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Abstract

This paper explores the link between trade liberalization and firms' performance in Egypt combining macro and micro data. Using the Economic Census of Egypt 2013, we examine the association between tariffs and non-tariffs measures (NTM) imposed on intermediate inputs and total factor productivity (TFP). In a first step TFP is estimated as the residual of a Cobb-Douglas/Translog production function and in the second, TFP is regressed on weighted tariffs and NTM imposed on intermediate inputs. Egyptian input-output tables are used to construct the weights. Our main findings show a positive and significant association between imported inputs and value-added and a significantly negative relationship between tariffs and TFP.

Keywords: Input, Trade, Productivity, Firm-level

JEL Classifications: F10, F12, F15

ملخص

تستكشف هذه الورقة العلاقة بين تحرير التجارة وأداء الشركات في مصر بين البيانات الكلية والجزئية. باستخدام التعداد الاقتصادي لمصر 2013، ندرس الإرتباط بين التعريفات الجمركية والتدابير غير الجمركية المفروضة على المدخلات الوسيطة والإنتاجية الكلية لعوامل الإنتاج. في الخطوة الأولى ، تُقدَّر الإنتاجية الكلية لعوامل الإنتاج كقيمة متبقية لدالة الإنتاج وفقا لنموذج كوب ودوجلاس اللوغاريتمى المتسامى. وفي الثانية ، تتراجع الإنتاجية الكلية للعوامل عن التعريفات المرجحة و التدابير غير الكلية المفروضة على المدخلات الوسيطة. يتم استخدام جداول المدخلات والمخرجات المصرية لبناء الأوزان. تظهر النتائج الرئيسية التي توصلنا إليها وجود ارتباط إيجابي وهام بين المدخلات المستوردة والقيمة المضافة وعلاقة سلبية كبيرة بين التعريفات الجمركية والإنتاجية الكلية لعوامل الإنتاج.

1. Introduction

Trade policy has been widely used during different historical episodes and by different countries as a basis for a comprehensive development strategy. The contribution of trade policy to a country's development has long been investigated. Findings on this matter, however, have been as diverse as the postulated theories supporting them (Hirschman, 1971; Luong, 2011; Page, 1994; Winters, 2004). Revisionists argue that government interventions are required for the generation of proper incentives in industries that would have otherwise not developed under the rule of comparative advantage (Asian Development Bank, 1997b). On the other side, however, supporters of free trade claim that distortionary policies are counterproductive as integration to world markets improves access to foreign technology, expands input availability and unleashes competitive forces that raise efficiency (Goldberg et al., 2010; Grossman and Helpman, 1991; Melitz, 2003; Taylor, 1998). While recent studies tend to favor trade openness over trade protection, the heterogeneity of its impact across and within countries has been widely acknowledged (Rodrıguez and Rodrik, 2000; Schor, 2004).

The extent to which tariff barriers impact firm growth is predicated on how it affects the inflow of imports. This transmission channel is then differentiated on whether the imported product is an intermediate good or a final good, as each is expected to deliver different incentives to the firm. Namely, imported final goods represent inflowing competition from abroad, while imported intermediate goods may be valuable factors of production. As a result, the ambiguous link between trade openness and growth is assessed by targeting the effects of tariff barriers that are mediated by the extent of the market, as proposed by Alesina et al. (2005)[4].

It also important to note that firm competitiveness is a function of the cost and quality of the inputs they have access to. Although Jaud and Freund (2015) highlight the relatively weak performance of MENA exporters due to the fact that firms do not have access to a wide variety of competitively priced inputs, most studies focus on developing countries like Chile, Brazil, Colombia, Indonesia and India (Amiti and Konings (2007), Altomonte and Békés (2009), Bas (2012), Smeets and Warzynski (2010)). The MENA region has been relatively neglected in this literature. This is why this research explores the link between change in trade policy variables (measured by both tariff and non-tariff measures) and firms' performance in Egypt. Egypt is an interesting case because, although it has taken a gradual approach to trade liberalization, the once highly restrictive trade regime has been reversed with the initiation of reforms from 1986 to the beginning of WTO agreements in 1994/5 and the signing of several multi and bilateral trade agreements in the mid-1990s. Pledged to be in full compliance with WTO commitments, Egypt has had a policy of removing non-tariff barriers and replacing them with tariffs (Refaat, 2003). During the 1990s, Egypt passed legislation protecting its industries, such as increasing the local component requirements for car assembly. Following WTO accession in 1995, Egypt's commitments have been more or

[4] Alesina et al. (2005) claim that there are many reasons why trade openness (however measured) may display a positive coefficient on growth. For instance, trade policy towards reduced protection may induce improved functioning of institutions, increased foreign direct investment, scale effects, technology spill-over, etc.

less to bind tariff rates[5] at levels that in many cases have exceeded existing levels (WTO, 2005). To further open the Egyptian economy, a reform was introduced in 2004 to reduce the average unweighted tariff rate and rationalize the tariff structure. The number of products subject to non-tariff barriers was also substantially reduced. It is evident that both nominal and effective protection has declined for almost all manufacturing sectors, with most trade liberalization efforts concentrated in the area of intermediate and capital goods. It is, therefore, interesting to measure the impact of such significant changes in trade liberalization variables on the productivity of Egyptian firms.

Against this background, and since the observation of microeconomic dynamics enriches the impact assessment of macroeconomic policies, this study relies on standardized survey data representative of the entire firm population. Using the Economic Census of Egypt 2013, this paper contributes to the literature in three ways. First, we combine both tariffs and non-tariff measures in order to examine their association with value added and productivity. Second, we use input-output tables in weighting both tariffs and non-tariff measures given that each industry relies on different imported inputs. Third, we apply this for a MENA country (Egypt) since the latter has been understudied in this literature. Our main findings show a positive and significant association between imported inputs and value-added and a significant negative relationship between tariffs and TFP.

