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Adjustment Strategies and the Costs of Adjustment to Trade Liberalization:

Firm Level Evidence from Egypt

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Adjustment strategies and the costs of adjustment to Trade Liberalization: Firm level evidence from Egypt

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Egypt's trade regime witnessed significant changes since the early 1990's as the country – like many other developing countries – started implementing World Bank structural adjustment and stabilization programs. Accordingly, significant reduction in trade barriers took place. Later on, the country's accession to the World Trade Organization in 1995 followed by the signing of a preferential trade agreement with the European Union – Egypt's main trading partner- lead to further reduction in trade barriers. The most important salient feature of this reform is that it was gradual in nature. Non-tariff barriers were phased out first and replaced by tariffs. Subsequently tariffs started to fall gradually. This is most evident in the case of EU agreement which came into force in 2004 and according to which tariffs on imports originating in the EU were gradually phased out over a transitional period of 12 years. In particular, tariffs on intermediate and capital goods were eliminated first followed by tariffs on finals goods.

It is widely documented in the empirical literature and from country experience that the main purpose of gradual reduction of trade barriers is to provide breathing space for firms to adjust to competition from imports. Gradual adjustment is thus expected to reduce adjustment costs to trade liberalization. Adjustment costs to trade liberalization are mainly manifested in falling output, rising unemployment and balance of payment problems. Reducing adjustment costs is of paramount importance to the sustainability of trade reform. High adjustment costs have led to reversal of many trade liberalization attempts as evident from country experience. (Michaely et al ,1991). A strategy of gradual elimination of trade barriers seemed particularly important in the case of Egypt given the country's adoption of import substitution strategy following the 1952 revolution. Much of the state led industrialization of this period took place behind prohibitively high trade barriers. While the open door policy in-acted in 1973 marked a shift towards encouraging a greater role of the private sector in industrialization and economic activity in general, industrialization continued to take place behind high trade barriers. Only starting the early 90's as mentioned above did a significant change in this policy stance took place.

The empirical literature addressing both the issues of adjustment strategies and adjustment costs to trade liberalization is in general scant particularly for developing countries among which is Egypt. With few exceptions, most existing studies are qualitative in nature. Only few studies tackle this issue using firm level data.

Against this background, the present research paper seeks to explore the nature of adjustment costs to trade liberalization and identify the adjustment strategies pursued by firms in Egypt's manufacturing sector as they faced competition from imports. The most important questions in this regard are 1) how did firms adjust to competition from imports?, did they contract by reducing output and/or employment?. 2) What firm characteristics make these firms vulnerable to competition from imports? 3) how did adjustment to import competition differ between formal

versus informal firms, private versus public firms, small versus large firms. The research paper will attempt to answer these question using firm level data from Egypt Economic Census for the years 2012/2013 and 2017/2018 and by employing Quantile regression analysis.

Our contribution to the literature is three-fold: First: we fill an important gap in the literature regarding adjustment to trade liberalization at the firm level. As mentioned before the literature addressing this issue is in general scant particularly in the case of developing countries. We are also the first to investigate this issue in the case of Egypt. Second: we use firm level data to assess whether Egypt's trade reform was associated with high adjustment costs. Only a handful of qualitative studies (See Michaely et al (1991),) address this related topic. Third: To the best of our knowledge, we are the first to make use of quantile regression to answer these questions. This permits us to explore whether the effect of import penetration differ across the different quantiles of the distribution and conditional on several important firm characteristics like skill intensity, capital intensity, age, integration into Global Value Chains etc.

We find that -for the majority of firms- import penetration has not led either in 2012/13 or in 2017/18 to contraction either in terms of output or employment. Firms were thus able to withstand competition from and successfully adjust to imports. The advent of exchange rate depreciation occurring since the decade starting from 2000 along with the gradual nature of trade reform in Egypt are two possible reasons underlying these results. This holds important lessons for other developing countries that wish to liberalize trade while minimizing adjustment costs.

The rest of the paper proceeds as follows: Section II reviews the empirical literature, Section III lays out the methodology , Section IV discusses the data, Section V presents the estimation results and finally Section VI concludes.

II. Literature Review

Although many countries undergone attempts at liberalizing trade in the 80's and 90's, little is known about the nature of the transitional path as trade barriers are reduced or eliminated. In particular, Little is known about how labor markets adjust to this shock. (Dix-Carneiro and Kovak, 2017). Dix-Carneiro and Kovak, (2017) document falling earnings, employment and number of establishments in Brazil following trade liberalization. This was mainly driven by slow reallocation of capital from negatively affected regions.

