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DISCUSSION PAPER SERIES

IZA DP No. 16547

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ABSTRACT

Re-Assessing the Impacts of Exports on Local Labour Market Outcomes: A Supply Chain Perspective. Evidence from Egypt[1]

This paper examines the overall impact of exports while accounting for supply chain linkages on local labor market outcomes in Egypt between 2007 and 2018. We assess the effects not only on directly exporting industries but also on industries indirectly affected by rising export demand. Furthermore, we examine potential impacts on specific worker groups, such as high-skilled individuals and female workers. The results show that trade does not lead to the same connection with domestic labor markets in Egypt as observed in other countries, as highlighted in the existing literature explaining the adverse effects of imports on developing countries. Despite being more open to trade, trade-intensive industries in Egypt have not experienced a significant increase in their share of employment within the overall workforce.

JEL Classification: F13, F14, F15, F16, J23, J31, O15, O19

Keywords: trade policy, trade flows, labor market outcomes, firm dynamics

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1. Introduction

The past two decades have witnessed a growing integration of developing countries into global trade and global value chains (GVCs), sparking interest among policymakers and researchers in understanding the labor market consequences of this global integration. Consequently, a substantial body of literature has emerged, examining the relationship between trade and local labor market outcomes (Topalova, 2010, and others1). However, the findings of these studies vary significantly across countries, underscoring the need for country-specific investigations.

This study aims to assess the relationship between Egyptian exports and labor market outcomes, contributing to a broader understanding of trade and labor markets. Egypt, as a prominent country in the Middle East North Africa (MENA) region, offers a valuable opportunity for analysis due to several factors. Firstly, the MENA region experiences greater economic volatility compared to industrialized nations, as evidenced by fluctuations in aggregate output, private consumption, and investment (World Bank, 2012). Moreover, many MENA countries heavily rely on a limited range of commodities, leading to significant fluctuations in relative prices. Additionally, security concerns in the region, affecting not only the tourism industry but also foreign investment and labor markets, add to the complexity of the economic landscape.

Additionally, despite the challenging environment, Egypt has actively pursued trade promotion by entering into various trade agreements. In the early 2000s, Egypt established free trade agreements (FTAs) with the European Union (EU), the Agadir Agreement (including Turkey, Jordan, Morocco, and Tunisia), and the European Free Trade Association (EFTA) countries comprising Iceland, Liechtenstein, Norway, and Switzerland. Furthermore, since becoming a member of the World Trade Organization (WTO) in 1995, Egypt has joined 11 preferential or regional trade agreements (RTAs)2. These agreements have resulted in a significant increase in export volume, providing an excellent context for assessing the impacts of trade on labor market outcomes.

Lastly, despite recent economic reforms, Egypt's labor market faces several challenges, including slow private-sector employment growth, a rise in informal employment, and increasing wage inequality. Notably, there is a persistent regional disparity in employment growth and job quality between Upper and Lower Egypt, as highlighted by the latest Labor Force Survey (LFS). Furthermore, labor-intensive manufacturing sectors such as garments and furniture have experienced declining employment shares, while low-end non-traded services such as construction, storage, and communication have witnessed growth

Although existing literature in Egypt has extensively documented the direct effects of rising trade integration on labor and welfare outcomes, there are remaining gaps in estimating indirect impacts. For instance, Zaki (2011) demonstrates the positive effects of exports on aggregate employment and individual-level employment outcomes, specifically male wages and female labor force participation. Using multiple rounds of the Egyptian Labor Market Panel Survey (ELMPS), Salem and Zaki (2019) examine the impact of trade reforms on informal and irregular workers in Egypt, revealing a positive association between tariffs and both informal and irregular employment. They argue that tariff increases force less productive informal firms to exit the industry, leading to increased demand for formal workers in the international market. Consequently, this shift favours formal (and eventually regular) employment, resulting in a likely decline in informal (and irregular) employment. Analysing the effects on real wages and

job stability, Giovenneti et al. (2021) find that higher tariff protection worsens labor market conditions, lowering real wages and reducing the probability of finding stable employment. Notably, tariff changes exhibit significant asymmetries, with a negative and significant correlation between tariff increases and real wages, while the positive impact of tariff reductions proves negligible and insignificant.

