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Is International Trade Always Beneficial to Labor Markets?

A Case Study from Egypt

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Abstract

The Arab Republic of Egypt's industries rely heavily on imported goods for production. Thus, an increase in imports could have a potentially positive effect on the labor market as it means more inputs for the production of exporting goods. Alternatively, minimal backward linkages in global value chains could also mean that increasing imports substitute for domestic production and, thus, lost employment opportunities. This paper evaluates the relationship between regional trade agreements using a gravity model and import flows to test whether rising imports have impacted wages, informality, and female labor force participation. The results suggest that imports are not to blame for disappointing labor market outcomes in Egypt.

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Is International Trade Always Beneficial to Labor Markets? A Case Study from Egypt

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JEL: F1, J2, C1
Keyworks: Imports, Trade, Labor Market, Informality, Econometrics, Bartik, Egypt

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1. Introduction

The literature assessing the impacts of trade shocks generally observes a positive relationship between economic growth and poverty reduction in the aggregate (Frankel and Romer, 1999; Dollar and Kraay, 2004; Bhagwati and Srinivasan, 2002; Noguer and Siscart, 2005). Rising exports have been linked to falling poverty by generating new employment opportunities, raising wages (Lopez-Acevedo and Robertson, 2012), and decreasing prices of goods and services for poor consumers (Bartley Johns et al., 2015).

Seeking to grasp the benefits of trade, in the last decades, the Arab Republic of Egypt has pursued a liberalization agenda and bold economic reforms that would suggest improving labor market outcomes for its population. However, real wages, female labor force participation, and informality are stubborn problems that have not benefited from increasing trade. On the contrary, they seem to have worsened following the trade liberalization.

Contrary to exports, rising imports are often associated with rising unemployment, poverty, decreased labor-force participation, and lower wages in more exposed to trade local labor markets (Topolova, 2007; Autor, Dorn and Hanson, 2013; Kovak, 2018). Moreover, in the developing world, imports have also been related to increasing informality in Argentina (Cruces, Porto & Vollaz, 2018), Vietnam (McCaig & Pavnik, 2018), and Brazil (Ponceck & Ulyssea, 2020). Thus, it is possible that the adverse effects of imports on the labor market may dominate and counteract the positive effects of exports.

In this paper, we test whether imports explain the disappointing Egyptian labor market performance. First, we test whether the liberalization policy effectively promotes rising imports. If the signature of new Free Trade Agreements (FTAs) does not increase trade for Egypt, the decline in wages, female labor participation, and increase in informality should be better explained by domestic factors. To do so, we present a two-pronged approach. First, using a gravity model, we provide evidence of the trade-promoting consequences of the Egyptian liberalization strategy. Second, we use a geographic Bartik model to study the link between rising trade and local labor markets.

This paper extends the literature on distributional impacts of trade by studying a region often overlooked due to data limitations (Amatanov et al., 2020). To our knowledge, no study has evaluated their impact on labor markets. One exception is Zaki et al. (2018), who argue that Egypt's reliance on imports has limited the export-promoting effects of currency depreciation and pushed inflation up (Zaki et al., 2018). We extend our analysis outside the labor-intensive manufacturing-only industries that most of the literature focused on. We estimate the impacts on the latter but also on the services sector for the overall economy and include the study of potential effects on different types of workers such as urban, rural, young, high-skilled, and female workers. Adverse labor market outcomes generally concentrate on low-educated workers, women, or a combination of both (Autor et al., 2013; Gaddis and Pieters, 2017; Yu, Wu, Li, and Guo, 2021; Mansour, Medina, and Velasquez, 2022). Thus, we study if that is also the case

for a country where female labor participation is now less than half of the world's average and has been historically stubborn.

We argue that Egypt is an excellent case to conduct this kind of study as its labor markets are highly geographically segmented with low internal mobility. Job opportunities and migration in the non-tradable sector can alleviate trade-induced displacements (Topolova, 2007; Mansour, Medina, and Velasquez, 2022). However, if rigidities prevent mobilization between geographical regions, a shift-share Bartik estimation is the best candidate to evaluate impacts on local labor markets.

Our results suggest that imports fall short of explaining the stubborn labor market outcomes in Egypt. Signing new free trade agreements does increase exports, but we do not find a statistically significant effect on imports. There is no evidence that the liberalization policy conducted by the Egyptian government is flooding the market with competing imports. Further, changes in the predicted volume of imports are weakly associated with labor market outcomes. In the local labor markets, we only find small and short-lived effects mostly on wages and informality, suggesting domestic factors can potentially better explain the evolution of labor outcomes in Egypt.

Our paper proceeds as follows. Section 2 provides a comprehensive description of Egypt's labor market challenges and its trade situation. Section 3 describes the data and the empirical methodology to assess the impact of trade liberalization and presents the results. Section 4 describes Egypt's geographical context, the methodology to estimate trade shocks in local labor markets and the results. Section 5 discusses the results. Finally, section 6 concludes.

2. Labor Market Outcomes and Trade in Egypt

Egypt has encouraged trade by signing trade agreements. Since 2004, Egypt has signed eight of the eleven preferential or regional trade agreements (RTAs).[2] The first was a free trade agreement (FTA) with the European Union in 2004, and the most recent FTAs with MERCOSUR and the United Kingdom in 2018 and 2020, respectively. The volume of imports and exports dramatically increased after this new era of liberalization policies. Trade volumes more than doubled from 2004 to 2009 (Figure 1), and the average applied tariff on imported goods significantly decreased (Figure 2).

Before the 2008-2009 financial crisis, imports accounted for almost 40% of Egypt's GDP, and exports were close to 30% of the GDP (World Bank, 2022). Although trade ceased its exponential growth following the crisis, it recovered and has increased in the last years. An explanation for the recovery is the strong depreciation of the Egyptian pound experimented in 2016 after the exchange rate liberalization (Zaki et al., 2018). This depreciation made Egypt's exports relatively less expensive and its imports relatively more expensive, thus boosting its economic growth.

[2] See http://rtais.wto.org/UI/PublicSearchByCrResult.aspx for the WTO's list of Egypt's regional trade agreements that are in force.

Egypt strongly depends on imports and has had a trade deficit in the last four decades. Almost three-quarters of imported goods are either intermediate or raw materials. Therefore, increasing imports could affect labor markets in at least two ways. First, imports can boost employment and wages if they are used as intermediate goods for production or rising exports. Second, imports can have the opposite effect on wages and employment if they are substituting for domestic production.

The concern about Egypt's lack of improvement in labor market outcomes following trade agreements comes from trends such as rising informality, decreasing wages, and stubborn female labor force participation (FLFP) that have not improved at the national level in the last decade. What is more pressing is the possibility that the liberalization strategy pursued by the government might be having reinforcing deleterious effects on local labor markets. Imports substituting for domestic industrial production could be contributing to worsening labor market outcomes.

From Figures 3 and 4, however, we observe that goods from top importing industries are not the same top employer industries in Egypt. Further, rising imports do not seem to be positively or negatively associated with better labor market outcomes in the major importing industries, nor the services or manufacturing industries. At most, they could be contributing to the positive trend on informality, similar to the cases of Argentina (Cruces, Porto & Vollaz, 2018), Vietnam (McCaig & Pavnik, 2018), and Brazil (Ponceck & Ulyssea, 2020). Figures 4, 5, and 6 show some evidence of the latter. Employment shares have remained stable and below 2% of total employment for most industries. In addition, the employment share has remained steady at close to 10% for manufacturing industries, the services industries close to 50%, and the percentage of workers in the agriculture sector has increased in the last years of our study. Informality[3] rates in all sectors have increased, especially for the mineral extracting industries (Figure 5). Real mean wages have also recently started taking a downward trend (Figure 6), even for the better-paid mineral extracting workers.

