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Tracing the Local Impacts of Exports on Poverty and Inequality: The Case of Mexico

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Abstract

Evidence about the effect of exports on welfare at the local level is scarce. Using a unique dataset of international trade and poverty maps for almost 2,000 Mexican municipalities between 2004 and 2014, the study presented in this paper provides new evidence on the impact of a significant rise in exports on poverty and inequality at the local level. The analysis implements an instrumental variable approach that combines the initial structure of exports across municipalities with global trends in exports from developing to developed countries by sector. The results show that a 10 percent increase in the ratio of exports to workers reduces income inequality measured by the Gini coefficient by 0.17 points (using a 0 to 100 scale), but no significant effects on poverty reduction or average household incomes are identified. The lack of impacts on average incomes is driven by a rise in the supply of labor at the local level because municipalities with higher export growth experienced an increase in labor force participation and attracted more net migration, particularly of unskilled workers. Therefore, while total labor incomes grew in response to an increase in exports, average labor incomes per worker did not change. Declining remittances also blunted the effect of growing exports on household incomes.

Keywords: International trade, exports, poverty, local impacts, migration
JEL Codes: F14, F16, I3, D3, J61

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1. Introduction

Despite the large theoretical and empirical literature documenting that access to international trade can be beneficial for economic development (Edwards 1993; Goldberg and Pavcnik 2016; Wacziarg and Welch 2008), there has been a rise in protectionism in discourse and measures around the world recently (Donnan 2016). This trend is also reflected in the perceptions of individuals on trade. Pavcnik (2017) shows that the share of people reporting that trade is beneficial to the economy has declined since 2002.

Consistent with these trends, recent empirical evidence points to the negative impact import competition from developing countries had on workers in developed economies (for example, see Autor, Dorn, and Hanson 2013; Balsvik, Jensen, and Salvanes 2015; Hakobyan and McLaren 2016). Meanwhile, standard trade models predict that a rise in exports from developing to developed nations would benefit workers in countries with abundant labor. In fact, recent studies show a substantial impact of exports on poverty reduction and improved labor market outcomes at the local level in China and Vietnam (Erten and Leight 2019; McCaig 2011, McCaig and Pavcnik 2018) and on poverty and inequality among states in Brazil (Castilho, Menéndez, and Sztulman 2012). Yet other empirical studies find contrasting results, including that trade liberalization does not necessarily benefit all households in developing countries and may lead to widening inequality and declining labor market outcomes (De Loecker et al. 2016; Dix-Carneiro and Kovak 2017; Erten, Leight and Tregenna 2019; Goldberg and Pavcnik 2007; Nicita 2009; Pavcnik 2017; Revenga 1997; Topalova 2010). The underlying channels through which international trade may or may not benefit individuals and regions in developing countries are not fully understood.

This paper investigates the effects of a rise in exports on poverty and inequality using a rich municipality-level dataset from a developing country. Mexico is an interesting case given its lackluster performance in economic growth and poverty reduction, despite a significant trade expansion (Hanson 2010). Mexico joined the forerunner of the World Trade Organization, the General Agreement on Tariffs and Trade, in 1986 and the North American Free Trade Agreement (NAFTA) in 1994, leading to substantial tariff reductions globally and regionally, greater export orientation, and diversification away from oil. Exports as a share of gross domestic product (GDP) rose by 20 percentage points beginning in 1994, following reforms to open the economy to trade and to liberalize domestic markets. Most of Mexico's exports—

about 70 percent to 80 percent since 2004—go to one high-income economy, the United States. Yet, Mexico has underperformed in terms of growth, inclusion, and poverty reduction relative to its peers (World Bank 2019), and there has been only limited income and poverty convergence across municipalities (López-Calva, Ortiz-Juárez, and Rodríguez-Castelán 2019).[1]

That increasing exports did not translate into lower poverty and higher income growth is not yet fully understood. Lederman, Maloney, and Servén (2005) argue that NAFTA had positive impacts on foreign direct investment (FDI), trade, and productivity in Mexico, but only modest impacts on wages and the convergence of income per capita. Rodríguez-Castelán, López-Calva and Barriga (2020) find that local exposure to trade is associated with higher productivity in the manufacturing sector which in turn declines with higher industry concentration. Accordingly, suggestive research points out that negative aggregate shocks in Mexico tend to have important negative effects in regional growth, but that positive shocks, such as a rise in export growth, are not typically reflected in large positive effects on growth nor, to a certain extent, on household welfare. In most states in Mexico between 2005 and 2014, as Campos-Vázquez and Monroy-Gómez-Franco (2016) observe, negative shocks increased poverty more than positive shocks reduced it. The dynamics behind this observation is, up to a point, what this paper aims to test, that is, to identify how and whether a positive trade shock—growth in exports—benefits (or not) the population at the local level.

