Trade openness and domestic market share

Evidence from Egypt firm-level data

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Abstract

This paper examines the response of Egypt manufacturing plants to change in trade costs using firm level-data from the World Bank Enterprise Survey. Using Levinshon and Petrin (2003) model to calculate the total factor productivity for the Egyptian firms in the sample, the results stand in line with the heterogeneous-firm models of international trade predicting that fall in trade costs induces the least productive firms to exit from the market. This leads to a decrease in the market shares of both types of firms : the least productive that exit the market and the ones that could afford foreign competition.The decrease of market share of the Egyptian manufacturing firms after trade reforms in 2004 reflects that the market became less concentrated after trade openness.

Keywords: Trade liberalization, import competition, market concentration, competition policy

JEL classifications : D22, D40, D24, F13, F14, L1, L60

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1. Introduction

Over the last two decades, theoretical works studied how trade liberalization affects the market structure through its impact on firms' behavior. The seminal model of Melitz (2003) shows that trade openness leads to the exit of the least productive firms as they could not afford the competition faced from foreign firms (Bernard & Jensen 1999).
Due to the existence of fixed and sunk costs of exporting, only the most productive firms could afford these costs and start to export. Thus, trade liberalization increases the average productivity available in the market.

Recently, the emergence of micro-data sets encourages researchers to evaluate the impact of trade openness on firms' behavior following periods of trade liberalization. Therefore, the analysis of trade openness has shifted from sectors and countries to firms and products.
This paper focuses on the evaluation of the impact of trade reforms adopted in 2004 on the domestic market structure in Egypt. Doing so, the paper studies how market share of the manufacturing firms varies after 2004 wave of trade reforms. Relying on the change in the market share, it will be possible to conclude whether the market becomes more or less concentrated.

The analysis of the Egyptian market is quite interesting since Egypt has witnessed major reforms concerning both trade and competition policies during the 1990s. In order to improve the business environment after adopting the privatization process, the Egyptian government has adopted policies of liberalization since the early 1990s during the Economic Reform and Structural Adjustment Program (ERSAP). The maximum tariff rate has fallen from 110% at the end of 1980s to reach 40% by the end of 1990s. In 2004, the Egyptian market becomes more liberalized thanks to a new phase of trade reforms that reduces both tariff and non-tariff barriers. Following these reforms, the nominal and the effective protection rate in the manufacturing sector fall from 21.3% to 12.1% and from 23.3% to 14% respectively.
On the other hand, concerning the competition policy, and thanks to the Egyptian European Partnership, the government has considered its competition law to be more effective to be able to join the free trade area with the European Union (EU). Moreover, there were great demands to ensure an effective competition policy following periods of great privatization.

This paper assesses the implications of the heterogeneous-firm models by examining whether the market structure in Egypt was affected by the evolution of trade costs. A key contribution of this analysis is the linkage between Egypt domestic firm-level data from the World Bank Enterprise Survey and product-level tariff data from the UNCTAD and WTO databases.

Trying to assess the impact of trade openness in Egypt on the domestic market share of the Egyptian firms and hence their revenue, this paper's contribution is twofold : First, using Egyptian firm level data from the World Bank enterprise survey, it studies how decline in trade costs changes the Egyptian market structure. Second, it attempts to fill the gap in the literature concerning the impact of trade on domestic market outcomes (domestic sales and

market share).

The potential link between trade openness and level of competition in the domestic market is very important to evaluate in order to assess the interaction between trade and competition policies and whether they are seen as complements or substitutes. Trade openness affects firms' behavior which in his turn changes the market structure. Following Melitz (2003) in this part, as the less productive firms exit from the market after the decline in trade costs, his model predicts that the market share of the domestic firms will fall following periods of trade liberalization for all the surviving firms.

Following periods of tariffs cut, the number of firms selling in the domestic market increases, and so does the total number of varieties available to domestic buyers. Given that, trade liberalization leads to pro-competitive effects due to the increase in the number of sellers and varieties.

Trade liberalization policies and competition policy are not dissociated; there are many theoretical works that conclude that trade liberalization may facilitate the collusion between foreign and domestic firms as the punishment after the decrease in trade costs is more severe[2]. Indeed, there was evidence of international cartels formed after periods of openness between home and foreign firms.

The paper is organized as follows Section 2 reviews the literature on trade and competition. Section 3 shows the theoretical background to our empirical part. Section 4 presents some stylized facts. Section 5 shows the methodology and the data used and section 6 concludes.

2. Literature review

To the best of my knowledge, there is a little work in the literature that links between trade openness and firms' domestic market share. Aside from Bernard et *al.* (2006), there does not exist empirical works that study how tariff decline affects domestic firms' sales.

Traditional trade theories were studying the way in which economies respond to international trade using macro-level data. Although, during the last two decades, the emergence of micro-data sets has largely contributed to the change in the literature as the focus point has shifted from sectors and countries to firms and products. These new models generated aggregate results based on firm-level data.

Obviously, these new data sets show that firms' participation in international trade is very small. Exporters and importers represent a very low percentage among producers in both developed and developing countries. In the US manufacturing sector, exporting firms represent only 18 % of the total sector (Bernard and Jensen 1995).

[2]There are many models that study the possibility of collusion in a context of trade openness and found that cartel are more stable. For more details see :Brander and Krugman (1983), Pinto(1986), Ashournia *et al.*, (2011) and Bond & Syropoulos (2008).

Plants participating in international trade are on average, more productive, more skill-intensive and pay higher wages than the firms that sell in the domestic market only (Bernard et al. 2012). This could be explained by Melitz (2003) self-selection model where firms that are more productive could afford the fixed cost of entry to the export market and hence export. However, less efficient firms exit from the market. Most of the theoretical literature in international trade was based on this model and made generalizations to its results.