The remainder of the paper is organized as follows. Section 2 reviews the literature. Section 3 provides some stylized facts on trade policy and TFP in Egypt. Section 4 explains the procedure we adopt. Section 5 is dedicated to the empirical findings and Section 6 concludes.

2. Literature Review

Theoretically, the relationship between free trade and growth is studied and depicted by many researchers, covering its macro- and microeconomic aspects. Baldwin and Forslid (2000) used the Tobin's q-theory to test for the openness-growth relationship, incorporating trade barriers explicitly. The main findings of their model suggest that when the traded goods are input factors, a reduction of trade barriers promotes growth by diminishing the marginal cost of replacement capital. According to Melitz's (2003) model, competition is a main factor in determining the gains from trade. The model's findings suggest a positive relationship between trade liberalization and growth for high-productivity firms, as low-productivity firms exit the market as a result of the higher competition generated by trade liberalization. Also, Goldberg et al. (2010) provide theoretical groundwork for microeconomic mechanisms through which imported inputs impact firm growth. They stress static and dynamic gains arising from the availability of new input varieties, whereby the effect of input tariffs on the total availability of input varieties operates through two different channels. The first is the price of previously imported inputs, where diminishing prices enable the production of previously unprofitable products. The second is the inflow of new input varieties, where imported varieties expand the set of intermediate inputs. Similarly, Halpern et al. (2015) proposes a model using the quality ladder and the product-variety models, in order to explain gains from using imported inputs. These models support the idea of the reduction of tariff

[5] The bound tariff is the maximum MFN tariff level for a given commodity line. When countries join the WTO or when WTO members negotiate tariff levels with each other during trade rounds, they make agreements about bound tariff rates, rather than actually applied rates.

barriers as it increases productivity by reducing the price of imports and raising the number of input varieties. (Goldberg et al., 2010 and Halpern et al., 2015)

Many of the empirical studies conducted on the relationship between trade and productivity have focused on time periods of deep economic change and transformation. These analyses were conducted in Chile 1979-86 (Pavcnik, 2002), Brazil 1988-90 (Ferreira and Rossi, 2003), Colombia 1977-91 (Fernandes, 2007), Indonesia 1991-2001 (Amiti and Konings, 2007), and India 1987-2001 (Topalova and Khandelwal, 2011). Supporting Melitz's (2003) model empirically, Pavcnik (2002) finds that trade liberalization in Chile during the 1979-1986 period increased productivity in import-competing industries, and that the low-productivity firms exited the market due to import-competition. For United States, Bernard et al. (2006) also find that, between 1977 and 2001, a reduction in trade costs generated more gains within and across industries and plants, where plants with low productivity were more likely to exit the market. However, in India, there is no evidence for any growth in productivity due to the trade liberalization of 1991 (Balakrishnan et al., 2000).

In Brazil, Ferreira and Rossi (2003) notice that trade liberalization over the 1988-90 period increased the productivity growth rate by 6 percent. On the other hand, Fernandes (2007) realize that not only the tariff reductions, but also the higher imports of intermediate goods, higher skill intensity and heavy machinery investment had a positive impact in Colombia during the period of 1977-1991. In recent studies, input tariffs are incorporated in the empirical analysis. For example, Amiti and Konings (2007) use plant census data from Indonesia for the period 1991-2001 to estimate productivity gains from output and input tariffs. The majority of these studies show a positive link between trade openness and productivity, taking into consideration other factors; however, it is unclear whether these circumstances in the 80s and 90s were unique or if they are replicable in today's world.

A study by Schor (2004) focuses on data gathered from Brazilian manufacturing firms between 1986 and 1998 studies trade liberalization and firm production efficiency. Trade liberalization tends to promote productivity gains in firms that had previously suffered from some form of x-inefficiency as they are subsequently forced to compete with more efficient foreign firms. An increase in the level of both the quality of foreign inputs being imported and the foreign technologies being implemented creates a much more competitive final product for the firms in question. This, in turn, allows them to sell their goods for export at a higher price. However, this finding is not homogenous across all sectors and firms. Those that were exposed to liberalization while having a low level of production were either able to drastically increase their production efficiency or were forced from the market by foreign imports (Schor, 2004). More recent papers included in Schor's study, for example, Topalova and Khandelwal (2011) and Nataraj (2011) agree with the large and positive effect of input tariff reduction on productivity; however, the impact and the role of output tariffs vary from one study to another.

Using an analysis of more recent Chinese transaction data for the time period between 2000 and 2006, Bas and Strauss-Kahn attempt to determine the effects stemming from reductions in exogenous input tariffs and their effect on the prices of HS6-traded goods. The conclusion of the study point to a scenario where firms took advantage of lowered trade barriers in order to import higher quality inputs, making their final goods, those intended for export, of a higher quality. This benefit is expressed in two ways. First, it is expressed by an increase in

input varieties and a decrease in the price of these varieties. Secondly, firms producing for export are able to increase the price of their export as the inputs (when of a higher quality) contribute to the production of a higher quality product, especially when exported to high income nations. The analysis determines that, in general, trade liberalization increases the quality of export goods which, in turn, makes them more competitive as exports on the global market (Bas and Strauss-Kahn, 2014).

3. Stylized Facts

3.1 Demand for Inputs by Industry

Table 1 shows the Input-Output table of Egypt in 2000/2001[6] with 17 sectors (289 cells). Almost 20% of the cells are zero (bold letters) showing that some industries have no backward nor forward linkages with other industries.