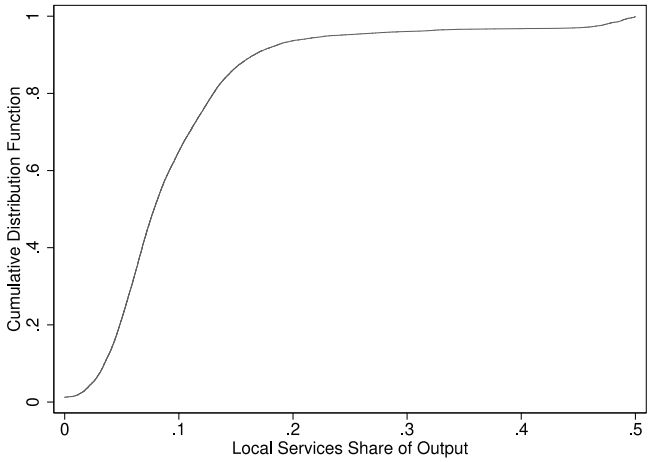
In this study, we extend the existing literature on Egypt by examining the total impact of exports, account for supply chain linkages, which the previous research has abstracted from. We estimate the impacts not only on directly exporting industries but also account for industries that are indirectly affected by rising export demand.

A key motivation for this question relies on the fact that as economies undergo structural transformation, the share of domestic services in total output tends to increase. Initially, this may suggest that a larger portion of employment remains unaffected by trade, given the larger non-tradable component of services sector. However, even non-tradable services can be indirectly influenced by trade if they serve as inputs to tradable sectors. On average, domestic services account for 10% of non-service sector output. Approximately 50% of non-service sector-country clusters exhibit a local services use share greater than 8%, with some clusters reaching as high as 20%, as shown in Figure 1 below.

The results of this paper reveal no significant impact of total export exposure accounting for input-output linkages on local labour markets in Egypt between 2007 and 2012, and 2012 and 2018. These results are in line with the findings of Robertson, Vergara et al. (2021) who do a similar analysis but without accounting for export-induced demand in calculation of total exposure.

Our paper is structured as follows: Section 2 discusses the literature and contribution of this paper. Section 3 describes the measurement of key variables and construction of databases. This section also provides a snapshot of the performance of labor market indicators and extent of export exposure during the study period in Egypt. Section 6 discusses results, and Section 5 concludes the paper.

Figure 1: Domestic Service Sector Share in Total Output of Domestic Non-Service Sector, 2014
(Cumulative Distribution Function)



Source: World Bank staff calculation with World Input Output Database data.

2. Literature and Contribution

Over the past decade, a significant body of literature has emerged to examine the effects of trade integration on labor markets. Notably, Autor, Dorn, and Hanson (2013) made a seminal contribution by employing a Bartik (1991) approach to estimate the causal impact of the "China Shock" on employment and wages at the community zone level in the United States. Their findings reveal that employment is the primary margin of adjustment to the China Shock, accounting for approximately 25 percent of the decline in US employment. These results prompted further exploration into the effects of trade shocks on labor markets, leading to subsequent studies by Pierre and Schott (2016), Acemoglu et al. (2016), Autor et al. (2014), Dix-Carneiro and Kovak (2017), Kovak (2013), Topalova (2010), and others. Collect this literature has expanded to assess the impacts of various trade shocks on local labor market outcomes in both developed and developing economies (Pierre and Schott, 2016; Acemoglu et al., 2016; Autor et al., 2014; Dix-Carneiro and Kovak, 2017; Kovak, 2013; Topalova, 2010, and others). The key finding of this literature is that trade shocks within a country can have substantial and persistent impacts on local labor markets, giving rise to distributional concerns (Engel et al., 2020).