At the empirical level, recently, there are many authors who were interested in assessing the competitive effects of trade liberalization in both the domestic and the export market. Using firm-level data, there is a large literature that focuses on the analysis of firms' behavior following phases of trade openness.
Altomonte & Baratieri (2014) estimate the impact of import penetration on the price markup for Italian firms in the manufacturing sector, they found clear evidence for pro-competitive effect of trade on the aggregate level. However, when they do the same analysis for a more detailed industry level, they found that increasing import penetration could result in higher price-cost margin which reflects a possible anti-competitive effect of trade openness. This might be explained by the industry's product mix. After trade liberalization, industries may switch their product mix towards low elasticity goods which induces higher mark-ups for firms in these industries. However, industries with more concentrated product mix are more competitive. Furthermore, Altomonte & Ogliari (2010) studied the same relationship for single vs. multi-product firms, they found a pro-competitive effect in the long run for increasing import penetration for Italian firms between 2000 and 2007. This effect is lower for multi-product firms. However, in the short run the relationship is not significant. This result reveals that in the long run firms adjust their product scope following periods of liberalization.
Melitz & Ottaviano (2008) showed in their model of monopolistic competition with heterogeneous firms and endogenous markups that free trade leads to higher productivity, lower markups and greater products variety. Their model combines all possible sources of welfare gain following trade in the same set-up.
Chen et al. (2009) investigated the impact of trade openness for the EU manufacturing sector and they found that in the short run, domestic market openness has pro-competitive effects through the decrease in price level, profit margin and an increase in the productivity, however, foreign openness induces the opposite impacts. Yet, in the long run trade leads to more anti-competitive effect as the firms could react to increased competition through producing in more closed markets and selling to their domestic market through exports as it is less costly due to low trade costs.
Bernard et al. (2006) showed that, in contrast with heterogeneous firm models, there is no correlation between changes in industry-level trade costs and firm-level domestic market share in the US. However, Tybout (2000) found that trade openness in developing countries decreases firms' domestic sales.
These works reveal that we could not have a unique conclusion on the competitive effect of trade liberalization. Sometimes, decline in trade costs increases competition and in other cases it may encourage anti-competitive behaviors.

3. Theoretical Background

The empirical analysis in this paper is based on theoretical models of trade with heterogeneous firms. The firm-level models of intra-industry trade of Bernard et al. (2003) and Melitz (2003) show that few firms are involved in international trade. They showed that exporters are relatively larger, more productive and more likely to face foreign competition than non-exporters (Bernard et al., 1995).

As mentioned before, after phases of trade openness, domestic firms are more likely to be be exposed to fiercer foreign competition. Only the most productive firms can afford this competition, and remain in the market. However, the least productive plants die and leave the market.

Thanks to that, trade openness leads to an increase in the average productivity in the industry: when trade costs decrease, least productive firms die, the more productive firms that were not exporting start to export and finally, the most productive exporting plants increase their exports.

In his model of intra-industry trade with heterogeneous firms, Melitz (2003) builds a dynamic model where firms produce horizontally differentiated good. A decline in trade costs reallocate production across firms which increases the aggregate industry productivity. Moreover, this increases the productivity threshold for the firms to enter the market, and hence the least productive firms leave the market. Furthermore, the fall in trade costs, increases the number of foreign firms operating in the domestic market, which implies the increase in the number of foreign varieties and the decrease in the domestic sales of all domestic firms.

In addition, Bernard et al. (2003) build a static Ricardian model with heterogeneous firms and imperfect competition with variable markups. In their model, firms have access to the same inputs to produce differentiated products, and hence, in an autarky framework, only the most productive plants serve the domestic market.

In a context of international trade and iceberg trade costs, they show that a domestic firm continues to produce for the domestic market if and only if it is the lowest cost producer of a given variety and if no foreign plant is a more efficient supplier.

Moreover, a domestic supplier will start to export if and only if it produces to the home market and if it is the most efficient producer in the foreign country. Hence, more productive firms are more likely to be engaged in international trade. As long as trade costs decrease, industry's aggregate productivity increases, as higher productivity firms will expand at the expense of the least efficient ones.

Nevertheless, these models lack of the possibility of the increase in the plant-level productivity thanks to exporting. Indeed, it has been empirically proven that after periods of trade openness there was an increase in the firm-level productivity (see, e.g.; Pavcnik, 2000; MacDonald, 1994; Lawrence, 2000). The growth in the plant-level productivity may have two main reasons: first, fiercer competition induces plants to improve their productivity efficiency. Second, the

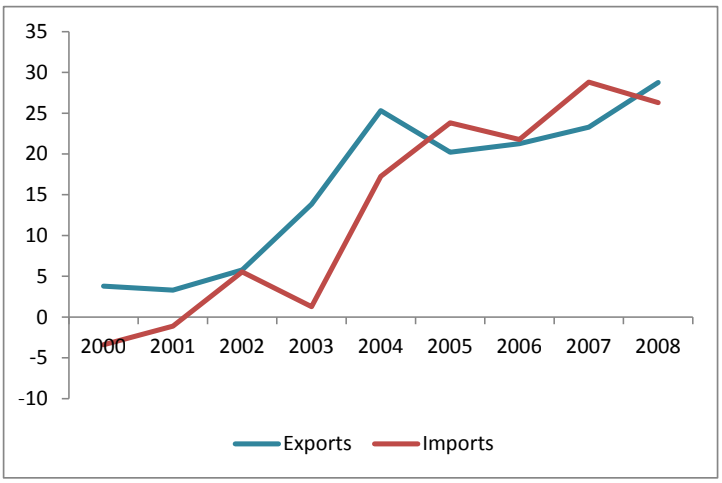
firm may change its product mix by dropping the worst products and skewing its production towards its best performing varieties.

4. Stylized Facts

4.1. Trade reforms

In 2004, the Egyptian government has adopted new trade reforms that targeted both tariffs and non-tariff barriers. These reforms reduce tariffs by an average of 40 % and eliminate the administrative fees on imports. The average tariff falls from 16% to 9%. The highest tariff rate decreases from 104% to reach 40% following this phase.
Thus, exports and imports increase significantly due to this phase of trade openness. The annual growth rate of the exports was approximately 5% before the reforms and increases to reach 25% after 2004. As well, imports were increasing by 0.6% between 2000 & 2004, but after 2004 the growth rate reaches 24% (See Figure 1).

Figure 1: Annual growth of Egyptian exports and imports



Source : Author elaboration using World Development Indicators.

After these reforms, the number of national tariff headings fell from 13000 to less than 6000. The number of tariff bands declined from 27 tariff brackets to 6. Hence, the nominal protection rate in the manufacturing sector decreased from 21.3% to 12.1%, and the effective protection rate declined from 23.3% to 14%. The effective protection rate for some industries has considerably decreased following the periods of trade liberalization (Foster & Valdes 2011). However, some industries such as tobacco and food have high protection rate due to high tariffs on one side and due to energy subsidies on the other side. According to (Foster & Valdes 2011) they found that the effective rate of protection in the private and the public sector has decreased from 85.6% to 45% and from 122.5%

to 37% respectively between 1999 and 2009.
Moreover, they showed that the dispersion of the effective rate of protection fell from 192% to be 57% in the same period.