A more detailed look at forward linkages shows that, among the manufacturing sector, four main sectors provide other sectors with their outputs. These are chemicals, basic metals, spinning and weaving and engineering and machinery, along with some products from the crops and vegetables production sector and from services. Indeed, these sectors are characterized by heavy forward linkages with other sectors. As per backward linkages, food, productive and social services, construction, chemicals, clothing and animal production rely heavily on other sectors. By contrast, the tobacco sector is not linked to any other sector.

At the sectoral level, 50 percent of the oil and extraction sector goes to chemicals and 18 percent to the construction sector. The rest of its output is distributed to other sectors more or less equally. As for chemicals, its output is chiefly distributed to crop and vegetables production (12 percent), food industries (6.5 percent), clothing (6.8 percent), chemicals (17.6 percent), non-metallic (10.4 percent) and basic metals (6.6 percent). Engineering and machinery's output is distributed to all sectors with an average of 3 percent, with the lion shares going to engineering and machinery itself (17 percent), transport (15 percent) and social services (30 percent).

Some of these products are imported from developed countries. Indeed, technological change, declining transport costs, and the process of globalization have led to the splitting up of interdependent production chains and the distribution to different locations of the various elements in the production of a good. Therefore, trade experienced a significant increase in the use of imported intermediate inputs in exported products. This same analysis applies to the Egyptian case. Indeed, in Egypt, it is worthy to note that around 75 percent of imports are either raw materials, intermediate inputs, investment goods or fuel (see Figure 1).

Trade policy measured by both tariffs and non-tariff measures imposed by the Egyptian government is likely to have a significant effect on imports from the rest of the world, and thus, firms' production and productivity. The following section provides an overview of both tariffs and non-tariff measures in Egypt.

[6] Although this matrix might be a little bit outdated, we opted to use as it is the most disaggregated one in the manufacturing sector. We found other matrices with much more services sector and just one manufacturing sector. This is why we rely on this one assuming that sectors intensity did not change significantly over this period.

3.2 Trade Policy Overview

In terms of tariffs and non-tariff measures, Egypt has significantly liberalized its manufacturing sector since early 1990s. Figure 2 shows the simple average most favored nation applied tariffs in 2012. Some sectors have low tariffs such as petroleum products, cotton, chemicals and dairy products. Yet, among the goods that are heavily used as intermediate inputs or as investment goods, transport equipment has a tariff of 13 percent followed by electrical machinery with 8 percent and non-electrical machinery with 5 percent.

As per non-tariff measures, Figure 3 shows that conformity assessment represent the most important impediment since 42.4 percent of Egyptian importers argued that conformity assessment measures are the most important obstacles facing their imports, followed by charges, taxes and para-tariff measures and technical regulations.

At the sectoral level, Table 2 shows that importers face the most impeding measures in input-related sectors. Indeed, according to the NTM Business Survey done by the International Trade Center, 51 percent of importers in engineering products are facing burdensome NTMs, followed by 41 percent in the chemicals sector and 39 percent in the textiles sector. This becomes even more important as 31 percent of the reported procedural obstacles are in the engineering products followed by 22 percent in chemicals, which are chiefly used as inputs in other industries as it was mentioned before.

Figure 4 shows tariffs weighted by the technical coefficients coming from the IO table. Two remarks are worth mentioning. First, the tariff-equivalent of services is extremely high in Egypt (39.6 percent for social services, 46.4 percent for transport and 70.4 percent for other productive services). Second, for the manufacturing sector, while chemicals are moderately protected (with a weighted tariff of 5.7 percent), engineering and machinery and spinning and weaving are characterized by a relatively higher tariff (10.5 and 10.9 percent respectively). Hence, the higher the tariffs imposed on inputs, the higher the cost of production and the lower the efficiency of Egyptian firms.

It is important to note that Egypt's trade policy favors exporters who rely on intermediate inputs. Indeed, this can be highlighted by three main schemes. First, Egypt has one Special Economic Zone (Suez Governorate in the Sokhna area and adjacent to the Sokhna Port) that benefits from simplified customs procedures, tariff-free imports of inputs and equipment, and lower taxes. Second, the Presidential Decree No. 184/2013 (Article 6) allows for the reduction of customs duties on intermediate goods if the final product has a certain percentage of local inputs[7]. For instance, the exemptions granted to the assembly industries under this Decree during 2013-2014 reached EGP202.9 million, whereas during 2014-15 they were EGP112.1 million (WTO, 2018). Finally, Egypt's trade policy is also characterized by a duty drawback scheme (under Articles 102 to 106 of the Customs Law and Prime Minister Decree No. 1635/2002). This scheme allows a full refund of customs duties paid on imports of inputs and components used in the manufacture of finished products as long as the final products are exported or shipped to a free zone within two years after the date of duties payment.

[7] Under this concession, the customs duty rate assessed based on the final product may be reduced by rates ranging from 10% if the local content of the final product is less than 30%, up to a maximum of 90% if the local content exceeds 60%.

4. Methodology

In this context, and in contrast to previous studies, this research exploits the inter-sectoral and also international variation in tariff barriers (and non-tariff barriers if available) to estimate the impact stemming from import tariffs on labor productivity and total factor productivity using combined empirical methods.

The identification strategy combines empirical methods employed in Frankel and Romer (1999) and Amiti and Konings (2007) with theoretical developments in Anderson and van Wincoop (2003), Melitz (2003) and Goldberg et al.(2010). In this context, the effect of trade liberalization on firm growth is estimated in a two-step procedure.