Rodriguez-Lopez and Ya (2017) examine the effect of trade liberalization on Chinese firm level employment while taking into consideration differences in firm type and productivity. Three channels through which trade liberalization affects employment are identified in their analysis. First: falling foreign tariffs facing Chinese exports makes it easier for Chinese firms to export. Second: falling tariffs on imports of final goods increase competition and force domestic firms to increase productivity. Third: falling tariffs on imports of inputs increase the productivity of input importing firms. Among their findings is that the fall in both foreign and Chinese tariffs on final goods exert the strongest effect on firm level employment. In particular, falling tariffs lead to job destruction in low productivity firms and job creation in high productivity firms.

Using a simple model, Groizard et al (2015) identifies three channels through which falling input trade costs affects firm level employment. The first channel is the substitution effect: as imported inputs become cheaper, the importing firms replaces inputs previously produced within its boundaries by imported inputs which reduces employment. The second is the scale effect: the falling trade cost of inputs reduces the marginal cost of the firm allowing it to charge lower prices and capture a larger share of the market which increases employment. The third effect is the competition effect: as importing firms become more efficient, competition intensifies which reduces firm level employment. Non-importing firms are subject to the competitive effect only. Using firm level data for California, they find that declining input and final trade cost lead to net job destruction at the intensive margin for low productivity firms. The opposite is true for high productivity firms. The effect of falling input trade cost on employment was stronger than final good trade.

Autor et al (2013) find that rising US imports from China to adversely affect manufacturing employment in the US. Mion and Zhu(2013) find that imports from China has a negative effect on firm level employment growth in Belgium. Bernard et al (2006) report similar results on firm level employment growth in USA manufacturing sector as a result of import penetration from low wage countries. In the case of Urguay, Casacuberta et al (2004) document that trade liberalization was associated with large net job destruction at the firm level in the manufacturing sector, but net destruction was lower for large firms. Unions along with the high concentration of industries mitigated some of these effects. Edwards and Jankins (2015) provide evidence that Chinese import penetration negatively affected employment in several manufacturing industries in South Africa. According to McCaig and McMillan (2020) trade liberalization has had an insignificant effect on industry employment shares in Bostwana.

Acemoglu et al (2016) postulate that import competition affects labor markets through several channels. A direct channel through which import competition reduces employment in exposed industries. An indirect channel whereby industries supplying exposed industries with inputs contract as the latter contracts (upstream industries). The indirect effect also includes lower employment as industries which are purchasers of inputs from exposed industries contract (downstream industries) if imported inputs cannot substitute these domestic inputs. These direct and indirect effects which operate at the national level could however be offset through the reallocation effect which occur at the local level whereby labor moves from declining sectors to more profitable opportunities in expanding sectors. This occurs provided certain assumptions hold such a as fully inelastic labor supply, no market frictions in addition to other neoclassical assumptions requiring that the economy be always at full employment. However, in the presence of labor market imperfections, the reallocation effect might not be big enough to offset the direct and indirect effects so that employment falls as competition from imports intensify. A final general equilibrium effects that acts to reduce employment following a trade shock is the aggregate demand effect. According to the aggregate demand effect, falling employment in some sectors lead to declining income followed by declining spending which causes another round of contraction in non-exposed sectors. The direct effect of Competition from imports from China on US labor markets was found to be negative. The same result holds for the upstream effect while estimates of the downstream effect were imprecise. No robust evidence for the reallocation effect were found in the case of the USA, while the aggregate demand effect had an adverse effect. The analysis was conducted at the sectoral level not at the firm level to account for the

fact that some firms will contract while others will expand in response to competition from imports and what matters is the net effect on each sector's employment.

Sotiriou Rodriguez-Pose (2021) find that import penetration in Chile negatively affected sales, employment and labor productivity at the industry level, but the effect turns positive in the case of export oriented and industries with higher share of foreign ownership.

The above studies find that competition from imports has in general negative effect on employment whether at the firm level or the industry level and whether in the case of developed or developing countries. Only one study - Sotiriou Rodriguez-Pose (2021) considers the effect of competition from imports on firm output and again find that this effect to be negative. Exploring the effect of import competition on both employment and output is important because it provides a more accurate assessment of the nature of the adjustment costs to trade liberalization. Apart from the few studies cited above, the literature addressing these issues is in general scant especially for studies that make use of firm level data. None of these studies considers the role of the macroeconomic environment and how it may influence adjustment to trade liberalization. In this regard, Michaely et al (1991) point to the importance of exchange rate depreciation in rendering imports expensive and hence enabling import substituting industries to withstand competition.