Table 1: Evolution of Egyptian tariffs between 2000-2007

		2000	2002	2003	2006	2007
Manufactured products	Binding coverage (%)	99.44	99.48	99.48	99.43	99.43
	Applied, simple mean (%)	51.18	12.97	12.04	9.5	9.36
	MFN, simple mean	74.69	13.68	13.38	10.21	10.09
	Applied, weighted mean (%)	30.87	11.41	11.86	9.78	9.54
	MFN, weighted mean(%)	30.87	11.41	12.27	10.26	10.01
All products	Binding coverage (%)	99.3	99.33	99.33	99.27	99.27
	Applied, simple mean (%)	47.92	20.29	19.09	12.52	12.6
	MFN, simple mean(%)	61.76	19.94	19.59	17.33	17.27
	Applied, weighted mean (%)	23.69	13.1	13.26	8.14	8.05
	MFN, weighted mean(%)	23.69	13.1	13.7	9.02	8.74
Primary products	Binding coverage (%)	98.78	98.81	98.81	98.74	98.74
	Applied, simple mean (%)	19.06	88.27	85.16	36.14	37.58
	MFN, simple mean(%)	18.56	41.61	41.08	41.15	41.13
	Applied, weighted mean (%)	9.33	18.07	17.65	6.32	6.35
	MFN, weighted mean(%)	9.33	18.07	18.2	7.77	7.4

Source : World Development Indicators.

Most of the Egyptian tariffs are bound to the WTO. Tariffs on the agricultural goods are very high compared to non-agricultural products with an average of 66.04% and 12.8% respectively. This could be explained by a very high tariff rate on beverages and spirits (over 1000%)(See Table 1 for more details).
It is clear, from Table 1, that almost 99% of the Egyptian tariffs are bound to the WTO. The (simple) weighted average applied tariff has decreased in the manufacturing sector from (51.18%) 30.87% to (9.36%) 9.54% between 2000 and 2007. The simple average tariff rate has been higher than the weighted average due to the existence of tariff peaks (Abdel Latif and Ghoneim, 2008).

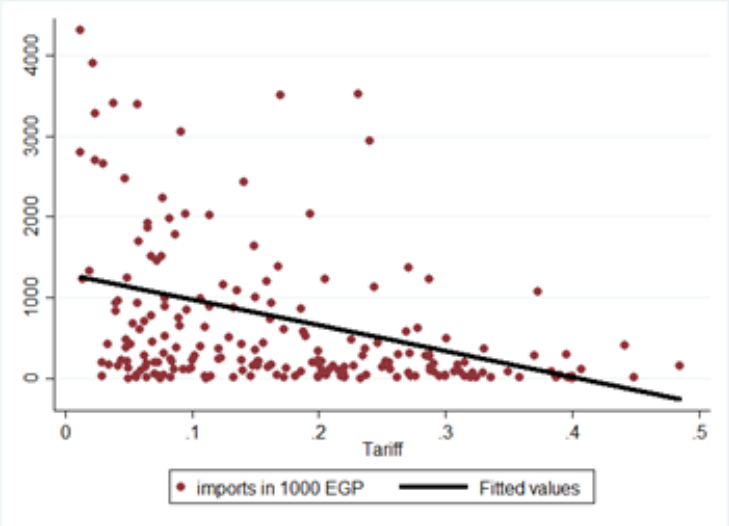
Moreover, non-tariff barriers used to prevail ranging from the complexity of customs procedures to non-transparency. Such burdens protected Egyptian producers from foreign competition and created an anti-export bias.

In addition to these unilateral reforms, Egypt has signed many bilateral and multilateral Free Trade Agreements (FTA). On the bilateral side, Egypt has agreements with Turkey, some Arab countries (Jordan, Lebanon, Libya, Syria, and Iraq), the European Union (2004), the Egypt-US Trade and Investment Framework Agreement (TIFA), the European Free Trade Association (EFTA)[3]. On the regional level, Egypt has many agreements such as the Common Market

[3]It is a regional trade organisation and free trade area consisting of the Republic of Iceland, the Kingdom of Norway, the Swiss Confederation and the Principality of Liechtenstein

of East and South Africa (COMESA) signed in 1981, the Qualified Industrial Zones (QIZ) in signed 2005. Besides, Egypt has signed the Agreement of Agadir to establish a free trade area between the Arab Mediterranean countries (Jordan, Tunisia and Morocco). Moreover, in 1981 Egypt has signed the Agreement On Facilitation And Development of Trade Among Arab States in order to establish the Pan Arab Free Trade Area (PAFTA).

Figure 2: Imports and tariff between 2004 & 2008



Source : Author calculation using comtrade Data.

All of these agreements and the cut in the level of tariffs levied by the Egyptian Government lead to an increase in the level of exports and imports. According to Figure 2, we can see that between 2004 and 2008, there exists a negative relationship between the level of tariffs and the volume of imports. A decrease in trade tariffs was associated with an increase in imports.

According to these stylized facts of the Egyptian trade system, the changes in the level of tariffs after 2004 may have strong impacts on the level of competition in the Egyptian market and hence the market share of the domestic firms.
Yet, in order to test this relation, we should empirically test the impact of these reforms on the market share and hence the revenue of the Egyptian firms.

4.2. Market structure of the Egyptian manufacturing sector

The manufacturing sector[4] in Egypt represents around 19% of the GDP. Industries, in Egypt, depend mainly on labor-intensive activities and natural resources based manufacturing. If we look at the different industrial activities in Table 2, we can see that 70% of the total manufacturing sector output comes

[4]Manufacturing refers to industries belonging to ISIC divisions 15-37.

from 5 industries only: food and beverages (15), petroleum products (23) and chemicals (24) basic metals (27) and textiles (17). All these industries are resource-based or labor-intensive activities.
Moreover, these industries absorb around 60% of the labor force employed in the manufacturing sector.

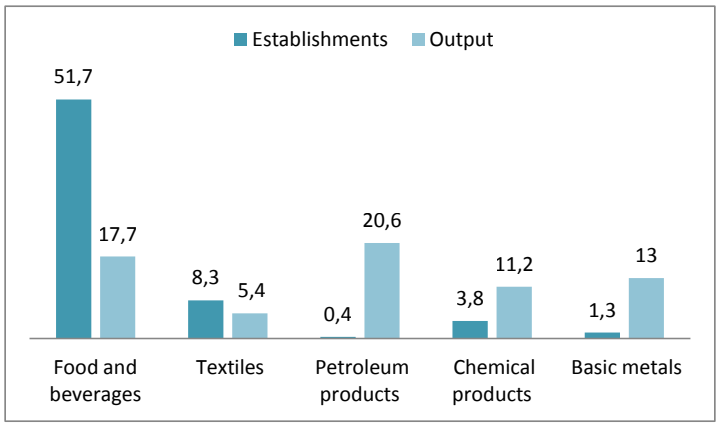
Table 2: Employment and Output by activity (% of total manufacturing)

ISIC definition	Employment					Outpout				
	2002	2004	2005	2006	2010	2002	2004	2005	2006	2010
15 Food and beverages	20	20	21	20.5	21.33	22.5	16.3	18	16	17.73
17 Textiles	22	20	19.6	18	12.65	7	5.6	5.8	5	3.6
23 Petroleum products	3	3.3	3.5	3	3.64	18	15	21.3	22.5	26.6
24 Chemicals	8	9.3	9	9.43	9.3	14	9.5	10.75	10.5	11
27 Basic metals	6	5.84	6	5.5	5.64	8.7	28	15	2.5	11.4

Source : UNIDO database.