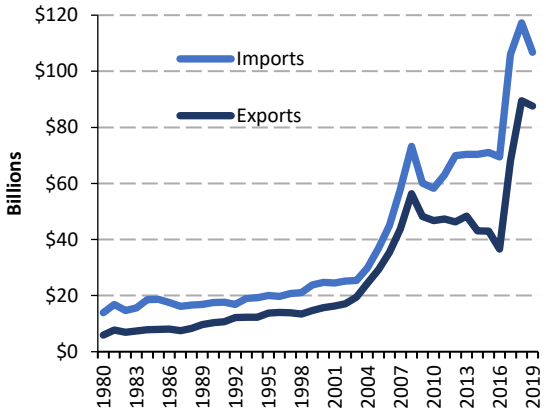
Take machinery imports –the most imported good in Egypt– as an example. An essential part of imported machinery is final consumption products such as broadcasting equipment, computers, and telephones. The rest of the imports consist of machines for industrial production, such as wires, valves, pumps, excavation machinery, motors, and others (WITS, 2022). Suppose that machinery imports were substituting for domestic production in this sector, this industry's employment share would be expected to decrease. However, if most imports are used as intermediate goods for production, rising imports would stimulate internal demand. Figures 4, 5 and 6 suggest a neutral development: employment in the industry has not decreased and remained low, wages rose until recently and informality has been stable.

Descriptive statistics suggest a weak relationship between imports and labor outcomes. Yet, there could be competing effects between competing imports for domestic production and

[3] We consider informal workers as those self-employed, unpaid family workers or workers without social security coverage.

imports stimulating internal demand by serving as intermediates for production. To test our hypothesis, we present a two-stage methodology in which we first estimate the potential impacts of newly signed trade agreements on trade.

Figure 1. Imports and exports of goods and services, constant 2010 $ US Panel B.



Source: Authors' elaboration using UN COMTRADE data

Figure 2. Average weighted applied tariff rates for all products, 1995-2016

Source: World Bank

Figure 3. Egypt Imports, Industry share. (WITS, 2022)

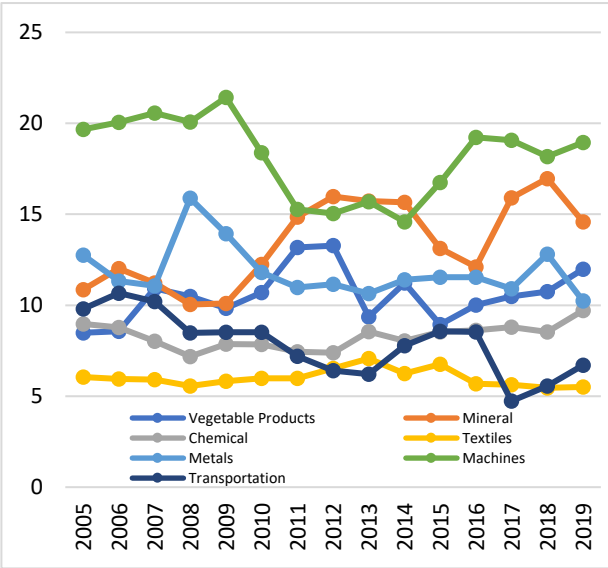
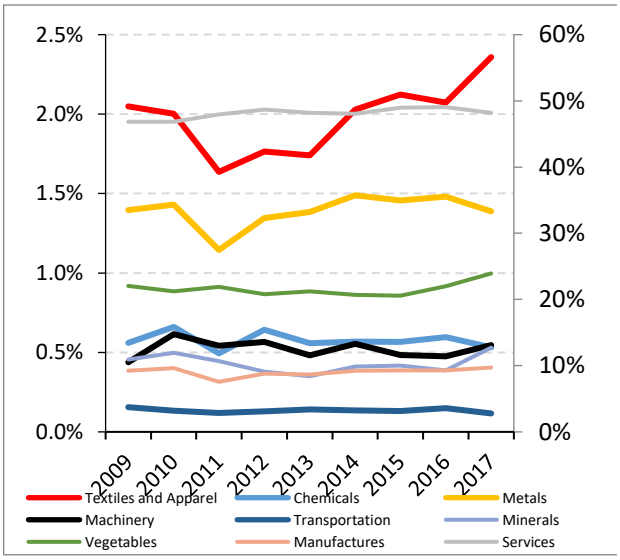


Figure 4. Employment share of top importing industries, 2009-2017, the secondary axis for agricultural products, manufacturing, and services industries.[4]



[4] Minerals include mining of coal and lignite, extraction of crude oil and natural gas, other mining and quarrying, and the manufacture of coke and refined petroleum products. Transportation includes manufacture of motor vehicles or other transport equipment. Vegetables include growing of cereals, vegetables, fruits, sugar cane, fiber crops, spices, crops, plant propagation, supporting activities for crop production, seed processing and post-harvest crop activities. Chemicals include manufacturing of chemicals, chemical products, and pharmaceutical products. Metals include mining of metal ores, basic metals, metal products and mining support activities. Machinery includes manufacturing of computer, electronic, optical products, electrical equipment, and other machinery.

Figure 5.- Informality rates for top importing industries,[3] 2009-2017.

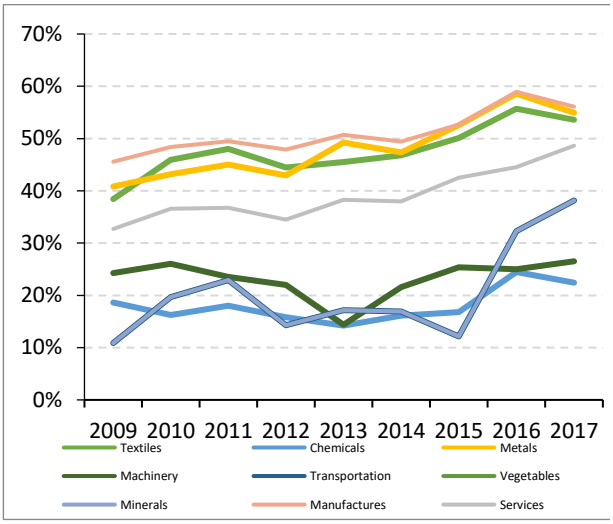
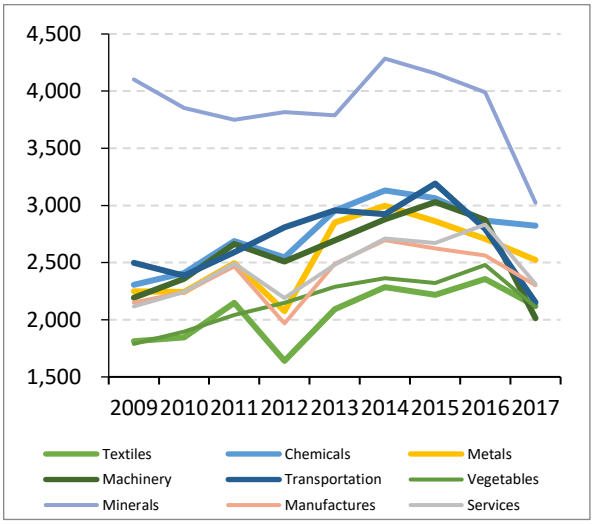


Figure 6.- Mean annual real wages for top importing industries and the manufacturing and services sector,[3] 2009-2017[5]



3. Is the Liberalization Strategy Increasing Imports?

- **Overview of the Gravity Approach**

The Gravity model is an often-used approach to estimate the relationship between bilateral trade flows and variables that affect trade including trade policy (e.g. Head and Meyer 2015, Chaney 2018). Its name references the gravitational pull two countries exert on each other based on their proportional economic mass. Thus, to predict the volume of trade between two countries the model uses each country's gross domestic product (GDP), the distance between them, and their relative trade frictions or trade costs (Tinbergen 1962).

We follow a familiar foundation of the empirical approach by Anderson and van Wincoop (2003) and model exports from region i to region j (x_{ij}) as a function of gross domestic production in regions i and j (y_i and y_j), world nominal income (y^w), the cost in j of importing a good from i (t_{ij}), a substitution elasticity σ between all goods from different countries, and aggregate price levels (consumer price indices) for each country P_i and P_j:

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma} \qquad (1)$$

For relative trade frictions, we include the aggregate price terms to capture "multilateral resistance", distance (modeled as the geographic distance between countries), a wide range of information costs –such as language and colonial lineage (Egger and Lassman 2012, Fidrmuc and

[5] The 2012 dips in earnings for some industries can be explained by the political context surrounding the 2011 Egyptian revolution and its impact on some economic variables.