First, to determine the effect of trade liberalization on productivity and firms' growth, we consider a plant with a Cobb-Douglas production function as follows:

$$VA_{ikg} = A_{ikg} L_{ikg}^{\alpha} K_{ikg}^{\beta} \quad (1)$$

where *Value Added,* VA_{ikg}, is total output, $Y_{ikg,}$ minus used inputs, I_{ikg}, K is capital, L is labor, A is technology efficiency parameter, i denotes individual plant and k denotes industry (4-digit level) and g governorate (region). By log-linearizing equation (1) and adding a number of dummy variables for exporters (ExpDum) importers of inputs (InputDum) and several sets of fixed effects (for sectors at 2-digits, regions)[8], we obtain an estimable equation as follows:

$$ln(Y_{ikg}-I_{ikg}) = lnA_{ikg} + \alpha_0 \ln L_{ikg} + \beta_0 \ln K_{ikg} + \lambda_1 ExpDum + \lambda_2 InputDum + \xi_k + \pi_g + \varepsilon_{ikg} \quad (2)$$

Alternatively, we also estimated a Translog production function using value added as dependent variable (production minus inputs used in production) and as explanatory variables we used labor, capital, the squared term of both inputs and their interaction[9]. The translog production function is as follows:

$$VA_{ikg} = A_{ikg} L_{ikg}^{\alpha} K_{ikg}^{\beta} (L_{ikg}^2)^{\lambda_3} (K_{ikg}^2)^{\lambda_4} (L_{ikg} K_{ikg})^{\lambda_5} \quad (3)$$

Hence, the log-log specification of the Translog model is given by:

$$lnVA_{ikg} = lnA_{ikg} + \alpha_1 \ln L_{ikg} + \beta_1 \ln K_{ikg} + \lambda_3 (\ln L_{ikg})^2 + \lambda_4 (\ln K_{ikg})^2 + \lambda_5 \ln L_{ikg} * \ln K_{ikg} + \xi_k + \pi_g + \varepsilon_{ikg} \quad (4)$$

Hence we obtain TFP' as follows,

$$TFP'_{ikg} = lnVA_{ikg} - \widehat{lnVA}_{ikg} \quad (5)$$

were $\ln \widehat{VA}_{ikg}$ is the estimated value added from (4).

We extended the value-added model by including a dummy variable for an exporting firm and another dummy for those who have imported inputs from the rest of the world. It is important to note that only 369 firms are exporters, which represent less than 1% of the firms (chiefly food, textile, apparel and chemicals). Meanwhile 7,176 firms are importing inputs, which represent 11.5% of all firms. Most of the firms are concentrated in the following sectors: repair and computers, manufacture of food, furniture, wearing apparel, fabricated metal products, textile, rubber and plastic and repair and installation of machinery.

In the second stage, we examine the impact of trade liberalization on plant-level productivity. Using the plant-level measures of TFP from equation (5), we estimate the following equation:

$$TFP'_{ikg} = \gamma_0 + \gamma_1 Inputtariff_k + \gamma_2 NTM_k + \delta_g + \varepsilon_{ikg} \quad (6)$$

[8] Two additional dummy variables are added indicating whether the firm holds a commercial registration and regular accounting statements.

[9] In this case we excluded the exporter and importer dummies, since in the second step we will estimate TFP as a function of trade policy variables as proxies for openness.

where *Inputtariff* for each industry *k* (4 digit level activities) is measured as a weighted average of all tariffs, with the weights based on the cost shares of each input used in the industry and *NTM* is an index of non-tariff measures. Industry (2-digit level activities, see Appendix 3) and regional dummies (Appendix 4) are also included. Alternatively, we also use the trade shares as measures of trade openness and exclude the trade policy variables from the model. The specification in this case is given by:

$$TFP'_{ikg} = \gamma_0 + \gamma_1 shareIM_k + \gamma_2 shareX_k + \delta_g + \varepsilon_{ikg} \quad (7)$$

Our data come from several sources. First, TFP has been estimated using variables from the Economic Census 2013 (see descriptive statistics in Appendix 1), tariffs and NTMs come from the World Trade Organization dataset (we used 2012 dataset). Yet, it is important to note that, due to data constraints, we could not distinguish between tariffs imposed on final products and that imposed on intermediate inputs. This is why we calculated these weighted tariffs using an Input / Output table. The latter comes from the Ministry of Planning (Egypt).

5. Empirical Findings

The main results are presented in Tables 3-5. Table 3 present the estimates obtained from equation (2) without exporter and importer dummies. Labor and capital are positive and statistically significant for the Cobb-Douglas function (columns 1 and 2) with the labor coefficient higher than the capital one. Using the translog function (columns 3 and 4), while labor is significant, neither capital nor squared terms are significant. By contrast, the interaction labor and capital is positive and statistically significant.

Table 4 presents the estimation of equation (2). The first column includes in addition to the production factors, capital and labor, a dummy for firms that sell part of their production abroad. The estimated coefficient indicates that exporters perform better than non-exporters in terms of value added. Exporter value added is on average 40 percent higher ((exp(0.341)-1)*100) than non-exporters value added. In the second column a dummy for firms importing intermediate goods is added, indicating that those firms value added is around 15 percent higher. Column 3 includes both dummies simultaneously and only the estimated coefficient of the exporter dummy is slightly lower than in column 1. Finally, when introducing also an interaction term that takes the value of 1 when a firm exports and imports, the corresponding coefficient is not statistically significant.