The scarce research on the impact of export growth on wages and employment in Mexico tends to concentrate on studies on plants or firms (Frías, Kaplan, and Verhoogen 2012; Verhoogen 2008), industry (Waldkirch, Nunnenkamp, and Bremont 2009), or regions (Airola 2008; Chiquiar 2008; Feenstra and Hanson 1997). Within this research, there is some evidence of an equalizing effect of trade on wages that is consistent with the Heckscher–Ohlin model. Chiquiar (2008) finds that regions exposed to NAFTA show an increase in wage levels, but a decrease in the skill premium, and Airola (2008) finds that the wage skill premium is negatively related to maquiladora employment (used as a proxy for FDI). There is also evidence of a small but positive impact of FDI on manufacturing employment (Waldkirch,

[1] Between 2004 and 2014, poverty declined in Mexico by 4.0 percentage points, from 37.6 percent to 33.6 percent, while, in Latin America and the Caribbean, it declined by nearly 17.0 percentage points, from 41.3 percent to 24.4 percent (US$5.50-a-day per capita poverty line in 2011 purchasing power parity). Moreover, almost half the decline in poverty in Mexico is explained by redistribution (because of the shift from general subsidies to targeted and conditional transfers) rather than to economic growth, despite the expansion in trade over the period. In Latin America, in contrast, redistribution only explains about 20.0 percent of the decline, while economic growth accounted for nearly 80.0 percent of the reduction in poverty.

Nunnenkamp, and Bremont 2009). Meanwhile, there is evidence pointing to a connection between trade and wage inequality (Frías, Kaplan, and Verhoogen 2012; Verhoogen 2008), as well as a link between FDI and a rise in the share of skilled labor in total wages (Feenstra and Hanson 1997). Hanson (2007) explores the distributional impacts of NAFTA and finds that Mexican regions more highly exposed to the agreement witnessed a larger decline in poverty and inequality. Prina (2013, 2015) finds that the change in prices of agricultural exports associated with NAFTA benefited small farmers more than large farmers. She also finds that agricultural wages did not change, but employment grew in sectors that had experienced a price increase. None of these studies, however, identifies the causal impact of the overall increase in exports experienced by Mexico on local household incomes.

This paper contributes to the literature by exploiting variations in export growth across Mexican municipalities between 2004 and 2014 to identify the impacts on poverty, inequality, and household incomes across the distribution. It finds that the effects of exports on household incomes tend to be progressive because they tend to be positive only among the poorest deciles. Nonetheless, these results are not robust to alternative specifications. To understand what is behind such weak impacts of rising exports on incomes, the paper investigates labor market mechanisms. It finds that, while exports do raise the total amount of labor incomes at the municipal level, average labor incomes do not change. This is because municipalities experiencing growing exports also experience an increase in labor supply that is driven by rising labor force participation, inflows of returning migrants, and lower emigration outflows. These results are consistent with the hypothesis put forward by Robertson (2007), who argues that the lack of positive labor market impacts of trade integration may be partly explained by migration. In addition, the paper finds that remittances tend to decline more in municipalities experiencing higher export growth.

This article contributes to the literature in several ways. It is the first study to focus on the role of exports at the local level in a developing country using unique panel data from poverty maps, combined with data on exports at the municipal level. Second, it uses an instrumental variable that allows the causal impact of exports to be disentangled. The instrument combines the initial export structure by sector at the municipal level with global trends in exports from developing to developed countries by sector. Municipal-level trends in this instrument are thus not affected by local-level shocks. Third, it provides new evidence on the channels that could help explain why increasing exports may not necessarily translate into higher income growth

and poverty reduction. This appears to be the first study to show that migration and remittances mitigate the impacts of exports on incomes and poverty at the local level in Mexico.[2]

The rest of this article is structured as follows. Section 2 presents the identification strategy. Section 3 describes the data sources. Section 4 presents the findings, and section 5 concludes.

2. Identification Strategy

An equation is estimated as follows:

$$y_{m,t} - y_{m,t-\tau} = \alpha + \beta \left(x_{m,t} - x_{m,t-\tau}\right) + \Gamma X_{m,t_0} + \varepsilon_{m,t,t-\tau}, \qquad (1)$$

where $y_{m,t}$ is the poverty headcount ratio or income distribution measure in municipality *m* and year *t*. X_{m,t_0} is a vector of variables to control for different trends across municipalities. These include literacy rate, sectoral structure of employment, total population, and the share of the population in rural areas in the baseline year t_0. The change in the main variable of interest, $x_{m,t}$, is as follows:

$$\ln\left(\frac{exports_{m,t}}{workers_{m,0}}\right) - \ln\left(\frac{exports_{m,t-\tau}}{workers_{m,0}}\right), \qquad (2)$$

where $exports_{m,t}$ represents yearly exports originating from municipality *m*, and $workers_{m,0}$ is the number of workers ages 12 or more in municipality *m* in the year 2000. This variable is introduced in logarithms to limit the weight of extreme values because it is highly skewed toward the left. As seen in figure 1, the distribution of this variable becomes more symmetric (in both levels and first-differences) if logs are used. In addition, to prevent losing municipalities from the sample that have zero exports in one or both years because of the logarithmic transformation, a constant equal to 1 is added to the exports per worker variable so that this is never zero.