It is crucial to note that trade affects not only tradable sectors but also non-tradable sectors within the same local labor markets. While increased import competition or market access directly impact specific tradable sectors, there are indirect effects on non-tradable sectors such as retail, healthcare, or hospitality in the same region. For instance, Autor et al. (2013) find that wages in non-tradable sectors in areas most exposed to Chinese imports decreased, while preliminary evidence by Wang et al. (2017) suggests that these sectors experienced employment expansion. Dauth et al. (2014) also report wage gains in the services sector of export-oriented regions in Germany, and Menezes-Filho and Muendler (2011) show that the services sector and the less trade-exposed informal sector absorbed initially displaced workers after Brazil's trade liberalization.

A recent and growing body of literature has emerged to address these indirect effects of import shocks on local labor markets by incorporating input-output linkages in production. For example, Wang, Wei, Yu, and Zhu (2018) estimate the direct and indirect impacts of the "China Shock" on local employment and wages in the United States, considering upstream and downstream channels. Their findings indicate a positive overall impact on employment, in contrast to the direct effect captured by Autor, Dorn, and Hanson (2013). Goutam (2018) also examines the changes in induced demand resulting from trade through supply chain linkages and finds an even more pronounced impact on labor force participation. Furthermore, Acemoglu et al. (2016) demonstrate that inter-industry linkages amplify the employment effects of trade shocks, doubling the size of the impact within manufacturing and producing a similarly substantial employment effect outside of manufacturing. This emerging literature emphasizes the importance of indirect impacts from trade shocks but has yet to address the effects of export shocks, particularly in developing countries.

Few studies have exclusively focused on the impact of trade on service jobs. For example, Eliasson, Hansson, and Lindvert (2012) utilize data from Sweden in the mid-1900s and find that increased competition from low-wage countries abroad has a considerable impact on the creation of skilled jobs and the displacement of less skilled jobs in the tradable sector. In a

more comparable setting, Mitra (2011) investigates a similar question based on India but only identifies negligible results regarding the direct and indirect effects of exports and imports on employment. These findings hold true for both formal and informal services.

This study extends this scant literature by studying the impact of export expansion on local labor market outcomes using a supply chain perspective, in a low-middle income country such as Egypt. To the best of our knowledge, there is only one study in the literature that directly does so by Goutam et al. (2018) who look at the impact of export-induced demand, mapped through input-output linkages, in Bangladesh on four types of employment: formal, casual, unpaid, and self-employment. They find a larger impact of trade when accounting for spillover or indirect effects. We differ from this work by focusing on not just employment but a range of labour market outcomes.

It is important to highlight that this work is an extension of Robertson, Vergara, Kokas and Acevedo (2021) who use the Bartik (1991) estimates to analyse if higher exports generate better local labor market outcomes in Egypt between 2009 and 2017. Their results suggest that that trade does impact labor market outcomes in the short run, but the effects quickly dissipate throughout the country and remain statistically insignificant for most types of workers. In this paper, we use the same methodological framework but now accounting for indirect effects through supply chain linkages.

3. Database and Measurement

The aim of the paper is to assess the total impact of export expansion on local labor market outcomes in Egypt accounting for supply chain linkages, exploiting variation in export expansion across kizms and markaz, between 2007 and 2018. To this effect, we combine export data from UNCOMTRADE data, input-output coefficient matrix, and information on local labour market outcomes using databases and techniques described below.

Labour Force Data and Descriptive Statistics

Our main source of labour market data is the labour force survey (LFS) provided by Economic Research Forum, and available for years between 2007 and 2018, and implemented every 1-2 years. The LFS surveys are detailed individual level surveys and collect information in a host of areas including key labour market characteristics, household characteristics, and individual demographic characteristics with units of analysis as individuals. For the purpose of this paper, we use the LFS for the years 2007, 2012, and 2018.