III. Methodology

Quantile regression is a statistical method that extends classical linear regression by making it possible to estimate not only the conditional median of a dependent variable, but also other quantiles of the conditional distribution of this variable. Unlike linear regression, which only models the median, quantile regression can provide a more complete view of the relationship between variables, by focusing on different points in the distribution (e.g., the 10th , 50th, or 90th percentiles). In classic regression, we seek to estimate the conditional mean of the dependent variable y given the vector of independent variables X, that is we estimate the following equation

$$y_i = \beta_0 + \beta' X_i + \varepsilon_i \qquad (1)$$

where $X_i = (x_{1,i}, x_{2,i}, \dots, x_{K,i})'$ is the vector of explanatory variables, $\beta = (\beta_0, \beta_1, \beta_2, \dots, \beta_K)'$ is the vector of the model parameters and ε_i is the error term.

Quantile regression, for its part, seeks to estimate a τ-th quantile (with τ between 0 and 1) of the conditional distribution of y, given a vector of variables X. This gives an equation like:

$$Q_\alpha(y_i/X_i) = \beta_{0,\alpha} + \beta'_\alpha X_i \qquad (2)$$

where α is a probability between zero and one.
Quantile Regression has many advantages. First, unlike linear regression, quantile regression is flexible since it doesn't assume the symmetry of the distribution of the dependent variable. That is, it can capture skewness and non-normality of the distribution. Second, it is more robust to outliers. Third, it captures heterogeneity by estimating different effect of the explanatory variables

on the dependent variable across quantiles. For the literature on quantile regression, we refer the reader to Koenker et. Al. (1978 and 2001), Konker (2005), Buchinsky (1998) and Roger et. Al. (1999) and the references therein.

IV. Data

The model was estimated using Economic Census cross section data available for the years 2012/2013 and for the years 2017/2018 which make available output and employment data at the firm level in Egypt's manufacturing sector. These are the only two years for which such data is available. Both Census data were published by the Central Agency for Mobilization and Statistics in Egypt (CAPMAS). Trade data was also available from CAPMAS. Import penetration (ImPen) is calculated as follows:

$ImPen_j = M_j \backslash M_j + Q_j - X_j$

Where M_j is import, Q_j is output and X_j is exports while j denotes industry. Given that a host of non-trade barriers continue to be in place in Egypt despite the decline in tariff rates, we opted to rely on import penetration rather than tariffs to explore the effect of falling trade barriers on firm level output and employment. According to WTO Trade Policy Review for Egypt (2005, 2018), the MFN applied simple average tariff rate stood at 26.8% in 1998 and fell to 20% in 2005. In 2012 this simple average rate stood at 16.5% and at 19.1% in 2017.

Table (1) Variable Definition and Expected sign

Variable	Definition	Expected Sign
Skill Intensity	ratio of skilled to unskilled labor	?
Capital Intensity	ratio of capital to labor	?
Capital	Fixed assets	+
Labor	Total number of employees	+
Age	Years since start of operation and until Economic Census Year	?
Foreign Ownership	Dummy variable = 1 if firm is foreign owned & zero otherwise	?
Import	Dummy variable = 1 if firm import intermediate inputs & zero otherwise	+
Location	Dummy variable =1 if firm is located in Greater Cairo or Alex & zero Otherwise	+
Formality	Dummy variable =1 if firm pays social security & zero otherwise	?
Sector	Dummy variable =1 firm is privately owned & zero of publicly owned	?

ImPen	Import Penetration	?
Export.	Dummy variable =1 if firm exports & zero otherwise	+

