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# Local Economic Development Through Export-Led Growth: The Chilean Case

Andrés César y Guillermo Falcone

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# Local Economic Development Through Export-Led Growth: The Chilean Case * †

Andrés César
CEDLAS-UNLP

Guillermo Falcone
CEDLAS-UNLP

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**Abstract**

We study the causal impact of export growth on Chilean local economic development during 2000–2006 by exploiting spatial and temporal variations in local exposure stemming from the interaction of past differences in industry specialization across local labor markets and the evolution of tariffs cuts and exports across industries. We find that growing exports implied a significant reduction in labor informality and labor income gains in more exposed local markets, driven by job creation and wage growth in the formal sector. These effects concentrate on senior skilled workers. Exposed locations also exhibit a greater relative decline in the poverty rate.

*JEL Classification:* F14, F16, J23, J31, O17, Q02, R12, R23.

*Keywords:* Export Growth, Tariff Cuts, Local Labor Markets, Employment, Informality, Wages, Poverty, Chile.

*To contact the authors: César: andresmcesar@gmail.com; Falcone: guillermofalcone@gmail.com

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# I Introduction

Classic trade models underline the differential impacts of trade on employment and wages across sectors, occupations and skill groups (Heckscher-Ohlin, Ricardo-Viner). A recent and booming literature emphasizes the spatial dimension by documenting substantial differences in the effects of trade on individuals living in geographic locations with different patterns of industrial specialization.[1] Following these advances, we study the causal effect of export growth on local economic development in an small and open economy such as Chile.

We exploit spatial and time variations in local exposure arising from past differences in industry specialization across geographic locations and the evolution of export growth (and tariffs cuts) across industries. We focus on typical outcomes such as employment, labor informality, wages, and the poverty rate. Our findings allow us to conclude that in the Chilean case export growth have promoted local economic development through the creation of better paid formal jobs.

Figure 1 depicts the unconditional correlation between the change in poverty rate (FGT0) and the change in exports between 2000 and 2006 at the level of Chilean local labor markets (LLMs). First, we note that the vast majority of LLMs exhibit both a growth in exports and a strong decline in poverty. Second, it shows that locations more exposed to export growth exhibit a greater relative decline in poverty.[2] Throughout the paper we will demonstrate that this relationship is causal and we will investigate the mechanisms behind this finding.

The empirical strategy is very close to the shift-share design proposed by Bartik (1991).[3] For identification we exploit two sources of variation: (i) Export growth (and tariff cuts) vary over time and across industries; and (ii) Chilean LLMs exhibit different patterns of industry specialization. These patterns are constructed using 1992 census data, a date prior to the period under study (2000-2006). To address the possible endogeneity of export growth, we use the average industry tariff cut across destination countries as an instrument for exports, assuming that tariffs' changes are not driven by the actions of Chilean firms and workers. The exogeneity of LLM's employment industrial composition assumes that unobserved industry shocks do not affect regional outcomes through the same combination of exposure shares. We perform a pre-trend analysis to validate this assumption and conduct a robustness exercise applying the econometric framework developed by Borusyak, Hull, and Jaravel (2021). Under this framework, identification follows from the quasi-random assignment of shocks, exposure shares are allowed to be

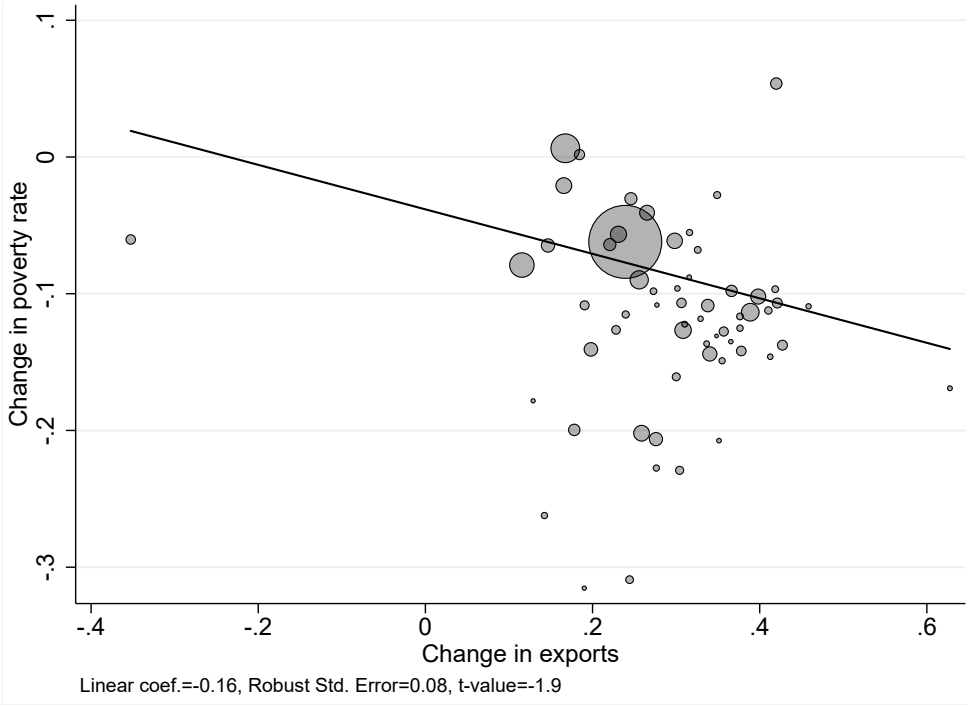
[1] Topalova (2010), Kovak (2013), Autor, Dorn, and Hanson (2013), Dauth, Suedekum, and Findeisen (2014), Costa, Garred, and Pessoa (2016), Dix-Carneiro and Kovak (2017), Caliendo, Dvorkin, and Parro (2019), among many others.

[2] The relation also holds if we use the local change in export tariffs cuts instead of the change in exports. See Figure A1 in the appendix.

[3] This method has also been applied by many recent papers (e.g. Topalova (2010), Kovak (2013), Autor et al. (2013), Costa et al. (2016), Dix-Carneiro and Kovak (2017; 2019)).

endogenous and standard errors can be clustered at the industry-level. Our estimates deliver relative effects across geographic units but cannot account for the aggregate effects of growing exports, which depend on spillovers across industries in different locations and other general equilibrium effects operating through changes in input and output prices, firms' productivity and aggregate demand multiplier effects.[4]

Figure 1
Export growth and poverty decline




*Notes.* Observations = 60 local labor markets (LLMs). The change in exports across LLMs (horizontal axis) measured as the interaction of local industry employment shares in 1992 and the evolution of (log) exports across industries between 2000 and 2006. The change in poverty rate across LLMs (vertical axis) between 2000 and 2006 calculated using a poverty line of USD 5.5 per day per person. Fitted line weighted by LLM's share of Chile's population of working age in 1992 (bubble size). LLMs are defined by Casado-Díaz et al. (2017). Sources. 1992 Chilean census, CASEN, BACI.

The main data set comes from the Chilean national household survey (*Encuesta de Caracterización Socioeconómica Nacional-CASEN*) conducted by the Chile's Ministry of Planning (MIDEPLAN) every two or three years.[5] These data is complemented with the 1992 Chilean demographic census (*Censo Nacional de Población y de Vivienda*) sourced from the Chile's National Institute of Statistics (*Instituto Nacional de Estadística-INE*). To construct the measure of export growth and export tariff cuts at the industry-level we employ two datasets: the BACI database (*Centre d'Etudes Prospectives et d'Informations Internationales-CEPII*) and the United Nations Conference on Trade and Development (UNCTAD) Trade Analysis Information System (TRAINS).

The baseline estimation equation regresses each outcome variable (labor informality rates, employment, average wages, poverty rate) on exports exposure. We include LLM

[4]See for instance Acemoglu, Autor, Dorn, Hanson, and Price (2016) and Caliendo et al. (2019).
[5]The CASEN survey is national in scope and includes information on more than 300 municipalities (*comunas*) which are aggregated into 61 LLMs.

and region-year fixed effects so we are exploiting within-LLM variation over time in each region. The preferred specification accounts for several preexisting trends. Exports exposure is endogenous because industry shocks affecting the labor market might be correlated with shocks to exports supply. Therefore we instrument exports exposure with the average industry tariff cuts, again, assuming that tariff changes do not depend on the behavior of Chilean firms and workers. The results of first-stage regressions suggest that the instrument has a strong predictive power.

We find that locations with greater exposure to growing exports experienced a relative decline in labor informality and a rise in labor income, which were driven by job creation and wage gains in the formal sector of the economy. These gains concentrated in the group of senior (41 to 65 years old) skilled workers, i.e. those with at least one year of tertiary education completed; supporting the idea that these workers are most in demand by exporting firms. In this line, the two occupations with the greatest relative increase in employment were production managers and engineers and technicians. This last group, as well as machine operators, assemblers and clerical workers also exhibit relative wage gains. Exposed locations also experience a relative decline in poverty.

Our paper fits in the vast literature studying the effects of exports on domestic firms, workers, and markets. Exporters typically pay higher wages and hire more workers than non-exporters (Bernard and Jensen 1999; Bernard et al., 2007), while there is also an exporter skilled wage premium explained by quality provision and skill upgrading (Verhoogen, 2008; Brambilla et al., 2012), profit sharing and the provision of specialized skilled tasks (Matsuyama, 2007). Moreover, greater access to foreign markets encourages firms to simultaneously export and invest in raising productivity and product quality (Lileeva and Trefler, 2010; Atkin et al., 2017). At the spatial level, greater access to developed country markets reduced poverty, shifted labor away from agriculture and created formal jobs in Vietnam (McCaig, 2011; McCaig and Pavcnik, 2018). In China, counties more exposed to the reduction in tariff uncertainty post China's accession to the World Trade Organization in 2001 experienced growing exports and foreign direct investment, and higher total and per capita GDP (Erten and Leight, 2021). On the other hand, domestic tariff cuts that increased import competition slowed the pace of poverty reduction and wage growth in India and Brazil (Topalova, 2010; Dix-Carneiro and Kovak, 2017).

Our work is also related to recent papers studying the impact of both supply and demand shocks on local labor markets. Dauth et al. (2014, 2017) finds that German locations specialized in export-oriented industries have had employment gains that outweighed the employment losses of regions specialized in import-competing industries, concluding that in Germany globalization fostered manufacturing employment. Egger, Kaynak, and Zoller-Rydzek (2020) documents similar findings for Turkey. Costa et al. (2016) find that Brazilian microregions more exposed to import competition exhibit relative slower growth in manufacturing wages than less exposed areas, while locations

specialized in commodities have had relative wage gains and shifts towards formal employment. The closest paper is César, Falcone, and Gasparini (2021). The authors document that Chilean LLMs more exposed to Chinese import competition exhibit a relative rise in labor informality, especially among young and unskilled workers, and locations more exposed to growing demand for primary products experience employment gains for the young and reallocation from self-employment towards formal salaried jobs and relative wage gains among old-age workers. Although both papers study the effects of trade on Chilean local labor markets, the sources of exogenous variation in trade are completely different. While César et al. (2021) exploits the supply and demand shocks derived from the global expansion of China in international trade markets, our paper exploits a period of rapid trade liberalization characterized by a strong reduction in both Chilean import and export tariffs. Moreover, while China demands only primary products from Chile, we show that the decline in export tariffs allowed Chile to expand its exports in both primary and manufacturing industries. On the contrary, while the decline in import tariffs does not seem to have differentially affected imports across industries, the growing participation of China in Chilean imports was a major shock that led to significant effects on manufacturing firms, workers and local labor markets (César and Falcone, 2020). Indeed, César et al. (2021) show that the informal sector acts as a buffer that prevents a larger increase in unemployment in response to import competition, especially for unskilled workers. On the other side, our paper highlights that positive export shocks lead to a reduction in labor informality and welfare gains, mostly for skilled workers.

Our main contribution to this booming literature is to present solid empirical evidence supporting that growing exports enhance the creation of better jobs that reduce poverty and promote local economic development. Moreover, we document that there are heterogeneous effects of export growth across different sub-population groups and occupational categories, which substantially enriches our findings and discussions.

The remainder of the paper is structured as follows. In Section II, we delve into the empirical strategy, providing a comprehensive account of the data and summarizing trade and labor market statistics. Moving on to Section III, we present and analyze all empirical findings. Our conclusions are then summarized in Section IV, where we wrap up with final remarks. Supplementary figures and tables can be found in the Appendix.

# II Empirical strategy

## II.1 Approach and identification

Our empirical strategy exploits cross-local labor market variation in the evolution of exports exposure (and export tariffs cuts) arising from the interaction of past differences in local employment composition by industry and the temporal evolution of exports (and export tariffs cuts) across industries. Locations with a greater participation of workers

in largely exposed industries such as crop production, farming of animals or forestry and logging will be more exposed to export growth. The industrial composition of employment across LLMs is constructed using 1992 census data, some years before the period under study (2000-2006).

In order to study the effect of growing exports on Chilean LLMs we estimate the following regression equation:

$$Y_{lt} = \beta_0 + \beta_1 EE_{lt} + \alpha_l + \gamma_r \times \delta_t + Y_{l,2000} \times \delta_t + \varepsilon_{lt} \quad (1)$$

where $Y$ is an outcome of interest such as the log average wage of formal salaried workers and $l$ and $t$ index LLMs and time, respectively.