Fidrmuc 2015), literacy rates and linguistic diversity (Melitz 2008), population and population dispersion (Chung and Wall 2005), and a common currency (Head et al. 2010), and policies that might affect demand or production costs, such as labor compliance.

We first follow the commonly used log-linearized form (LLF) to estimate equation (1). However, we acknowledge the potential biases of zero trade flows occurrences and the heteroskedasticity often found in trade data raised by Head and Meyer (2014) and Yotov et al. (2016). Zero trade observations do not occur randomly and when used in a log-linear model they are automatically dropped from the estimation since the logarithm of zero is undefined. The latter not only renders parts of the data unusable for estimation but bias the estimates of the effects of trade costs and trade policy and is also inconsistent with the LLF of the OLS estimator or other approaches that require a non-linear transformation.[6] Dropping these observations or adding one with the goal to have defined logarithms are not potential solutions as they generate information losses and do not solve the problem of a biased estimation.

To address concerns related to the log linearized estimation, we follow the literature (Santos Silva and Tenreyro, 2006; Yotov et al., 2016) and proceed with a second estimation of (1) using a Pseudo Poisson Maximum Likelihood (PPML) estimator. This approach allows to directly use the levels of the dependent variable (instead of the logarithm), avoiding dropping zero trade flow observations. Further, the PPML is a robust approach to the presence of heteroskedasticity (Burger, Van Oort, and Linders 2009, Silva and Tenreyro 2011, Martínez-Zarzoso 2013). Thus, we us it as our main empirical strategy for the gravity analysis. We also include country-specific fixed effects to address potential trade multilateral resistance –the barriers to trade each country faces with all its trading partners– and country-pair fixed effects to control for the endogeneity of trade agreements (Bair and Bergstrand 2007).

- **Construction of the Data Set**

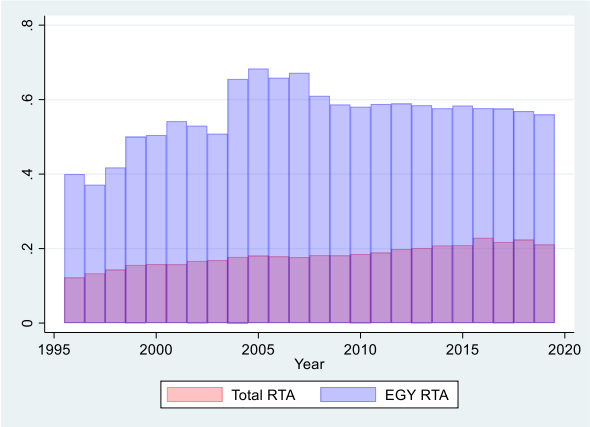
We employ the Centre d'Études Prospectives et d'Informations Internationales (CEPII) gravity data set to estimate the change in Egypt's imports following Egypt's trade agreements. The CEPII database contains total trade (summed across all HS codes) for each country pair over a long time span, but we limit the data to 1996-2019. The CEPII dataset includes an indicator for regional trade agreements (RTA) for each country pair-year covered by an RTA registered with the World Trade Organization. The CEPII database consists of 248 importers and 248 exporters, and we limit the sample to country pairs with positive trade flows. We draw upon the World Bank's World Development Indicators data for the annual GDP.

As explained, the empirical strategy compares the change in trade between country pairs that have a regional trade agreement. We generate a dummy variable equal to 1 indicating when Egypt is an importer and another equal to one when Egypt is an exporter and interact each of

[6] Chung and Wall (2005) find that unless heteroskedasticity is accounted for correctly, gravity models will typically overestimate the effects of integration with regards to trade.

these with the RTA indicator. Figure 7 compares the overall RTA coverage for all country pairs ("Total RTA") and the coverage of Egypt's trading relationships as measured as the percent of Egypt's trading relationships covered by an RTA as reported in the CEPII database. The figure shows that more than half of Egypt's trading partners have an RTA with Egypt, and this share has remained steady from 2010 to 2019. The fraction increased in the mid-2000s when Egypt expanded its trade agreements but fell somewhat as Egypt expanded trade with countries that were not covered by a trade agreement.

Figure 7. More than half of Egypt's trading partners have an RTA with Egypt, 1996-2019



Source: Authors' elaboration using CEPPI gravity database

- **Gravity Results**

The main results are shown in Table 1. Three estimation approaches are shown. In the first column, the Ordinary Least Squares (OLS) results include year fixed effects, importer fixed effects, and exporter fixed effects. The OLS results suggest that RTAs increase trade by over 50%, which is much larger than the 10-20% range found in most studies. Part of the reason for the large result is that the sample is restricted to country pairs with positive trade. The results in column (1) also suggest that the RTA effects for Egypt's trade are much larger than that of the "average" trade agreement. Both imports and exports are much larger with Egypt's RTAs. Note that the other gravity variables, including WTO, distance, and GDP have the expected signs. The magnitude of the importer and exporter GDP coefficients are smaller than expected.

The second column employs the high-dimensional fixed effects PPML estimator. This estimator includes importer and exporter time trends, year fixed effects, and country-pair fixed effects (and standard errors clustered on country pairs). The main results are similar but smaller in magnitude. The RTA estimate is now much lower than the 10-20% range found in the literature. Egypt seems to have exports and imports expand more through RTAs than the "typical" agreement, but the increase in imports is not statistically significant. As such, the main implication is that Egypt's trade agreements are not generating a flood of new imports that might adversely affecting labor market outcomes. We explore this hypothesis in more detail in the next section. The observed drop in the number of observations between columns 1 and 2 represents

nearly 0.3 percent of the total, and results from collinear observations being dropped and model specificities.

The third column uses the same PPML estimator including all observations (including zeros). These estimates show the same signs and significance than the second column, and almost the exact same magnitude, prevailing then the same implications as the previous paragraph.

Though not directly comparable due to differences in model specifications, these results are consistent with those in Robertson et al. (2021). Like us, Robertson et al. (2021) find that the coefficient on the interaction term "Egypt as an Importer x RTA" is not statistically significant. Also, they find that the estimated coefficient on "Egypt as an Exporter x RTA" is positive and statistically significant.

Table 1: Gravity Estimation Results

	(1)	(2)	(3)
VARIABLES	OLS	PPMLHDFE	PPMLHDFE w/0
RTA	0.552***	0.058***	0.057***
	(0.009)	(0.013)	(0.013)
Egypt as Exporter x RTA	0.573***	0.450***	0.461***
	(0.074)	(0.133)	(0.135)
Egypt as Importer x RTA	0.416***	0.042	0.105
	(0.078)	(0.059)	(0.075)
WTO Importer	0.107***		
	(0.019)		
WTO Exporter	0.099***		
	(0.019)		
Log Distance	-1.642***		
	(0.005)		
Log GDP Importer	0.682***		
	(0.012)		
Log GDP Exporter	0.424***		
	(0.012)		
Constant	-1.726***	16.317***	16.290***
	(0.277)	(0.007)	(0.007)
Observations	580,132	578,223	995,075
R-squared	0.732		

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS stands for Ordinary Least Squares. OLS estimation includes fixed effects for year, exporter, and importer. PPMLHDFE stands for Poisson Pseudo Maximum Likelihood High Dimensional Fixed Effects and includes country-specific time trends, country-pair fixed effects, and year fixed effects without including the "zero" observations. PPMLHDFE w/0 includes all observations (including zeros).

4. The Broken Relationship between Imports and Labor Markets: A Bartik Analysis

- **Overview of the Bartik Approach**

Canonical trade models predict that increased trade increases factor income and alters the wage bill. However, recent empirical evidence suggests that labor markets are not as flexible as most models assume them to be, implying that adjustment to changes in trade volumes can be very slow (Autor, Dorn & Hanson, 2013; Dix-Carneiro & Kovak, 2014). Furthermore, since the effects of trade are typically heterogeneous across sectors, individuals and regions are differentially exposed to sector-specific shocks, giving rise to distributional concerns.