V. Estimation Results

Table (2) Import Penetration and Firm Output 2012/2013 Economic Census

Dep Var=Log output						
Quantile		0.1		0.5		0.9
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	-0.0780	-0.4954	4.4914***	4.5111***	5.8950***	6.1033***
	(2.0934)	(2.0539)	(0.2139)	(0.2268)	(0.3112)	(0.3108)
Skill intensity	-0.1042**	-0.0919*	0.0014	0.0000	0.0284	0.0167
	(0.0528)	(0.0496)	(0.0012)	(0.0013)	(0.0703)	(0.0589)
Log K	-0.0839	-0.1130	0.3244***	0.3202***	0.4051***	0.3987***
	(0.0854)	(0.0761)	(0.0166)	(0.0170)	0.0251	(0.0235)
Log L	4.1199***	4.0917***	1.7254***	1.7375***	1.4269***	1.4360***
	(0.1651)	(0.1388)	0.0851	(0.0856)	(0.0994)	(0.0931)
Age	0.0010	0.0065	-0.0075***	-0.0078***	-0.0057**	-0.0074***
	(0.0067)	(0.0065)	(0.0016)	(0.0017)	(0.0022)	(0.0025)
Foreign Ownership	-0.6870*	-0.6962**	-0.3460***	-0.3271***	-0.9829***	-1.0311***
	(0.4045)	(0.3297)	(0.0870)	(0.0906)	(0.1508)	(0.1529)
Import	1.1110***	1.3006***	0.5794***	0.5836***	0.5723***	0.5601***
	(0.3938)	0.3055	(0.1045)	(0.1206)	(0.1028)	(0.1108)
Location	-1.0854	-1.5697**	0.1233**	0.1306**	0.0330	0.0291
	(0.8529)	(0.7434)	(0.0520)	(0.0558)	(0.0838)	(0.0902)
Formality	0.0865	0.0828	-0.1457**	-0.1402**	-0.0614	-0.0559
	(0.2334)	(0.2057)	(0.0643)	(0.0669)	(0.0939)	(0.0984)
Sector	2.5265	3.0204	-0.4885***	-0.5138**	-0.1837	-0.2717
	(2.0933)	(2.0583)	(0.1877)	(0.2076)	(0.2952)	(0.2936)
ImPen	0.0546**	0.5366**	0.0119	0.0057	-0.0003	-0.3100**
	(0.0264)	(0.2568)	(0.0119)	(0.0567)	(0.0174)	(0.1231)
Export	1.2759***	1.4179***	0.7135***	0.7467***	0.6123***	0.6703***
	(0.4854)	(0.4397)	0.1151	(0.1286)	(0.1989)	(0.2026)
ImPen* Skill intensity		0.0114		0.0053		0.0125
		(0.0078)		(0.0042)		(0.0097)
ImPen* Age		-0.0056*		0.0011**		0.0028
		(0.0030)		(0.0005)		(0.0032)
ImPen* Import		-0.0531		-0.0223		0.0225
		(0.0531)		(0.0268)		(0.0264)

ImPen* Location		0.2304**		-0.0133		0.0190
		(0.0987)		(0.0243)		(0.0610)
ImPen*Formality		0.0408		-0.0413*		-0.0416
		(0.0504)		(0.0237)		(0.0538)
ImPen* Sector		-0.4735**		0.0323		0.2306**
		(0.2409)		(0.0366)		(0.1021)
ImPen*Export		-0.0685		-0.0305		-0.0413
		(0.0766)		(0.0280)		(0.0689)
Quasi-LR statistic	484.3362	570.5394	4038.5087	4099.4605	3039.9363	3232.1972
Prob(Quasi-LR stat)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	2832	2832	2832	2832	2832	2832

Standard errors in parenthesis. * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

In Table 2, the estimation results for the effect of import penetration along with other correlates of output for the year 2012/13 are presented. Interestingly, import penetration is associated with higher output in the case of the 10th quantile given the positive and significant -at 5% level- of the coefficient of this variable across all model specifications. That is firms in this quantile – which are small in terms of output produced- not only survived competition from imports, but it boosted their output possibly due to the availability of cheaper and better quality inputs. (Sotiriou and Rodriguez-Pose, 2021). Import penetration has no effect on firm output for the 50th quantile regardless of whether interaction terms are included or not and has a negative and statistically significant effect in the case of 90th quantile only when interaction terms are added. Given that the bulk of firms in Egypt's manufacturing sector are classified as small, one can conclude that import penetration has had a rather modest effect on firm output. In other words one can postulate that for the majority of firms, competition from imports did not lead to a reduction in output.

We are interested to explore whether certain firm characteristics like skill intensity, age, location , formality etc. would render firms more vulnerable to competition from imports. We thus estimated the model with interaction terms to assess the conditional effect of import penetration. We excluded the interaction between import penetration and the foreign ownership variable due to perfect multicollinearity. In general, interaction terms appear to have mostly statistically insignificant effect across all three quantiles. However, older and private firms (in the 10th quantile) and formal firms in (50th quantile) are vulnerable to competition from imports. Across all quantiles, import penetration has no statistically significant effect on firms that import intermediate inputs or those that export -noting that some of the latter firms may be producing for the domestic market also. Import penetration is associated with higher output for *private* firms in 90th quantile. While we showed above that in the main model, import penetration is associated with lower output for firms in the 90th quantile, including interaction terms shows that *not all* firms in this quantile are vulnerable to competition from imports. On the other hand, import penetration is associated with higher output for firms located in greater Cairo and Alexandria as indicated by the positive and statistically significant coefficient of the interaction term between imports and location in the case of the 10th quantile. Firms located in Greater Cairo

and Alexandria can benefit from access to labor and better services given that these are Egypt's two largest cities where the bulk of economic activity is concentrated. In a nutshell, there is evidence showing that firms that import intermediate inputs from world markets or export part or all of their output – that is firms integrated in GVC-are in a better position to compete with imports. To a lesser extent, older and formal firms are vulnerable to competition from imports. One reason could be that older firms do not employ new technology while formal firms could not reduce wages given their contractual obligations or have to abide by stifling regulations that increase their costs.