EE is a measure of exports exposure at the LLM-level, constructed as the interaction between the pre-shock pattern of industrial composition in each LLM, as given by the local industry employment share in 1992 ($w_{rj}^{1992}$), and the log value of exports at the industry-level:

$$EE_{lt} = \sum_j w_{lj}^{1992} Log(exports)_{jt} \quad (2)$$

Dependent variables ($Y_{lt}$) are labor market outcomes such as the labor informality rate, (log) number of formal salaried jobs, (log) number of informal salaried jobs, (log) number of self-employment jobs, (log) average monthly formal wage, (log) average monthly informal wage, (log) average monthly self-employment income, (log) average household per capita income, and poverty rate (FGT0). To study potential heterogeneous effects, we estimate separate regressions across sub-population groups according to skill and age. In all cases we include LLM ($\alpha_l$) and region-year ($\gamma_r \times \delta_t$) fixed effects and therefore exploit within LLM variation in exports exposure over time in each region. The preferred specification controls also for several preexisting trends: (i) Demographic variables: percentage of child under ages 0-17 in population, fractions of population under ages 18-35, 36-49, 50-65, and above 65, percentages of population with primary education-or below, secondary education, and tertiary education; (ii) Economic variables: local employment shares in the primary and manufacturing sectors, female labor force participation, and average household per capita income; (iii) Exposure to trade with China; (iv) Exposure to offshoring; and (v) Exposure to routine task content of jobs.

Our main estimates weight each observation by the 1992 LLM share of national labor force, which results in average treatment effects that are weighted by workers instead of LLMs (in line with Autor et al. (2013) and Costa et al. (2016)). We also exhibit and discuss the results of unweighted regressions in the section of robustness exercises (Table A8).

$EE_{lt}$ is potentially endogenous because industry shocks affecting local labor market

outcomes (e.g. shocks to input or output markets, technological progress, changes in preferences) are correlated with the supply of exports. To account for this endogeneity concern, we instrument exports exposure using a measure of local exposure to export tariffs cuts ($TariffCuts_{lt}$). Specifically:

$$TariffCuts_{lt}^{IV} = \sum_{j} w_{lj}^{1992} Tariff_{jt} \tag{3}$$

where $TariffCuts_{jt}$ is the average industry tariff cut across destination countries. Intuitively, this variable serve as an instrument for export growth if it is capable of capturing a demand-driven shock that allows Chile to increase its exports of different products within specific manufacturing and primary industries over time in response to declining export tariffs in destination countries. This variable is exogenous as it does not depend on the decisions of Chilean firms or workers. The identifying assumptions are that (i) tariff cuts are not driven by Chilean demand and supply industry shocks, (ii) LLMs with a higher initial share of labor allocated to industries with larger export growth are not differentially affected by other labor market shocks or trends; and (iii) export shocks do not affect labor mobility across LLMs in the short-run.

Assumption (i) is justified in the context of tariffs cuts being implemented by third countries (i.e. export partners) and the relatively small size of the Chilean economy. If industry lobby does have played a role in industry-specific tariff cuts, it may pose a threat to our identification strategy. For asumptions (ii) we conduct a pre-trend analysis. Assumption (iii) states that estimates may be biased if workers migrate across locations in response to export shocks.[6] Unfortunately, the CASEN surveys do not include questions related to migration status until 2009. To partially alleviate this concern we run regressions using total population and population of working age (both in logs) as dependent variables and we find that population does not shift across locations in response to changes in exports exposure.

## II.2 Data and descriptives

We combine four data sets: household surveys, a demographic census, trade data and tariffs data. The Chile's Ministry of Planning (MIDEPLAN) conducts the Chilean national household survey (*Encuesta de Caracterización Socioeconómica Nacional-CASEN*) every two or three years. Our main analysis exploits the 2000, 2003 and 2006 surveys. We do not include the following surveys (i.e. 2009 and 2012) because tariff changes in these years are not correlated with export growth across industries (see the discussion in the following section), which is required for the first-stage to work. We also incorporate the 1994 survey to conduct a pre-trend exercise. These surveys provide information on Chilean workers

[6]Previous evidence suggests that Chilean workers do not migrate in response to trade shocks (César, Falcone, and Gasparini (2021). Relatedly, Dix-Carneiro and Kovak (2017) finds that there is imperfect labor mobility across Brazilian microregions in the context of trade liberalization.

located in different LLMs throughout the country, including information on employment status, labor incomes, pension access, and municipality of residence (*comuna*), among other relevant variables.

We consider two definitions for labor informality. Following the international standard suggested by the International Labour Organization (ILO), our preferred definition is based on social security access: the share of salaried workers that have no right to receive a pension when retired, in the sense that they do not contribute to any pension fund. The second definition incorporates self-employed workers without a college degree to the group of informal workers, which allows us to consider a larger fraction of workers, not only salaried ones, and partially accounts for the potential mobility of (unskilled) workers between salaried and self-employment jobs.

We restrict the sample to individuals under ages 18 to 65. To identify local labor markets (LLMs) we follow the definition proposed by Casado-Díaz, Rowe, and Martínez-Bernabéu (2017).[7] We construct all the relevant variables at the LLM-level using population weights.

Importantly, we employ the 1992 Chilean demographic census (*Censo Nacional de Población y de Vivienda*) carried out by the Chile's National Institute of Statistics (*Instituto Nacional de Estadística-INE*). These data is used to calculate the pre-shock pattern of industry specialization in each local labor market, as measured by the local employment shares at the three-digit industry-level. This variable is interacted with the log of total exports and the (weighted) average tariff cut, both of which vary across industries and time.[8] It is worth noting that we count on census data that includes the complete sample of Chilean population, which minimizes potential measurement errors.

Data on exports by industry and year comes from the BACI data set preparated by the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Tariffs data was obtained from the United Nations Conference on Trade and Development (UNCTAD) Trade Analysis Information System (TRAINS). We calculate a weighted average industry tariff cut across destination countries.

***Trade variables***

Between 2000 and 2006 Chilean exports more than tripled, from 18.9 to 60.3 billion USD. The increase in exports was generalized across industries (Figure 2). Most industries in the primary (upper panel) and manufacturing sector (bottom panel) exhibit a strong increase in exports. The primary industries with the highest increase in exports between 2000 and 2006 are mining of non-ferrous metal ores and mining of iron ores (462% and

[7]The authors created a data set classifying 302 municipalities into 62 LLMs by means of an optimization algorithm based on evolutionary computation using commuting data from the Chilean Internal Migration Database (CHIM) and Censuses data for 1982, 1992 and 2002.

[8]To perform the matching between census and trade data we created a concordance table that assigns each three-digit industry reported in the 1992 Census to a single four-digit industry of the International Standard Industrial Classification (Rev. 4).

190%, respectively). In manufacturing, export growth was highest in radio, television and communication equipments (482%), coke and refined petroleoum products (345%) and basic metals (308%). However, Chilean exports exhibit a high degree of concentration, e.g. in 2006 more than 60 percent of exports concentrate in two single industries, manufacture of basic precious and non-ferrous metals (38.9 percent of total exports) and mining of non-ferrous metal ores (25.1 percent).[9] The period under study includes the first years of the commodity boom (e.g. between 2003 and 2006 the international price of copper doubled). Our results are robust to controlling for the participation of the mining sector in local employment, and also to excluding LLMs with the highest participation of mining. On the other side, imports more than doubled during these years, from 17.4 to 38.2 billion USD. Chilean imports are much more diversified than its exports. The industries with the higher import share in 2006 are extraction of crude petroleum and natural gas (15.5 percent), machinery and equipment (11.1 percent), chemicals (10.4 percent) and manufacture of motor vehicles (10.2 percent).[10]

Table 1 shows that the period under study characterizes by a strong trade liberalization, as there were large declines in both export and import tariffs. Export tariffs across industries decreased on average from 10.3 percent in 2000 to 5.7 percent in 2006, while import tariffs diminished on average from 14.5 percent to 9.7 percent during the same period, and there is a lot of variability across industries.

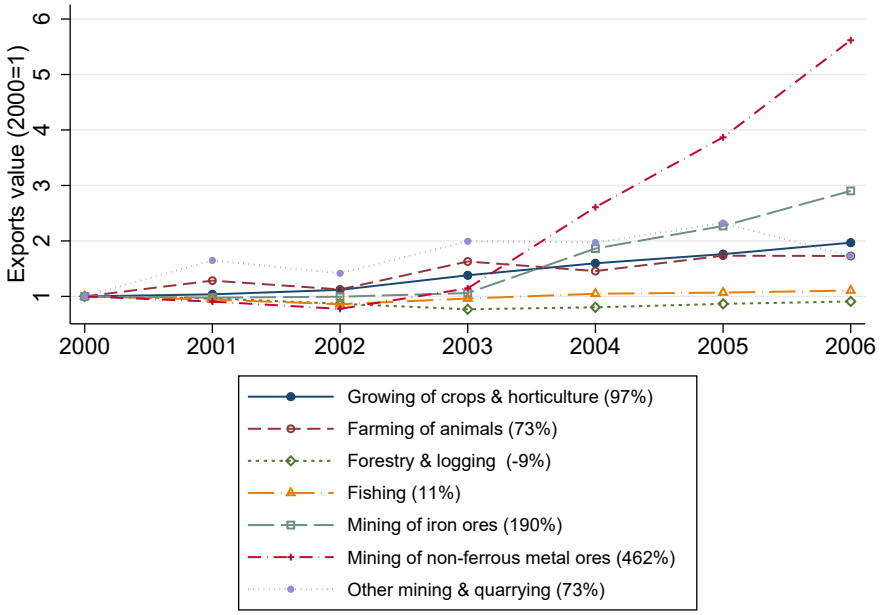
Are these changes in trade tariffs correlated with changes in trade flows? Figure 3 answers this question. The upper panel shows that most industries saw a decline in export tariffs between 0 a 10 p.p., and that industries with a larger reduction in tariffs exhibit a higher increase in exports. This correlation is key to our identification strategy. On the imports side, the lower panel shows that most industries exhibit a decline in import tariffs between 4 and 6 p.p., but these changes in tariffs are not correlated with changes in import flows across industries. This is the main reason why we focus most of our analysis on studying the causal effect of export growth only. However, we conduct a robustness exercise incorporating the import side to verify that our main findings are robust to this inclusion.

Figure 4 depicts the spatial distribution of the 2000-20006 change in exports exposure and tariffs cuts across Chilean LLMs. Darker colors correspond to LLMs that exhibit a higher value of $\overline{\Delta EE}$ and $\overline{\Delta Tariffs}$ and, therefore, are more exposed to these shocks. We separate LLMs' exposition using different percentiles of the $\overline{\Delta EE}$ and $\overline{\Delta Tariffs}$ distribution as thresholds (p5, p10, p25, p50, p75, p95). Both export growth and tariff cuts concentrate in LLMs located in the Central region such as Cabildo, Carahue, Rengo and Melipilla. The map highlights that regions more exposed to export growth are very similar to those more exposed to export tariffs cuts, i.e. the first-stage works in the expected direction. Indeed, the unconditional correlation between $\overline{\Delta EE}$ and $\overline{\Delta Tariffs}$

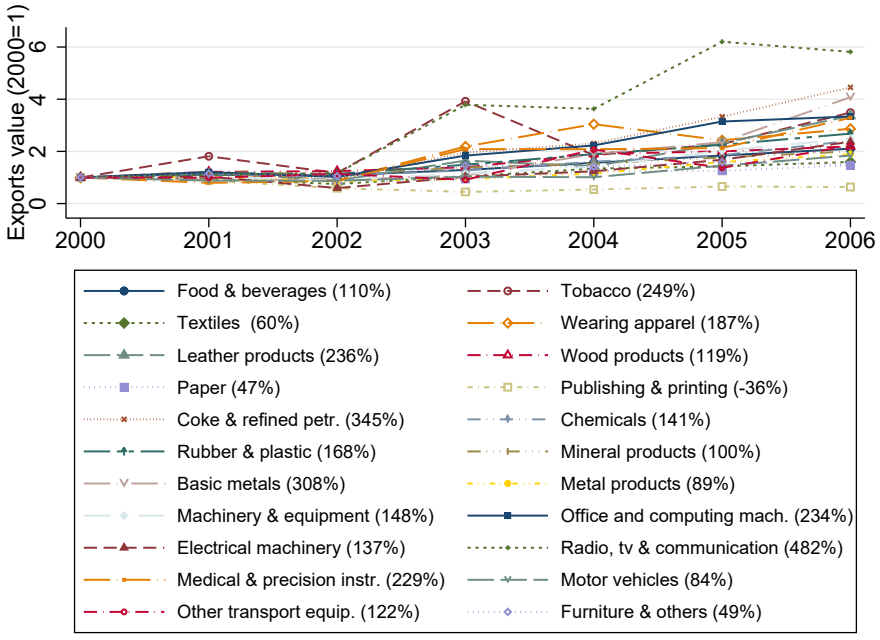
[9]Table A1 in the appendix details the evolution of exports across industries.
[10]Table A2 in the appendix details the evolution of imports across industries.

across LLMs is 0.70, and it is statistically significant at the 1 percent level.

Figure 2
Evolution of exports by sector and industry
**(a)** Primary sector




**(b)** Manufacturing sector




*Notes.* Export value in each industry was normalized to 1 in the year 2000. Industry export growth between 2000 and 2006 in parenthesis. Source: BACI.