The results from the second step estimation using the Cobb-Douglas and translog production functions (equation 6) are shown in Table 5 and 6 respectively. In general, the effect of tariffs and non-tariff measures does not change with the TFP specification. Indeed, for the translog estimation, the coefficient of the tariff variable, which has been weighted using input-output coefficients, indicates that a decrease in tariffs by 1 percent is associated to an increase in TFP of around 3 percent, this effect can mostly be attributed to tariffs on imported inputs, since this is the relevant protection for firms that heavily rely on imported products (whether machines, equipment or raw materials). Concerning the effect of NTM, the coefficient of the IO-NTM variable is negative and significant in column 2, indicating that a decrease in NTMs is also associated to a decrease in TFP. However, when tariffs and NTM are introduced in the model, the results in column 3 indicate that whereas the effect of tariffs stays negative and statistically significant at the 5 percent level, the coefficient of NTM turns out to be positive and significant only at the 10 percent level. In the last column we add additional controls, in

particular a dummy for firms with foreign participation and another dummy for firms that are in the stock market and the results stay similar. Obviously, including both variables, tariffs and non-tariff measures, is problematic because the correlation between the two is high and negative (-0.64), therefore we should rely on the estimates obtained in columns (1) and (2). Finally, in Table 7 we present the results obtained from estimating equation (7), in which the share of exports over total sales and the share of imported inputs over total inputs are used as explanatory variables. The results show that only the second shows a positive and statistically significant coefficient, indicating that the firms that use a higher share of imported inputs are more productive. However, it cannot be concluded that firms exporting a higher share have higher total factor productivity.

6. Conclusion and Policy relevance

Using the Economic Census of Egypt 2013, this paper contributes to the literature in three ways. First, we combine both tariffs and non-tariff measures in order to examine their association with value added and productivity. Second, we use input-output tables in weighting both tariffs and non-tariff measures given that each industry relies on different imported inputs. Third, we apply this for a MENA country (Egypt) since the latter has been understudied in this literature. Our main findings show a positive and significant association between imported inputs and value-added and a significantly negative relationship between tariffs and TFP. When taken individually, tariffs and non-tariffs have a negative association with TFP. Yet, when they introduced together, only tariffs remain negative and significant given the collinearity between them.

From a policy standpoint, this paper sheds some light on the role of trade liberalization (both in terms of tariff reduction and non-tariff measures removal) in improving firms' productivity. This will allow Egyptian firms benefit at three levels. First, they will have access to inputs that are not available on the domestic market. Second, they will be able to benefit from cheaper imported intermediate inputs since the latter will be subject to lower tariffs and lower non-tariff measures. Third, such imported inputs might be associated to technology transfer which can also improve firms' productivity. It is worthy to note that non-tariff measures and administrative barriers to trade are still costly in Egypt. Indeed, according to the World Bank Enterprise Survey, customs and trade regulations are identified as a major constraint by 20 percent of the surveyed firms, which shows a notable deterioration compared to the 9 percent of 2013 (Figure 10). Again, this is mainly due to a lengthier time to clear exports and imports. This is further reforms to be undertaken are highly recommended to address non-tariff measures.

In a nutshell, trade liberalization has become an important part of many countries' development strategies. Opening local markets to foreign competition and foreign direct investment can lead to a more efficient allocation of resources that will result in productivity improvements in domestic industries and higher overall output.

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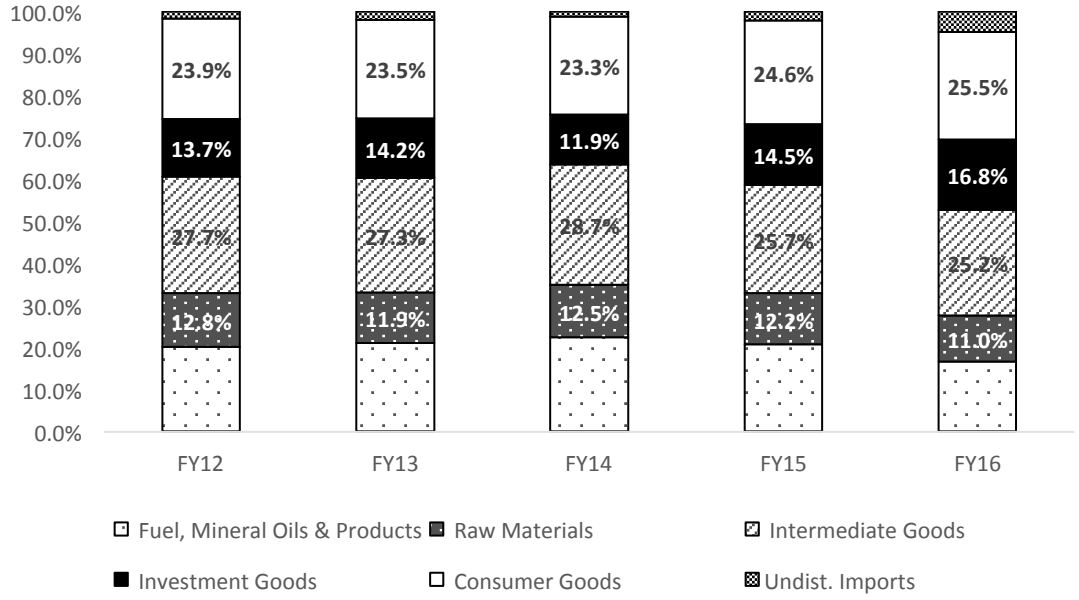
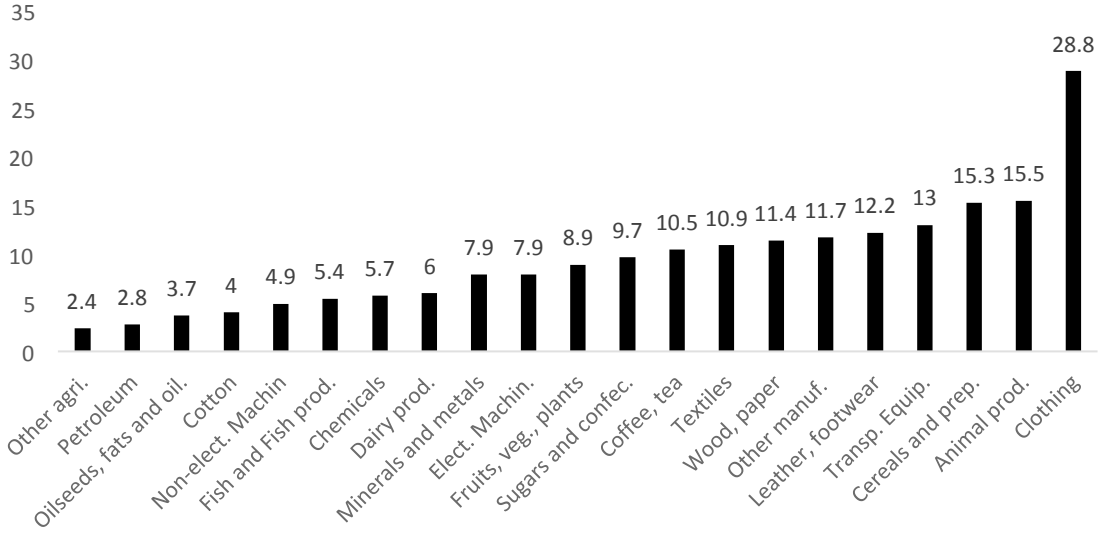
Figure 1. Egyptian Imports Structure from 2012 to 2016