In the previous section we analyzed how trade agreements impact trade flows from Egypt to the rest of the world. Liberalization policies do seem to have a positive effect on exports but negligible on imports. Yet, labor market outcomes have worsened. To estimate the relationship between labor markets and trade, we follow a common methodological framework to specific local conditions and employ a geography-based Bartik (1991) approach to quantify exogenous export demand shocks from the US and EU countries for Egyptian imports.

Bartik models exploit the spatial variation in sectoral-composition assuming that changes in sector-specific foreign demand is different across regions. In other words, regions more exposed to trade for a particular sector and with major employment for the same sector will be more affected from a trade shock particular to the sector. Differences in trade exposure of regions to this shock serves as an identification tool. For the trade exposure to be regionally identifiable, some barriers or rigidities in the labor market should exist. Sluggish or segmented regional labor markets are a fundamental principal of the approach (Raymond et al, 2020).

Figures 8 and 9 provide evidence of the concentrated trade exposure and segmented labor markets. Using the Enterprise Census (EC) from 2017 and the Labor Force Survey (LFS) from the same year, we show in Figure 8 that regions with a higher number of exporting firms (Panel A) are also the regions with major employment concentration (Panel B). Although the EC does not allow us to track importing firms, exporting firms heavily rely on imported raw materials and inputs for domestic production and exports. Around 75% of imported goods are raw materials, intermediate goods, and fuel necessary for both production and exports. Thus, we argue it is a good proxy for importing firms (Zaki et al., 2018).

Similarly, in Figure 9, we observe that informality rates, mean real wages, and female labor force participation are highly distinct between regions at the beginning and end of our study period (2009-2017). In fact, although all indicators have increased, most of the regional differences persist after eight years. For example, the four regions with the highest informality rates, FLFP, and mean wages in 2009 remain the top four in 2017. The same pattern is maintained for the four regions with the lowest labor market indicators. Barriers to labor mobility seem to be stringent. The structure of occupations in Egypt could be a potential explanation since it is skewed

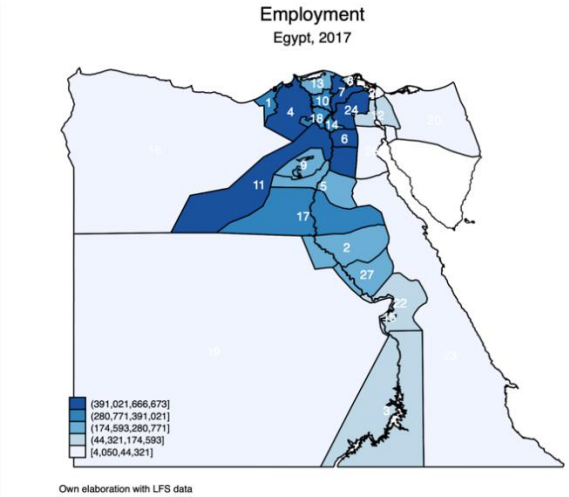
towards manual and physical jobs in the private sector (World Bank, 2021) with low regional mobility.

In fact, there is regional specialization across industries. Figure 10 shows how the distribution of employment across industries differs greatly. In some regions (Menia, Behira, Beni-suef, and Kafr-el-sheik), more than 40% of all workers are in the agriculture, forestry, and fishing sector. While in regions with more workers in the manufacturing industry (Giza, Damietta, Suez, Cairo), agriculture does not play a big role in employment, and services have become more relevant. Even though the national manufacturing employment share is close to 10%, some regions have an employment share of more than double the national estimate (Kalyoubia, Damietta, Alexandria, Suez). Importantly, those regions also happen to be some of the regions that concentrate most exporting firms, including Cairo, Giza, and Port Said, with a manufacturing employment share close to 20%. In other words, if trade increases and there is a direct impact on the manufacturing industry, for example, at least the regions mentioned above should experience a shock in their labor market outcomes since they specialize in the manufacturing industry.

Granted the regional disparities in Egypt for trade and employment and the conditions for regional variation to be identifiable, we proceed to compute the impact of the change in imports on labor markets. Observing changes in labor outcomes and demand for imports simultaneously, however, poses a potential endogeneity concern in which we cannot identify a proper direction of causality. Thus, we take a similar approach to Artuc et al. (2019) and Robertson et al. (2020; 2021) and propose a two-stage econometric analysis using an exogenous variation source. First, we use third countries' export supply as an exogenous source of variation for fluctuations in Egyptian imports.

Figure 8 – Employment is concentrated in the regions with a major number of firms connected to international trade.

Panel A



Panel B

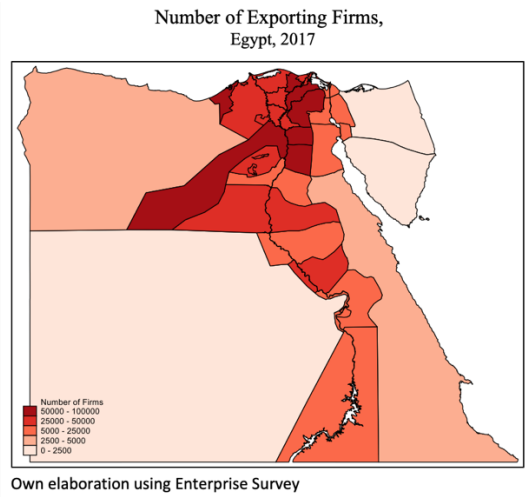
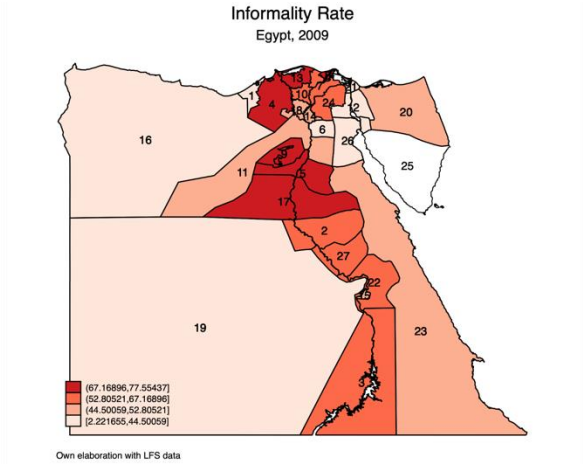
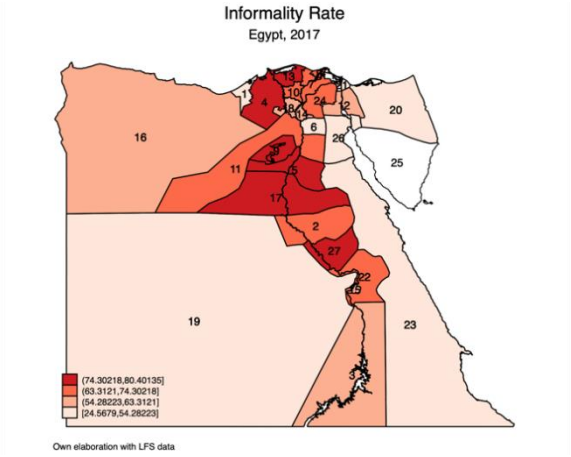


Figure 9 – Labor market outcomes show high geographical variation both at the beginning and end of our study period (2009-2017).