We could see that the industrial sector in Egypt is characterized by a high degree of specialization in very few industries. Additionally, the largest part of the production is produced by large firms, reflecting high degree of concentration for both: employment and production (Ghoneim and Abdel-Latif, 2008).

Figure 3: Share of establishments and outputs between 2002-2010



Source : Author elaboration from UNIDO database.

To investigate the relationship between specialization and the level of competition in the Egyptian market, we study the number of establishments operating in each industrial activity over the period 2002-2010. From the UNIDO Database, we can see that there is no relation between the specialization in production and the structure of establishments. In Figure 3, it is shown that the food and beverages sector produces on average 17% of the total manufacturing production between 2002 & 2010. However, it includes more than 50% of the total manufacturing establishments. On the other side, the petroleum products sector which is the first ranked sector in generating production (around 21% of the

total manufacturing sector) has the lowest rank in the number of establishments with less than 0.5% of the total establishments.
This reflects that the average size of the firm in the food sector is small compared to the average size of firms in the petroleum sector which is quite large.

At the firm level, data from the World Bank Enterprise Survey was used to assess the impact of trade openness in Egypt on the level of competition in the domestic market. It is a panel data for Egyptian firms in the manufacturing sector, it captures data for 3 years: 2004, 2007 and 2008. The survey collects data on the production of the firms and their business environment like access to finance, access to infrastructure, the competition faced and corruption. It also includes data on the firms' main products, their sales and whether they are domestic sales or exports. In addition, there is data on the number of workers inside the firms and their level of education and experience.
This set includes 977 firms in 2004, 996 plants in 2007 and 1156 in 2008 where 554 only are available for the three years.

Table 3: Domestic Vs. Exporting and Importing Firms

		Percentage Values				
Year	Firms	Export Only	Import Only	Export & Import	Domestic Only	Total
2004	977	7.47	16.1	16.1	60.3	100
2007	996	7.83	19.27	27.71	45.18	100
2008	1156	30.96	3.63	44.03	21.28	100
Pooled	3129	16.26	12.5	30.10	41.06	100
Panel 2004	554	8.12	16.60	16.96	58.30	100
Panel 2007	554	6.85	18.05	19.13	55.95	100
Panel 2008	554	32.13	3.43	40	24.36	100

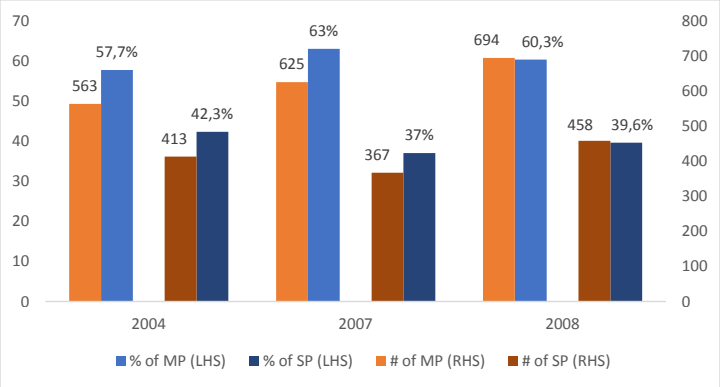
Source: Constructed by the author using the survey data.

From Table 3, it is clear that the number of Egyptian firms involved in international trade is small compared to the firms that sell their products domestically. However, the percentage of the Egyptian firms that export and/or import increases over time from 40% in 2004 to reach 79 % in 2008.
Trade reforms adopted by the Egyptian government in 2004 encourage the firms to participate more in the international market. Furthermore, having a look at the firms that are interviewed in the three years, it is shown that only 24% in 2008 serve the domestic market only. This ratio was 58% in 2004.

Figure 4 displays the distribution of the Egyptian firms that are multi-product. It is clear that the manufacturing sector in Egypt is characterized by a high than usual percentage of multi-product firms[5]. Moreover, this percentage increases after 2004 trade reforms. The next section will study how

[5]Multi-product firms usually represents around 40% of total firms (See Bernard et al., 2010

Figure 4: Multiproduct & single product firms between 2004 & 2008



Source : Author calculation using survey Data.

this data set was merged with other databases to test how the domestic market structure was affected by trade liberalization.

5. Model Specification

To test the nexus between trade costs decline and domestic market share of Egyptian firms, this microeconomic database (World enterprise survey) was combined with some macroeconomic variables (tariffs and trade flows) from the WITS database using the firm's main product.

As the data set gives information about the three main products of each firm with ISIC codes (ISIC Rev. 3.1), the survey database was merged with tariffs data from the WITS databaseand with data on the Egyptian production from CAPMAS (Central Agency for Public Mobilization and Statistics) using the same classification (ISIC Rev. 3.1).

An index for the market concentration and hence the level of competition was constructed through calculating the market share of each firm as follows :

$$marketshare_{ikt} = \frac{totalsales_{ikt}}{totalproduction_{kt} + imports_{kt} - exports_{kt}} \quad (1)$$

where $totalsales_{ikt}$ are the total sales of the main product k of the firm i in year t, $totalproduction_{kt}$ is the total production in Egypt of the product k in year t , $imports_{kt}$ and $exports_{kt}$ are the total Egyptian imports and exports of the product k in year t respectively.

This firm's market share is regressed on a set of variables that accounts for each firm characteristics and trade variables, to study the impact of tariffs

for the US case).

decline as follows :

$$\ln share_{ikt} = \alpha_0 + \alpha_1 tariff_{kt} + \alpha_2 \ln tfp_{it} + \alpha_3 \ln wages_{it} + \alpha_4 \ln age_{it} + \alpha_5 trade_{it} + \theta_i + \beta_k + \varepsilon_{ikt} \quad (2)$$

where $tariff_{kt}$ is the tariff levied by the Egyptian authorities on the product k in year t. The other variables included in the model to control for firms characteristics : tfp_{it} is the Total Factor Productivity (TFP) of firm i in year t estimated using Lenishon and Petrin (2003) strategy, $wages_{it}$ are total wages paid by the firm i in year t, age_{it} is the firm's age and $trade_{it}$ is a dummy variable that takes the value of 1 if the firm participates in foreign trade. θ_i is the firm fixed effect and β_k is the product fixed effect and ε_{ikt} is the error term. The dependent variable $share_{ikt}$ is the firm's market share calculated as the firm's total sales divided by the sum of total production of the firm's product and the net exports of that product. To account for firms and products characteristics, I add a product and a firm fixed effects.