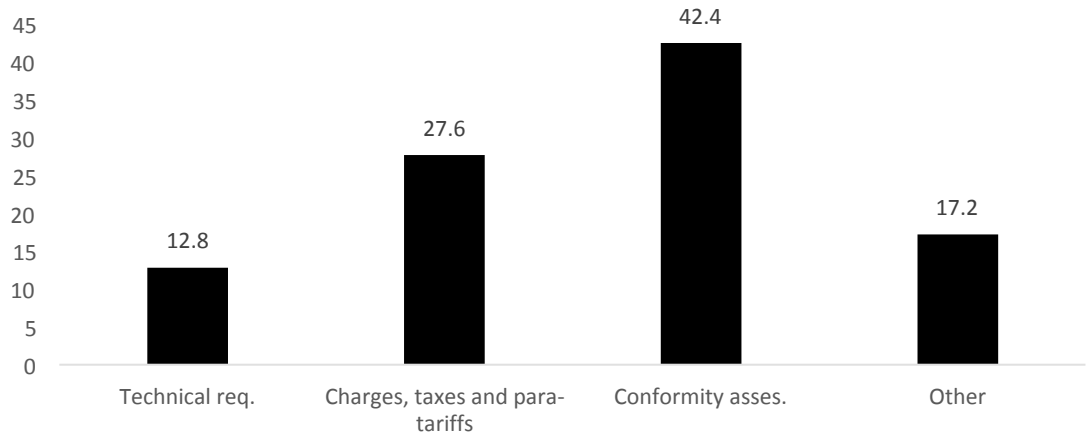
Source: The Central Bank of Egypt.

Figure 2. Most Favored Nation Applied Tariffs in 2012 (average)



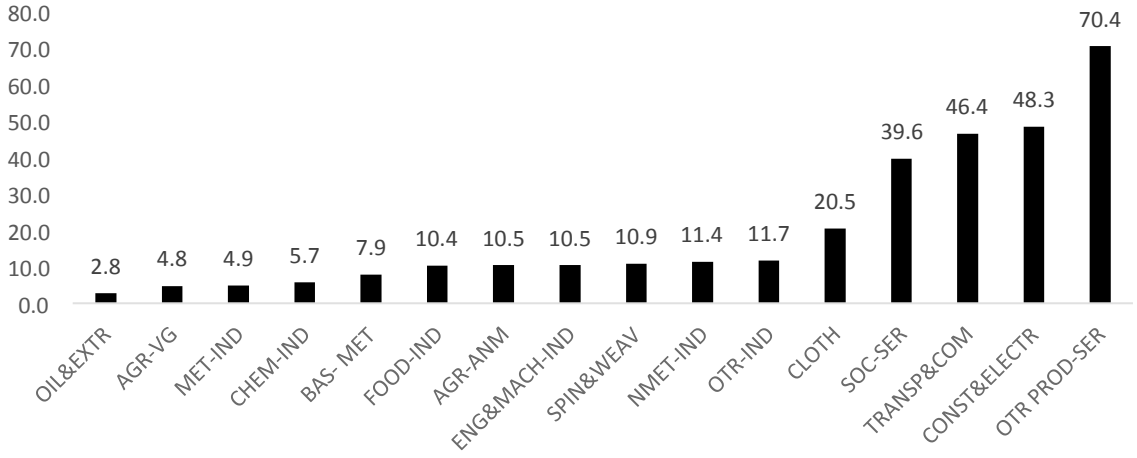
Source: World Trade Organization.

Figure 3. Non-Tariff Measures in Egyp



Source: NTM Business Survey, International Trade Center.

Figure 4. Weighted Tariffs by Input utilization



Source: Constructed by the authors using the Social Accounting Matrix of 2000/2001.