Our analysis includes the following labour force variables: real wages, informality status and female labour force participation. Over the period 2007 and 2018, several changes were introduced in the Egyptian LFS together with updates in concepts and definitions used which are standardized to make key labour market outcomes, administrative geographies as well as industry classifications comparable over time.

Table 1 in annex provides an overview of main labour force variables' summary during the study periods. The data reveals a notable rise of 8.2 percentage points in informal employment within Egypt from 2007 and 2018, reaching a substantial 59 percent in 2018. While variables

like real wages and female labour force participation demonstrated positive growth from 2007 to 2012, they experienced a decline by 2018.

Measurement and Construction of Export Exposure using Input-Output Linkages

Any changes in the foreign export demand for products of particular sector will have dual effects. First, it will lead to a direct increase in demand for output in that sector. Secondly, it indirectly affects the upstream sectors that supply inputs to the directly impacted sector. Not accounting for these linkages will lead to an underestimation of the export exposure at the district level, as some districts may not have concentration of industries directly exporting but still be supplying to exporting sectors. The literature represents this chain of responses using Leontief inverse of an input-output production matrix for an economy, which clearly track the use of intermediate inputs by each sector (Goutam et al. 2017; Acemoglu et al. 2016; Acemoglu et al. 2012).

To explore potential effects of exports through domestic inputs, we employ the 2008 Egypt Input-Output table to calculate the input shares of each industry. These shares are determined by dividing the input usage by the gross output (which includes the value added in the own sector with own sector inputs). The resulting shares are then multiplied by the exports of the final sector and aggregated over the input industry to obtain the total value of exports for each input sector (representing the cumulative effect of servicing multiple exporting sectors). In this sense, non-traded sectors that are assigned a value zero for exports will also have an implied value and will be used to estimate the *total export exposure index* at the district level using the following index.

The *total export exposure* (accounting for supply chain linkages) is measured as the growth in exports in industry i between time periods, *t* and *t+1* captured by the term $W_{t+1}^{i} - W_{t}^{i}$. This change is allocated to each district in Egypt by dividing this expression with L_t^a which is employment in areas (kizm and markaz) in Egypt in the initial period. This index is further weighted by share of area *a* in total employment in Egypt in industry *i* ($\frac{L_t^{i,a}}{L_t^a}$).

$$x_{t,t+1}^{a} = \sum \frac{\mathrm{L_t^{i,a}(W_{t+1}^{i} - W_t^{i})}}{\mathrm{L_t^{a} L_t^{i,egypt}}}$$

To construct the total exposure index at the district level in Egypt, we utilize several databases. Initially, we gather data on export value from the UNCOMTRADE database. In order to account for the demand generated in other sectors as a result of exports and calculate the overall exposure index, we incorporate the 2008 input-output (I-O) tables from Global Trade Analysis Project (GTAP).

We begin by computing the input-output coefficients from the GTAP I-O tables which capture the interdependencies between sectors in an economy. We match these coefficients with trade data from the United Nations Commodity Trade Statistics database (UNCOMTRADE) to compute the total export value for each sector, accounting for indirect changes in export

demand through input-output linkages. Annex 2 of the study provides a detailed explanation of how these coefficients are computed and merged with UNCOMTRADE data.

The next step is to link these total export data with labor force surveys. To this effect, we utilize concordance tables available online which provide mappings between International Standard classification (ISIC) rev 3.1. codes and HS codes. By leveraging this concordance, we merge the microdata on labor force variables at the industry and area level in Egypt with total export data. Once the integrated labour and trade data is prepared, we are able to calculate the total trade exposure index based on districts, as previously explained. However, it is worth mentioning that all workers below the age of 15 from the sample were excluded from the analysis to ensure the accuracy and integrity of the findings.