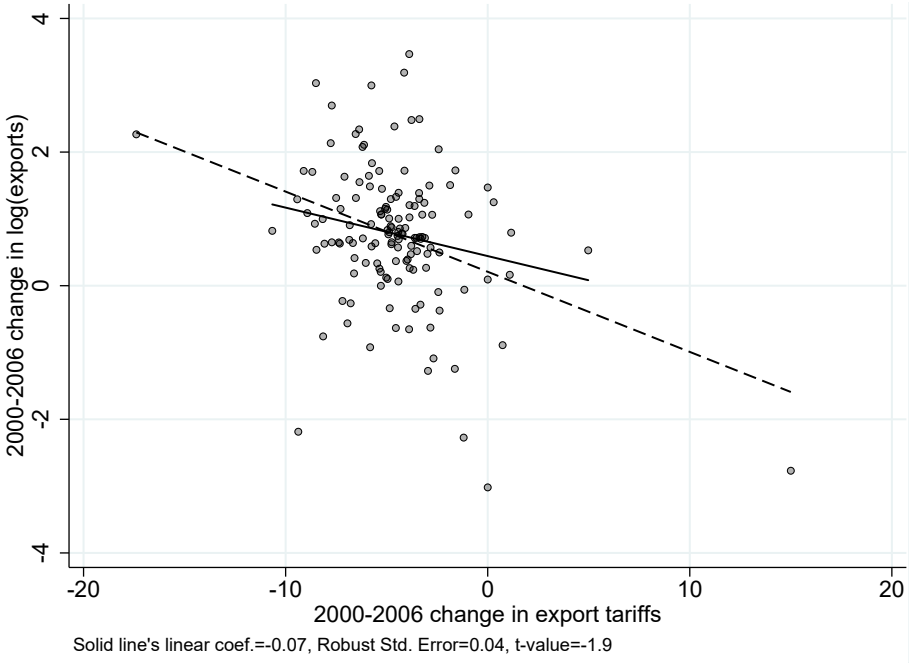
Table 1. Evolution of tariffs and trade flows

| | Mean | SD | P10 | P25 | P50 | P75 | P90 |
|---|---|---|---|---|---|---|---|
| **Panel A: Export tariffs cuts** | | | | | | | |
| 2000 | 10.3 | 5.0 | 4.6 | 6.9 | 10.0 | 12.9 | 16.3 |
| 2006 | 5.7 | 4.6 | 1.2 | 2.6 | 5.1 | 7.6 | 11.0 |
| **Panel B: Exports (millions of 2015 USD)** | | | | | | | |
| 2000 | 134.2 | 565.6 | 0.4 | 1.9 | 10.4 | 43.6 | 167.0 |
| 2006 | 421.5 | 2287.0 | 0.5 | 4.5 | 20.3 | 91.4 | 484.7 |
| **Panel C: Import tariffs cuts** | | | | | | | |
| 2000 | 14.5 | 1.8 | 14.3 | 14.3 | 14.3 | 14.3 | 14.3 |
| 2006 | 9.7 | 1.8 | 8.9 | 9.3 | 9.6 | 9.8 | 10.0 |
| **Panel B: Imports (millions of 2015 USD)** | | | | | | | |
| 2000 | 120.8 | 232.4 | 3.0 | 10.2 | 43.5 | 124.6 | 317.8 |
| 2006 | 268.9 | 632.4 | 5.7 | 19.9 | 84.4 | 286.5 | 640.1 |
| Number of industries | | | | 139 | | | |

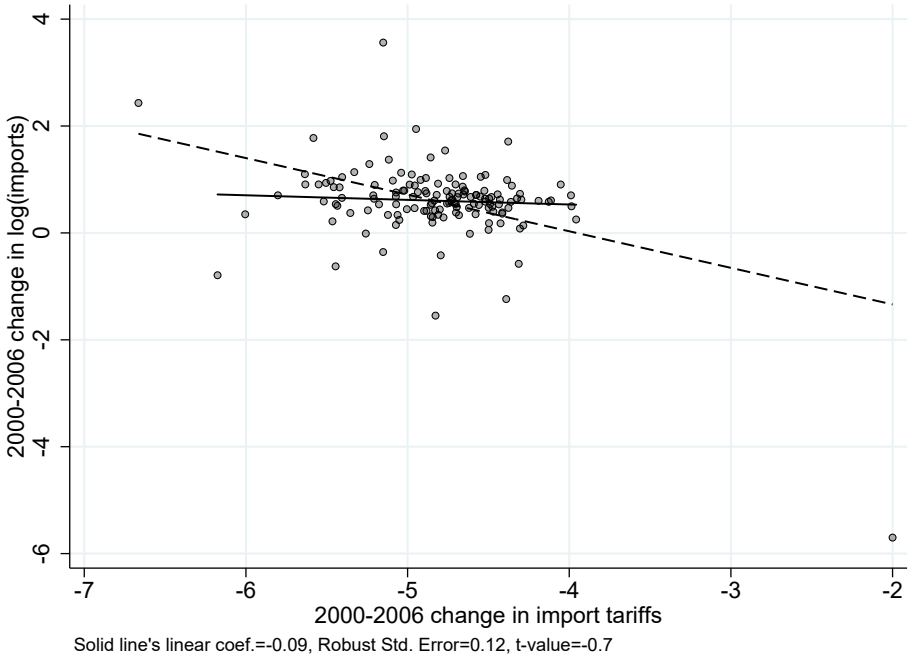
*Notes.* Trade values measured in constant million USD. Industries defined at the four-digits the International Standard Industrial Classification (Rev. 4). Sources: BACI and TRAINS.

Figure 3
Correlation between changes in tariffs and trade flows at the industry-level

**(a)** Exports

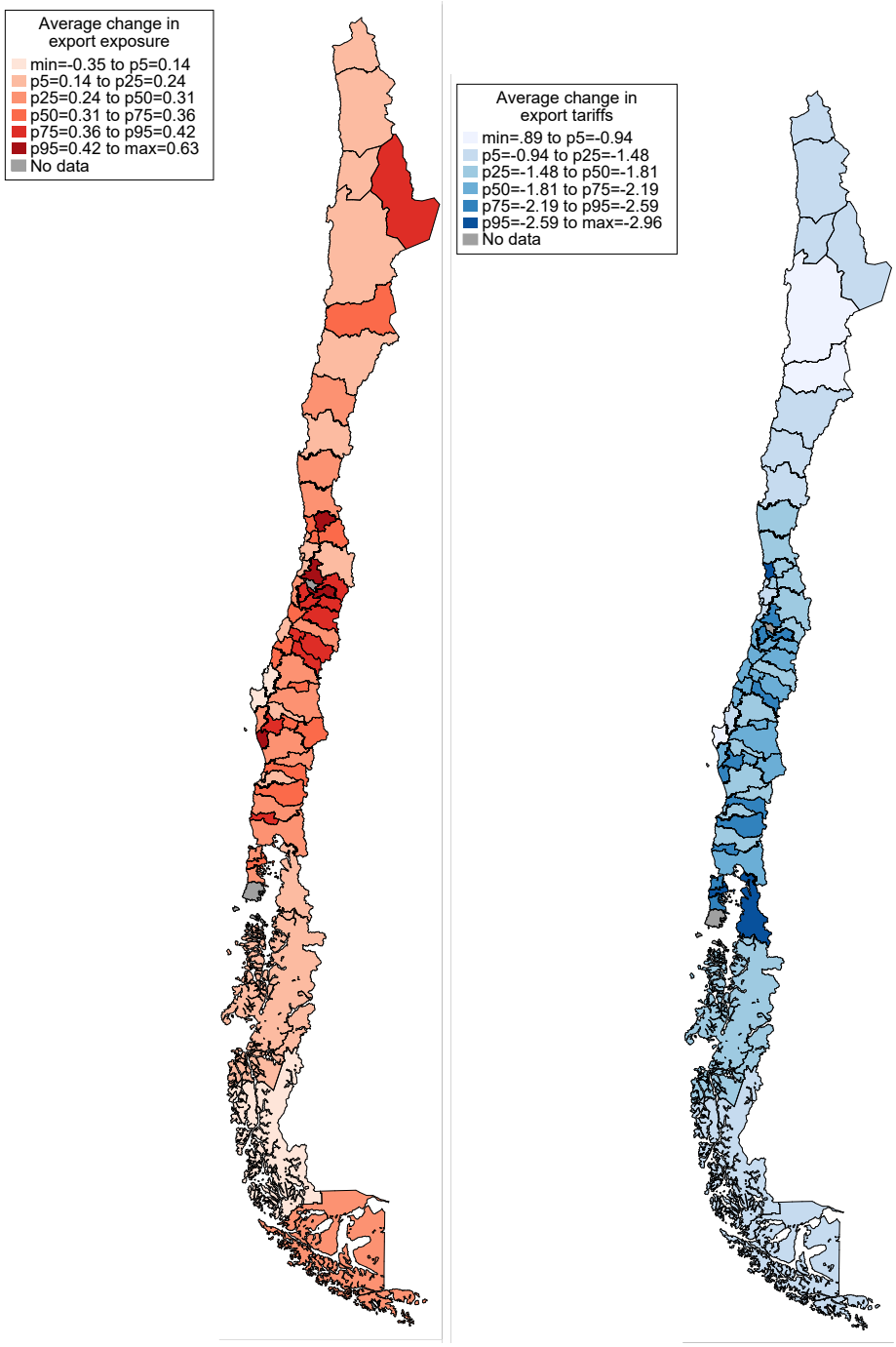



**(b)** Imports




*Notes.* Observations = 139. Industries defined at the four-digit of the International Standard Industrial Classification (Rev. 4). The solid lines exclude 1 percent outliers in each variable. Sources: BACI and TRAINS.

Figure 4
Spatial distribution of export growth and tariffs cuts




*Notes.* The change in exports exposure-left (the change in export tariffs-right) across LLMs measured as the interaction of local industry employment shares in 1992 and the evolution of log exports (average tariffs cuts) across industries and time. This figure plots the 2000-2006 change in each of these variables across LLMs over time. LLMs are defined by Casado-Díaz et al. (2017). Sources. 1992 Chilean census, BACI, and TRAINS.

### *Labor market variables*

Table 2 presents descriptive statistics for the most relevant variables at the LLM level. We report the average and standard deviation (in parenthesis) across LLMs for each year

of the sample period. The period under study exhibits a considerable improvement in labor market outcomes. The average employment rate increased by 4.3 p.p. between 2000 and 2006. The unemployment rate fell accordingly, from 10.3 percent in 2000 to 7.3 percent in 2006. The labor informality rate decreased from 22.4 percent to 19.3 percent, and this was mainly driven by the creation of formal salaried jobs, which increased by 19.4 percent between 2000 and 2006. The average formal wage exhibits a small decline (-3 percent), while informal wage and self-employment income grew by 7.4 percent and 8.5 percent, respectively. The average poverty rate declined by 7 p.p. between 2003 and 2006. In line with trade statistics described above, the average exports exposure increased from 4.32 in 2000 to 4.58 in 2006. While average exports tariffs diminished from 4.23 to 2.66 during this period.

Table 2. Local labor markets statistics

| | 2000 | 2003 | 2006 |
|---|---|---|---|
| Employment rate | 0.585 | 0.603 | 0.628 |
| | ( 0.048) | ( 0.046) | ( 0.046) |
| Unemployment rate | 0.103 | 0.098 | 0.073 |
| | ( 0.023) | ( 0.020) | ( 0.020) |
| Labor informality rate | 0.224 | 0.217 | 0.193 |
| | ( 0.055) | ( 0.049) | ( 0.040) |
| Labor informality rate* | 0.358 | 0.358 | 0.336 |
| | ( 0.067) | ( 0.068) | ( 0.060) |
| Formal wage jobs | 610.3 | 657.0 | 729.0 |
| | ( 643.0) | ( 694.6) | ( 768.1) |
| Informal wage jobs | 151.1 | 164.6 | 163.6 |
| | ( 155.0) | ( 171.2) | ( 170.7) |
| Self-employment jobs | 172.3 | 181.6 | 212.3 |
| | ( 178.8) | ( 187.0) | ( 222.2) |
| Formal wage | 724.6 | 688.1 | 702.5 |
| | ( 172.5) | ( 127.6) | ( 128.6) |
| Informal wage | 349.8 | 353.3 | 375.6 |
| | ( 66.7) | ( 78.6) | ( 79.6) |
| Self-employment income | 446.2 | 444.8 | 484.3 |
| | ( 98.0) | ( 101.4) | ( 99.8) |
| Poverty rate (FGT0) | 0.40 | 0.40 | 0.33 |
| | ( 0.12) | ( 0.11) | ( 0.09) |
| Exports exposure | 4.32 | 4.38 | 4.58 |
| | ( 1.60) | ( 1.64) | ( 1.66) |
| Tariffs cuts (IV) | 4.23 | 3.63 | 2.66 |
| | ( 1.21) | ( 1.07) | ( 0.94) |
| Number of districts | 60 | 61 | 61 |
| Number of observations | 225 183 | 229 956 | 231 346 |

*Notes.* Labor market statistics are restricted to adults under ages 18-65. Each value represents the weighted average across LLMs for each year. Standard deviation is in brackets. Weights are LLM's share of country's population of working age in 1992. Employment rate is the fraction of employed adults in the total adult population. Unemployment rate is the share of adults in the labor force that have been actively looking for a job in the last month. Labor informality rate is the fraction of unregistered salaried workers. The second definition (*) includes self-employed workers without a tertiary degree as informal. Employment levels are expressed in thousand workers. Monthly wages expressed in constant USD PPP 2005. Sources. CASEN household surveys, 1992 Chilean census, BACI, and TRAINS.

# III Results

## III.1 Main estimates

In this section we discuss the main estimates of the (relative) impact of exports growth on local economic development. We are interested in labor market outcomes at the district-level: the labor informality rate, share of salaried jobs in total employment, number of formal salaried jobs, number of informal salaried jobs, number of self-employment jobs, average formal wage, average informal wage, average self-employment income, average household per capita income and poverty rate (FGT0).