In order to see how the firm's sales are affected by the decrease in trade tariffs, the firm's deflated sales were regressed on the same set of independent variables cited above:

$$\ln sales_{ikt} = \gamma_0 + \gamma_1 tariff_{kt} + \gamma_2 \ln tfp_{it} + \gamma_3 \ln wages_{it} + \gamma_4 age_{it} + \gamma_5 trade_{it} + \theta_i + \beta_k + \epsilon_{ikt} \quad (3)$$

where ϵ_{ikt} is the error term.

The next section will show the empirical results got from estimating the model. In order to do that, first, the firm's total productivity should be estimated following Levinsohn & Petrin (2003) model.

6. Empirical Results

6.1. Estimating Total factor Productivity

Total factor productivity is defined as the part of firm's productivity not explained by the amount of inputs used. In other words, it is the difference between actual and predicted output. There exists a potential link between input levels and the unobserved firm-specific productivity shocks in the estimation of production function parameters which leads to biased parameters using OLS.
Firms that face a large positive productivity shock will respond by using more inputs. Many alternatives to the OLS estimates have been proposed to correct to the potential bias using OLS method. Olley and Pakes (1996) use the investment proxy to control for correlation between input levels and the unobserved productivity shock.
Levinsohn & Petrin (2003) extend their model, and use intermediate inputs instead of the investment to control for the simultaneity bias.
A main advantage of Levinsohn & Petrin's model is data-driven : that the investment proxy is only valid for the firms that report non-zero investment.

However, concerning the intermediate inputs, almost all plants report positive amounts of inputs like materials, electricity or fuel.
There is another advantage for the intermediate inputs over the investment proxy : mainly that the use of intermediate inputs could be easily adjusted for productivity shocks than the investment, and hence the correlation between the error term and the regressors could disappear. This is done by making the intermediate input as a function of the firm's state variable, the capital and the productivity.

Table 4: Percentage of zero observations

Year	Raw Material	Fuel	Electricity
2004	0.63	2.92	-
2007	1.33	11.65	0.83
2008	0.97	7.27	9.62
Total	0.98	7.42	5.6

Source: Author calculation using survey data.

To choose the intermediate input that be used in estimating the firms' total factor productivity, we start by counting the zero values of each input in our data-set. Table 4 reports the percentage of firms reporting zero levels of fuels, raw materials and electricity.
The Table shows a great heterogeneity between firms in using intermediate inputs. From the observations, we can see that almost 99% of the firms report positive use of raw materials. For the electricity the percentage of zeros is higher than in the case of raw materials. And finally, concerning the use of fuel, we can see it is the intermediate input the least used by the firms. Results are shown in Table 5.

Table 5: Total Factor Productivity estimation

	(1) Ln(value added)	(2) Ln(value added)	(3) Ln(value added)
Ln(skilled labor)	0.235***	0.393***	0.401***
	(0.0306)	(0.0421)	(0.0324)
Ln(unskilled labor)	0.106***	0.165***	0.188***
	(0.0242)	(0.0449)	(0.0344)
Ln(capital)	0.422***	0.320***	0.299***
	(0.0348)	(0.0402)	(0.0404)
Observations	2,482	1,592	2,229
Proxy	raw material	electricity	fuel

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

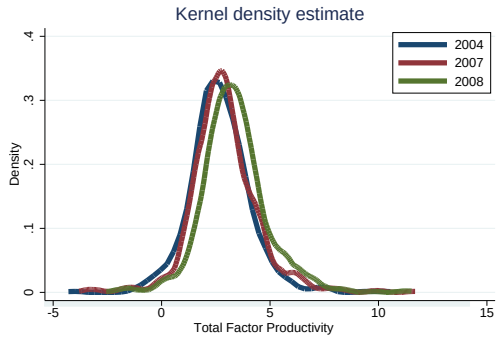
Standard errors in parentheses. The Log of Skilled labor and unskilled labor is taken as the free input, however the Log of capital is the endogenous input which is instrumented by the Log of Intermediate inputs.

Based on Levinsohn & Petrin's method and using raw materials as intermediate

input proxy, total factor productivity was estimated (Column 1). Moreover, in columns 2 and 3, electricity and fuel were used as a proxy and I get the same results.

Figure 5 reveals the evolution of Egyptian firms' total factor productivity between 2004 and 2008. The kernel density estimates prove an increase in average total factor productivity of the Egyptian firms after 2004 wave of reforms. This result stands on line with Melitz(2003), average productivity increases after periods of trade liberalization.

Figure 5: Evolution of TFP after 2004 trade reforms



Source: Author calculation using survey data

6.2. Domestic market share and tariff level

The estimation results show that the decline in trade costs and tariffs decreases the market share of the domestic firms. These results are consistent with Melitz (2003). In his model, Melitz shows that trade liberalization leads to the exit of the least productive firms from the market, and the most productive firms, remaining on the domestic market, face more competition from foreign firms that start to export to the home market. That's why, according to him, trade openness will induce a decline in the market share of all surviving firms and, certainly, for plants that close.
This result stands in contrast with Bernard et al. (2006) who find that there is no correlation between decline in trade costs and the market share of the American firms in US market. Yet, Tybout (2000) finds a positive relationship between trade costs and domestic firms' market share in developing countries.

The results are robust for different specification of the model and highly significant. In Table 6[6], we can see the different specifications of our model: column 1 shows OLS estimates, column 2 adds firm fixed effect. The coefficients

[6]As a robustness check, Table 1 in the Appendix reports the same set of results with TFP calculated at the sector level.

Table 6: Domestic firms' market share and the level of tariffs

	Ln(share)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln tariff	-0.0660	-0.0103	0.681***	0.700***	0.446**	0.528***	0.313*
	(0.0595)	(0.0957)	(0.141)	(0.141)	(0.180)	(0.150)	(0.187)
ln TFP	0.626***	0.607***	0.627***	0.626***	0.675***	0.724***	0.744***
	(0.0330)	(0.0473)	(0.0408)	(0.0402)	(0.0418)	(0.0401)	(0.0429)
ln wages	0.471***	0.385***	0.402***	0.394***	0.286***		
	(0.0283)	(0.0548)	(0.0485)	(0.0501)	(0.0458)		
ln age	-0.0762*	-0.0496	0.00585	0.0119	-0.106	0.0884	-0.0819
	(0.0456)	(0.0867)	(0.0591)	(0.0599)	(0.0941)	(0.0639)	(0.0982)
Trade	0.192*	0.423**	0.374***	0.326**	0.110	0.670***	0.283
	(0.102)	(0.178)	(0.141)	(0.146)	(0.210)	(0.162)	(0.218)
Import	0.426***			0.156	0.0330	0.408***	0.154
	(0.0901)			(0.133)	(0.169)	(0.132)	(0.175)
Comp	-0.177			0.159	0.413	0.0650	0.386
	(0.220)			(0.209)	(0.369)	(0.227)	(0.386)
ln earning						0.109**	0.116**
						(0.0529)	(0.0527)
Firm FE	-	Yes	Yes	Yes	-	Yes	-
Product FE	-	-	Yes	Yes	-	Yes	-
Group FE	-	-	-	-	Yes	-	Yes
N	2100	2100	2100	2100	2100	2100	2100
R^2	0.508	0.401	0.718	0.719	0.969	0.667	0.966

Standard errors in parentheses

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

of the variable of interest "$tariff_{ikt}$" are not significant, this is due to the fact that the tariff levied is product specific that's why we should control for the product fixed effect.