4. Methodology

The goal of the current empirical strategy is to understand the impact of rising export expansion on real wages, informality and female labor force participating, exploiting the cross-regional exposure to total exports in Egypt between 2007 and 2018.[2] To this effect, we consider the following simple linear regression model:

$$y^{a}_{t,t+1} = \beta_0 + \beta_1 x^{a}_{t,t+1} + \beta_2 \mathbf{K'}^{a}_{t} + \epsilon_a$$

$y^{a}_{t,t+1}$ is the dependent variable, $\beta_0$is the intercept, β_1 is the coefficient of our trade exposure variable, and β_2 is the coefficient for the set control variables $\mathbf{K'}$. $x^{a}_{t,t+1}$ is our main independent variable, which stands for the area level total export exposure index, as defined in the previous section. We include time *t* levels of the dependent variable to control for possible trends that are not related to the export shock. The size of the sample equals the number of areas (kizms and markaz) in Egypt.

A relevant issue we need to address is the potential endogeneity in the export exposure covariate. Since we observe changes in labor outcomes and exports simultaneously, we cannot identify which one is driving the other. To ensure truly exogeneity of our export exposure, we need a variable that predicts exports from Egypt based solely on its trading partners internal demand growth, rather than supply-side determinants. Hence, we construct our instrument using time-series regressions of Egypt exports to its trading partners on the trading partner's GDP by industry at the four-digit level as follows:

$$\Delta Z_{a,t+h} \equiv \sum_{s} \frac{L_{r,i,t}}{L_{i,t}} \cdot \sum_{j} \frac{Q_{j,i,t}}{Q_{i,t}} \cdot \Delta Y_{j,t+h}$$

[2] The starting point for the analysis is the idea that the impact of a trade shock is differentiated across regions, depending on each district industry composition. A fundamental principle for this approach is the existence of segmented labor markets. Existing labor mobility barriers or rigidities (such as commuting costs or lack of transport infrastructure) allows us to observe variations in local labor market outcomes and, as a result, to estimate the effects of differentiated exposure to trade.

here, $\frac{Q_{j,s,t}}{Q_{s,t}}$ denotes country *j*'s share of industry i' exports; $\Delta Y_{j,t+h}$ is the change in real GDP in destination country *j*.

Predicted values or exports from these regressions would serve as a proxy for Egypt's exports to its trading partners explained exclusively by the latter's domestic aggregate demand.

These predicted exports will be combined with I-O coefficients to generate total exports accounting for supply chain linkages. Subsequently, these total exports will be used to generate the export exposure at the area level in Egypt.

Then, estimation will take the form of two-stage least squares, with the first stage being:

$$\Delta X_{a,t+h} = \tilde{\alpha} + \tilde{\beta}\Delta Z_{a,t+h} + \mathbf{K'}_t^a\tilde{\boldsymbol{\delta}} + \tilde{\varepsilon}_{a,t+h}$$

and the second stage:

$$y_{t,t+1}^a = \beta_0 + \beta_1\Delta\hat{X}_{t,t+1}^a + \beta_2\mathbf{K'}_t^a + \epsilon_a$$

where $\Delta\hat{X}_{t,t+1}^a$ are the predicted values of the first stage regression.

5. Results

To assess the impact of total export shocks on area-level wages, informality, and female labor force participation rates in Egypt, we divide the analysis into two distinct periods: 2007-2012 and 2012-2018. The IV estimates of total export exposure on local labor market outcomes, presented in Tables 2b in annex 3, reveal that areas (markaz and kizm) that are more exposed to total exposure per worker do not exhibit any significant effects on key labor force variables such as real wages, female labor force participation, and informality.

These findings align with previous studies conducted by Robertson, Vergara et al. (2021) and Berg & Vergara (2023). The former study discovers that export exposure, when not accounting for input-output linkages, remains statistically insignificant for most worker categories, thus reinforcing the broken link hypothesis posited by an earlier paper. The latter study finds that, in the short run, subdistricts experiencing higher export exposure observe a decline in average real wages, but this effect diminishes over time. Regarding informality and female labor force participation rates, no significant impact is observed in either the short or long term.