Baseline estimates of equation (1) are reported in Table 3. All columns display fixed effect-two-stage least squares estimates in which exports exposure is instrumented using local average tariffs cuts as an exogenous shifter. All regressions include LLM and region–year fixed effects and therefore exploit within LLM variation over time in each region. Standard errors are robust against heteroskedasticity and clustered at the LLM level. Different columns subsequently account for several preexisting trends, computed as the value of a given variable in 2000 interacted with year dummies. The variables used to compute preexisting trends are the following. From column (2) onward we include demographic variables: the shares of population in age groups 0–17, 18–35, 36–49, 50–65, and more than 65; and the shares of population of working age with no high-school, high school degree and college degree. Column (3) adds economic variables: the log average per capita income, female labor force participation, and employment shares in the primary and manufacturing sectors. Columnn (4) and (5) add LLM's exposure to imports and exports to China (column 4), and offshoring (column 5). The exposures in columns 4 and 5 are computed as shift-share variables, i.e. as a weighted average of the initial industry-level imports, exports and the offshoring index of Feenstra and Hanson (1999), using the 1992 industry shares in local employment as weights. Column (6) adds a LLM-level index of job routinization. Routinization is defined as a quantification of local jobs that are repetitive, codifiable, and susceptible to be replaced by automation technologies. The index is defined at the occupation level using information from the Survey for Adult Skills from the OECD (Brambilla et al., 2022) and aggregated to the LLM level as a weighted average where occupation shares in local employment are used as weights.

Panel A shows that the instrument has a strong predictive power and it is statistically significant at the 1 percent level in all specifications; the hypothesis of weak instrument is rejected. In Panel B the dependent variable is the labor informality rate. Results suggest that there is a negative and significant effect of exports exposure on labor informality. An increase in exports exposure of 0.152 (i.e., the median growth of exports exposure across LLMs) results in a relative decline in the fraction of unregistered salaried workers of around 2.46 percentage points (column 6); compared to a LLM with no exports exposure, *ceteris paribus*.[11] The relative decline is 4.04 p.p. if we include non-professional self-employed as

[11] The median change in exports exposure at the LLM level between 2000–2003 and 2003–2006 was 0.152;

informal workers (Panel C). The economic magnitudes of estimated coefficients are large and need to be interpreted with caution.

Results in Panel D show that districts more exposed to export growth exhibit a relative increase in the fraction of salaried jobs in total employment. To decompose this result, Panels E, F and G present the estimates for local employment levels: number of formal salaried jobs, number of informal salaried jobs and number of self-employment jobs, respectively. The three variables are expressed in logarithms so point estimates can be interpreted as semi-elasticities. In panel D we find that exports have a strong creation effect on formal salaried jobs. Presumably, export growth is likely to be more intense in large companies that exhibit higher rates of labor formalization than non-exporters. Results in Panel G suggests that locations more exposed to export growth exhibit a strong relative decline in the number of self-employment jobs, compared to regions with no exports exposure. The point estimates for the log number of informal salaried workers are negative but statistically indistinguishable from zero (Panel F). Overall, these estimates suggests that in locations exposed to export growth there is reallocation from self-employment towards new salaried jobs in the formal sector.

Table 4 reports the baseline estimates for the impact of exports on incomes and poverty. Results in Panel A suggests that locations more exposed to export growth exhibit a relative increase in the average monthly wage of formal workers, in line with the idea that growing exports encourage the creation of high paid formal salaried jobs. Point estimates for the log average monthly wage of informal workers and the log average self-employment income (Panels B and C) are positive but statistically insignificant.

Finally, Panels D and E show that exposed locations face a relative increase in the average household per capita income that leads to a relative decline in the fraction of individuals with household per capita income below the 5.5 USD (per day per person) poverty line.

the mean and standard deviation were 0.124 and 0.106.

Table 3. The effects of exports on employment outcomes

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel A: First-stage regression** | | | | | | |
| Tariffs cuts (IV) | −0.125*** | −0.114*** | −0.112*** | −0.125*** | −0.128*** | −0.129*** |
| | ( 0.019) | ( 0.014) | ( 0.014) | ( 0.008) | ( 0.008) | ( 0.007) |
| KP F-stat | 35.0 | 53.7 | 46.7 | 159.0 | 199.3 | 227.6 |
| R-squared | 0.926 | 0.946 | 0.955 | 0.960 | 0.961 | 0.962 |
| **Panel B: Labor informality rate** | | | | | | |
| Exports exposure | −0.308*** | −0.163** | −0.165** | −0.164** | −0.160** | −0.162** |
| | ( 0.115) | ( 0.073) | ( 0.082) | ( 0.070) | ( 0.066) | ( 0.067) |
| **Panel C: Labor informality rate (incl. self-employment)** | | | | | | |
| Exports exposure | −0.380*** | −0.316*** | −0.302*** | −0.277*** | −0.259*** | −0.266*** |
| | ( 0.110) | ( 0.103) | ( 0.107) | ( 0.088) | ( 0.082) | ( 0.081) |
| **Panel D: Share of salaried jobs** | | | | | | |
| Exports exposure | 0.195*** | 0.181*** | 0.185*** | 0.144*** | 0.137*** | 0.139*** |
| | ( 0.058) | ( 0.051) | ( 0.057) | ( 0.038) | ( 0.037) | ( 0.036) |
| **Panel E: Log (number of formal salaried jobs)** | | | | | | |
| Exports exposure | 1.154*** | 0.809* | 0.987* | 0.669** | 0.667*** | 0.675*** |
| | ( 0.360) | ( 0.425) | ( 0.511) | ( 0.270) | ( 0.251) | ( 0.235) |
| **Panel F: Log (number of informal salaried jobs)** | | | | | | |
| Exports exposure | −0.376 | −0.064 | 0.105 | −0.178 | −0.183 | −0.180 |
| | ( 0.370) | ( 0.297) | ( 0.420) | ( 0.296) | ( 0.305) | ( 0.274) |
| **Panel G: Log (number of self-employment jobs)** | | | | | | |
| Exports exposure | −0.659* | −0.774** | −0.677** | −0.819*** | −0.716*** | −0.759*** |
| | ( 0.354) | ( 0.366) | ( 0.314) | ( 0.239) | ( 0.238) | ( 0.218) |
| Observations | 182 | 182 | 182 | 182 | 182 | 182 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |

Notes. All regressions include LLM and region-year fixed effects. All regressions run by 2SLS using industry tariffs cuts weighted by 1992 industrial composition at the LLM level as instrument for exports exposure. Preexisting trends are: percentage of child under ages 0-17 in population, fractions of population under ages 18-35, 36-49, 50-65, and above 65, percentages of population with primary education-or below, secondary education, and tertiary education (Column 2 and onwards); local employment shares in the primary and manufacturing sectors, and female labor force participation (Column 3 and onwards); exposure to China's imports and exports (Column 4 and onwards); exposure to offshoring (Columns 5 and 6); and exposure to routine task content of jobs (Column 6). Robust standard errors clustered at the LLM level. Regressions weighted by LLM's share of Chilean population of working age in 1992. Significance at the 1, 5 and 10 percent levels denoted with ***, ** and *.

Table 4. The effects of exports on incomes and poverty

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel A: Log (average formal wage)** | | | | | | |
| Exports exposure | 0.451*** | 0.371** | 0.525*** | 0.458*** | 0.411** | 0.384*** |
| | ( 0.151) | ( 0.166) | ( 0.199) | ( 0.169) | ( 0.162) | ( 0.140) |
| **Panel B: Log (average informal wage)** | | | | | | |
| Exports exposure | 0.530* | 0.470 | 0.543 | 0.361 | 0.327 | 0.322 |
| | ( 0.321) | ( 0.291) | ( 0.350) | ( 0.271) | ( 0.258) | ( 0.262) |
| **Panel C: Log (average self-employment income)** | | | | | | |
| Exports exposure | 0.442* | 0.167 | 0.369 | 0.279 | 0.209 | 0.207 |
| | ( 0.267) | ( 0.242) | ( 0.244) | ( 0.199) | ( 0.194) | ( 0.199) |
| **Panel D: Log (average per capita income)** | | | | | | |
| Exports exposure | −0.026 | 0.040 | 0.467** | 0.480*** | 0.450*** | 0.426*** |
| | ( 0.309) | ( 0.364) | ( 0.201) | ( 0.172) | ( 0.170) | ( 0.158) |
| **Panel E: Poverty rate (FGT0)** | | | | | | |
| Exports exposure | −0.433*** | −0.167* | −0.327*** | −0.271*** | −0.257*** | −0.254*** |
| | ( 0.108) | ( 0.090) | ( 0.093) | ( 0.055) | ( 0.058) | ( 0.057) |
| Observations | 182 | 182 | 182 | 182 | 182 | 182 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |

Notes. All regressions include LLM and region-year fixed effects. All regressions run by 2SLS using industry tariffs cuts weighted by 1992 industrial composition at the LLM level as instrument for exports exposure. Preexisting trends are: percentage of child under ages 0-17 in population, fractions of population under ages 18-35, 36-49, 50-65, and above 65, percentages of population with primary education-or below, secondary education, and tertiary education (Column 2 and onwards); local employment shares in the primary and manufacturing sectors, and female labor force participation (Column 3 and onwards); exposure to China's imports and exports (Column 4 and onwards); exposure to offshoring (Columns 5 and 6); and exposure to routine task content of jobs (Column 6). Robust standard errors clustered at the LLM level. Regressions weighted by LLM's share of Chilean population of working age in 1992. Significance at the 1, 5 and 10 percent levels denoted with ***, ** and *.

## III.2 Heterogeneous effects by age and skill

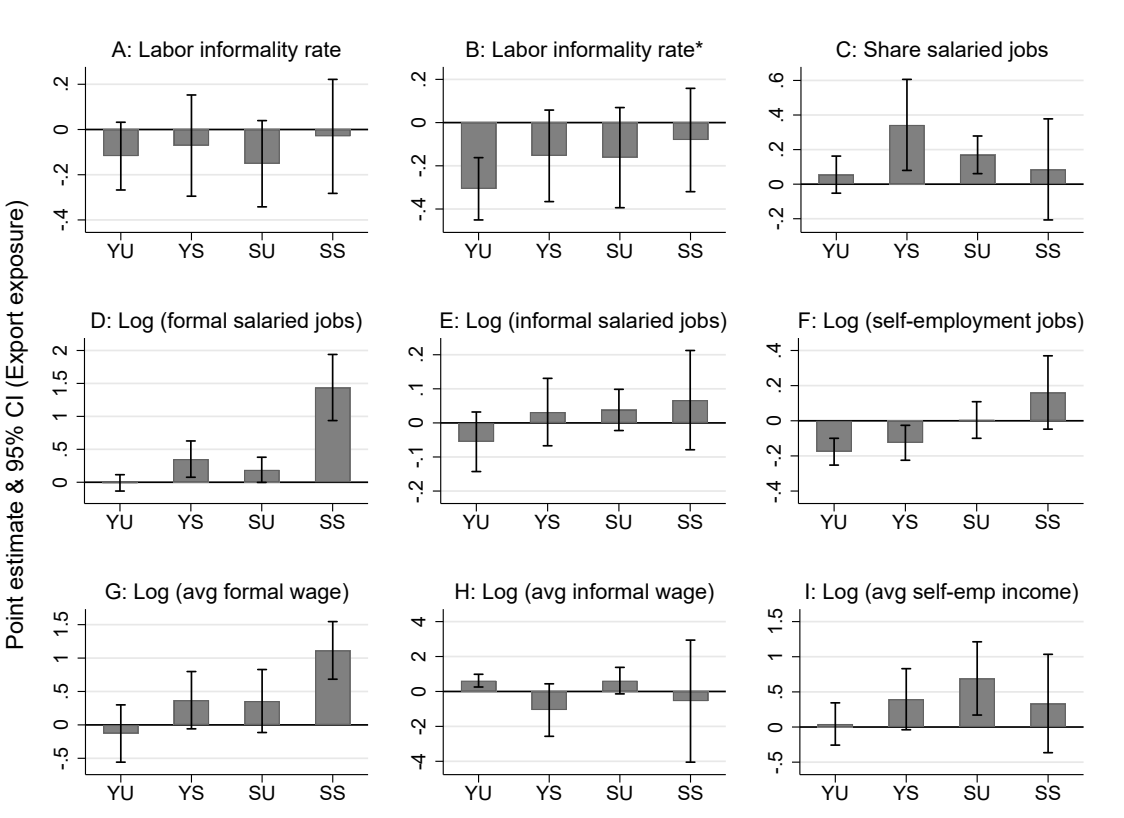
In this section we explore the heterogeneous effects of growing exports by age and worker skill level. We separate workers in two age groups: young (18 to 40 years old) and

senior (41–65); and two skill groups: unskilled (high-school diploma or below) and skilled (at least one year of tertiary education completed). Figure 5 plots the estimated coefficients and confidence intervals from running regression (1) separately for four different groups: young unskilled (YU), young skilled (YS), senior unskilled (SU) and senior skilled (SS).

We find that relative gains in the average formal wage and employment concentrate in the group of senior skilled workers. These results suggest that more educated workers with enough work experience are probably the most demanded by exporting firms. To a lesser extent, young skilled workers also take advantage of the new formal salaried jobs.

We also find labor income gains for senior unskilled self-employed workers, who are likely to have a trade and enough work experience to benefit themselves from an improvement in local labor market conditions.

Figure 5
Heterogeneous effects of exports on employment and income by age and skill




*Notes.* Observations = 182. Regressions are analogous to Tables 1 and 2, Column (6). Point estimates correspond to separate regressions for four mutually exclusive samples based on age and skill. Young workers (Y): 18–40; Senior workers (S): 41–65; Unskilled workers (U): high-school diploma or below; Skilled workers (S): at least one year of tertiary education completed. Labor informality rate is the fraction of unregistered salaried workers. The second definition (*) includes self-employed workers without a tertiary degree as informal. The capped lines provide 95 percent confidence intervals.