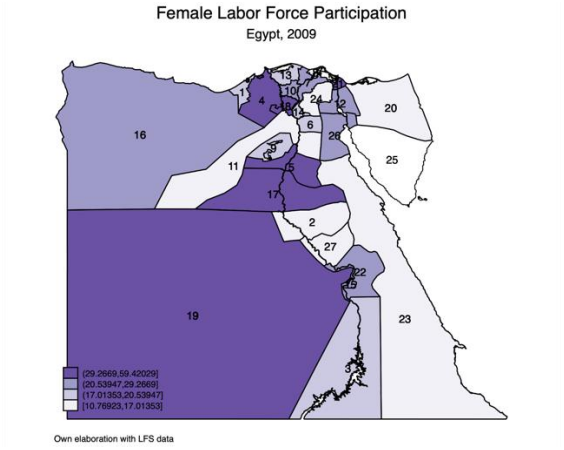
Panel A: Informality rate, beginning of the period of study (2009)



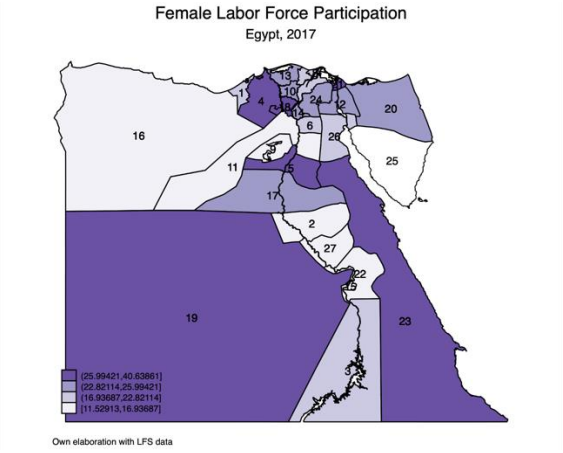
Panel B: Informality rate, end of the period of study (2017)



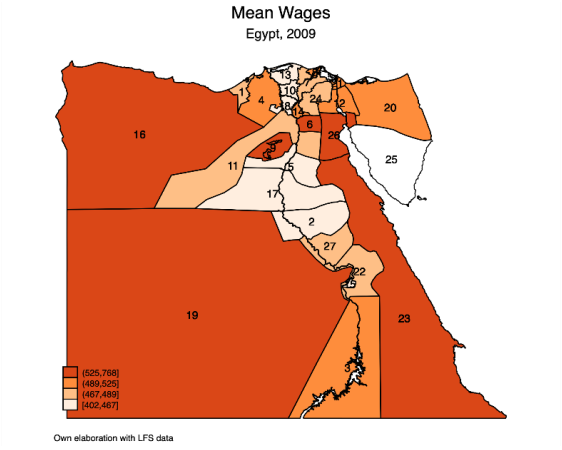
Panel C: Female Labor Force Participation Rate (FLFPR), beginning of the period of study (2009)



Panel D: Female Labor Force Participation Rate (FLFPR), end of the period of study (2017)



Panel E: Mean real wages in Egyptian pounds, beginning of the period of study (2009)



Panel F: Mean real wages in Egyptian pounds, end of the period of study (2017)

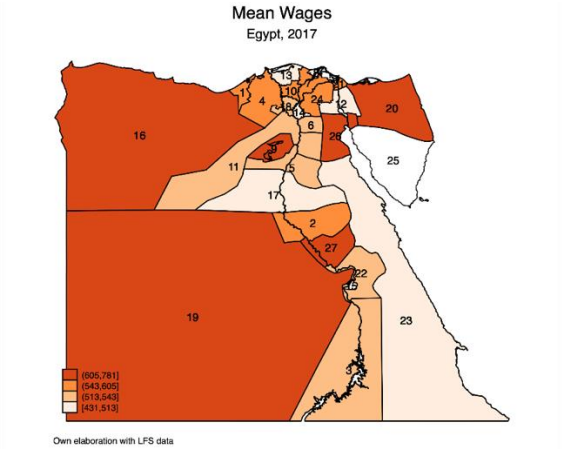
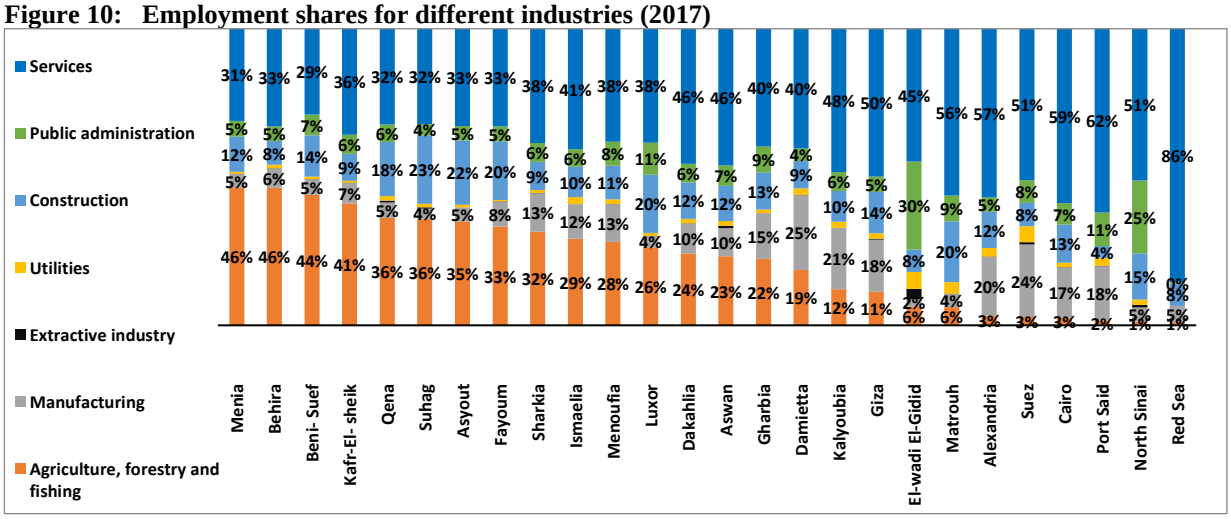


Figure 10: Employment shares for different industries (2017)



First stage: Egypt has had a historical trade deficit, with imports accounting for almost 30% of its GDP by 2017 and has a highly concentrated import basket in terms of trading partners. Imports originated in the US and European Union (EU) country members account for 40.13% of the total Egyptian imports (WITS, 2022). Thus, in the first stage, we estimate the contribution of the US and EU export supply to the increase in Egyptian imports. We argue that US and EU's GDP growth is unlikely to affect Egyptian local labor markets, except through trade, and Egypt's local labor markets are unlikely to affect US and EU's GDP growth, thus ensuring the true exogeneity of our instrument. Due to the lack of enough time series data to check for differences in trends, and moreover that the differences in the construction of the trade exposure index takes away any differences in those trends, we construct our instrument using time-series regressions of Egypt's imports from the US and EU on the US and EU GDP by industry at the four-digit level from 1991 to 2018 annually. Predicted values from these regressions would serve as a proxy for Egypt's imports from the US and EU, explained exclusively by the latter's gross domestic product growth. This variable is, by construction, orthogonal to every Egyptian local market condition.

Given the lack of data on international trade at the sub-district level in Egypt, we compute a measure for sub-district predicted imports based on the sub-district employment concentration in each importing industry. Thus, each kizm and markaz level (sub-district) in Egypt constitutes an observation in our regressions. We call this new variable our "trade exposure index". The change in the industry i imports of Egypt from the US and EU countries (or exports from the US and EU to Egypt) between time t and t + n can be expressed as $Q_{t+n}^{i} - Q_{t}^{i}$. Then the change in imports per worker for industry i is equal to$\{(Q\}_{t+n}^{i} - Q_{t}^{i})/(\sum_{r}\{L_{t}^{i,r}\})\}$. Thus, we can calculate the effective change in imports to the US and EU weighted by the labor shares for each region r as:

$$x_{t,t+n}^{r} = \sum_{i} \frac{L_{t}^{i,r}(Q_{t+n}^{i} - Q_{t}^{i})}{(\sum_{j} L_{t}^{j,r})(\sum_{d} L_{t}^{i,d})}$$

Where *d* is destination country and *j* are other industries (i.e. *j ≠ i).* Alternatively, we can express the exposure formula as in Autor et al. (2013):

$$x_{t,t+n}^{r} = \sum_{i} \frac{L_{t}^{i,r}(Q_{t+n}^{i} - Q_{t}^{i})}{L_{t}^{r} L_{t}^{i,Egypt}}$$

where L_{t}^{r} is the total number of workers assigned to any industry in district r and $L_{t}^{i,Egypt}$ is the total size of industry i. The trade exposure variable $x_{t,t+n}^{r}$ can be interpreted as the change in exports per worker in district r measured in real US dollars.