6. Conclusion

Numerous studies have demonstrated the positive effects of increased trade on poverty reduction and economic growth in various developing nations. In line with this trend, Egypt initiated significant economic reforms and entered into multiple free-trade agreements at the turn of the century, which accelerated its imports and exports. However, the anticipated benefits have not materialized. Instead, Egypt's labor market continues to face significant challenges, such as high rates of informality and low female labor participation. Our findings suggest that Egypt's increased exports do not lead to the improved local labor markets observed in other low- and middle-income countries like Bangladesh, China, India, and Vietnam (Erten and Leight 2021; McCaig 2011; Topalova 2010).

It would be incorrect to conclude that "trade doesn't work" based solely on the lack of labor market response. The situation is more complex. The sluggish response of Egypt's labor market following trade liberalization can be attributed to the fact that its export market constitutes a relatively small share of its overall economy. Microanalysis conducted at the firm level demonstrates a positive employment response to export expansion. However, the scale of this response is insufficient to generate a noticeable impact at the macro level.

To harness the benefits of trade, Egypt must undertake deeper reforms aimed at significantly expanding the export sector, particularly in labour-intensive industries, and integrating further into global value chains (GVCs). It is crucial to enhance the business environment by reducing barriers to investment, particularly foreign direct investment. The private sector should be made more appealing in terms of wages and job security compared to the public sector. Additionally, the costs associated with formalization for firms need to be reduced.

This study examines the overall impact of exports while accounting for supply chain linkages. We assess the effects not only on directly exporting industries but also on industries indirectly affected by rising export demand. Furthermore, we examine potential impacts on specific worker groups, such as high-skilled individuals and female workers.

The empirical evidence presented in this paper indicates that trade does not establish the same connection with domestic labor markets in Egypt as observed in other countries, as highlighted in the existing literature explaining the adverse effects of imports on developing nations. Despite being more open to trade, trade-intensive industries in Egypt have not experienced a significant increase in their share of employment within the overall workforce.

Annex 1

Table 1: Summary Statistics, 2007-2018

Labour force variables	2007		2012		2018	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Real wages (USD)	6761.54	(1947.82)	7595.56	(1836.70)	6930.54	(955.01)
Informality rate	50.59	(19.03)	51.47	(18.48)	58.82	(15.71)
Female labour force participation	19.70	(10.37)	21.71	(11.85)	14.61	(7.27)

Annex 2

Data Construction

GTAP Sector codes have a correspondence table with the Central Product Classification (CPC) rev. 1.0 for agricultural products and with International Standard Industrial Classification of All Economic Activities (ISIC) rev. 3.0 for manufacturing and services sector.

The first step is to map CPC codes onto ISIC rev. 3 codes. We used the concordance available from the UN's ECOSOC Statistical Division to map CPC Codes onto ISIC 2-digit Chapters codes. Whenever the map was one-to-one, we reported the corresponding ISIC 2-digit Chapter codes. If there are multiple matches, then we extract the most common ISIC 2-digit Chapter codes among matches.

We then aggregate results at the GTAP Sector code. The result will be a table, indexed by GTAP Sector code, that lists at least one ISIC 2-digit Chapter code for each GTAP Sector code. Some GTAP sectors will be indexed to more than one ISIC 2-digit Chapter codes.

Mathematically, this table is represented by a collection of sets. Let $\mathcal{G}$ be the set of GTAP sector codes and $\mathcal{I}$ be the set of ISIC 2-digit Chapter codes. Then we can define the following sets:

$\mathcal{I}(g) \equiv \{i \in \mathcal{I}: i \text{ maps to } g \in \mathcal{G}\}$ and $\mathcal{I}^{-1}(g) \equiv \{g \in \mathcal{G}: i \in \mathcal{I} \text{ maps to } g\}$

The first set denotes every ISIC code that maps to a specified GTAP sector. The second set is the inverse image of that function: it lists every GTAP sector that a specified ISIC code maps to.