### III.3 Heterogeneous effects by occupation

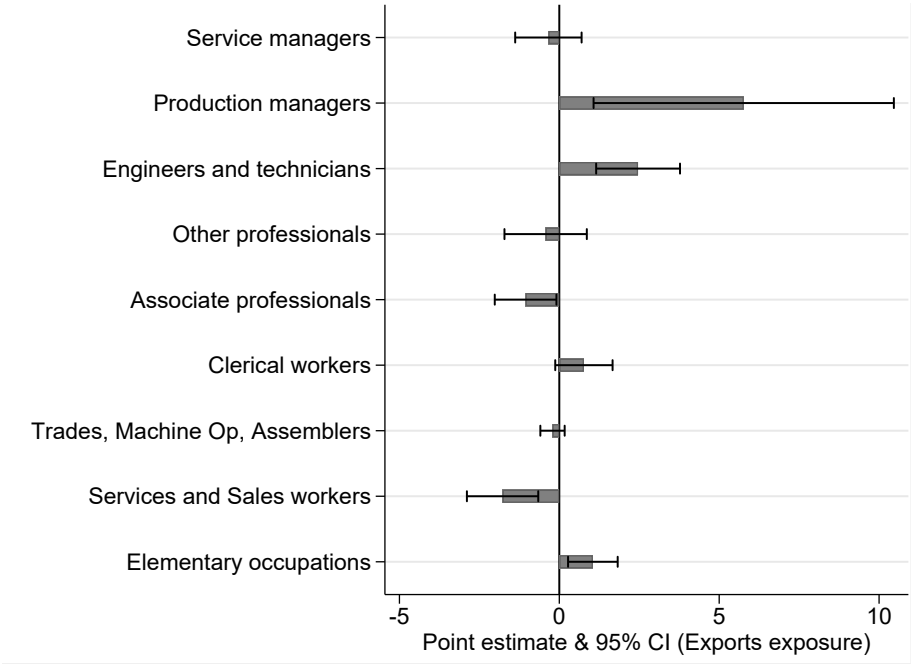
This section investigates the heterogeneous impacts of growing exports on employment and wages by occupational categories. We separate workers in nine groups, which are close to the first-digit of the International Standard Classification of Occupations (ISCO 08).

Figure 6 plots the estimated coefficients and confidence intervals from running regression (1) separately for the (log) employment level of each group. Results are very interesting and intuitive, as we find that locations more exposed to export growth exhibit relative employment gains mainly in two categories, which are likely to be complementary to exporting activities: production managers and engineers and technicians. These results are in line with previous findings for Chilean manufacturing plants documented by Brambilla, Lederman, and Porto (2016).

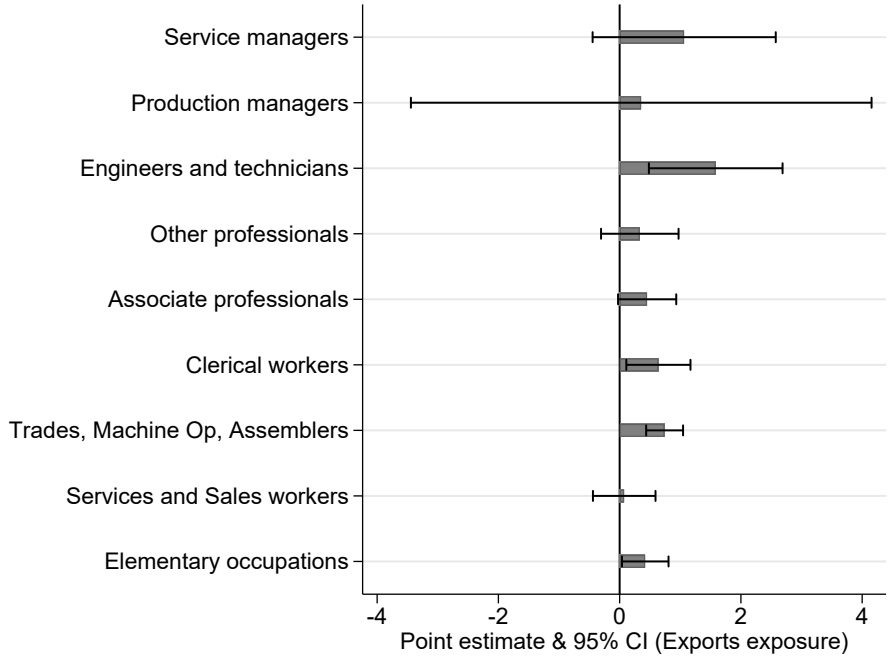
Figure 6 presents the estimates for the impact of growing exports on the (log) average wage of each occupation. First, we note that estimated coefficients are positive for all occupations. Again, and in line with economic intuition, the group that benefits the most from exports expansions are engineers and technicians. Trade workers, machine operators and assemblers also present relative wage gains, and the same occurs for clerical workers. These workers are likely to be involved in productive and administrative tasks related to exporting activities.

Figure 6
Heterogeneous effects of exports on employment and wage by occupation

**(a)** Log employment




**(b)** Log average wage




*Notes.* Observations = 182. Regressions are analogous to Tables 1 and 2, Column (6). Point estimates in each panel correspond to separate regressions for nine mutually exclusive samples of workers based on occupational categories.

## III.4 Pre-trend analysis

A typical concern of estimates of treatment effects is whether the exposure variable (exports shocks in our case) correlates with preexisting trends at the LLM level. If this

is the case, estimates could be biased by preexisting trends that persisted during the exposure period. We control for a large set of trends based on observed variables in the initial year of data, which substantially ameliorates this concern. As an additional validity test, we study the correlation between past changes in observed variables (in a pre-sample period) and future exports exposure.

The pre-sample period goes from 1994 to 2000. We run the following regression by OLS:

$$\Delta x_{l0} = \gamma_0 + \gamma_1 \Delta EE_{lt} + \Delta \varepsilon_{l0} \tag{4}$$

For each variable $x$ we regress the change between 1994 and 2000 ($\Delta x_{l0}$) on the change in exports exposure during 2000-2006 ($\Delta EE_{lt}$); where $x$ are LLM-level observable variables during the pre-sample period. We consider the following variables: employment rate, unemployment rate, informality rate, average wage, poverty rate, share of service workers in local employment, share of salaried workers in local employment, share of semi-skilled workers (high-school diploma) and share of highly skilled workers (at least one year of tertiary education complete).

Results are reported in Table 5, column (1).[12] All estimates are non-significant, which highlights that there is no correlation between past trends in LLM observables and the later change in exports exposure.

In columns (2) to (4) we conduct additional exercises. In column (2), we replace $\Delta EE$ with the instrument $\Delta TariffsCuts^{IV}$. In column (3), we replace $\Delta EE$ with a dummy variable that indicates whether $\Delta EE$ is above the median across LLMs. Column (4) is analogous to column (3) with the difference that the dummy variable is computed based on $\Delta TariffsCuts^{IV}$. Again, all results remain non-significant.

[12] These regressions use 55 observations (LLMs) because the 1994 CASEN has a lower regional coverage than the 2000 CASEN.

Table 5. Pre-trend tests

| | Change in exports exposure | Change in tariffs cuts (IV) | High exposure to exports | High exposure to tariffs cuts (IV) |
|---|---|---|---|---|
| Employment rate | −0.058 | 0.013 | −0.006 | 0.003 |
| | ( 0.051) | ( 0.011) | ( 0.022) | ( 0.028) |
| Unemployment rate | 0.016 | 0.001 | 0.013 | 0.039 |
| | ( 0.027) | ( 0.009) | ( 0.017) | ( 0.034) |
| Labor informality rate | −0.018 | −0.007 | 0.016 | −0.050 |
| | ( 0.082) | ( 0.019) | ( 0.049) | ( 0.042) |
| Log average wage | 0.156 | −0.009 | 0.065 | −0.037 |
| | ( 0.223) | ( 0.045) | ( 0.111) | ( 0.124) |
| Poverty rate (FGT0) | 0.156 | −0.009 | 0.065 | −0.037 |
| | ( 0.223) | ( 0.045) | ( 0.111) | ( 0.124) |
| Share of service workers | 0.131 | −0.029 | 0.017 | −0.063 |
| | ( 0.109) | ( 0.028) | ( 0.053) | ( 0.075) |
| Share of salaried workers | −0.058 | 0.011 | 0.005 | 0.013 |
| | ( 0.063) | ( 0.015) | ( 0.028) | ( 0.045) |
| Share of semi-skilled workers | −0.006 | 0.001 | −0.009 | −0.015 |
| | ( 0.027) | ( 0.007) | ( 0.013) | ( 0.017) |
| Share of highly-skilled workers | 0.032 | −0.000 | −0.013 | −0.003 |
| | ( 0.030) | ( 0.008) | ( 0.018) | ( 0.031) |
| Observations | 55 | 55 | 55 | 55 |

Notes. Each coefficient corresponds to a separate regression. Dependent variables in row panels. Changes in row variables refer to years 1994-2000. Explanatory variables in columns. Changes in column variables refer to years 2000-2006. Column (1): Change in exports exposure; Column (2): Change in tariffs (IV); Column (3): Change in exports exposure above the median; Column (4): Change in tariffs cuts (IV) above the median. Regressions control for region fixed effects. Regressions weighted by LLM's share of Chilean population of working age in 1992. Robust standard errors clustered at the LLM level are in parentheses. Significance at the 1, 5 and 10 percent levels denoted with *, ** and *.

### III.5 Robustness exercises

We estimate several alternatives to our baseline regression to validate the robustness of our results to: estimate directly on exposure to local tariffs cuts (IV), include imports exposure, use different employment outcomes, rule out the influence of outliers, not use weights in the regression, leave aside locations with greatest importance of crop production (which exhibits the largest Rotemberg weight), excluding districts with greatest participation of the mining industry (which concentrates most exports), and estimate more conservative confidence intervals applying an alternative methodology. We describe these tests below. All results, unless noted otherwise, are quantitatively similar to our baseline

estimates in Tables 3 and 4. They are reported in the appendix.

**Robustness to estimate the effects directly on local tariffs cuts.** Table A4 presents the estimates of running equation (1) by OLS directly on the instrumental variable, i.e. the local exposure to tariffs cuts (as in Dix-Carneiro and Kovak, 2017, 2019). Results are strongly robust and estimated coefficients are estimated very precisely. The signs of estimated coefficients are the opposite compared to the baseline estimates in Tables 3 and 4, i.e. a decrease in local tariffs leads to a relative decline in labor informality, mainly through the creation of new formal salaried jobs, and to a relative increase in the average formal wage of salaried workers.

**Robustness to including imports exposure.** Tables A5 (part 1) and A5 (part 2) present the baseline estimates when including local imports exposure, which is calculated in the same manner as exports exposure.[13] These regressions are run with two endogenous variables and two instruments. The new instrument is the local average industry import tariff cut, also calculated as a shift-share variable. The first-stage works well for the case of exports exposure, but in the case of imports exposure the tariff cut IV presents a positive and statistically significant coefficient, which suggests that imports have grown faster in locations that experience lower tariff cuts, which is at odds with economic intuition.[14] In this context, these estimates should be interpreted with caution. Importantly, all estimates for exports exposure remain strongly robust. Results show that LLMs more exposed to growing imports exhibit a relative decline in employment (of all worker types) and a relative increase in the average formal wage, which leads to a rise in the average household per capita income and to a small decline in the poverty rate.

**Robustness to alternative employment outcomes.** Table A6 presents the estimates for the impact of exports exposure on the employment rate (Panel A) and the unemployment rate (Panel B). The estimates for unemployment are computed for individuals that are economically active (i.e. either employed or unemployed), while the estimates for employment include also inactive individuals. In line with economic intuition, point estimates for the employment rate are positive while those for unemployment are negative, but in both cases they are statistically indistinguishable from zero.

**Robustness to population shifts**. Migration across LLMs represents a threat to our empirical strategy. Estimates might be biased if workers migrate across locations in response to exports shocks and changes in local economic conditions. To address this potential concern we estimate regressions using the logarithm of population counts as dependent variables. Panel C of Table A6 corresponds to total population and Panel D to population of working age (18–65). Point estimates are statistically indistinguishable from zero, which is reassuring as it indicates that population shifts across districts do not drive our results.

[13] $IE_{lt} = \sum_j w_{lj}^{1992} Log(imports)_{jt}$, IE is a measure of imports exposure at the LLM-level, constructed as the interaction between the initial pattern of industrial composition in each LLM, as given by the local employment share in 1992 ($w_{rj}^{1992}$), with the log value of imports at the industry-level.

[14] This table is not included in the paper but it is available upon request.

**Robustness to outliers in exports exposure.** To rule out that results are driven by outliers, we conduct a robustness exercise in which we exclude extreme values defined as the top and bottom 5 percent of the distribution of exports exposure. Results are in Table A7.

**Robustness to not using district importance weights.** The baseline specification is a weighted regression with weights given by LLM's share in Chilean population of working age in 1992. In this unweighted alternative specification all districts are given the same importance in the regression irrespective of their size. Results are in Table A8.