Second stage: We estimate how an increase in imports per worker in Egypt affects local labor market outcomes, such as average wages, FLFP and informality rates. We consider the following simple linear regression model:

$$y_{t+n}^{d,s} - y_{t}^{d,s} = \beta_{0,s} + \beta_{1,s} x_{t,t+n}^{d} + X_{c}\beta_{c,s} + \epsilon_{d,s} \qquad (1)$$

Were $y_{t+n}^{d} - y_{t}^{d}$ is the change in outcomes (average wage,[7] informality, FLFPR) for district *d* and type of worker *s*; $x_{t,t+n}^{d}$ is our main independent variable which stands for the trade exposure index (change in imports weighted by sectoral employment) computed in the first stage; X_{c} are control variables; $\beta_{0,s}$ the intercept and $\epsilon_{d,s}$ the error term. The regressions are run at the kizm and markaz (sub-district) level. The size of the sample corresponds to the 259 subdistricts that Egypt has. We can run these estimates for different types of workers by restricting the sample to types of workers: male, female, rural, urban, skilled, unskilled, young, and old. The interpretation of the regression is simple, and it tells us how much of the change in $y_{t}^{d,s}$ between years t and t + n can be attributed to the change in imports per worker driven by the exogenous supply of the

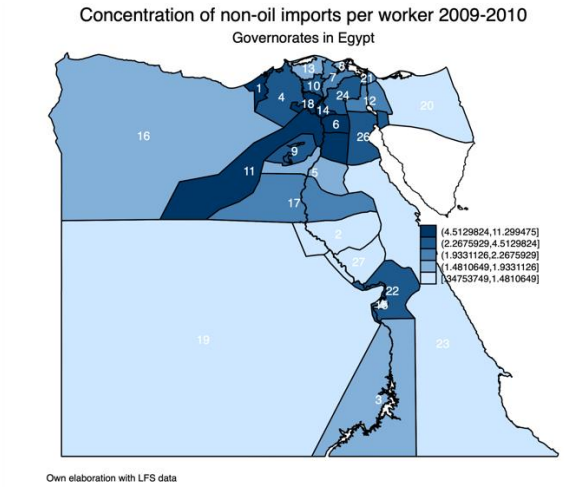
[7] For wages, we estimate the percent change in annual average wages for easier interpretation purposes. The dependent variable is transformed in the following way: $(y_{t+n}^{d} - y_{t}^{d})/y_{t}^{d}$.

United States and EU. We define four periods according to the LFS data available: 2009 to 2010, 2009 to 2012, 2009 to 2015, and 2009 to 2017.

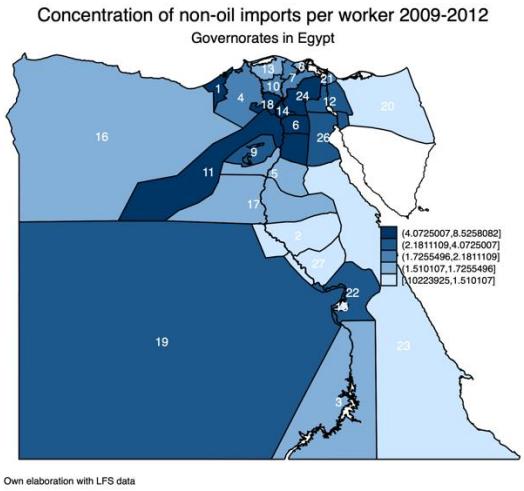
Figure 11 plots trade openness, defined as imports (excluding petroleum oil) per worker, for 26 governorates in Egypt. It shows significant spatial differences among the governorates, which can stem from intranational trade costs and regional comparative advantages. The biggest concentration of imports per worker is in Luxor, Cairo, Alexandria, Port Said, and Dakahlia. At the same time, New Valley (also called El-Wadi El-Gidid) has experienced a considerable increase in its share in recent years.

Figure 11 – Concentration of non-oil imports per worker, different periods.

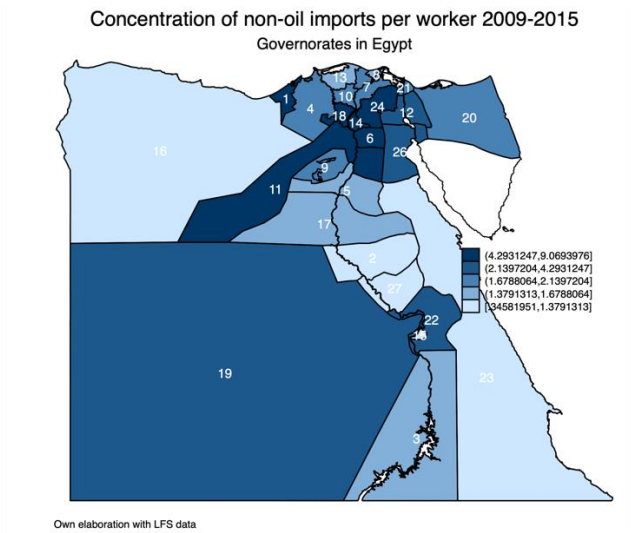
Panel A: Concentration of non-oil imports per worker 2009-2010



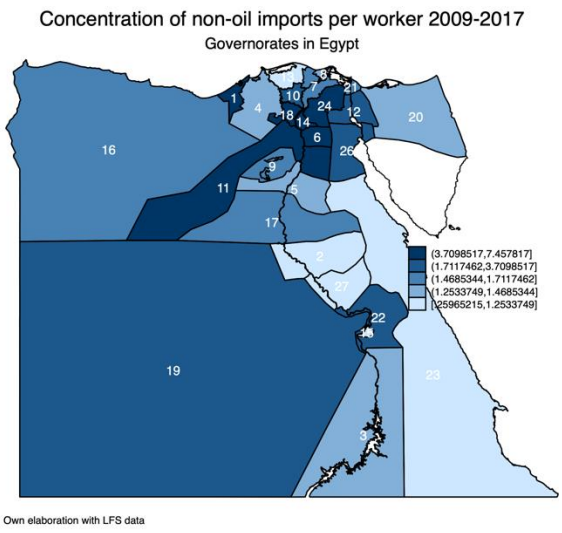
Panel B: Concentration of non-oil imports per worker 2009-2012



Panel C: Concentration of non-oil imports per worker 2009-2015



Panel D: Concentration of non-oil imports per worker 2009-2017



- **Bartik Results: Localized Effects of Trade**

The shift-share approach (Bartik,1991) allows us to analyze the effect of exogenous changes to imports on local labor market outcomes. This methodology is particularly useful if a policymaker is concerned about large divergences in effects across regions, as it measures the relative effect of the policy change for a particular region –and type of worker– rather than the aggregate effect.

The financial crisis of 2008 meant a deacceleration of worldwide trade, and Egypt was no exception. Although in 2009 Egypt's imports decreased in size as a percentage of its total GDP, all years after –except for 2010– show an increase in imports with respect to 2009. Thus, we chose 2009 as our baseline year to account for the impacts of positive changes in imports in labor markets. The results, shown graphically in Figure 11 and in Tables 2-4, show that sub-districts more exposed to trade experienced a small decrease in wages, FLFP and an increase in informality in the short term.

How did an increase in imports affect wages in Egypt? There is not a clear relationship between average real wages and more exposure to trade. Kizm and markaz that are more exposed to trade experience a marginal decrease or increase in average real wages relative to less exposed sub-districts in the short run, but this outcome is not statistically insignificant for most periods of time (Table 2). Only between 2009 and 2012, a $100 increase in imports per worker leads to a statistically significant decline in average wages by 0.001 percent point. This negative impact in average wages is observed economy-wide but is statistically significant only for male and urban workers.

Similar to the literature finding bigger deleterious effects in labor-intensive industries, the negative impact on wages for the manufacturing sector (0.002 percentage point) –although not

significant– is double the size than the effect for the entire economy, and close to zero for workers in the services industries. Interestingly, we do not find an important effect on low-skill workers, the main type of worker in labor-intensive industries.