Ordinary least squares (OLS) estimates of β may be biased if there are omitted variables correlated both with household incomes and exports. More specifically, more prosperous areas with higher income growth and poverty reduction rates would be more likely to attract FDI and thereby become export hubs. This would tend to lead to OLS estimates that are upward biased. However, if policy incentives encourage exporting firms to locate in poorer areas, then

[2] Majlesi and Narciso (2018) find that Mexican municipalities that are more highly exposed to Chinese import competition exhibit higher out-migration to other municipalities, but less out-migration to the United States.

the OLS estimates would be biased downward. To overcome this challenge, an instrumental variable is used to isolate changes in Mexican exports that are not driven by local factors: sectoral patterns in the demand of developed countries for developing-country exports, excluding Mexico. In particular, the following instrumental variable is used for $x_{m,t} - x_{m,t-\tau}$:

$$\ln\left(\frac{\sum_s X^*_{m,s,t}}{workers_{m,0}}\right) - \ln\left(\frac{\sum_s X^*_{m,s,t-\tau}}{workers_{m,0}}\right), \qquad (3)$$

where $X^*_{m,s,t}$ is the predicted level of exports by sector, as follows:

$$X^*_{m,s,t} = exports_{m,s,0} \text{ x } (1 + \phi_{s,t}), \qquad (4)$$

where $\phi_{s,t}$ is the rate of growth of sector *s* exports from developing countries (excluding Mexico) to developed countries from the initial year to year *t*. Thus, municipal-level changes in the instrument are not driven by local factors, but only by trends in the exports of other countries. These Bartik-type instruments are widely used in the empirical literature to estimate the local impacts of trade.[3]

3. Data and Descriptive Statistics

3.1. Data

Different data sources are used on trade, incomes, labor market outcomes, and migration at the municipal level. First, the data on exports by municipality, year, and sector supplied by the tax authority of Mexico (Servicio de Administración Tributaria) cover each municipality in 2004–14. Data are reported using the 2002 Harmonized System classification at the 4-digit level and converted to the International Standard Industrial Classification (Revision 4) classification using correspondence tables.[4] The poverty headcount ratios, Gini coefficients, and mean incomes by decile at the municipal level have been estimated using the poverty mapping methodology (Elbers, Lanjouw, and Lanjouw 2003). The data are available for 2000, 2005,

[3] For example, Autor, Dorn, and Hanson (2013) estimate the impacts of import competition from China on local US labor markets by combining the initial local distribution of employment across sectors and nationwide changes in imports from China by sector. They instrument this variable using changes in Chinese imports by other high-income countries.

[4] See UNDESA (2008); HS (Harmonized Commodity Description and Coding Systems) (database), Statistics Division, Department of Economic and Social Affairs, United Nations, New York, https://unstats.un.org/unsd/tradekb/Knowledgebase/50018/Harmonized-Commodity-Description-and-Coding-Systems-HS.

2010, and 2015. The 2005 and 2015 data have been used because they match more closely the end-point years of the trade data. (See Enamorado et al. [2016] for a detailed description of the data.)

For labor market and migration indicators, tabulations from the 2000 and 2010 Census of Population and Housing and the 2015 Population Count are used to obtain labor market indicators, as well as information on the demographic characteristics of the population at the municipal level.[5] Given that publicly available data from the Mexican Institute of Statistics do not allow for more than two cross-tabulations, the census microdata samples of the Integrated Public Use Microdata Series are used to estimate labor market indicators on more detailed groups (Ruggles et al. 2007). Because the 2005 data do not include detailed information on labor market outcomes, 2000 data are used instead as the initial year for these indicators. The analysis also relies on the absolute index of migratory intensity between Mexico and the United States in 2000–10 to capture emigration and immigration with respect to the United States, as well as the remittances received in Mexico from that country (CONAPO 2014). The analysis uses the exports from developing to developed countries at the 2-digit level from the BACI international trade database to construct the instrumental variable (Gaulier and Zignago 2010).[6] Low- and middle-income countries are defined as developing economies, and high-income countries are defined as developed, following the World Bank's income classification.

3.2. Descriptive Statistics

Mexico has experienced a substantial increase in exports since the 1990s (figure 2). Exports of goods and services increased from US$96.7 billion to US$480.0 billion in 1990–2018. As a share of GDP, the rise was from 18.7 percent to 39.2 percent. This analysis focuses on 2004–14 period because the municipal-level export dataset only covers those years. While this excludes the initial period of NAFTA, it still captures a significant increase in exports, from about 28.4 percent to about 31.9 percent of GDP.