**Robustness to excluding districts with greatest importance of crop production.** In their discussion of Bartik instruments, Goldsmith-Pinkham, Sorkin, and Swift (2020) recommend to report the industries with the highest Rotemberg weights (i.e. those that explain a greater fraction of the variation in the instrument). We report these statistics in Table A3. The first column in Panel A shows that the crop production industry has the highest Rotemberg weight (explains $0.919/1.344 = 68.4$ percent of the variation in the IV), which indicates that reduced-form estimates may be sensitive to unobserved shocks affecting LLMs specialized in this industry. We conduct two robustness exercises. First, we add a pre-trend for the employment share of crop production to our baseline estimates (see column 2 of Table A9). Second, we exclude the 5 percent locations (i.e. three LLMs) with the highest participation of crop production (see column 3).[15]

**Robustness to excluding locations with greatest importance of mining.** The mining sector concentrates most of Chilean exports (e.g. more than 60 percent in 2006). Moreover, the period under study includes a sharp rise in the international price of copper (i.e. it more than doubled between 2003 and 2006) and other raw materials. To take into account these facts, we perform two robustness exercises (which closely follow the format of the previous exercise). First, we add a pre-trend for the employment share of the mining sector to our baseline estimates (column 2 of Table A10). Second, we exclude the 5 percent locations (i.e. three LLMs) with the highest participation of mining (column 3 of Table A10).[16].

**Robustness to alternative shifh-share design.** In Bartik regression models, errors could share common shocks across locations with similar industrial compositions. Borusyak, Hull and Jaravel (2021) discuss settings of shift-share designs in which confidence intervals obtained following the usual methods tend to be too liberal. We conduct a robustness exercise in which we apply the method proposed by Borusyak et al. (2021). Under this framework, identification follows from the quasi-random assignment of shocks while exposure shares are allowed to be endogenous. This method also allows to correct standard errors for clustering at the original level of the shock variable, that is, the industry level. Under this methodology, the point-estimates of the coefficients are by

[15]The excluded LLMs are Rengo, Parral and Carahue.
[16]The excluded LLMs are Calama, Diego De Almagro and Cabildo.

construction the same, while the confidence intervals are estimated more conservatively. We report results in Table A11.

# IV Concluding Remarks

In this paper we empirically investigate the causal effect of growing exports on Chilean local labor market outcomes. Using data from national household surveys, census, trade flows and trade tariffs, we document that locations with a higher share of workers allocated to industries more exposed to tariffs cuts and rising exports exhibited a better relative performance in terms of labor market indicators such as formal employment and formal wages than less exposed locations, which led to increasing the average household per capita income and reducing poverty. We conclude that growing exports promote local economic development through the creation of higher quality jobs.

Formal employment and formal wage gains concentrate on senior skilled workers, who seem to be the workers most in demand by exporting firms. Relatedly, the two occupations that exhibit the largest relative increase in employment in response to growing exports are production managers and engineers and technicians. The last group, as well as machine operators, assemblers and clerical workers, also exhibit relative wage gains, which supports the idea that these workers perform tasks that complement exporting activities.

Finally, and importantly, our estimates correspond to relative effects across local labor markets but does not account for the aggregate economic impact of growing exports, which depend on spillovers across industries in different regions and other general equilibrium effects (e.g. changes in prices, total factor productivity, and aggregate demand multiplier effects).

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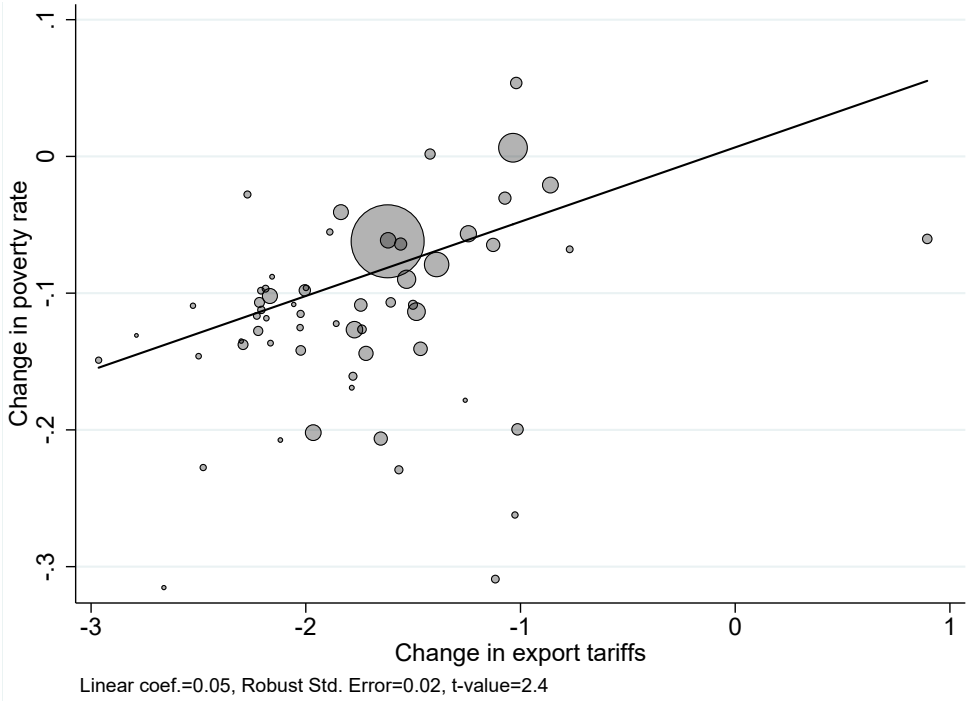
# A Appendix

Figure A1
Export tariffs cuts and poverty decline




*Notes.* Observations = 60 local labor markets (LLMs). The change in export tariffs across LLMs (horizontal axis) measured as the interaction of local industry employment shares in 1992 and the evolution of average tariffs cuts across industries between 2000 and 2006. The change in poverty rate across LLMs (vertical axis) between 2000 and 2006 calculated using a poverty line of USD 5.5 per day per person. Fitted line weighted by LLM's share of Chile's population of working age in 1992 (bubble size). LLMs are defined by Casado-Díaz et al. (2017). Sources. 1992 Chilean census, CASEN, BACI.

Table A1. Evolution of exports by sector and industry

| | 2000 | 2006 | % change | Share (2006) |
|---|---|---|---|---|
| **Panel A. Primary sector** | | | | |
| Growing of crops and horticulture | 1760.7 | 3466.1 | 97 | 5.8 |
| Farming of animals | 23.5 | 40.7 | 73 | 0.1 |
| Forestry and logging | 116.1 | 105.6 | -9 | 0.2 |
| Fishing | 176.0 | 194.6 | 11 | 0.3 |
| Mining of hard coal | 0.2 | 0.1 | -24 | 0.0 |
| Extraction of petroleum and natural gas | 0.2 | 4.5 | 2326 | 0.0 |
| Mining of iron ores | 167.0 | 484.7 | 190 | 0.8 |
| Mining of non-ferrous metal ores | 2663.9 | 14964.2 | 462 | 25.1 |
| Other mining and quarrying | 44.8 | 77.4 | 73 | 0.1 |
| **Panel B. Manufacturing sector** | | | | |
| Food and beverages | 3106.2 | 6534.9 | 110 | 11.0 |
| Tobacco | 8.9 | 31.2 | 249 | 0.1 |
| Textiles | 130.7 | 208.6 | 60 | 0.3 |
| Wearing apparel | 33.3 | 95.5 | 187 | 0.2 |
| Leather products | 41.9 | 141.0 | 236 | 0.2 |
| Wood products | 935.0 | 2049.0 | 119 | 3.4 |
| Paper | 1326.5 | 1944.7 | 47 | 3.3 |
| Publishing and printing | 106.6 | 67.8 | -36 | 0.1 |
| Coke and refined petroleum | 254.0 | 1131.4 | 345 | 1.9 |
| Chemicals | 1101.5 | 2651.0 | 141 | 4.4 |
| Rubber and plastic | 160.7 | 430.9 | 168 | 0.7 |
| Mineral products | 60.6 | 121.4 | 100 | 0.2 |
| Basic metals | 5685.8 | 23187.9 | 308 | 38.9 |
| Metal products | 119.5 | 226.0 | 89 | 0.4 |
| Machinery and equipment | 169.2 | 419.9 | 148 | 0.7 |
| Office and computing machinery | 14.1 | 47.1 | 234 | 0.1 |
| Electrical machinery | 44.7 | 105.9 | 137 | 0.2 |
| Radio, tv and communication equipment | 16.3 | 94.7 | 482 | 0.2 |
| Medical and precision instruments | 16.9 | 55.5 | 229 | 0.1 |
| Motor vehicles | 215.6 | 397.1 | 84 | 0.7 |
| Other transport equipment | 108.6 | 241.0 | 122 | 0.4 |
| Furniture and other manufacturing | 85.1 | 127.2 | 49 | 0.2 |

Notes. Export values measured in constant million USD. Industries defined at the two-digits of the International Standard Industrial Classification (Rev. 4). Sources: BACI.

Table A2. Evolution of imports by sector and industry

| | 2000 | 2006 | % change | Share (2006) |
|---|---|---|---|---|
| **Panel A. Primary sector** | | | | |
| Growing of crops and horticulture | 396.4 | 655.7 | 65 | 1.7 |
| Farming of animals | 7.9 | 10.7 | 34 | 0.0 |
| Forestry and logging | 10.3 | 15.5 | 51 | 0.0 |
| Fishing | 4.8 | 8.8 | 82 | 0.0 |
| Mining of hard coal | 125.1 | 293.0 | 134 | 0.8 |
| Extraction of petroleum and natural gas | 1992.8 | 5897.2 | 196 | 15.5 |
| Mining of iron ores | 16.6 | 0.1 | -100 | 0.0 |
| Mining of non-ferrous metal ores | 23.1 | 812.2 | 3421 | 2.1 |
| Other mining and quarrying | 27.1 | 42.9 | 58 | 0.1 |
| **Panel B. Manufacturing sector** | | | | |
| Food and beverages | 848.3 | 1658.7 | 96 | 4.4 |
| Tobacco | 10.2 | 5.7 | -44 | 0.0 |
| Textiles | 643.0 | 1046.5 | 63 | 2.8 |
| Wearing apparel | 507.5 | 832.0 | 64 | 2.2 |
| Leather products | 300.5 | 578.0 | 92 | 1.5 |
| Wood products | 87.0 | 178.0 | 105 | 0.5 |
| Paper | 426.3 | 586.2 | 38 | 1.5 |
| Publishing and printing | 147.0 | 147.3 | 0 | 0.4 |
| Coke and refined petroleum | 531.1 | 2471.0 | 365 | 6.5 |
| Chemicals | 2191.7 | 3938.6 | 80 | 10.4 |
| Rubber and plastic | 538.4 | 1017.0 | 89 | 2.7 |
| Mineral products | 256.9 | 408.0 | 59 | 1.1 |
| Basic metals | 517.3 | 1332.4 | 158 | 3.5 |
| Metal products | 423.6 | 795.4 | 88 | 2.1 |
| Machinery and equipment | 2059.9 | 4212.4 | 104 | 11.1 |
| Office and computing machinery | 657.9 | 980.1 | 49 | 2.6 |
| Electrical machinery | 522.4 | 1110.3 | 113 | 2.9 |
| Radio, tv and communication equipment | 1096.7 | 2146.4 | 96 | 5.7 |
| Medical and precision instruments | 358.9 | 717.3 | 100 | 1.9 |
| Motor vehicles | 1619.3 | 3874.6 | 139 | 10.2 |
| Other transport equipment | 547.9 | 1502.7 | 174 | 4.0 |
| Furniture and other manufacturing | 400.3 | 690.6 | 73 | 1.8 |

Notes. Import values measured in constant million USD. Industries defined at the two-digits of the International Standard Industrial Classification (Rev. 4). Sources: BACI.

Table A3. Summary of Rotemberg weights

**Panel A: Negative and positive weights**

| | Sum | Mean | Share |
|---|---|---|---|
| Negative | -0.344 | -0.006 | 0.204 |
| Positive | 1.344 | 0.103 | 0.796 |

**Panel B: Top 10 Rotemberg weight industries**

| | $\hat{\alpha}_k$ | $g_k$ | $\hat{\beta}_k$ | Ind Share |
|---|---|---|---|---|
| Growing of crops | 0.919 | 14.741 | 0.020 | 9.370 |
| Farming of animals | 0.128 | 10.438 | 0.014 | 2.753 |
| Forestry and logging | 0.100 | 11.545 | 0.021 | 1.397 |
| Manufacture of wood products | 0.053 | 13.063 | 0.020 | 1.159 |
| Production of meat, fish, fruit, veg., oils | 0.041 | 15.111 | -0.013 | 1.987 |
| Sawmilling and planing of wood | 0.041 | 13.749 | 0.023 | 0.534 |
| Mining of non-ferrous metal ores | 0.025 | 15.700 | -0.092 | 0.812 |
| Fishing farms | 0.024 | 12.116 | -0.010 | 1.471 |
| Manufacture of grain mill products | 0.007 | 10.582 | 0.027 | 0.160 |
| Manufacture of dairy products | 0.004 | 11.315 | 0.008 | 0.303 |

**Panel C: Variation across years in $\alpha_k$**

| | Sum | Mean |
|---|---|---|
| 2006 | 0.431 | 0.006 |
| 2003 | 0.309 | 0.004 |
| 2000 | 0.260 | 0.004 |

Notes. Statistics for the Rotemberg weights. Statistics correspond to aggregated weights for a given industry across years (Panel B) and for a given year across industries (Panel C). Panel A reports the share and sum of negative Rotemberg weights. Panel B reports the top ten industries and Panel C the top five years with highest Rotemberg weights. The $g_k$ is the national industry exports exposure, $\hat{\beta}_k$ is the coefficient from the just-identified regression, and Ind Share is the industry share (multiplied by 100 for legibility).