For other control variables, some results are consistent across all quantiles and model specifications. For example, Labor correlates positively with firm output. Firms that export or import intermediate inputs produce more output. Firms that have access to cheaper and better quality inputs from world markets can produce more output and can benefit from technology embedded in imported inputs as documented in the literature. Foreign ownership is associated with lower firm output. Except for the 10^{th} quantile where the coefficient of age is statistically insignificant, older firms tend to produce less output. Similarly, except for the 10^{th} quantile where the coefficient of capital is statistically insignificant, capital correlates positively with output. The statistical significance and sign of the coefficients of other control variables vary across the different quantiles and model specifications rendering it hard to draw broad conclusions. However this serves to highlight the advantages of using quantile regression.

Table (3) Import Penetration and Firm Employment 2012/2013 Economic Census
Dep Var= Log Employment

Quantile		0.1		0.5		0.9
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	1.2045***	2.1860***	2.0292***	3.0074***	2.3531***	3.4505***
	(0.3100)	(0.2654)	(0.2265)	(0.1900)	(0.1694)	(0.2415)
Skill intensity	0.2516***	0.0107	0.2824***	0.1067***	0.3525***	0.1685
	(0.0223)	(0.0180)	(0.0210)	(0.0374)	(0.0150)	(0.1180)
Log Capital intensity	0.0117***	0.0000	0.0608**	0.0000***	0.0718***	0.0000
	(0.0015)	(0.0000)	(0.0261)	(0.0000)	(0.0122)	(0.0001)
Age	0.0109***	0.0062***	0.0113***	0.0136***	0.0152***	0.0218***
	(0.0015)	(0.0019)	(0.0014)	(0.0017)	(0.0022)	(0.0045)
Foreign Ownership	-0.5841***	-0.7818***	-0.6530***	-0.8107***	-0.5059***	-0.9406***
	(0.1214)	(0.1597)	(0.0798)	(0.1122)	(0.1409)	(0.1719)
Import	-0.1247	-0.0662	0.2237***	0.6365***	0.3366***	0.7958**
	(0.0869)	(0.1014)	(0.0796)	(0.1253)	(0.1004)	(0.3842)
Location	0.4252***	0.3078***	0.3540***	0.1854***	0.3587***	0.2101*
	(0.0561)	(0.0589)	(0.0550)	(0.0505)	(0.0713)	(0.1157)
Formality	0.3949***	0.4231***	0.4263***	0.5302***	0.5208***	0.9872***
	(0.0518)	(0.0503)	(0.0452)	(0.0594)	(0.0865)	(0.1871)
Sector	-1.0896***	-0.7985***	-1.10138**	-0.8567***	-0.8782***	-0.4747*
	(0.2969)	(0.2717)	(0.2268)	(0.1878)	(0.1897)	(0.2622)
ImPen	-0.0047	0.3418	0.0017	0.0894	0.0276	0.0261

	(0.0305)	(0.2467)	(0.0159)	(0.0792)	(0.0174)	(0.1759)
Export	1.1944***	2.0153***	1.2720***	1.8483***	1.2278***	1.4003***
	(0.2037)	(0.2588)	(0.1137)	(0.1856)	(0.1011)	(0.4771)
ImPen* Skilled intensity		0.0146		0.0039		-0.0101
		(0.0147)		(0.0067)		(0.0243)
ImPen*Capital intensity		-0.0009**		-0.0018***		0.0018
		(0.0004)		(0.0006)		(0.0052)
ImPen* Age		-0.0074		-0.0325		-0.0100
		(0.0554)		(0.0423)		(0.0723)
ImPen* Import		-0.0596		-0.0045		-0.0441
		(0.0381)		(0.0346)		(0.0583)
ImPen*Location		0.0286		0.1151**		-0.0530
		(0.0336)		(0.0544)		(0.0690)
ImPen* Formality		-0.2969		-0.1069*		0.0806
		(0.2257)		(0.0581)		(0.1503)
ImPen* Sector		-0.0551		-0.0819		-0.0350
		(0.0759)		(0.0514)		(0.1089)
ImPen*Export		0.0000		0.0000		0.0000
		(0.0000)		(0.0000)		(0.0000)
Quasi-LR statistic	717.0162	591.0156	2779.2527	2330.7013	2336.0103	1493.3091
Prob(Quasi-LR stat)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	2832	2832	2832	2832	2832	2832

Standard errors in parenthesis. * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

In table 3, the estimation results of the effect of import penetration on firm employment along with other correlates of employment for the year 2012/13 are presented. Import penetration does not have a statistically significant effect on firm employment across all quantiles and model specification. Therefore, firms did not adjust to competition from imports by laying off workers. The coefficients of the interaction terms between import penetration and firm characteristics are in general statistically insignificant. However, import penetration correlates negatively with employment in capital intensive firms in the 10^{th} and 50^{th} quantile. Such result is reasonable to expect given that Egypt does not have a comparative advantage in capital intensive industries. Import penetration boosts employment in firms located in Greater Cairo or Alexandria in the 50^{th} quantile and reduces employment in formal firms in the same quantile. Compared to informal firms, formal firms have less scope to reduce wages to be able to compete with imports given that they mostly hire with contracts.