According to various measures, poverty declined almost every year, with the main exception of the 1994–95 tequila crisis (figure 3). This is particularly true of the US$3.20-a-day and

[5] Even though the 2015 population count is from a survey, the sample size is sufficiently large to provide statistics representative at the municipality level. See Enamorado et al. (2016).

[6] These include the following sectors: agriculture, mining, food products, textiles, wood, paper, printing, chemicals, rubber and plastics, metal, electronics, machinery, automotive, other manufacturing, utilities, construction, education, and other nonmanufacturing.

US$1.90-a-day poverty lines. Moderate poverty showed a smaller decline, from about 44 to 34 percentage points in 1992–2006 and has remained stagnant since then. Nonetheless, these declines are relatively small compared with those in other countries typically mentioned as examples of successful export-led growth. For example, while the share of exports in GDP in Vietnam rose from 54.7 to 70.3 percentage points in 2002–08, the share of people living on less than US$3.20-a-day declined from about 70.8 to 46.8 percentage points. Measured according to the US$1.90-a-day poverty line, the decline was also large, from about 38.0 to 14.8 percentage points.[7]

Table 1 shows descriptive statistics on the sample used in the estimations. The focus is on urban and semiurban areas (1,982 of 2,457 municipalities), given that these areas represent more than 99 percent of total exports over 2004–14 and two-thirds of rural municipalities show zero or close to zero exports. Municipalities with a higher ratio of exports per worker exhibit a lower incidence of poverty and higher incomes (figure 4). Income inequality is similar across these two groups of municipalities, with a Gini coefficient of about 0.38 or 0.39. Moreover, a simple inequality decomposition of the Theil index shows that within-municipality inequality accounts for about three-quarters of total inequality in Mexico. Understanding the role of trade in shaping inequality at the local level in Mexico is thus relevant because trade explains most of the inequality at the national level.

4. Results

4.1. Poverty and Income

Table 2 shows the estimates of equation 1 using the share of the extreme poor as the dependent variable. The preferred specification is in column (3), which controls for the share of the rural population, the literacy rate, total population, and the shares of workers by sector as well as median income per capita in 2000 to account for different trends in trade and labor market outcomes along these dimensions. Illustrated in columns 1–3, exports per worker are negatively correlated with poverty at the municipal level. The results are statistically

[7] For the export data, see "Exports of Goods and Services (% of GDP): Vietnam," World Bank, Washington, DC, https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?end=2018&locations=VN&start=1986. For the poverty data, see Poverty and Equity Data Portal: Vietnam (database), World Bank, Washington, DC, http://povertydata.worldbank.org/poverty/country/VNM. The US$5.50-a-day poverty line is not a good reference point for comparing Mexico and Vietnam because, during this period, the vast majority of Vietnamese households were poor according to this definition.

significant, but small in magnitude. In particular, a 10 percent rise in exports per worker is associated with a 0.034 (column 3) to 0.039 (column 1) percentage point decline in poverty.[8]

Because OLS estimates may be biased if unobserved shocks at the local level are correlated with both exports and income levels, the analysis adopts an instrumental variable approach. The results of the first-stage regressions are displayed in table 3 and indicate that the instrument is highly correlated with the endogenous variable: the F-statistic surpasses the standard significance threshold. Figure 5 shows that the association between the instrument and the endogenous variable is strong.

Table 2, columns 4–6 show the instrumental variable estimates of the impacts on extreme poverty. Exports do not lead to lower poverty rates at the municipal level. According to the preferred specification in column 6, a 10 percent rise in exports per worker reduces the poverty headcount ratio by 0.17 percentage points, a magnitude that is statistically indistinguishable from zero. The impact is negligible considering that the exports-to-worker ratio increased by 12.3 percent during the period under analysis and that the extreme poverty rate was 37 percent in 2005.

Table 4 shows that the rise in household incomes per capita led by export growth in urban and semiurban areas was experienced solely at the bottom of the income distribution. Export growth led to higher income growth among households in the two poorest deciles in urban areas. This explains why no impacts are found in poverty rates; the extreme poverty line corresponds to the income levels of households in the third decile. A 10-percent increase in exports per worker raised average incomes per capita by about 0.86 percent and 0.60 percent in the first and second deciles, respectively. The magnitude of the coefficients declines gradually as one ascends the income distribution. As a result, the estimates imply that exports tend to reduce income inequality at the local level. In particular, the Gini index falls by around 0.17 points (using a 0–100 scale) if the exports-to-worker ratio rises by 10 percent (table 5, column 6). This is a significant change, considering that the Gini index declined 0.17 points (from 38.6 to 38.43) in 2005–15 (table 1) and that, according to the estimates, three-quarters of Mexico's income inequality is explained by within-municipality inequality.

[8] In a lin-log model, to calculate the expected change in the dependent variable associated with a 10 percent rise in the independent variable, the estimated coefficient should be multiplied by log(110/100) = log(1.1) = .095.