Table A4. Effects of tariff cuts

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel A: Labor informality rate** | | | | | | |
| Export tariffs cuts | 0.038** | 0.019** | 0.018** | 0.021** | 0.020** | 0.021** |
| | ( 0.018) | ( 0.007) | ( 0.008) | ( 0.008) | ( 0.008) | ( 0.008) |
| **Panel B: Labor informality rate (incl. self-employment)** | | | | | | |
| Export tariffs cuts | 0.048*** | 0.036*** | 0.034*** | 0.035*** | 0.033*** | 0.034*** |
| | ( 0.017) | ( 0.009) | ( 0.009) | ( 0.010) | ( 0.010) | ( 0.010) |
| **Panel C: Share of salaried jobs** | | | | | | |
| Export tariffs cuts | −0.024*** | −0.021*** | −0.021*** | −0.018*** | −0.018*** | −0.018*** |
| | ( 0.005) | ( 0.005) | ( 0.005) | ( 0.005) | ( 0.005) | ( 0.004) |
| **Panel D: Log (number of formal salaried jobs)** | | | | | | |
| Export tariffs cuts | −0.145** | −0.092** | −0.110** | −0.084*** | −0.085*** | −0.087*** |
| | ( 0.058) | ( 0.042) | ( 0.045) | ( 0.031) | ( 0.030) | ( 0.028) |
| **Panel E: Log (number of informal salaried jobs)** | | | | | | |
| Export tariffs cuts | 0.047 | 0.007 | −0.012 | 0.022 | 0.023 | 0.023 |
| | ( 0.050) | ( 0.034) | ( 0.046) | ( 0.037) | ( 0.039) | ( 0.035) |
| **Panel F: Log (number of self-employment jobs)** | | | | | | |
| Export tariffs cuts | 0.083** | 0.088** | 0.076* | 0.103*** | 0.092*** | 0.098*** |
| | ( 0.039) | ( 0.040) | ( 0.040) | ( 0.031) | ( 0.031) | ( 0.029) |
| **Panel G: Log (average formal wage)** | | | | | | |
| Export tariffs cuts | −0.056*** | −0.042** | −0.059*** | −0.057*** | −0.053** | −0.049*** |
| | ( 0.018) | ( 0.018) | ( 0.022) | ( 0.022) | ( 0.021) | ( 0.018) |
| **Panel H: Log (average informal wage)** | | | | | | |
| Export tariffs cuts | −0.066 | −0.054* | −0.061* | −0.045 | −0.042 | −0.041 |
| | ( 0.040) | ( 0.030) | ( 0.035) | ( 0.033) | ( 0.032) | ( 0.033) |
| **Panel I: Log (average self-employment income)** | | | | | | |
| Export tariffs cuts | −0.055* | −0.019 | −0.041 | −0.035 | −0.027 | −0.027 |
| | ( 0.030) | ( 0.026) | ( 0.025) | ( 0.024) | ( 0.024) | ( 0.025) |
| **Panel J: Poverty rate (FGT0)** | | | | | | |
| Export tariffs cuts | 0.054*** | 0.019** | 0.037*** | 0.034*** | 0.033*** | 0.033*** |
| | ( 0.020) | ( 0.009) | ( 0.009) | ( 0.007) | ( 0.008) | ( 0.008) |
| Observations | 182 | 182 | 182 | 182 | 182 | 182 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |

Notes. Analogous to Tables 3 and 4 but run by OLS using the local tariff variable (the IV) as a measure of local exposure to export trade liberalization.

Table A5. Inclusion of imports exposure (part 1: employment)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel B: Labor informality rate** | | | | | | |
| Exports exposure | −0.308*** | −0.156** | −0.146* | −0.149** | −0.149** | −0.152** |
| | ( 0.118) | ( 0.072) | ( 0.078) | ( 0.068) | ( 0.067) | ( 0.067) |
| Imports exposure | 0.004 | −0.008 | −0.019 | −0.013 | −0.010 | −0.009 |
| | ( 0.007) | ( 0.008) | ( 0.012) | ( 0.009) | ( 0.009) | ( 0.009) |
| **Panel C: Labor informality rate (incl. self-employment)** | | | | | | |
| Exports exposure | −0.380*** | −0.309*** | −0.276*** | −0.257*** | −0.242*** | −0.251*** |
| | ( 0.111) | ( 0.101) | ( 0.099) | ( 0.084) | ( 0.081) | ( 0.080) |
| Imports exposure | 0.002 | −0.007 | −0.026* | −0.018 | −0.014 | −0.014 |
| | ( 0.007) | ( 0.011) | ( 0.014) | ( 0.011) | ( 0.011) | ( 0.011) |
| **Panel D: Share of salaried jobs** | | | | | | |
| Exports exposure | 0.195*** | 0.185*** | 0.183*** | 0.147*** | 0.141*** | 0.142*** |
| | ( 0.057) | ( 0.050) | ( 0.056) | ( 0.038) | ( 0.038) | ( 0.036) |
| Imports exposure | −0.002 | −0.004 | 0.002 | −0.002 | −0.003 | −0.002 |
| | ( 0.003) | ( 0.006) | ( 0.009) | ( 0.009) | ( 0.009) | ( 0.008) |
| **Panel E: Log (number of formal salaried jobs)** | | | | | | |
| Exports exposure | 1.155*** | 0.854** | 1.017** | 0.727** | 0.742*** | 0.747*** |
| | ( 0.383) | ( 0.428) | ( 0.507) | ( 0.286) | ( 0.271) | ( 0.254) |
| Imports exposure | −0.023 | −0.047** | −0.030 | −0.051 | −0.066* | −0.063** |
| | ( 0.019) | ( 0.023) | ( 0.043) | ( 0.036) | ( 0.035) | ( 0.032) |
| **Panel F: Log (number of informal salaried jobs)** | | | | | | |
| Exports exposure | −0.375 | 0.050 | 0.276 | −0.000 | −0.007 | −0.014 |
| | ( 0.368) | ( 0.313) | ( 0.430) | ( 0.300) | ( 0.311) | ( 0.271) |
| Imports exposure | −0.007 | −0.119*** | −0.171*** | −0.156*** | −0.154*** | −0.146*** |
| | ( 0.019) | ( 0.037) | ( 0.065) | ( 0.052) | ( 0.051) | ( 0.042) |
| **Panel G: Log (number of self-employment jobs)** | | | | | | |
| Exports exposure | −0.659* | −0.706* | −0.546 | −0.692** | −0.581** | −0.628** |
| | ( 0.362) | ( 0.376) | ( 0.341) | ( 0.271) | ( 0.268) | ( 0.248) |
| Imports exposure | −0.020 | −0.071 | −0.130** | −0.112* | −0.118* | −0.116** |
| | ( 0.016) | ( 0.053) | ( 0.065) | ( 0.063) | ( 0.061) | ( 0.058) |
| KP F-stat | 15.9 | 26.2 | 23.0 | 60.3 | 69.1 | 79.4 |
| Observations | 182 | 182 | 182 | 182 | 182 | 182 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |

Notes. Analogous to Table 3 but including local imports exposure, which is calculated as a shift-share variable using the 1992 industrial employment composition at the LLM level, and it is instrumented with local average industry import tariffs cuts.

Table A5. Inclusion of imports exposure (part 2: incomes)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel A: Log (average formal wage)** | | | | | | |
| Exports exposure | 0.451*** | 0.306* | 0.427** | 0.359* | 0.301* | 0.277* |
| | ( 0.153) | ( 0.171) | ( 0.207) | ( 0.187) | ( 0.176) | ( 0.154) |
| Imports exposure | 0.006 | 0.069*** | 0.099*** | 0.087*** | 0.097*** | 0.095*** |
| | ( 0.013) | ( 0.024) | ( 0.023) | ( 0.019) | ( 0.018) | ( 0.018) |
| **Panel B: Log (average informal wage)** | | | | | | |
| Exports exposure | 0.530* | 0.487* | 0.574* | 0.415 | 0.360 | 0.356 |
| | ( 0.319) | ( 0.292) | ( 0.348) | ( 0.276) | ( 0.265) | ( 0.270) |
| Imports exposure | 0.008 | −0.018 | −0.031 | −0.048 | −0.029 | −0.030 |
| | ( 0.016) | ( 0.031) | ( 0.036) | ( 0.032) | ( 0.028) | ( 0.028) |
| **Panel C: Log (average self-employment income)** | | | | | | |
| Exports exposure | 0.444* | 0.181 | 0.342 | 0.265 | 0.203 | 0.198 |
| | ( 0.257) | ( 0.226) | ( 0.241) | ( 0.197) | ( 0.192) | ( 0.198) |
| Imports exposure | −0.043*** | −0.015 | 0.027 | 0.012 | 0.005 | 0.008 |
| | ( 0.016) | ( 0.035) | ( 0.040) | ( 0.039) | ( 0.039) | ( 0.039) |
| **Panel D: Log (average per capita income)** | | | | | | |
| Exports exposure | −0.027 | −0.050 | 0.344 | 0.360* | 0.326* | 0.302* |
| | ( 0.318) | ( 0.386) | ( 0.223) | ( 0.191) | ( 0.187) | ( 0.174) |
| Imports exposure | 0.022 | 0.094** | 0.123*** | 0.106*** | 0.109*** | 0.109*** |
| | ( 0.021) | ( 0.041) | ( 0.040) | ( 0.027) | ( 0.027) | ( 0.027) |
| **Panel E: Poverty rate (FGT0)** | | | | | | |
| Exports exposure | −0.433*** | −0.129 | −0.285*** | −0.232*** | −0.223*** | −0.219*** |
| | ( 0.104) | ( 0.097) | ( 0.088) | ( 0.059) | ( 0.061) | ( 0.059) |
| Imports exposure | −0.004 | −0.040*** | −0.042*** | −0.034*** | −0.030*** | −0.030*** |
| | ( 0.008) | ( 0.008) | ( 0.013) | ( 0.010) | ( 0.009) | ( 0.009) |
| KP F-stat | 15.9 | 26.2 | 23.0 | 60.3 | 69.1 | 79.4 |
| Observations | 182 | 182 | 182 | 182 | 182 | 182 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |

Notes. Analogous to Table 4 but including local imports exposure, which is calculated as a shift-share variable using the 1992 industrial employment composition at the LLM level, and it is instrumented with local average industry import tariffs cuts.

Table A6. The effects of exports on employment and population

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel A: Employment rate** | | | | | | |
| Exports exposure | 0.051 | 0.044 | 0.039 | 0.016 | 0.014 | 0.007 |
| | ( 0.073) | ( 0.053) | ( 0.049) | ( 0.044) | ( 0.043) | ( 0.047) |
| **Panel B: Unemployment rate** | | | | | | |
| Exports exposure | −0.054 | 0.004 | −0.032 | −0.013 | −0.021 | −0.023 |
| | ( 0.043) | ( 0.037) | ( 0.038) | ( 0.026) | ( 0.023) | ( 0.023) |
| **Panel C: Log (population)** | | | | | | |
| Exports exposure | 0.310 | 0.154 | 0.231 | 0.011 | 0.043 | 0.042 |
| | ( 0.285) | ( 0.343) | ( 0.348) | ( 0.186) | ( 0.179) | ( 0.169) |
| **Panel D: Log (population of working age)** | | | | | | |
| Exports exposure | 0.219 | 0.060 | 0.184 | −0.036 | −0.003 | −0.002 |
| | ( 0.280) | ( 0.318) | ( 0.319) | ( 0.155) | ( 0.149) | ( 0.142) |
| KP F-stat | 35.0 | 53.7 | 46.7 | 159.0 | 199.3 | 227.6 |
| Observations | 182 | 182 | 182 | 182 | 182 | 182 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |

Notes. Analogous to Tables 3 and 4. The employment rate is the fraction of population of working age (18–65) that is employed. The unemployment rate is the percentage of individuals that are economically active and were looking for a job in the last month.

Table A7. Exclusion of outliers in exports exposure

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel A: Labor informality rate** | | | | | | |
| Exports exposure | −0.333** | −0.217** | −0.232** | −0.205** | −0.201** | −0.199** |
| | ( 0.168) | ( 0.097) | ( 0.104) | ( 0.086) | ( 0.083) | ( 0.082) |
| **Panel B: Labor informality rate (incl. self-employment)** | | | | | | |
| Exports exposure | −0.405*** | −0.370** | −0.364** | −0.289** | −0.277** | −0.292*** |
| | ( 0.156) | ( 0.153) | ( 0.151) | ( 0.115) | ( 0.108) | ( 0.108) |
| **Panel C: Share of salaried jobs** | | | | | | |
| Exports exposure | 0.223*** | 0.209*** | 0.173** | 0.109* | 0.107* | 0.123** |
| | ( 0.075) | ( 0.066) | ( 0.079) | ( 0.063) | ( 0.063) | ( 0.061) |
| **Panel D: Log (number of formal salaried jobs)** | | | | | | |
| Exports exposure | 1.173** | 1.146* | 1.348** | 0.805** | 0.799** | 0.853*** |
| | ( 0.480) | ( 0.589) | ( 0.644) | ( 0.322) | ( 0.316) | ( 0.306) |
| **Panel E: Log (number of informal salaried jobs)** | | | | | | |
| Exports exposure | −0.448 | −0.084 | 0.055 | −0.232 | −0.237 | −0.120 |
| | ( 0.507) | ( 0.382) | ( 0.506) | ( 0.408) | ( 0.403) | ( 0.346) |
| **Panel F: Log (number of self-employment jobs)** | | | | | | |
| Exports exposure | −0.810* | −0.586 | −0.384 | −0.549 | −0.496 | −0.601 |
| | ( 0.413) | ( 0.584) | ( 0.555) | ( 0.465) | ( 0.425) | ( 0.394) |
| **Panel G: Log (average formal wage)** | | | | | | |
| Exports exposure | 0.581*** | 0.540** | 0.636** | 0.484** | 0.460** | 0.398** |
| | ( 0.184) | ( 0.228) | ( 0.256) | ( 0.207) | ( 0.182) | ( 0.161) |
| **Panel H: Log (average informal wage)** | | | | | | |
| Exports exposure | 0.867** | 1.270** | 1.581** | 1.161** | 1.132** | 1.150** |
| | ( 0.387) | ( 0.587) | ( 0.736) | ( 0.533) | ( 0.489) | ( 0.490) |
| **Panel I: Log (average self-employment income)** | | | | | | |
| Exports exposure | 0.357 | 0.069 | 0.306 | 0.237 | 0.193 | 0.193 |
| | ( 0.377) | ( 0.299) | ( 0.316) | ( 0.252) | ( 0.211) | ( 0.219) |
| **Panel J: Poverty rate (FGT0)** | | | | | | |
| Exports exposure | −0.369*** | −0.132* | −0.268** | −0.150* | −0.146* | −0.141* |
| | ( 0.112) | ( 0.080) | ( 0.112) | ( 0.083) | ( 0.082) | ( 0.077) |
| KP F-stat | 46.9 | 36.4 | 33.3 | 108.4 | 126.9 | 127.4 |
| Observations | 161 | 161 | 161 | 161 | 161 | 161 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |



Notes. Analogous to Tables 3 and 4 but excluding the top and bottom 5 percent extreme values of the distribution of exports exposure.