Skill intensity and capital intensity correlate positively with firm employment for all quantiles in the model specification without interaction terms and is statistically significant when interaction terms are included only for the 50^{th} quantile. As documented in the literature (see Taylor, (2004) for a survey of this literature), the sign of the coefficient of capital intensity can go either way. It

can be negative if capital is substituted for labor. On the other hand, this coefficient can be positive if the embodied technology in capital increases labor productivity leading to better quality and cheaper products. In turn this increases demand leading to higher demand for labor. Similarly, one can argue that higher skilled labor is able to absorb and utilize better technology embodied in capital and again leads to the same conclusion that demand for labor will increase. Across all quantiles and model specification, older firms, firms located in Greater Cairo and Alexandria as well as informal firms and those that export hire more employees while foreign firms and private firms in general hire less. Except for the 10^{th} quantile where the coefficient of import is statistically insignificant, firms that import intermediate inputs hire more workers in both model specifications.

In summary, the results for output and employment reveal that the majority of firms in 2012/2013 did not contract when exposed to competition from imports. Firms that employ labor intensive technology, are informal, import and/or export and -to a lesser extent- are located in Greater Cairo and Alexandria where particularly shielded from competition from imports.

Table (4) Import Penetration and Firm Output 2017/2018 Economic Census

Dep Var=Log output

Quantile		0.1		0.5		0.9
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	9.9243***	9.9415***	11.0422***	11.0088***	13.0610***	13.0719***
	(0.1828)	(0.1844)	(0.0600)	(0.0665)	(0.0642)	(0.0733)
Skilled intensity	0.0126***	0.0104	0.0203*	0.0374***	0.0361**	0.0598
	(0.0038)	(0.0252)	(0.0117)	(0.0075)	(0.0193)	(0.0429)
Log K	0.0949***	0.0867***	0.1438***	0.1413***	0.1287***	0.1256***
	(0.0135)	(0.0133)	(0.0052)	(0.0052)	(0.0058)	(0.0061)
Log L	3.0285***	3.0253***	2.4245***	2.4221***	2.5105***	2.4938***
	(0.1742)	(0.1868)	(0.0805)	(0.0750)	(0.0589)	(0.0691)
Age	0.0026	0.0052***	-0.0020	-0.0004	-0.0019	-0.0037
	(0.0017)	(0.0018)	(0.0014)	(0.0019)	(0.0021)	(0.0029)
Foreign Ownership	4.6981***	2.1908***	0.5157	0.5436**	-1.2368***	-1.1783***
	(0.2706)	(0.2928)	(0.2311)	(0.2310)	(0.1466)	(0.1620)
Import	0.8000***	0.1250	0.7401***	0.6921***	0.6807***	0.7591***
	(0.1028)	(0.1381)	(0.0619)	(0.0727)	(0.0898)	(0.1129)
Location	-0.0690	-0.0670	0.2485***	0.3054***	-0.0787	-0.0829
	(0.0940)	(0.0881)	(0.0446)	(0.0535)	(0.0611)	(0.0812)
Formality	0.1103	0.1629	-0.3033***	-0.3106***	-0.4036***	-0.3929
	(0.0980)	(0.1088)	(0.0513)	(0.0608)	(0.0724)	(0.0822)
Sector	-0.9087	-16.1376***	0.2502	0.3219	0.2034	0.3026
	(0.6989)	(0.7711)	(0.2565)	(0.2636)	(0.2034)	(0.6021)
Import Penetration	-3.5303***	-3.3715***	0.0767**	0.1761*	0.0894**	0.0664
	(0.1040)	(0.2398)	(0.0380)	(0.1044)	(0.0470)	(0.1259)