That exports exert a progressive impact on incomes at the local level contrasts with the findings of plant-level studies documenting the unequalizing impacts on wages in Mexico. For example, Frías, Kaplan, and Verhoogen (2012) find that exports raise within-plant wage inequality, and Verhoogen (2008) finds that they increase within-industry wage inequality. However, the results of the analysis are broadly in line with the findings of the literature exploiting regional variations in exports and labor market outcomes (Airola 2008; Chiquiar 2008; Hanson 2007).

Table 6 illustrates a robustness check of the main results by controlling for the initial characteristics of municipalities. The impact of exports on the average income of the poorest decile is sensitive to the inclusion of this additional set of controls: the estimated coefficient becomes statistically insignificant if one controls for the sectoral composition of employment and exports. However, the impacts of exports on relative incomes continues to be statistically significant and progressive across all specifications, as shown by the effects on the Gini coefficient.

To understand the impacts of exports on the income distribution more precisely, the following subsections examine two mechanisms that may help explain why any potential gains in exports are not reflected in higher household incomes per capita and less poverty.

4.2. Labor Market Impacts

Table 7 shows the impact of exports on the labor market. The estimates indicate that exports tend to increase labor force participation (panel a). In particular, a 10 percent increase in exports per worker raised the share of working-age individuals working or looking for a job by 0.15 percentage points (column 6). The economic significance of this impact is rather small, considering that the labor force participation rate in the average municipality in 2000 was 45.8 percentage points.

The OLS results suggest that exports per worker and employment rates are strongly associated, although the economic significance is small (panel b). In particular, a 1 percent rise in exports per worker is associated with an increase of 0.05 percentage points in the local employment rate, which represents only 0.11 percent of the employment rate of the average municipality in 2005. The instrumental variable estimates are less precise than the OLS estimates. The only statistically significant result is in the specification without any control variables, which shows

that a 10 percent increase in exports raised employment rates by 0.23 percentage points on average.

The weak employment impacts may be explained by the fact that exports led to a labor supply shock by raising the number of net migrants, thereby increasing both the numerator and the denominator of the employment rate. The analysis investigates this issue by examining the impacts on total labor incomes, that is, the sum of all labor incomes in the municipality. The impacts of exports on total labor income at the local level are statistically significant. A 10 percent rise in exports per worker raised total labor incomes by 2.4 percent on average (panel c, column 6). This is significant in economic terms as well, considering that total labor incomes in real terms grew by 9.2 percent during the period. Despite the increase in total labor incomes, labor income per worker did not rise in response to export growth. The OLS and IV effects are not statistically significant (panel d).

4.3. Migration and Remittances

The period under analysis includes the financial crisis (2008–09), that is, the first year in which the stock of Mexican migrants to the United States started to decline because of a lower number of arrivals to the United States and a higher number of Mexican returnees. The number of unauthorized migrants from Mexico to the United States fell from the peak of 6.9 million in 2007 to 5.6 million in 2015 (Gonzalez-Barrera and Krogstad 2019). The total stock of people born in Mexico and living in the United States fell from about 11.7 million to 11.2 million in 2010–18.[9] Local exports played an important role in determining which municipalities were less likely to send emigrants to the United States and which ones were more likely to absorb returnees. Internal migration flows were also responsive to changes in local exports.

Table 8 shows the impacts of exports on migration. A 10 percent rise in exports per worker raised the number of people who had migrated in the previous five years to the municipality by about 7.1 people (panel a, column 1). This represents about 4.6 percent of the number of recent migrants for the average municipality in 2005. Most of this immigration response was generated by internal migrants (panel b). Indeed, a 10 percent increase in exports per worker raised the number of immigrants from other Mexican municipalities by about 4.9 people. The corresponding estimate for external migrants was only 2.2 people (panel c). The inflows of

[9] See "U.S. Immigration Trends," Migration Policy Institute, Washington, DC, https://www.migrationpolicy.org/programs/data-hub/us-immigration-trends#source.

migrants were larger among the unskilled. A 10 percent rise in exports per worker raised the number of unskilled migrants by 5.2 people (panel a, columns 2–4). In contrast, the increase in the number of middle skilled and highly skilled migrants was only a fifth or less.

Table 9 shows the impacts among returnees from and emigrants to the United States in 2000–10.[10] A rise in exports per worker by 10 percent raises the number of households with returning migrants from the United States by 14 on average. At the same time, it reduces the number of households with emigrants to the United States by about 9.

These internal and external patterns of migration also help explain the increase in the size of the working-age population experienced by municipalities when exports are growing. The size of the total population ages 14–55 in urban municipalities rose, especially among the unskilled, in response to export growth (table 8, panel d). While the size of the skilled working-age population increased by about 11.6 people when exports per worker rose by 10 percent in the average municipality, the size of the unskilled working-age population increased by about 82.1 people. This represents about 30 percent of the increase in the number of unskilled people in this age-group in the average municipality during the period. The migration response to higher exports implies that the estimated positive impacts on the local labor market are partially diluted because of the increase in the size of the local working-age population, particularly the unskilled.