Despite rising wages for women in Egypt –until recently–imports seem to negatively impact them, and statistical significance increases as years pass. In previous studies, Artuç, Lee, and Bastos (2019) and Robertson et al. (2020) found that better-off groups –older and highly skilled– had the largest wage gains from trade. We do not find evidence of the latter in the case of Egypt.

***How did an increase in imports affect the informality rate in Egypt*?** Egypt's informal rates have been relatively stubborn, with an upward trend since 2009. Consistent with this, we do not find any improvement in informality rates after a trade shock in the EU and US export supply. On the contrary, between 2009 and 2012, there was a small and statistically significant positive effect on the informality rate of all workers – which then completely dissipated in magnitude and significance (Table 3).

The positive effect seems to be guided by young workers, as they are the only group that experiences a positive, statistically significant impact in the same period. The latter is possibly related to Egypt's historically high youth unemployment rate, above 25% or 30% for some years between 2009 and 207 (World Bank 2022). A $100 increase in imports from 2009 to 2010 is related to an increase of 0.001 percentage point in the informality rate for workers between 15 and 35 years old (Table 3). However, the effect dissipates in the long term. Although coefficients are not statistically significant for high-skilled workers, they are the only group of workers that show a negative relationship between their informality rates and increasing imports.

How did an increase in imports affect Egypt's FLFP rate? The evolution of FLFP in Egypt is not encouraging. It has not surpassed the 24 percent threshold for the past two decades. Moreover, imports do not seem to be helping more women enter the labor market. In fact, similar to the literature that finds adverse effects on female labor participation, Kizm and markaz that are more exposed to trade saw a negative effect on their FLFPR after a $100 increase in imports per worker (Table 4). Further, our results suggest that women older than 35 years old are the most affected. In the long run, the negative effects seem to grow in magnitude but decline in statistical significance.

5. Discussion of Results: A Weak Relationship between Trade and Labor Markets

Egypt’s liberalization policy seems to have marginal effects on the volume of imports and not encouraging effects on the local labor markets when analyzing imports’ effects. Gravity model estimates suggest that the average increase in trade from signing new trade agreements is 5.8%, much less than the literature has found. Specifically for imports, we do not find a statistically significant effect of signing an additional RTA, plausibly due to the historically long trade deficit and the Egyptian trend to import most of its intermediate goods for production. A trade liberalization agenda could potentially increase Egyptian exports, however.

In other words, new RTAs are not flooding the Egyptian market with new imports that could be competing with domestic production. Imports seem to have a weak connection with wages, informality, and female labor force participation. In the case of wages, the correlation we find is harmful to the manufacturing workers and, depending on the specification, for female workers. The correlation between informality and increasing imports is positive for manufacturing workers, at least in the short term. For women's labor participation, estimates are less robust.

Two plausible factors limiting trade's effects on Egyptian labor markets are the size of top importing industries and their capital-intensive nature. On the one hand –and as previously mentioned in Figures 3 and 4–goods from top importing industries are not the same top employer industries in Egypt. Thus, it is possible that we do not observe stark negative effects on labor markets due to the small size of the potential domestic production that would be substituted from increasing imports. In fact, most imported goods in Egypt are not produced domestically anyway, only 15% of imported goods are also exported when analyzing HS codes at the 6-digit level from UN Comtrade's database.

On the other hand, most papers studying the imports-labor market outcomes relationship that find adverse effects of increasing imports focus on labor-intensive and manufacturing industries (Feliciano, 2001; Autor, Dorn, and Hanson, 2013). All major imported goods in Egypt are capital intensive, particularly from the machinery, chemical, and mineral –mainly petroleum– industries. Even if imports were substituting for domestic production, since imported goods are not labor-intensive, the impact on local labor markets would be low. Further, the total share of employment in the manufacturing industry is close to 10%, suggesting that changes in the local labor market outcomes do not necessarily rely on the latter industry.

Although estimating productivity gains is out of the scope of this study, it is possible that capital-intensive imported goods could be increasing the productivity of labor for Egyptian firms. For example, some of the main imported goods from each top industry: computers, telephones, medicaments, and pesticides, all could increase the marginal productivity of labor. Moreover, the positive effects of capital-intensive imports on labor markets could also compete with the adverse effects commonly found in the literature after liberalization efforts increase imports.

Another plausible hindering factor is that trade theory predicts that competing imports are most disruptive when countries trade with low-wage countries (Krugman, 2000). Following the Stolper-Samuelson theorem, trade with unskilled labor-abundant countries would reduce the relative price of unskilled labor-intensive goods in the receiving country and thus would lower wages for more minor educated workers. However, Egyptian imports mostly come from OECD countries which have higher wages. In 2009, Egyptian imports from the OECD accounted for 58.26% of total imports, and the US and EU alone accounted 40.13% (WITS, 2022). Other important trade partners such as Russia, Saudi Arabia, Japan, Brazil, and South Korea –accounting for 17.36% of total imports- have higher real wages, and only Turkey (4.92%) or China (9%) have similar or comparatively lower wages (ILO, 2021). Trade partners' shares did not change dramatically in the following years.

We have also previously argued there are wide geographical disparities in wages, informality and FLFPR, and sluggish labor market mobility between regions. Thus, volatile coefficients are not a result of the Bartik model failing to identify trade's effect on local labor markets. There could also be some competing effects from labor market reforms at odds with trade impacts (Feliciano, 2001). For example, a 2003 labor law that brought more protection to workers may have helped existing jobs in formal firms to transition into better employment within the formal sector. Still, it may also have suppressed the creation of formal work for women and the general population (Langot and Yassin 2018). Moreover, in the last decades, most middle-skilled private sector jobs were in the construction and transportation sectors, usually not a formal employment source (World Bank, 2021).

Finally, as exogenous shocks seem not to be the cause of Egypt's poor labor market outcomes, it could be domestic factors that explain them. Egyptian firms' structure could be one explanation. In Morocco, Currie and Harrison (1997) found that non-exporting firms with excess profits absorb the adverse shocks of trade liberalization by reducing their profit margins and increasing productivity without affecting employment. In Egypt, small firms and non-exporting firms are the biggest employers in Egypt, often offer lower wages, and are informal (Assaad et al., 2019). Suppose that firms behave similarly to Morocco, then increasing trade could have negligible effects on employment but increase informality, which is what we observe in Egypt.

Currie and Harrison (1997) also found that public sector enterprises in Morocco increased employment to absorb the shock but reduced wages. Egypt has the world's biggest State-Owned Enterprises (SOEs) in strategic sectors. SOEs play an important role in Egypt's economy. By 2018 they represented around 16 percent of the economy in terms of production, 25 percent of capital investment, and 6 percent of employment (IMF, 2021). Although private firms' productivity is on average almost 400% higher than SOEs, SOEs have preferential treatment in taxes or customs. If trade agreements affect SOEs primarily, and they decide to operate with overcapacity as a result, adjustments in the labor market might not be tangible. This is a line for further research.

6. Conclusions

Many studies have shown that rising trade reduced poverty and spurred economic growth in several developing countries. Following suit, at the beginning of the century, Egypt undertook bold economic reforms and signed several free-trade agreements that accelerated its imports and exports. Yet, the sought benefits do not seem to have arrived. Instead, its labor market continued to be rife with challenges, including high informality rates and low female labor participation. With concern, the discussion centered on whether imports were driving the downward trend in labor outcomes as in other developing nations. In this paper, we study if the latter is true. To do so, we take a two-pronged approach and extend the existing literature on the distributional impacts of trade. Our empirical strategy consists of a Gravity model and a Bartik model. We use the first to understand how trade agreements changed trade flows to Egypt. And we use the geography-based model to analyze the impacts of trade on local labor markets.

Results suggest Egypt's liberalization policy seems to have tangible effects on the volume of exports –but not imports– and small effects in the local labor markets when analyzing trade's distributional impacts on labor markets. Gravity model estimates suggest that the average increase in trade from signing new trade agreements is 4.2% for imports and 45% for exports. That is, liberalization can potentially increase Egyptian exports to the rest of the world but does not suggest that signing new RTAs pose a threat to local markets from rapidly growing imports.