The coefficients of the remaining variables do not differ from the fixed effect model, they have the same direction and are highly significant as well. In columns 3-7, product fixed effects were added to the model. Column 3 shows that a decrease of 1% in the level of tariff leads to around 0.7% decrease in the firm's market share.

Total factor productivity is positively correlated to the firm's market share. The model predicts that higher productive firms have higher market share. An increase of 1% in the firm's total factor productivity increases the domestic market share by 0.6 %. The variable "wages" affects positively the market share of the firm. A firm that pays higher wages has a higher market share.

Moreover, when a firm participates in international trade, the model predicts

that it will have a higher market share. And finally, the firm's age coefficient is not significant, which means that it does not affect its market share. In columns (6 and 7), a different definition for salaries paid by firms was used, the variable "*earning*" is the logarithm of wage per worker. This variable is significant and positively correlated with the market share of the firm. From column 4, we add two dummy variables "*import*" and "*Comp*" reflecting, respectively, whether the firm is importing any input or not and if the main competitor of the domestic firm is an importer. These variables are not significant reflecting that they do not impact the firms' market share.
Finally Columns (5 and 7) add a goup of firm-product fixed effect, the coefficient of the tariff is still positive and significant.

Table 7: Total factor productivity and Loss of market share

	Ln(share)				
	(1)	(2)	(3)	(4)	(5)
ln tariff	0.894***	0.723***	0.553***	0.534**	0.763***
	(0.141)	(0.232)	(0.156)	(0.234)	(0.190)
ln tfp	0.510***	0.493***	0.697***	0.598***	0.582***
	(0.0646)	(0.0989)	(0.0648)	(0.0960)	(0.0842)
tariff×TFP	-0.0770**	-0.113**	-0.0589*	-0.0918*	-0.0253
	(0.0340)	(0.0502)	(0.0339)	(0.0504)	(0.0464)
ln wages	0.522***	0.293***			0.395***
	(0.0266)	(0.0622)			(0.0499)
ln age	-0.0897***	-0.123	-0.00135	-0.0959	0.0104
	(0.0328)	(0.0860)	(0.0394)	(0.0873)	(0.0600)
trade	0.105	0.0847	0.755***	0.265	0.322**
	(0.0827)	(0.233)	(0.0904)	(0.273)	(0.144)
import	0.360***	0.0525	0.784***	0.174	0.158
	(0.0734)	(0.166)	(0.0850)	(0.169)	(0.133)
ln earning			0.162***	0.117*	
			(0.0397)	(0.0627)	
N	2097	2100	2097	2100	2100
R^2	0.770	0.890	0.676	0.880	0.719
FE	Product	Group	Product	Group	Firm-Product

Standard errors in parentheses

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

In Table 7, an interaction term between the level of tariff levied and the firm's total factor productivity was added to the model. According to Melitz theory, trade openness will lead to a decrease in the domestic market share of

all the firms in the market (which disappear and which survive the international competition). However, this decrease is not of the same amount for all firms. More productive firms will lose market share less proportionally than less productive ones.
The interaction term is significant and has the expected sign in all the specifications. The negative coefficient of the interaction term between total factor productivity and the tariff level is consistent with the theory and reflects that firms with higher productivity will lose market share after trade liberalization lower than their competitors with lower productivity.

More generally, there could be a reverse causality between the firm's market share and the level of tariff. Egyptian firms with higher market share and hence more market power could lobby and affect the government's decision to not decrease the tariff affecting their products in order to maintain their market power and not to be subject to foreign competition.
If this reversal causality exists, it would be a source of endogeneity and hence, the estimates obtained using OLS estimates will be biased. To address this concern, as well as other potential sources of endogeneity bias, the tariff variable should be instrumented as described below.

6.3. Instrumenting for trade policy

There exists a large literature on the political economy of trade protection that states that, in some countries, industries lobby government for protection (Grossman and Helpman, 1994). However, Mobarak and Purbasari (2005) show that in developing countries, this would not be the case, as governments cannot protect their industries through levying high output tariffs as they are under the close observation of international organizations.
The literature on political economy states that policy makers take into their account the different industry characteristics when they decide about the level of tariffs levied, this is captured in our model by adding the firm fixed effect.
The fixed effect corrects for the bias in the OLS estimates when the political economy factors are time invariant like industry concentration. However, concerning the political economy factors that are time variant, the fixed effect model does not account for the bias caused by these factors.
The tariff variable should be instrumented relying on a theoretical model on the dynamics of political economy of trade protection. Nevertheless, to the best of our knowledge, the political economy models analyze the static patterns of protection and not the dynamics one.

As the structure of trade protection in the sample period varies over time, the time-variant political economy variables are important and this should be taken into account. In order to do that, and following the literature in this area, the tariff variable is instrumented using tariffs in a country where tariff structure is similar to that of Egypt. Moreover, the tariff for the following product in ISIC Rev. 3.1 is used as an instrument in some specifications. For robustness check, pre-reform tariff level, international reserves and terms of trade were used, as well, as instrumental variable.

Egypt has started this phase of trade reforms following its commitments to the WTO, so, there was not any opportunity for industry lobbying. That is why, from the firm's point of view, the level of tariff was exogenously predetermined. This also could be reflected in the fact that the industries that were highly protected before the reforms are the industries that experienced the largest tariff cut as it is shown in figure 6.

Figure 6: Change in tariffs, 2007-2004, relative to initial tariffs 2000

Source: Author elaboration using WITS database.

Following the trade literature, the tariff variable is instrumented using : pre-reform tariff, the volume of international reserves, the tariff of the following product and the tariff in Jordan and India assuming that all of these 3 variables satisfy the exclusion restriction condition. These instruments are highly correlated with the level of tariff after the reforms, and they are not correlated with the dependent variable (the market share of the firms).