Export	-0.0130	-0.2588	0.1716	0.0868	0.7000***	0.7967***
	(0.1941)	(0.2179)	(0.1111)	(0.1267)	(0.2344)	(0.2739)
ImPen*Skill intensity		0.0065		-0.0096***		-0.0170
		(0.0086)		(0.0022)		(0.0105)
ImPen*Age		-0.0093**		-0.0052		0.0059
		(0.0038)		(0.0041)		(0.0091)
ImPen* Import		3.4114***		0.0513		-0.1142
		(0.3394)		(0.0601)		(0.1029)
ImPen*Location		0.0699		-0.0994		0.0319
		(0.1381)		(0.0683)		(0.1437)
ImPen* Formality		-0.1717		0.0314		-0.0514
		(0.2628)		(0.0764)		(0.0890)
ImPen* Sector		4.9157***		-0.0835		-0.5706
		(0.2743)		(0.2035)		(1.7136)
ImPen* Export		0.7671**		0.3152*		-0.1140
		(0.3881)		(0.1796)		(0.1630)
Quasi-LR statistic	1814.9839	2322.0957	5934.3219	6047.3600	4887.5869	5062.3667
Prob(Quasi-LR stat)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	6746	6746	6746	6746	6746	6746

Standard errors in parenthesis. * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

As is evident from table 4 where the estimation results for output in 2017/18 are presented, with a highly statistically significant coefficient, import penetration correlates negatively with output for firms in the 10th quantile whether interaction terms are included in the model or not. That is smaller firms in terms of output are vulnerable to competition from imports. In this same quantile, older firms reduce output when faced with competition from imports as indicated by the negative and statistically significant coefficient of the interaction terms between import penetration and age. However, within this quantile import penetration correlates positively with output for firms that import intermediate inputs or export or are privately owned. That is even for this quantile one cannot generalize that import penetration led firms to reduce output.

In contrast, import penetration correlates positively with output for firms in 50th quantile in both model specifications. For the 90th quantile, import penetration correlates positively with output in the main model while is statistically insignificant in the model with interaction terms. One can conclude that import penetration in 2017/2018 had a positive impact on firms that have median to high level of production (50th and 90th quantile) and a negative impact on firms in the 10th quantile. This can be explained by the fact that – in contrast to large firms- small firms (in the 10th quantile) cannot exploit economies of scale and lower prices and thus cannot compete with cheaper imports.

As mentioned earlier, older firms in the 10th quantile were vulnerable to competition from imports. This applies also to skill intensive firms in the 50th quantile. Again such result is reasonable to expect given that Egypt has a comparative advantage in unskilled labor intensive

industries. Firms integrated in GVC are not vulnerable to competition from imports across the three quantiles.

With regards to other control variables log capital and log labor have the correct sign and are highly statistically significant across all quantiles and model specification. The coefficient of import is positive and highly statistically significant for the all quantiles under both model specifications with the exception of the 10^{th} quantile when interaction terms are added. Export positively correlates with output for the 90th quantile and the coefficient is highly significant while is statistically insignificant for the rest of the quantiles under both model specifications. The sign and statistical significance of the coefficients of other control variables vary across the different quantiles and model specification. Again this makes it hard to draw general conclusions about the effect of these variables on output.

Table (5)Import Penetration and Firm Employment 2017/2018 Economic Census
Dep Var= Log Employment

Quantile		0.1		0.5		0.9
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	0.6305***	0.8097***	1.2401***	1.4406***	1.6773***	1.8172***
	(0.0389)	(0.0559)	(0.0336)	(0.0223)	(0.0440)	(0.0420)
Skill intensity	0.0177***	0.0361***	0.0408***	0.1549***	0.1087***	0.2343***
	(0.0050)	(0.0020)	(0.0045)	(0.0306)	(0.0079)	(0.0732)
Capital intensity	0.0251***	0.0000***	0.1064***	0.0000	0.1481**	0.0000***
	(0.0033)	(0.0000)	(0.0277)	(0.0000)	(0.0682)	(0.0000)
Age	0.0075***	0.0063***	0.0112***	0.0087***	0.0233***	0.0144***
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0037)	(0.0025)
Foreign Ownership	1.7836***	1.8769***	0.3936***	0.5816***	-1.7611***	-1.2523***
	(0.0953)	(0.0909)	(0.1427)	(0.1446)	(0.2165)	(0.1345)
Import	0.0902*	0.0352	0.4129***	0.4639***	0.5605***	0.6665***
	(0.0521)	(0.0691)	(0.0552)	(0.0951)	(0.1313)	(0.1574)
Location	0.0477	0.0512	0.0956***	0.1085***	0.3039***	0.4675***
	(0.0332)	(0.0392)	(0.0229)	(0.0269)	(0.0538)	(0.0780)
Formality	0.4888***	0.4290***	0.3704***	0.2724***	0.7836***	1.1877***
	(0.0358)	(0.0489)	(0.0254)	(0.0255)	(0.0947)	(0.1214)
Sector	0.7834**	0.4109**	1.7820***	1.4712***	0.9114***	1.3522***
	(0.3430)	(0.2177)	(0.1953)	(0.3021)	(0.2161)	(0.2725)
Import Penetration	0.0710**	-0.1513	0.1371***	0.0900**	-0.0368	0.3320***
	(0.0287)	(0.0924)	(0.0218)	(0.0351)	(0.0459)	(0.0356)
Export	0.0922	-0.0440	0.2604*	0.1611	0.9761***	-0.1715
	(0.0826)	(0.1054)	(0.1464)	(0.1502)	(0.1965)	(0.1308)
ImPen*Skill intensity		-0.0082***		-0.0429***		-0.0510**
		(0.0006)		(0.0087)		(0.0215)
ImPen*Capital intensity		0.0014		0.0001		0.0043**