We then turn to the Bartik model expecting to resolve whether trade explains Egypt's stubborn labor market outcomes. Empirical evidence provided in this paper indicates that trade does not connect to domestic local labor markets in the same way it does in other countries as found in most of the literature explaining the negative effects of imports in developing countries. In fact, we do not find sufficient evidence of import-labor market linkages that could indicate globalization –in the form of import competition– is entirely driving the poor labor market outcomes in Egypt.

Results do not suggest that rising imports –in the form of intermediate goods– stimulate industrial production for domestic or foreign consumption, or at least not labor-intensive industries, to the point that labor market outcomes can reflect the changes. Despite being more open to trade, trade-intensive industries in Egypt have not increased their share of employment in the total workforce. In the period studied, the manufacturing industry grew less than one percentage point. Within that growth, the biggest winners were the apparel, furniture, and food production industries, but all have employment shares less than 3% of the national workforce. Although those industries are also known for having low entry barriers for less educated people, informality rates are higher, and wages are below average national estimates (Robertson et al. 2021), aggregate levels at the national or local labor markets could be too small to be detectable.

There is also no conclusive evidence of domestic production being substituted with imports since employment shares of most traded industries have remained stable or marginally increased. Using an alternative instrument to account for imports thar could be substituting for industrial production, we do not get robust results. We argue that most imports are also capital intensive and come from developed countries with higher average salaries on average. Thus, labor-intensive, and low-skilled workers are not negatively impacted by competing imports that could substitute for domestic production. Egypt's case serves as an example of a country where an increase in imports does not generate big disruptions in local labor markets as in other developing countries following liberalization strategies.

Mean real wages also had an upward trend until recently, suggesting a possible tight labor market with strong labor demand. However, it is possible that the institutional framework and firm structure might hinder the welfare-enhancing potential of more trade. For example, under Egyptian law, SOEs may not be deprived of any benefits or be burdened with any charges that may put them at a competitive disadvantage concerning joint-stock companies. The latter creates uncertainty for a stagnant and undercapitalized private sector resulting in Egyptian firms not growing as much as firms in peer economies (World Bank, 2021).

Future research on two fronts is needed to gain more insight into the relationship between greater trade and local labor market outcomes in Egypt. First, a theoretical and empirical framework to identify firm-level and short-run industry-specific effects separately. Second a disaggregated imports analysis with the right data that distinguishes between intermediate imports and imports of final goods. Additionally, future versions of this study might be able to conduct a similar analysis using data that classifies final goods, intermediate goods and raw materials based on international trade HS codes.

Table 2. Percent change in the average annual real wages after a US$100 increase in imports per worker (Egyptian pounds of 2010)

Type of worker		2009-2010 (1)	2009-2012 (2)	2009-2015 (3)	2009-2017 (4)
All	Coefficient	0.008	-0.001*	0.003	-0.001
	t-statistic	(0.24)	(-1.95)	(0.20)	(-1.04)
	N	249	250	248	246
Manufacturing	Coefficient	-0.000	-0.002	0.001	-0.002
	t-statistic	(-0.24)	(-1.46)	(0.85)	(-0.52)
	N	121	119	114	110
Services	Coefficient	0.014	-0.000*	0.017	-0.002
	t-statistic	(0.10)	(-1.69)	(0.05)	(-1.00)
	N	248	250	248	246
Males	Coefficient	0.004	-0.001**	0.001	-0.001
	t-statistic	(0.45)	(-2.09)	(0.45)	(-0.70)
	N	249	250	248	246
Females	Coefficient	-0.002	-0.000	-0.001	-0.001**
	t-statistic	(-0.61)	(-0.89)	(-0.97)	(-2.57)
	N	202	201	204	205
Low Skill	Coefficient	0.003	-0.000	0.000	-0.001
	t-statistic	(0.41)	(-0.39)	(0.04)	(-0.79)
	N	245	247	245	242
High Skill	Coefficient	-0.001	-0.000	-0.001	-0.000
	t-statistic	(-0.36)	(-1.01)	(-0.54)	(-1.07)
	N	233	236	232	231
Young	Coefficient	0.026	-0.001	0.046	0.000
	t-statistic	(0.05)	(-1.64)	(0.02)	(0.37)
	N	247	246	245	244
Old	Coefficient	0.005	-0.001	0.002	-0.002
	t-statistic	(0.35)	(-1.60)	(0.32)	(-0.75)
	N	248	250	248	246
Rural	Coefficient	-0.021	0.006	-0.095	-0.003
	t-statistic	(-0.79)	(0.09)	(-0.15)	(-0.38)
	N	148	149	147	146
Urban	Coefficient	0.004	-0.001**	0.003	-0.001
	t-statistic	(0.27)	(-2.15)	(0.20)	(-1.15)
	N	156	156	160	149

Table 3. Change in the informality rate after a US$100 increase in imports per worker

Type of worker		2009-2010	2009-2012	2009-2015	2009-2017
		(1)	(2)	(4)	(5)
All	Coefficient	-0.003	0.000***	-0.006	-0.000
	t-statistic	(-0.18)	(2.74)	(-0.17)	(-0.60)
	N	249	250	248	246
Manufacturing	Coefficient	-0.000	0.001	-0.001	-0.006
	t-statistic	(-0.21)	(1.41)	(-1.10)	(-0.26)
	N	151	150	155	138
Services	Coefficient	-0.000	0.000	-0.034	-0.000
	t-statistic	(-0.02)	(0.53)	(-0.02)	(-0.54)
	N	249	250	248	246
Males	Coefficient	0.000	0.000	-0.002	-0.001
	t-statistic	(0.20)	(0.27)	(-0.49)	(-0.55)
	N	249	250	248	246
Females	Coefficient	0.001	0.000	0.001	0.000
	t-statistic	(1.21)	(1.39)	(1.44)	(0.11)
	N	229	226	226	224
Low Skill	Coefficient	-0.001	0.000	-0.002	-0.000
	t-statistic	(-0.22)	(0.44)	(-0.40)	(-0.36)
	N	245	247	245	242
High Skill	Coefficient	-0.001	-0.000	-0.000	-0.000
	t-statistic	(-0.52)	(-0.53)	(-0.89)	(-1.34)
	N	239	241	239	238
Young	Coefficient	-0.606	0.001**	0.070	-0.000
	t-statistic	(-0.00)	(2.02)	(0.03)	(-0.20)
	N	249	250	248	246
Old	Coefficient	-0.001	0.000	-0.002	-0.001
	t-statistic	(-0.19)	(0.87)	(-0.27)	(-0.59)
	N	249	250	248	246

Table 4. Change in the FLFP rate after a US$100 increase in imports per worker

Type of worker		2009-2010 (1)	2009-2012 (2)	2009-2015 (3)	2009-2017 (5)
All	Coefficient	0.00173	-0.00039**	-0.02863	-0.00030
	t-statistic	(0.38)	(-2.06)	(-0.04)	(-0.43)
	N	249	250	251	246
Low skill	Coefficient	0.00055	-0.00012	0.00816	-0.00014
	t-statistic	(0.44)	(-1.35)	(0.14)	(-0.37)
	N	247	248	248	244
High skill	Coefficient	-0.00484	-0.00010	-0.00099	-0.00001
	t-statistic	(-0.42)	(-0.51)	(-0.56)	(-0.04)
	N	244	245	246	242
Young	Coefficient	0.00049	-0.00012	-0.01108	0.00028
	t-statistic	(0.28)	(-0.51)	(-0.08)	(0.94)
	N	249	250	251	246
Old	Coefficient	0.00259	-0.00059***	0.33254	-0.00096
	t-statistic	(0.41)	(-6.13)	(0.00)	(-0.63)
	N	247	248	249	245
Rural	Coefficient	-0.00547	0.00598	-0.02224	0.00036
	t-statistic	(-0.30)	(0.22)	(-0.11)	(0.11)
	N	148	149	145	146
Urban	Coefficient	0.00124	-0.00028**	-0.02681	-0.00021
	t-statistic	(0.37)	(-2.37)	(-0.03)	(-0.44)
	N	156	156	156	149

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