces the fears and uncertainty related to capital controls and caps on currency transfers. This consequently increases the flow of foreign direct investment (FDI) in any country. Indeed, it has been shown that 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.

Our future research agenda includes the following. First, it is important to examine how the import content of exports is affected by such devaluation using input-output table from different social accounting matrices. Second, it is worthwhile to examine the impact of devaluation on the likelihood of becoming an exporter to see whether the number of exporters increases or not.

Appendix 1. Country Codes

Code	Country	Code	Country
ABW	Aruba	LAO	Lao People's Democratic Republic
AFG	Afghanistan	LBN	Lebanon
AGO	Angola	LBR	Liberia
AIA	Anguilla	LBY	Libyan Arab Jamahiriya
ALB	Albania	LCA	Saint Lucia
AND	Andorra	LKA	Sri Lanka
ANT	Netherland Antilles	LSO	Lesotho
ARE	United Arab Emirates	LTU	Lithuania
ARG	Argentina	LUX	Luxembourg
ARM	Armenia	LVA	Latvia
ATF	French Southern Antartic territories	MAC	Macau (Aomen)
ATG	Antigua and Barbuda	MAR	Morocco
AUS	Australia	MDA	Moldova, Rep.of
AUT	Austria	MDG	Madagascar
AZE	Azerbaijan	MDV	Maldives
BDI	Burundi	MEX	Mexico
BEL	Belgium and Luxembourg	MHL	Marshall Islands
BEN	Benin	MKD	Macedonia (the former Yugoslav Rep. of)
BFA	Burkina Faso	MLI	Mali
BGD	Bangladesh	MLT	Malta
BGR	Bulgaria	MMR	Burma
BHR	Bahrain	MNG	Mongolia
BHS	Bahamas	MNP	Northern Mariana Islands
BIH	Bosnia and Herzegovina	MOZ	Mozambique
BLR	Belarus	MRT	Mauritania
BLZ	Belize	MSR	Montserrat
BMU	Bermuda	MTQ	Martinique
BOL	Bolivia	MUS	Mauritius
BRA	Brazil	MWI	Malawi
BRB	Barbados	MYS	Malaysia
BRN	Brunei Darussalam	NAM	Namibia
BTN	Bhutan	NCL	New Caledonia
BWA	Botswana	NER	Niger
CAF	Central African Republic	NFK	Norfolk Island
CAN	Canada	NGA	Nigeria
CCK	Cocos (Keeling) Islands	NIC	Nicaragua
CHE	Switzerland	NIU	Niue
CHL	Chile	NLD	Netherlands
CHN	China	NOR	Norway
CIV	Côte d'Ivoire	NPL	Nepal
CMR	Cameroon	NRU	Nauru
COG	Congo	NZL	New Zealand
COK	Cook Islands	OMN	Oman
COL	Colombia	PAK	Pakistan
COM	Comoros	PAL	Palestine
CPV	Cape Verde	PAN	Panama
CRI	Costa Rica	PCN	Pitcairn
CUB	Cuba	PER	Peru

CXR	Christmas Island	PHL	Philippines
CYM	Cayman Islands	PLW	Palau
CYP	Cyprus	PNG	Papua New Guinea
CZE	Czech Republic	POL	Poland
DEU	Germany	PRI	Puerto Rico
DJI	Djibouti	PRK	Korea, Dem. People's Rep. of
DMA	Dominica	PRT	Portugal
DNK	Denmark	PRY	Paraguay
DOM	Dominican Republic	PYF	French Polynesia
DZA	Algeria	QAT	Qatar
ECU	Ecuador	REU	Reunion
EGY	Egypt	ROM	Romania
ERI	Eritrea	RUS	Russian Federation
ESH	Western Sahara	RWA	Rwanda
ESP	Spain	SAU	Saudi Arabia
EST	Estonia	SDN	Sudan
ETH	Ethiopia	SEN	Senegal
FIN	Finland	SGP	Singapore
FJI	Fiji	SHN	Saint Helena
FLK	Falkland Islands	SLB	Solomon Islands
FRA	France	SLE	Sierra Leone
FRO	Faroe Islands	SLV	El Salvador
FSM	Micronesia (Federated States of)	SMR	San Marino
GAB	Gabon	SOM	Somalia
GBR	United Kingdom	SPM	St. Pierre and Miquelon
GEO	Georgia	STP	Sao Tome and Principe
GHA	Ghana	SUR	Suriname
GIB	Gibraltar	SVK	Slovakia
GIN	Guinea	SVN	Slovenia
GLP	Guadeloupe	SWE	Sweden
GMB	Gambia	SWZ	Swaziland
GNB	Guinea-Bissau	SYC	Seychelles
GNQ	Equatorial Guinea	SYR	Syrian Arab Republic
GRC	Greece	TCA	Turks and Caicos Islands
GRD	Grenada	TCD	Chad
GRL	Greenland	TGO	Togo
GTM	Guatemala	THA	Thailand
GUF	French Guiana	TJK	Tajikistan
GUY	Guyana	TKL	Tokelau
HKG	Hong Kong	TKM	Turkmenistan
HND	Honduras	TMP	East Timor
HRV	Croatia	TON	Tonga
HTI	Haiti	TTO	Trinidad and Tobago
HUN	Hungary	TUN	Tunisia
IDN	Indonesia	TUR	Turkey
IND	India	TUV	Tuvalu
IRL	Ireland	TWN	Taiwan
IRN	Iran	TZA	Tanzania, United Rep. of
IRQ	Iraq	UGA	Uganda
ISL	Iceland	UKR	Ukraine

ISR	Israel	URY	Uruguay
ITA	Italy	USA	United States of America
JAM	Jamaica	UZB	Uzbekistan
JOR	Jordan	VCT	Saint Vincent and the Grenadines
JPN	Japan	VEN	Venezuela
KAZ	Kazakhstan	VGB	British Virgin Islands
KEN	Kenya	VNM	Viet Nam
KGZ	Kyrgyzstan	VUT	Vanuatu
KHM	Cambodia	WLF	Wallis and Futuna
KIR	Kiribati	WSM	Samoa
KNA	Saint Kitts and Nevis	YEM	Yemen
KOR	Korea	YUG	Serbia and Montenegro
KWT	Kuwait	ZAF	South Africa
		ZAR	Congo (Democratic Republic of the)
		ZMB	Zambia
		ZWE	Zimbabwe

Source: CEPII dataset.

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