A 10 percent increase in the growth of the export-to-worker ratio reduces the share of households receiving remittances from the United States by 0.18 percentage points (table 9, column 3). This represents almost 1.4 times the decline in the share of households receiving remittances during the period. This may be explained by the fact that the number of household workers abroad falls disproportionately as exports grow. An additional consumption-smoothing mechanism may be important if, for example, more job opportunities reduce the need to rely on remittances.

5. Conclusion

This paper provides new evidence about the impacts of exports on welfare in developing countries. Using a rich dataset on exports, income distribution, labor market outcomes, and migration at the municipal level in Mexico in 2004–14, it offers new insights on why a

[10] These data are not available for 2005 and 2015.

significant growth in exports does not necessarily lead to better average welfare indicators at the local level.

Although the analysis finds that raising exports may reduce income inequality, there is no evidence of significant effects on poverty and average household incomes. This is because, while growth in exports leads to higher total labor income, it also raises the supply of labor through inflows of migrants, particularly unskilled ones. Internal and external migration flows thus offset somewhat the positive impacts of exports for the average resident at the local level. Remittances also tend to decline in response to rising exports.

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Tables

Table 1. Descriptive statistics of the sample. Municipality averages

Variable	2005	2015	2015-2005 change
Poverty with food poverty line	35.5	34.7	-0.88
Decile 1 Per capita income	588	652	64
Decile 2 Per capita income	783	876	93
Decile 3 Per capita income	963	1086	123
Decile 4 Per capita income	1151	1308	157
Decile 5 Per capita income	1364	1559	194
Decile 6 Per capita income	1623	1861	238
Decile 7 Per capita income	1963	2255	292
Decile 8 Per capita income	2472	2835	363
Decile 9 Per capita income	3453	3926	473
Gini index	38.59	38.42	-0.17
Labor foce participation rate	45.80	42.84	-2.96
Employment rate	44.84	40.66	-4.18
Total labor income	6806147	7435732	629585
Average labor income	4258	4442	184
Immigrants from other mexican states or countries: All	153.70	136.24	-17.46
Immigrants from other mexican states or countries: Unskilled	95.70	99.56	3.87
Immigrants from other mexican states or countries: Semi-skilled	23.08	24.09	1.01
Immigrants from other mexican states or countries: Skilled	15.75	12.12	-3.63
Immigrants from other mexican states: All	112.38	102.71	-9.67
Immigrants from other mexican states: Unskilled	77.11	72.40	-4.70
Immigrants from other mexican states: Semi-skilled	20.06	19.25	-0.81
Immigrants from other mexican states: Skilled	13.67	10.66	-3.01
Immigrants from other countries: All	41.31	33.53	-7.79
Immigrants from other countries: Unskilled	18.59	27.16	8.57
Immigrants from other countries: Semi-skilled	3.02	4.84	1.82
Immigrants from other countries: Skilled	2.08	1.46	-0.62
Total working age population (aged 14-55)	2783	3104	321
Unskilled working age population (aged 14-55)	2012	2300	288
Semi-skilled working age population (aged 14-55)	474	575	102
Skilled working age population (aged 14-55)	258	220	-38
Number of households with emigrants to the US	440	265	-175
Number of households with returning migrants from the US	90	301	211
Percentage of households receiving remittances from the US	6.38	6.25	-0.13
Exports/Workers 2000 (+1, in logs)	4.20	4.59	0.38
Exports/Workers 2000 (in levels)	2170	3323	1153
Number of municipalities	1982	1982	1982
Covariates (2000 values)			
Literacy rate	0.82		
Population	44026		
Share of population in rural areas	0.85		
Share of population > 12 years in primary sector	0.44		
Share of population > 12 years in secondary sector	0.15		
Share of population > 12 years in tertiary sector	0.41		
Per capita median income	1233		

Note: Labor force participation, employment and labor incomes as well as US migration and remittances in 2005 corresponds to the year 2000, while exports in 2005 refer to the year 2004. Similarly, US migration and remittances in 2015 corresponds to the year 2010, while exports in 2015 refer to the year 2014. Per capita incomes of each decile are expressed at 2014 prices, while average and total labor incomes are at 2015 prices (both deflated using the average National Consumer Price Index-base December 2010).