Note that in general ISIC 2-digit chapters codes will be a **coarser** classification than GTAP sectors. While some ISIC chapters map to multiple GTAP sectors, in general the oppose will be true. We show the relationship between these groups in the table below.

Use share coefficients

For GTAP sectors $g \in \mathcal{G}$ we have available the following key data the (a) total sales by industry g: $p_g y_g$; and (b) total expenditures in domestic intermediates from sector g' for use in sector g: $p_{g'} i_{g',g}$. Whenever there is a single GTAP sector the maps to multiple ISIC sector, we make an adjustment by dividing expenditures proportionately by the number of sectors we are splitting the GTAP sector into. The object of interest for our study are the total expenditures in domestic intermediates from ISIC sector *l'* for use in ISIC sector *l* as a share of total sales in ISIC sector *l*:

$$\gamma_{\{l',l\}} \equiv \frac{p_{l'} i_{l',l}}{p_l y_l}$$

If the GTAP sectors g mapped uniquely to a unique labor sector codes l, it would be trivial to construct these domestic intermediate use shares. However, since there are cases in which this is not the case, we sum across every g that maps for a particular l. Formally:

$$\gamma_{\{l',l\}} \equiv \frac{\sum_{\{g' \in \mathcal{I}^{-1}(l')\}} \sum_{\{g \in \mathcal{I}^{-1}(l)\}} p_{g'} i_{g',g}}{\sum_{\{g \in \mathcal{I}^{-1}(l)\}} p_g y_g}$$

In some cases, the same GTAP sector g can map to two ISIC sectors. In that case, for the formula above to hold, we need to make an additional assumption that intermediate expenditures as sales are proportionally distributed across ISIC sectors. We will also run consistency checks below to show that the sum of domestic use shares is always below one.

ISIC Chapter Description	ISIC Chapter Code	GTAP Sectors
Crop and animal production, hunting and related service activities	1	['fsh', 'pdr', 'wht', 'gro', 'v_f', 'osd', 'c_b', 'pfb', 'ocr', 'ctl', 'oap', 'rmk', 'wol', 'frs'],
Forestry and logging	2	['frs'],
Fishing, aquaculture and service activities incidental to fishing	5	['fsh'],
Mining of coal and lignite; extraction of peat	10	['coa'],
Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying	11	['oil', 'gas'],
Mining of uranium and thorium ores	12	['omn'],
Mining of metal ores	13	['omn'],
Other mining and quarrying	14	['omn'],
Manufacture of food products and beverages	15	['pdr', 'cmt', 'omt', 'vol', 'mil', 'pcr', 'sgr', 'ofd', 'b_t'],
Manufacture of tobacco products	16	['b_t'],
Manufacture of textiles	17	['tex'],
Manufacture of wearing apparel; dressing and dyeing of fur	18	['wap'],
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	19	['lea'],
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	20	['lum'],
Manufacture of paper and paper products	21	['ppp'],
Publishing, printing and reproduction of recorded media	22	['ppp'],