Table 1. Input-Output Table 2000/2001

	AGR-VG	AGR-ANM	OIL&EXTR	FOOD-IND	TOBC	SPIN&WEA	CLOTH	CHEM-IND	NMET-IND	BAS- MET	MET-IND	ENG&MAC	OTR-IND	CONST&EI	TRANSP&(	OTR PROD	SOC-SER	Total
AGR-VG	932	6788	0	17411	0	2392	0	172	3	0	0	16	353	0	91	656	779	29593
AGR-ANM	388	103	0	4487	0	30	0	0	0	0	0	0	0	0	134	286	295	5723
OIL&EXTR	0	0	853	695	0	53	19	7737	415	197	2	0	4	2816	935	1137	914	15777
FOOD-IND	0	2481	154	1275	18	46	68	231	0	0	0	0	60	0	1042	3504	1691	10570
TOBC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SPIN&WEA	133	19	0	441	0	4236	4034	29	3	0	26	14	120	41	12	142	2886	12136
CLOTH	0	0	161	92	0	0	543	54	58	44	22	14	53	0	61	308	1539	2949
CHEM-IND	2876	176	718	1555	64	971	1642	4247	2508	1581	265	623	1088	1086	1769	333	2577	24079
NMET-IND	19	0	79	63	0	18	0	324	63	28	166	144	61	7410	2	129	54	8560
BAS- MET	11	14	454	189	36	96	100	420	31	3257	718	672	596	6722	644	98	264	14322
MET-IND	23	8	254	125	144	153	97	214	24	37	45	615	363	202	154	61	804	3323
ENG&MAC	16	182	488	140	187	171	458	513	492	206	81	1877	393	219	1680	660	3305	11068
OTR-IND	16	25	319	366	366	155	236	312	241	158	67	480	723	1539	119	2358	757	8237
CONST&EI	131	132	143	424	55	776	327	449	214	182	65	131	276	116	447	1560	1500	6928
TRANSP&(	37	38	48	48	41	69	59	88	78	14	95	101	124	8	396	3236	256	4736
OTR PROD	771	1108	1489	699	318	3025	1777	4787	2104	1882	127	1343	1593	1530	1401	7658	1236	32848
SOC-SER	28	55	555	402	25	1095	3034	328	116	435	25	272	578	86	523	1347	2711	11615
Total	5381	11129	5715	28412	1254	13286	12394	19905	6350	8021	1704	6302	6385	21775	9410	23473	21568	202464

Source: Constructed by the author using the Social Accounting Matrix of 2000/2001.

Table 2. Non-Tariff Measures. Importance by Sector in 2010

Main import sectors	Import value million US$	Share in total non-oil imports	Share of importers facing burdensome NTMS	Share of reported procedural obstacles
Processed food	3272860	7%	63%	8%
Fresh food	7386007	17%	55%	12%
Engineering prod.	12941593	29%	51%	31%
Clothing	607609	1%	43%	2%
Chemicals	6905816	16%	41%	22%
Textiles	2035411	5%	39%	2%
Metals	7042373	16%	35%	7%
Furniture and wood prod.	2439730	5%	21%	6%
Leather prod.	175829	0%	0%	0%
Other manuf.	1661681	4%	59%	11%
Oil and minerals	8533981	19%	0%	0%
Total non-oil imports	44468909	100%	45%	100%

Source: NTM Business Survey, International Trade Center.

Table 3. Production Function Estimates – Basic specification

	Cobb-Douglas		Translog	
	(1)	(2)	(3)	(4)
Ln(Labor)	1.044***	0.958***	0.537***	0.593***
	[0.0213]	[0.0278]	[0.111]	[0.0987]
Ln(Capital)	0.140***	0.128***	0.0645	0.0486
	[0.0120]	[0.0112]	[0.0735]	[0.0784]
Ln(Labor)*Ln(Capital)			0.0561***	0.0340***
			[0.0137]	[0.0120]
$Ln(Labor)^2$			-0.0420***	-0.00187
			[0.0156]	[0.0138]
$Ln(Capital)^2$			0.00167	0.00267
			[0.00433]	[0.00442]
Constant	8.128***	8.561***	8.686***	8.964***
	[0.0952]	[0.693]	[0.318]	[0.718]
Region dum.	No	Yes	No	Yes
Industry dum.	No	Yes	No	Yes
Observations	60,661	60,661	60,661	60,661
R-squared	0.411	0.512	0.414	0.515

Note: Robust standard errors in brackets. Industry dummies at the 4-digit level.
*** p<0.01, ** p<0.05, * p<0.1.

Table 4. Extended Production Function (Cobb-Douglas)

	(1)	(2)	(3)	(4)
	Ln(VA)	Ln(VA)	Ln(VA)	Ln(VA)
Exporter Dummy	0.341**		0.289**	0.337**
	[0.134]		[0.133]	[0.136]
Imported Input Dummy		0.141***	0.140***	0.140***
		[0.0277]	[0.0278]	[0.0278]
Exp. Dum.*Input Dum				0.132
				[0.172]
Ln(Labor)	0.919***	0.917***	0.916***	0.916***
	[0.0298]	[0.0296]	[0.0298]	[0.0298]
Ln(Capital)	0.122***	0.121***	0.121***	0.121***
	[0.0112]	[0.0112]	[0.0112]	[0.0112]
Constant	8.898***	8.919***	8.921***	8.921***
	[0.649]	[0.650]	[0.651]	[0.651]
Region dum.	YES	YES	YES	YES
Industry dum.	YES	YES	YES	YES
Observations	60,661	60,661	60,661	60,661
R-squared	0.515	0.516	0.516	0.516

Note: Robust standard errors in brackets. Industry dummies at the 4-digit level.
*** p<0.01, ** p<0.05, * p<0.1.

Table 5. Model with TFP Estimated from Cobb-Douglas Production Function

	(1)	(2)	(3)	(4)
	Ln(TFP)	Ln(TFP)	Ln(TFP)	Ln(TFP)
IO Tariff	-0.0248***		-0.0563***	-0.0563***
	[0.00609]		[0.0125]	[0.0125]
IO NTM		-0.182***	0.231***	0.231***
		[0.0447]	[0.0472]	[0.0472]
Foreign Owned	1.007***	1.007***	1.007***	1.007***
	[0.192]	[0.192]	[0.192]	[0.192]
Stock Market	0.712*	0.712*	0.712*	0.712*
	[0.356]	[0.356]	[0.356]	[0.356]
Constant	1.167***	1.376***	0.900***	0.900***
	[0.141]	[0.191]	[0.0894]	[0.0894]
Region dum.	YES	YES	YES	YES
Sector dum.	YES	YES	YES	YES
Observations	31,267	31,267	31,267	31,267
R-squared	0.161	0.161	0.161	0.161

Note: Robust standard errors in brackets. Sector dummies at the 2-digit level.
*** p<0.01, ** p<0.05, * p<0.1.