Table 2. Impact of Exports on Extreme Poverty

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
log (Exports per worker), change	-0.411**	-0.257	-0.364*	-0.226	-0.808	-1.831
	(0.193)	(0.191)	(0.188)	(1.608)	(1.671)	(1.745)
Observations	1,982	1,982	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	NO	YES	YES	NO	YES	YES
Median income control (year 2000)	NO	NO	YES	NO	NO	YES

Note: Robust standard errors in parentheses. The dependent variable is the change in the poverty headcount ratio using the food poverty line, from 2005 to 2015. The explanatory variable is the change in the log of exports-to-workers from 2004 to 2014. Demographic and employment controls include the proportion of rural population, the proportion of population aged 15 and more who are literate, total population, and the share of employment in the primary, secondary and tertiary sectors of economic activity (all variables in the year 2000).
*** p < .01 ** p < .05 * p < .1

Table 3. First stage regressions

	IV		
	(1)	(2)	(3)
log (Predicted exports per worker), change	1.152***	1.104***	1.069***
	(0.154)	(0.154)	(0.154)
Observations	1,982	1,982	1,982
F-statistic	56.06	51.38	47.94
Demographic and employment controls (year 2000)	NO	YES	YES
Median income control (year 2000)	NO	NO	YES

Note: Robust standard errors in parentheses. The dependent variable is the change in the log of exports-to-workers from 2004 to 2014. The explanatory variable is the change in the log of predicted exports-to-workers from 2004 to 2014 (see equations (3) and (4) in the main text). Demographic and employment controls include the proportion of rural population, the proportion of population aged 15 and more who are literate, total population, and the share of employment in the primary, secondary and tertiary sectors of economic activity (all variables in the year 2000).
*** p < .01 ** p < .05 * p < .1

Table 4. Impact of Exports on Per capita Incomes

	IV								
	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9
log (Exports per worker), change	0.0864**	0.0606*	0.0450	0.0323	0.0204	0.00922	-0.00216	-0.0146	-0.0299
	(0.0394)	(0.0361)	(0.0350)	(0.0347)	(0.0350)	(0.0357)	(0.0369)	(0.0388)	(0.0421)
Observations	1,982	1,982	1,982	1,982	1,982	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	YES	YES	YES	YES	YES	YES	YES	YES	YES
Median income control (year 2000)	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: Robust standard errors in parentheses. The dependent variable is the change in the log of household per capita income for each decile, from 2005 to 2015. The explanatory variable is the change in the log of exports-to-workers from 2004 to 2014. Demographic and employment controls include the proportion of rural population, the proportion of population aged 15 and more who are literate, total population, and the share of employment in the primary, secondary and tertiary sectors of economic activity (all variables in the year 2000). Household per capita incomes for each decile correspond to the cut-off points resulting from dividing the households in each municipality into ten groups of equal size. All monetary values are in real terms at 2014 prices and were deflated using the average National Consumer Price Index (base December 2010).
*** p < .01 ** p < .05 * p < .1

Table 5. Impact of Exports on Inequality

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
log (Exports per worker), change	-0.229*	-0.196	-0.161	-1.312*	-2.050***	-1.811**
	(0.129)	(0.127)	(0.128)	(0.684)	(0.743)	(0.770)
Observations	1,982	1,982	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	NO	YES	YES	NO	YES	YES
Median income control (year 2000)	NO	NO	YES	NO	NO	YES

Note: Robust standard errors in parentheses. The dependent variable is the change in the Gini index, from 2005 to 2015. The explanatory variable is the change in the log of exports-to-workers from 2004 to 2014. Demographic and employment controls include the proportion of rural population, the proportion of population aged 15 and more who are literate, total population, and the share of employment in the primary, secondary and tertiary sectors of economic activity (all variables in the year 2000).
*** p < .01 ** p < .05 * p < .1