Jordan and India had a trade policy which is very similar to the trade policy adopted in Egypt. The correlation between the level of tariffs in the two countries and Egypt between 1990 & 2010 is very high and reaches 0.70.

The results in Table 8 show that the decline in tariffs will decrease the market share, the magnitude of the coefficients has increased after using the instrumental variables. The decrease of 1% in the level of tariff leads to a decrease in the market share of the firm of an amount that varies between 0.7% and 1.2% (this ratio was only between 0.4% and 0.7% in the OLS model), this shows that OLS estimates were downward biased. The other independent variables have the same signs and are significant. The results do not differ a lot whether the tariff level in Egypt was instrumented with the Indian, the Jordanian or the next product tariffs.

The $F - statistic$ of the first stage reported in the table is high enough which confirms the validity of instruments used.

It is easier to find an instrumental variable for the change in the tariffs than for the tariff level; that's why in the following table the 2SLS results are reported

Table 8: Two-Stage Least Square results

	Ln(share)					
	(1)	(2)	(3)	(4)	(5)	(6)
ln tariff	0.735***	0.609***	0.321*	0.639*	1.170***	1.121***
	(0.188)	(0.215)	(0.198)	(0.387)	(0.193)	(0.172)
ln TFP	0.604***	0.611***	0.608***	0.617***	0.629***	0.629***
	(0.0479)	(0.0468)	(0.0462)	(0.0315)	(0.0311)	(0.0311)
ln age	0.0195	0.00964	-0.0159	0.00776	0.0286	0.0268
	(0.0947)	(0.0937)	(0.0924)	(0.0652)	(0.0645)	(0.0643)
ln wages	0.398***	0.391***	0.385***	0.396***	0.409***	0.408***
	(0.0568)	(0.0567)	(0.0557)	(0.0353)	(0.0340)	(0.0338)
Trade	0.200	0.245	0.309*	0.312**	0.292**	0.295**
	(0.194)	(0.192)	(0.186)	(0.136)	(0.134)	(0.134)
Import	0.356**	0.316*	0.234	0.156	0.186	0.183
	(0.175)	(0.175)	(0.172)	(0.119)	(0.118)	(0.118)
Comp	0.224	0.200	0.154	0.158	0.200	0.196
	(0.312)	(0.307)	(0.294)	(0.254)	(0.254)	(0.254)
IV	Jor tar	Next prod	India tar	Jor tar	Next prod	India tar
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	No	No	No	Yes	Yes	Yes
$F-first$	472	201	272	110	848	1515
N	1378	1383	1383	1369	1374	1374

Standard errors in parentheses

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

using the change in the tariffs between 2008 and 2004 as the independent variable instead of the tariff level in the previous models. This change in tariff level is instrumented using pre-reform tariff, terms of trade and the amount of international reserves.

The results in Table 9 shows that when the change in the tariff level is lower, the home market share decreases and, hence the market becomes less concentrated [7]. The remaining independent variables are significant and have the same signs as above.

In order to test the validity of the instrumental variables, the test of over-identification was conducted to test whether the instruments satisfy the exclusion restriction. The results of Hansen J-statistic, reported in Columns (1 and 2) (≈ 13) leads to a non-rejection of the null hypothesis, and hence the instruments are not correlated to the residuals. The $F-statistic$ of the first stage is

[7] Note that variation in the tariff level is negative, so lower variation reflects that the market becomes more liberalized than before.

Table 9: 2SLS model with change in tariffs as independent variable

	Ln(share)					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Tariff	7.554**	9.987***	8.603***	12.96***	10.66***	15.54***
	(2.959)	(3.447)	(1.950)	(2.624)	(2.127)	(2.518)
ln TFP	0.715***	0.720***	0.737***	0.746***	0.741***	0.653***
	(0.0474)	(0.0478)	(0.0337)	(0.0355)	(0.0344)	(0.0349)
ln earning	0.153**	0.161**	0.123***	0.139***	0.130***	
	(0.0624)	(0.0633)	(0.0449)	(0.0474)	(0.0459)	
ln age	0.0807	0.0964	0.117*	0.143*	0.130*	0.0729
	(0.0926)	(0.0944)	(0.0708)	(0.0748)	(0.0723)	(0.0725)
Trade	0.617***	0.592***	0.627***	0.593***	0.611***	0.221
	(0.197)	(0.199)	(0.144)	(0.151)	(0.146)	(0.150)
Import	0.472***	0.498***	0.444***	0.483***	0.462***	0.233*
	(0.166)	(0.169)	(0.128)	(0.135)	(0.130)	(0.132)
Comp	0.195	0.251	0.210	0.307	0.256	0.440
	(0.299)	(0.304)	(0.282)	(0.297)	(0.288)	(0.287)
ln wages						0.411***
						(0.0377)
IV	tar 2000 reserves	tar 2000 TOT	tar 2000 reserves, TOT	tar 2000 TOT	tar 2000 reserves	tar 2000 TOT
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	-	-	Yes	Yes	Yes	Yes
F	70	43				
N	1383	1383	2100	2100	2100	2100
R^2	0.353	0.339	0.65	0.62	0.64	0.65
Hansen statistic	0.1252	0.1303				

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

still high, so the instruments are not *"weak"*.

Finally, to see how the firms revenues vary with trade reforms, equation (3) is estimated. The results are shown in Table 10, it is clear that there is a positive relationship between the level of tariffs levied and the firm's deflated sales. A decline in trade tariffs leads to a decrease in the Egyptian firms' sales and hence their revenues. The result is robust for different specifications of fixed-effect model. However, in the first column the OLS model predicts a negative relationship between the tariff level and the volume of deflated sales. In columns 2-4, firm and product fixed effects are added, the results are very similar to the results got when the market share was the dependent variable. Nevertheless, the interaction term between the tariff and the firm's productivity is not significant.

Column 2 shows use 2SLS model using the tariffs in India as an instrument for the endogenous variable " Tariff" and the results are the same but with higher magnitude, which means that OLS estimates were downward biased.