Table A8. Unweighted regressions

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel A: Labor informality rate** | | | | | | |
| Exports exposure | −0.413** | −0.199* | −0.164* | −0.127* | −0.127* | −0.128* |
| | ( 0.174) | ( 0.102) | ( 0.097) | ( 0.068) | ( 0.067) | ( 0.067) |
| **Panel B: Labor informality rate (incl. self-employment)** | | | | | | |
| Exports exposure | −0.510*** | −0.415*** | −0.282** | −0.219*** | −0.218*** | −0.227*** |
| | ( 0.190) | ( 0.159) | ( 0.115) | ( 0.084) | ( 0.083) | ( 0.080) |
| **Panel C: Share of salaried jobs** | | | | | | |
| Exports exposure | 0.158** | 0.211*** | 0.188*** | 0.127** | 0.126** | 0.129*** |
| | ( 0.067) | ( 0.066) | ( 0.072) | ( 0.056) | ( 0.055) | ( 0.048) |
| **Panel D: Log (number of formal salaried jobs)** | | | | | | |
| Exports exposure | 1.407** | 1.287** | 1.553** | 0.803*** | 0.802*** | 0.796*** |
| | ( 0.590) | ( 0.578) | ( 0.677) | ( 0.260) | ( 0.257) | ( 0.231) |
| **Panel E: Log (number of informal salaried jobs)** | | | | | | |
| Exports exposure | −0.647 | 0.192 | 0.767 | 0.251 | 0.241 | 0.228 |
| | ( 0.484) | ( 0.544) | ( 0.560) | ( 0.299) | ( 0.311) | ( 0.269) |
| **Panel F: Log (number of self-employment jobs)** | | | | | | |
| Exports exposure | −0.926** | −1.073** | −0.169 | −0.489 | −0.477 | −0.524 |
| | ( 0.452) | ( 0.543) | ( 0.557) | ( 0.387) | ( 0.383) | ( 0.336) |
| **Panel G: Log (average formal wage)** | | | | | | |
| Exports exposure | 0.660** | 0.503** | 0.571** | 0.326 | 0.320* | 0.292** |
| | ( 0.288) | ( 0.241) | ( 0.249) | ( 0.202) | ( 0.186) | ( 0.145) |
| **Panel H: Log (average informal wage)** | | | | | | |
| Exports exposure | 0.714** | 0.580 | 0.725* | 0.294 | 0.288 | 0.309 |
| | ( 0.355) | ( 0.364) | ( 0.403) | ( 0.288) | ( 0.275) | ( 0.262) |
| **Panel I: Log (average self-employment income)** | | | | | | |
| Exports exposure | 0.813** | 0.345 | 0.484 | 0.297 | 0.290 | 0.273 |
| | ( 0.352) | ( 0.243) | ( 0.306) | ( 0.214) | ( 0.204) | ( 0.222) |
| **Panel J: Poverty rate (FGT0)** | | | | | | |
| Exports exposure | −0.433*** | −0.175 | −0.260*** | −0.144** | −0.142** | −0.132** |
| | ( 0.159) | ( 0.122) | ( 0.096) | ( 0.072) | ( 0.070) | ( 0.066) |
| KP F-stat | 53.4 | 23.8 | 22.9 | 160.1 | 166.6 | 241.7 |
| Observations | 182 | 182 | 182 | 182 | 182 | 182 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |



Notes. Analogous to Tables 3 and 4 but not using weights, so all LLMs weigh the same irrespective of their size.

Table A9. Controlling for crop production

| | Full sample | | Excluding LLMs with highest crop prod. |
|---|---|---|---|
| | (1) | (2) | (3) |
| **Panel A: Labor informality rate** | | | |
| Exports exposure | −0.162** | −0.220* | −0.178** |
| | ( 0.067) | ( 0.120) | ( 0.078) |
| **Panel B: Labor informality rate (incl. self-employment)** | | | |
| Exports exposure | −0.266*** | −0.423*** | −0.282*** |
| | ( 0.081) | ( 0.146) | ( 0.088) |
| **Panel C: Share of salaried jobs** | | | |
| Exports exposure | 0.139*** | 0.125* | 0.128*** |
| | ( 0.036) | ( 0.065) | ( 0.038) |
| **Panel D: Log (number of formal salaried jobs)** | | | |
| Exports exposure | 0.675*** | 1.208*** | 0.655*** |
| | ( 0.235) | ( 0.404) | ( 0.240) |
| **Panel E: Log (number of informal salaried jobs)** | | | |
| Exports exposure | −0.180 | 0.083 | −0.319 |
| | ( 0.274) | ( 0.460) | ( 0.277) |
| **Panel F: Log (number of self-employment jobs)** | | | |
| Exports exposure | −0.759*** | −0.845* | −0.754*** |
| | ( 0.218) | ( 0.491) | ( 0.229) |
| **Panel G: Log (average formal wage)** | | | |
| Exports exposure | 0.384*** | 0.704*** | 0.382*** |
| | ( 0.140) | ( 0.247) | ( 0.140) |
| **Panel H: Log (average informal wage)** | | | |
| Exports exposure | 0.322 | 0.815* | 0.371 |
| | ( 0.262) | ( 0.486) | ( 0.258) |
| **Panel I: Log (average self-employment income)** | | | |
| Exports exposure | 0.207 | 0.776** | 0.180 |
| | ( 0.199) | ( 0.325) | ( 0.196) |
| **Panel J: Poverty rate (FGT0)** | | | |
| Exports exposure | −0.254*** | −0.198* | −0.268*** |
| | ( 0.057) | ( 0.112) | ( 0.056) |
| KP F-stat | 227.6 | 94.5 | 220.3 |
| Observations | 182 | 182 | 173 |
| **Preexisting trends** | | | |
| Baseline PT | Yes | Yes | Yes |
| Share crop production | - | Yes | - |

Notes. Column 1 is analogous to column 6 in Tables 3 and 4. Column 2 adds a pre-trend for the employment share of crop production. Column 3 exclude the 5 percent of locations with the highest participation of crop production.

Table A10. Controlling for mining

| | Full sample | | Excluding LLMs with highest mining |
|---|---|---|---|
| | (1) | (2) | (3) |
| **Panel A: Labor informality rate** | | | |
| Exports exposure | −0.162** | −0.122 | −0.122* |
| | ( 0.067) | ( 0.098) | ( 0.067) |
| **Panel B: Labor informality rate (incl. self-employment)** | | | |
| Exports exposure | −0.266*** | −0.339*** | −0.205** |
| | ( 0.081) | ( 0.116) | ( 0.082) |
| **Panel C: Share of salaried jobs** | | | |
| Exports exposure | 0.139*** | 0.214*** | 0.145*** |
| | ( 0.036) | ( 0.051) | ( 0.040) |
| **Panel D: Log (number of formal salaried jobs)** | | | |
| Exports exposure | 0.675*** | 0.744** | 0.589** |
| | ( 0.235) | ( 0.323) | ( 0.240) |
| **Panel E: Log (number of informal salaried jobs)** | | | |
| Exports exposure | −0.180 | 0.269 | 0.033 |
| | ( 0.274) | ( 0.405) | ( 0.220) |
| **Panel F: Log (number of self-employment jobs)** | | | |
| Exports exposure | −0.759*** | −1.429*** | −0.728*** |
| | ( 0.218) | ( 0.297) | ( 0.269) |
| **Panel G: Log (average formal wage)** | | | |
| Exports exposure | 0.384*** | 0.396** | 0.239* |
| | ( 0.140) | ( 0.201) | ( 0.143) |
| **Panel H: Log (average informal wage)** | | | |
| Exports exposure | 0.322 | 0.486 | 0.444 |
| | ( 0.262) | ( 0.381) | ( 0.339) |
| **Panel I: Log (average self-employment income)** | | | |
| Exports exposure | 0.207 | 0.444 | 0.528** |
| | ( 0.199) | ( 0.295) | ( 0.211) |
| **Panel J: Poverty rate (FGT0)** | | | |
| Exports exposure | −0.254*** | −0.273*** | −0.231*** |
| | ( 0.057) | ( 0.091) | ( 0.065) |
| KP F-stat | 227.6 | 113.6 | 188.4 |
| Observations | 182 | 182 | 173 |
| **Preexisting trends** | | | |
| Baseline PT | Yes | Yes | Yes |
| Share crop production | - | Yes | - |

Notes. Column 1 is analogous to column 6 in Tables 3 and 4. Column 2 adds a pre-trend for the employment share of the mining sector. Column 3 exclude the 5 percent of locations with the highest participation of the mining sector.

Table A11. Alternative shift-share design

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Panel A: Labor informality rate** | | | | | | |
| Exports exposure | −0.308*** | −0.163* | −0.165* | −0.164** | −0.160** | −0.162** |
| | ( 0.105) | ( 0.087) | ( 0.091) | ( 0.075) | ( 0.073) | ( 0.074) |
| **Panel B: Labor informality rate (incl. self-employment)** | | | | | | |
| Exports exposure | −0.380*** | −0.316** | −0.302** | −0.277*** | −0.259*** | −0.266*** |
| | ( 0.098) | ( 0.138) | ( 0.139) | ( 0.096) | ( 0.090) | ( 0.087) |
| **Panel C: Share of salaried jobs** | | | | | | |
| Exports exposure | 0.195*** | 0.181** | 0.185** | 0.144*** | 0.137*** | 0.139*** |
| | ( 0.031) | ( 0.090) | ( 0.080) | ( 0.049) | ( 0.046) | ( 0.050) |
| **Panel D: Log (number of formal salaried jobs)** | | | | | | |
| Exports exposure | 1.154*** | 0.809** | 0.987*** | 0.669*** | 0.667*** | 0.675*** |
| | ( 0.202) | ( 0.346) | ( 0.354) | ( 0.168) | ( 0.167) | ( 0.159) |
| **Panel E: Log (number of informal salaried jobs)** | | | | | | |
| Exports exposure | −0.376 | −0.064 | 0.105 | −0.178 | −0.183 | −0.180 |
| | ( 0.376) | ( 0.389) | ( 0.394) | ( 0.364) | ( 0.354) | ( 0.384) |
| **Panel F: Log (number of self-employment jobs)** | | | | | | |
| Exports exposure | −0.659** | −0.774 | −0.677* | −0.819** | −0.716** | −0.759** |
| | ( 0.269) | ( 0.484) | ( 0.372) | ( 0.340) | ( 0.304) | ( 0.302) |
| **Panel G: Log (average formal wage)** | | | | | | |
| Exports exposure | 0.451*** | 0.371 | 0.525*** | 0.458*** | 0.411*** | 0.384*** |
| | ( 0.175) | ( 0.229) | ( 0.201) | ( 0.174) | ( 0.145) | ( 0.143) |
| **Panel H: Log (average informal wage)** | | | | | | |
| Exports exposure | 0.530** | 0.470 | 0.543 | 0.361 | 0.327 | 0.322 |
| | ( 0.253) | ( 0.591) | ( 0.632) | ( 0.507) | ( 0.481) | ( 0.487) |
| **Panel I: Log (average self-employment income)** | | | | | | |
| Exports exposure | 0.442** | 0.167 | 0.369 | 0.279 | 0.209 | 0.207 |
| | ( 0.204) | ( 0.343) | ( 0.311) | ( 0.247) | ( 0.227) | ( 0.229) |
| **Panel J: Poverty rate (FGT0)** | | | | | | |
| Exports exposure | −0.433*** | −0.167 | −0.327*** | −0.271*** | −0.257*** | −0.254*** |
| | ( 0.105) | ( 0.139) | ( 0.110) | ( 0.079) | ( 0.077) | ( 0.075) |
| KP F-stat | 35.0 | 53.7 | 46.7 | 159.0 | 199.3 | 227.6 |
| Observations | 182 | 182 | 182 | 182 | 182 | 182 |
| **Preexisting trends** | | | | | | |
| Demographics | - | Yes | Yes | Yes | Yes | Yes |
| Economic conditions | - | - | Yes | Yes | Yes | Yes |
| Trade with China | - | - | - | Yes | Yes | Yes |
| Offshoring | - | - | - | - | Yes | Yes |
| Routinization | - | - | - | - | - | Yes |



Notes. These regressions calculate standard errors clustered at the industry-level applying the method developed by Borusyak, Hull, and Jaravel (2021).