Manufacture of coke, refined petroleum products and nuclear fuel	23	['p_c'],
Manufacture of chemicals and chemical products	24	['tex', 'crp'],
Manufacture of rubber and plastics products	25	['crp'],
Manufacture of other non-metallic mineral products	26	['nmm'],
Manufacture of basic metals	27	['i_s', 'nfm'],
Manufacture of fabricated metal products, except machinery and equipment	28	['fmp'],
Manufacture of machinery and equipment n.e.c.	29	['ome'],
Manufacture of office, accounting and computing machinery	30	['ele'],
Manufacture of electrical machinery and apparatus n.e.c.	31	['ome'],
Manufacture of radio, television and communication equipment and apparatus	32	['ele'],
Manufacture of medical, precision and optical instruments, watches and clocks	33	['ome'],
Manufacture of motor vehicles, trailers and semi-trailers	34	['mvh'],
Manufacture of other transport equipment	35	['otn'],
Manufacture of furniture; manufacturing n.e.c.	36	['omf'],
Recycling	37	['omf'],
Electricity, gas, steam and hot water supply	40	['ely', 'gdt'],
Collection, purification and distribution of water	41	['wtr'],
Construction	45	['cns'],
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	['trd'],
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	['trd'],
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	['trd'],
Hotels and restaurants	55	['trd'],
Land transport; transport via pipelines	60	['otp'],

Water transport	61	['wtp'],
Air transport	62	['atp'],
Supporting and auxiliary transport activities; activities of travel agencies	63	['otp'],
Post and telecommunications	64	['cmn'],
Financial intermediation, except insurance and pension funding	65	['ofi'],
Insurance and pension funding, except compulsory social security	66	['isr'],
Activities auxiliary to financial intermediation	67	['ofi'],
Real estate activities	70	['obs'],
Renting of machinery and equipment without operator and of personal and household goods	71	['obs'],
Computer and related activities	72	['obs'],
Research and development	73	['obs'],
Other business activities	74	['obs'],
Public administration and defence; compulsory social security	75	['osg'],
Education	80	['osg'],
Health and social work	85	['osg'],
Sewage and refuse disposal, sanitation and similar activities	90	['osg'],
Activities of membership organizations n.e.c.	91	['osg'],
Recreational, cultural and sporting activities	92	['ros'],
Other service activities	93	['ros'],
Activities of private households as employers of domestic staff	95	['ros'],
Extraterritorial organizations and bodies	99	['osg']

Annex 3

Table 2a: OLS estimates: Impact of Total Exposure on local labor outcomes

Variables		2007-2012	2012-2018
Real Wages	Total Exposure	-9.2	-9.1
	Std.Errors	(24.3)	(31.8)
	N	248	255
Log of real wages	Total Exposure	-0.0	-0.0
	Std.Errors	(0.0)	(0.0)
	N	248	255
Informality rate	Total Exposure	-0.0	0.0*

	Std.Errors	(0.0)	(0.0)
	N	248	255
FLFP rate	Total Exposure	0.0***	-0.0
	Std.Errors	(0.0)	(0.0)
	N	248	255

Standard errors in parenthesis
*p<0.1 p**<0.05 p**<0.01

Table 2b: IV estimates: Impact of Total Exposure on local labor outcomes

Variables		2007-2012	2012-2018
Real Wages	Coefficient	-257.7	81.5
	Std.Errors	(189.4)	(77.5)
	N	248	255
	Underidentification F	4.872	16.744
	Underidentification p-value	0.027	0.000
	Weak identification Wald F	4.965	16.594
log of real wages	Direct Exposure	-0.0	0.0
	Std.Errors	(0.0)	(0.0)
	N	248	255
	Underidentification F	4.920	15.554
	Underidentification p-value	0.027	0.000
	Weak identification Wald F	5.055	14.706
Informality rate	Direct Exposure	0.0	-0.0
	Std.Errors	(0.0)	(0.0)
	N	248	255
	Underidentification F	4.606	11.085
	Underidentification p-value	0.032	0.001
	Weak identification Wald F	4.882	18.691
FLFP rate	Direct Exposure	0.0	-0.0
	Std.Errors	(0.0)	(0.0)
	N	248	255
	Underidentification F	5.243	14.978
	Underidentification p-value	0.022	0.000
	Weak identification Wald F	5.411	15.796

Note: This regression is estimated using 2SLS regression techniques. The table reports estimate of second stage. Standard errors in parenthesis *p<0.1 p**<0.05 p**<0.01