Table 10: Deflated sales of domestic firms and tariff level

	Ln(Sales)				
	OLS	FE	FE	FE	IV
	(1)	(2)	(3)	(4)	(5)
Ln(Tariff)	-0.212***	0.388***	0.389***	0.395**	0.627***
	(0.0400)	(0.123)	(0.124)	(0.169)	(0.153)
Ln(TFP)	0.671***	0.634***	0.630***	0.626***	0.636***
	(0.0263)	(0.0346)	(0.0341)	(0.0745)	(0.0278)
Tariff× TFP				-0.00229	
				(0.0419)	
Ln(Wages)	0.564***	0.446***	0.416***	0.416***	0.418***
	(0.0226)	(0.0438)	(0.0462)	(0.0462)	(0.0308)
Ln(Age)	-0.122***	0.0356	0.0420	0.0419	0.0571
	(0.0302)	(0.0548)	(0.0558)	(0.0558)	(0.0573)
Trade			0.255*	0.255*	0.243**
			(0.131)	(0.131)	(0.117)
Import			0.146	0.146	0.153
			(0.122)	(0.122)	(0.104)
Comp			0.0973	0.0967	0.114
			(0.221)	(0.221)	(0.227)
Constant	-1.997***	-0.708	-0.239	-0.234	1.067
	(0.234)	(0.834)	(0.887)	(0.888)	(1.193)
Observations	2,288	2,288	2,288	2,288	2,274
R-squared	0.694	0.642	0.646	0.646	
Firm FE	No	Yes	Yes	Yes	Yes
Product FE	No	Yes	Yes	Yes	Yes
N		1,394	1,394	1,394	1,388

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7. Conclusion and Policy Implications

This paper is interested in studying the impact of trade reforms adopted by the Egyptian government in 2004 on the domestic market structure, and hence, the level of concentration. Egypt has started the liberalization of its trade system in the early 1990s following the Economic Reform and Structural Adjustment Program of the World Bank.

In 2004, there was a new phase of trade reforms that targeted both tariff and non-tariff barriers of international trade. Following these reforms, the nominal and the effective rate of protection in the manufacturing sector has largely decreased. Beside these trade reforms, Egypt has signed many free trade agreements with many countries. The volume of exports and imports has largely increased following these periods.

This article investigates the impact of these policies on the level of concentration in the Egyptian market. The paper uses firm-level data from the World Bank Enterprise survey between 2004 and 2008; this dataset has an advantage

of having a year before the reforms, so we could analyze what happens in the period of post-trade reforms. This database was merged with tariffs data from the WITS database.

The results obtained show that trade liberalization and increase in the foreign competition faced by the home firms will induce the home firms to lose market share.

Thus, trade policy in Egypt could be seen as a substitute to the competition policy as it promotes competition in the domestic market.

In such environment where the adoption of an efficient competition policy is not feasible, the reforms adopted to enable more trade openness in 2004 has a positive impact on the competition in the domestic market and helps to fill the gap that the competition law in Egypt does not fulfill.

As, according to the theory and following the estimation results, the loss of market share is more pronounced for the least productive firms (as the interaction term between tariff level and firm's total factor productivity is negative and significant), it is obvious that the shut down of some firms will not hurt the consumers as they are replaced by more productive firms.

This decrease in the market share is proportional to the firm's productivity. More productive firms are less vulnerable as they could face the foreign competition more than the least productive ones. And, hence the market becomes less concentrated around most productive firms.

In a developing country like Egypt where it is not too easy to apply an efficient competition policy and an independent anti-trust authority, trade policy could be used in order to promote competition and to refrain the impact of anti-competitive behaviors.

Like most of developing countries, after phases of transition to market economies and privatization of many state monopolies to private monopolies, Egypt needs a clear competition policy to ensure a healthy competitive environment. However, studies conducted on the competition in Egypt conclude that there is a move towards anti-competitive behavior due to many institutional challenges, inefficient government intervention and bad sequences of policies.

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Appendix

Robustness Check

Table 1: Robustness check with TFP calculated by sector

	(OLS)			(2SLS)		
	ln share	ln share	ln share	ln share	ln share	ln share
ln tariff	-0.0758	0.390**	0.584***	0.476**	0.533***	0.670***
	(0.0971)	(0.154)	(0.128)	(0.211)	(0.128)	(0.238)
ln TFP	0.562***	0.632***	0.447***	0.557***	0.549***	0.594***
	(0.0478)	(0.0447)	(0.0506)	(0.0407)	(0.0414)	(0.0440)
ln wages	0.438***		0.587***	0.453***	0.457***	0.364***
	(0.0588)		(0.0185)	(0.0461)	(0.0462)	(0.0490)
ln age	-0.000866	0.103	-0.0939***	0.0451	0.0503	-0.104
	(0.0892)	(0.0682)	(0.0338)	(0.0858)	(0.0852)	(0.102)
Trade	0.306	0.706***	0.191**	0.176	0.147	0.0436
	(0.187)	(0.166)	(0.0750)	(0.182)	(0.180)	(0.228)
Import	0.123	0.390***		0.279*	0.301*	0.114
	(0.168)	(0.139)		(0.167)	(0.160)	(0.182)
ln earning		0.177***				
		(0.0587)				
comp				0.285	0.295	0.566
				(0.353)	(0.354)	(0.403)
ln tariff× ln TFP			-0.0699***			
			(0.0265)			
FE	Firm	Firm-Product	Product	Firm	Firm	Group
N	2014	2014	2014	2014	2008	2008
R^2	0.389	0.637	0.627	0.363	0.35	0.514
Hansen-J statistic					0.11	0.43

Standard errors in parentheses

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

Note: The columns (4-6) correct for the endogeneity and use the 2SLS method to estimate. Column 4 uses the tariff for the following product as an IV. Columns 5 & 6 uses tariffs for the following product and for both Jordan and India as an IV.

Table 2: Data sources and Variables definition

Variable	**Definition**	**Source**
$Share_{ikt}$	The domestic market share of the firm "i" for product "k" in year "t". $share_{ikt} = \frac{totalsales_{ikt}}{totalproduction_{kt}+imports_{kt}-exports_{kt}}$ where $totalsales_{ikt}$ are the total sales of the main product k of the firm i in year t, $totalproduction_{kt}$ is the total production in Egypt of the product k in year t, $imports_{kt}$ and $exports_{kt}$ are the total Egyptian imports and exports of the product k in year t respectively.	Constructed by the author.
$Tariff_{kt}$	The tariff levied by Egypt on product "k" in year "t".	WITS database.
$Totalproduction_{kt}$	Total production in Egypt of product k in year t.	CAPMAS.
TFP_{it}	Total Factor Productivity of firm "i" in year "t".	Own estimation.
Age_{it}	The age of the firm "i" in year "t".It is calculated by subtracting the firm's first year of operating from the survey year.	Author calculation.
$Trade_{it}$	It is a dummy variable that takes the value 1 if the firm participates in foreign trade in year "t".	World Enterprise Survey.
$comp_{it}$	It is a dummy variable that takes the value of 1 if the main competitor of the domestic firm is an importer.	World Enterprise Survey.
$Earning_{it}$	Wage per worker in firm "i" in year"t"	World Enterprise Survey.
TOT_t	Terms of trade index (2000=100) in Egypt used as an IV for tariffs.	World Development Indicators.
$Reserves_t$	Total reserves (includes gold, current EGP).	World Development indicators.