Table 6. Model with TFP Estimated from Translog Production Function

	(1)	(2)	(3)	(4)
	Ln(TFP)	Ln(TFP)	Ln(TFP)	Ln(TFP)
IO Tariff	-0.0376***		-0.0742***	-0.0742***
	[0.00648]		[0.0133]	[0.0133]
IO NTM		-0.276***	0.268***	0.268***
		[0.0475]	[0.0502]	[0.0502]
Foreign Owned	0.997***	0.997***	0.997***	0.997***
	[0.217]	[0.217]	[0.217]	[0.217]
Stock Market	0.323	0.323	0.323	0.323
	[0.373]	[0.373]	[0.373]	[0.373]
Constant	1.386***	1.663***	1.131***	1.170***
	[0.519]	[0.634]	[0.392]	[0.401]
Region dum.	YES	YES	YES	YES
Sector dum.	YES	YES	YES	YES
Observations	31,267	31,267	31,267	31,267
R-squared	0.158	0.158	0.158	0.159

Note: Robust standard errors in brackets. Sector dummies at the 2-digit level.
*** p<0.01, ** p<0.05, * p<0.1.

Table 7. Effect of exports and import shares on TFP

	(1)	(2)
	Ln(TFP Cobb-Douglas)	Ln (TFP translog)
Exp. Share	0.0175	0.0672
	[0.149]	[0.169]
Share of imp. input	0.160**	0.163**
	[0.0814]	[0.0854]
Foreign Owned	-0.174	-0.377*
	[0.203]	[0.217]
Stock Market	-0.091	0.0384
	[0.159]	[0.161]
Constant	0.787***	0.428**
	[0.254]	[0.202]
Region dum.	YES	YES
Sector dum.	YES	YES
Observations	9,240	9,240
R-squared	0.194	0.174

Robust standard errors in brackets. Sector dummies at the 2-digit level.
*** p<0.01, ** p<0.05, * p<0.1.

Appendix 1

Variables definition

Variable	Definition
TFP translog	The estimated total factor productivity using a translog production function.
TFP CD	The estimated total factor productivity using a Cobb-Douglas production fun.
Ln(VA)	Value-added by firm.
Ln(Wages)	Total wage bill by firm.
Ln(Capital)	Total capital remuneration by firm
Input imp.	Intermediate goods consumed (b) materials and tasks

Source: Constructed by the authors.

Appendix 2

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
TFP translog	60661	0.03	1.20	-11.94	9.60
TFP CD	60661	0.06	1.20	-11.67	9.92
Ln(VA)	61114	11.01	1.93	1.39	25.09
Ln(Wages)	62108	1.34	1.28	0.00	11.06
Ln(Capital)	61625	10.26	2.33	0.69	24.47
Input imp.	62108	218.13	20730.48	0.00	3308987

Source: Constructed by the authors.

Appendix 3

List of 2 digit-level activities

2 digit level activities	Freq.	Percent
Accommodation	597	1.91
Activities of membership organizations	185	0.59
Advertising and market research	233	0.75
Air transport	10	0.03
Civil engineering	86	0.28
Construction of buildings	178	0.57
Education	1,444	4.62
Employment activities	129	0.41
Fishing and aquaculture	9	0.03
Food and beverage service activities	5,971	19.1
Forestry and logging	61	0.2
Gambling and betting activities	1	0
Human health activities	4,661	14.91
Information service activities	21	0.07
Legal and accounting activities	1,890	6.04
Manufacture of basic metals	169	0.54
Manufacture of beverages	13	0.04
Manufacture of electrical equipment	223	0.71
Manufacture of food products	3,347	10.7
Manufacture of furniture	1,870	5.98
Manufacture of paper and paper products	228	0.73
Manufacture of textiles	600	1.92
Manufacture of tobacco products	17	0.05
Manufacture of wearing apparel	1,519	4.86
Mining of metal ores	3	0.01
Mining support service activities	7	0.02
Other manufacturing	162	0.52
Other mining and quarrying	373	1.19
Other personal service activities	4,047	12.94
Postal and courier activities	39	0.12
Programming and broadcasting activities	20	0.06
Publishing activities	46	0.15
Real estate activities	449	1.44
Rental and leasing activities	1,737	5.56
Residential care activities	28	0.09
Scientific research and development	4	0.01
Security and investigation activities	38	0.12
Sewerage	1	0
Specialized construction activities	50	0.16
Telecommunications	641	2.05
Veterinary activities	34	0.11
Water collection, treatment and supply	16	0.05

Water transport	110	0.35
Total	31,267	100

Appendix 4

List of Regions

Governorate	Freq.	Percent
Cairo	5,099	16.31
Alexandria	2,699	8.63
Port Said	596	1.91
Suez	527	1.69
Damietta	695	2.22
Al-Dakahleya	1,868	5.97
Al-Sharkeya	1,554	4.97
Al-Kalyoubeya	1,621	5.18
Kafr Al-Sheikh	735	2.35
Al-Gharbeya	1,635	5.23
Al-Monoufeya	1,030	3.29
Al-Beheira	1,430	4.57
Al-Ismaeliya	634	2.03
Al-Giza	2,523	8.07
Beni Suwif	667	2.13
Al-Fayum	714	2.28
Al-Meniya	1,335	4.27
Asiyut	997	3.19
Sohag	1,055	3.37
Qena	653	2.09
Aswan	642	2.05
Luxor	699	2.24
Red Sea	316	1.01
Al-Wadi Al-Gadid	311	0.99
Matruh	379	1.21
Northern Sinai	409	1.31
Southern Sinai	444	1.42
Total	31,267	100