		(0.0009)		(0.0017)		(0.0020)
ImPen*Age		0.0701		-0.0003		-0.1037
		(0.0547)		(0.0679)		(0.0897)
ImPen* Import		0.0874		0.0194		-0.2935***
		(0.0589)		(0.0403)		(0.0425)
ImPen* Location		0.2141***		0.2005***		-0.1868***
		(0.0645)		(0.0436)		(0.0550)
ImPen* Formality		0.7380***		0.4899***		0.1355
		(0.1036)		(0.1280)		(0.1227)
ImPen*Sector		0.4739***		0.4776***		1.0394***
		(0.0661)		(0.0708)		(0.1215)
ImPen* Export		0.0000***		0.0000		0.0000
		(0.0000)		(0.0000)		(0.0000)
Quasi-LR statistic	458.0647	581.6691	3483.1965	4087.5346	3248.2282	3240.4348
Prob(Quasi-LR stat)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	6746	6746	6746	6746	6746	6746

Standard errors in parenthesis. * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Across the different quantiles and model specifications, the estimation results for employment in 2017/18 displayed in table 5 show that import penetration either correlates positively with employment or has a statistically insignificant effect. Skill intensive firms are vulnerable to competition from imports across all three quantiles. As mentioned earlier, this is reasonable to expect since Egypt does not have a comparative advantage in skill intensive industries. In the case of firms that import intermediate goods or those that are located in Greater Cairo or Alexandria, import penetration negatively correlates with employment only for the 90^{th} quantile. Thus apart from skill intensive firms, and with few other exceptions, we can safely rule out the possibility that competition from imports led firms to lay-off workers in 2017/2018

With regards to the other control variables, skill intensive along with older and formal private firms seem to create more employment as indicated by the positive and statistically significant coefficients of these variables across all quantiles and model specifications. Capital intensity correlates positively with employment except for the 50^{th} quantile in the model with no interaction terms. Foreign ownership is associated with higher employment for the 10^{th} and 50^{th} quantile and the reverse hold true for the 90^{th} quantile. Firms in Greater Cairo or Alexandria hire more in the case of the 50^{th} and 90^{th} quantile only. The coefficient of this variable is statistically insignificant in the case of the 10^{th} quantile. Firms that export hire more only in the case of the 50^{th} and 90^{th} quantile in the model with no interaction terms.

In summary, we find no compelling evidence that import penetration has led firms to contract either in terms of output or employment in 2012/13 for 2017/18 for the manufacturing sector in Egypt. Thus trade liberalization has not been associated with high adjustment costs. Two possible reasons underlying this result lie in the role of exchange rate devaluation and gradual

elimination of trade barriers. Between 2000 and 2013 the exchange rate of the Egyptian pound to the US dollar depreciated by 88% and between 2013 and 2017 the exchange rate depreciated by 157%. This has no doubt made imports more expensive and permitted firms to withstand competition from imports. Meanwhile, the gradual approach to the elimination of trade barriers that Egypt has in general followed since the early 90's must have provided firms with breathing space to adjust to competition from imports.

VI. Conclusion and Policy Implications

Using cross section firm level data from Egypt's Economic Census for the years 2012/13 and 2017/18, this research provides evidence that competition from imports was not associated with significant contraction in output or employment. In other words, firms were able to successfully adjust to and withstand competition from imports. Egypt's trade reform was not associated with high adjustment costs at least when it comes to output and employment. Successive rounds of exchange rate devaluation taking place since early 2000 along with the gradual nature of Egypt's trade reform have been instrumental in reducing adjustment costs to trade reform. While we did not explore whether firms might have adjusted to competition from imports by increasing productivity, we cannot rule out this possibility. Concerns that trade liberalization might hurt firms or lead them to lay-off workers, that is lead to high adjustment costs in the case of Egypt are to a great extent ill-founded. Efforts to liberalize trade in Egypt should continue to take advantage of enabling macroeconomic environment that continues to prevail as reflected in exchange rate depreciation.

The fact that Egypt's experience stands in stark contrast to available evidence in the literature showing that trade liberalization is associated with contraction in firm output and employment holds valuable lessons for other developing countries. Nonetheless more research on firm level adjustment strategies to competition from imports is needed in the context of other developed or developing countries.

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