Table 6. Robustness of main results. Instrumental variables estimates

		Additional controls (initial year)					
Estimated impact of log (Exports per worker) change on:	Baseline	Employment shares	Exports shares	Exports per worker	Market concentration	Government expenditure	Excluding outliers
Extreme poverty, change	-1.831	-0.912	1.152	-1.859	-0.651	-2.216	-1.956
	(1.745)	(1.947)	(1.627)	(1.743)	(1.711)	(1.775)	(1.942)
Decile 1 per capita income, change (in logs)	0.0864**	0.0677	0.0160	0.0871**	0.0478	0.0989**	0.0821*
	(0.0394)	(0.0428)	(0.0396)	(0.0394)	(0.0379)	(0.0401)	(0.0429)
Decile 2 per capita income, change (in logs)	0.0606*	0.0424	-0.00543	0.0614*	0.0282	0.0707*	0.0575
	(0.0361)	(0.0396)	(0.0361)	(0.0360)	(0.0349)	(0.0368)	(0.0396)
Decile 3 per capita income, change (in logs)	0.0450	0.0267	-0.0179	0.0459	0.0163	0.0541	0.0424
	(0.0350)	(0.0387)	(0.0354)	(0.0348)	(0.0340)	(0.0358)	(0.0384)
Decile 4 per capita income, change (in logs)	0.0323	0.0137	-0.0280	0.0332	0.00619	0.0405	0.0302
	(0.0347)	(0.0386)	(0.0358)	(0.0345)	(0.0339)	(0.0356)	(0.0381)
Decile 5 per capita income, change (in logs)	0.0204	0.00152	-0.0376	0.0214	-0.00388	0.0280	0.0189
	(0.0350)	(0.0390)	(0.0369)	(0.0347)	(0.0343)	(0.0359)	(0.0384)
Decile 6 per capita income, change (in logs)	0.00922	-0.00986	-0.0477	0.0103	-0.0137	0.0158	0.00857
	(0.0357)	(0.0399)	(0.0387)	(0.0354)	(0.0352)	(0.0367)	(0.0391)
Decile 7 per capita income, change (in logs)	-0.00216	-0.0217	-0.0587	-0.00105	-0.0240	0.00318	-0.00156
	(0.0369)	(0.0413)	(0.0411)	(0.0366)	(0.0365)	(0.0380)	(0.0403)
Decile 8 per capita income, change (in logs)	-0.0146	-0.0341	-0.0721	-0.0134	-0.0361	-0.0108	-0.0123
	(0.0388)	(0.0434)	(0.0446)	(0.0385)	(0.0385)	(0.0400)	(0.0423)
Decile 9 per capita income, change (in logs)	-0.0299	-0.0487	-0.0907*	-0.0287	-0.0517	-0.0289	-0.0243
	(0.0421)	(0.0468)	(0.0503)	(0.0417)	(0.0419)	(0.0434)	(0.0455)
Inequality, change	-1.811**	-1.853**	-1.863*	-1.801**	-1.567**	-2.089***	-1.534*
	(0.770)	(0.821)	(0.976)	(0.768)	(0.771)	(0.783)	(0.805)
Observations	1,982	1,982	1,982	1,982	1,938	1,839	1,831
Demographic and employment controls (year 2000)	YES	YES	YES	YES	YES	YES	YES
Median income control (year 2000)	YES	YES	YES	YES	YES	YES	YES

Note: Robust standard errors in parentheses. Each coefficient corresponds to a separate regression with the dependent variables specified in the first column and corresponding to those in Tables 2, 4 and 5. The explanatory variable is the change in the log of exports-to-workers from 2004 to 2014. Demographic and employment controls include the proportion of rural population, the proportion of population aged 15 and more who are literate, total population, and the share of employment in the primary, secondary and tertiary sectors of economic activity (all variables in the year 2000). Additional controls: 1) Employment shares: share of employment in the municipality in year 2000 corresponding to 16 sectors of activity from the Economic Census; 2) Export shares: share of exports in the municipality in year 2004 corresponding to the primary, secondary and tertiary sector; 3) Exports per worker: the explanatory variable in levels in year 2004; 4) Market concentration: three Herfindahl- Hirschman indexes of market concentration in year 2000, which are based on the sales reported in the Economic Census in each municipality in the sectors manufacturing, retail and services; 5) Government expenditure: log of per capita public expenditure in the municipality in 2000. The last column shows the baseline estimate excluding the municipalities that have a level of exports per worker in 2004 or 2014 that belongs to the highest 5% nationwide in the estimation sample.
*** p < .01 ** p < .05 * p < .1

Table 7. Impact of Exports on the Labor Market

a. Impact on Labor force participation

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
log (Exports per worker), change	0.389***	0.526***	0.523***	2.748**	1.625*	1.651*
	(0.147)	(0.132)	(0.133)	(1.109)	(0.946)	(0.987)
Observations	1,982	1,982	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	NO	YES	YES	NO	YES	YES
Median income control (year 2000)	NO	NO	YES	NO	NO	YES

b. Impact on Employment

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
log (Exports per worker), change	0.418***	0.556***	0.558***	2.491**	1.344	1.394
	(0.151)	(0.138)	(0.139)	(1.107)	(0.956)	(0.997)
Observations	1,982	1,982	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	NO	YES	YES	NO	YES	YES
Median income control (year 2000)	NO	NO	YES	NO	NO	YES

c. Impact on Total labor income

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
log (Exports per worker), change	0.0197	0.0203	0.0250*	-0.00214	0.188**	0.239***
	(0.0132)	(0.0129)	(0.0128)	(0.0780)	(0.0846)	(0.0908)
Observations	1,982	1,982	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	NO	YES	YES	NO	YES	YES
Median income control (year 2000)	NO	NO	YES	NO	NO	YES

d. Impact on Average labor income

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
log (Exports per worker), change	-0.00500	-0.00573	-0.00295	0.0191	0.0505	0.0789
	(0.00728)	(0.00732)	(0.00731)	(0.0488)	(0.0525)	(0.0567)
Observations	1,982	1,982	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	NO	YES	YES	NO	YES	YES
Median income control (year 2000)	NO	NO	YES	NO	NO	YES

Note: Robust standard errors in parentheses. The dependent variable is the change from 2000 to 2015 in the labor force participation rate (panel a), employment rate (panel b), log of total labor income (panel c), and log of average labor income (panel d). The explanatory variable is the change in the log of exports-to-workers from 2004 to 2014. Demographic and employment controls include the proportion of rural population, the proportion of population aged 15 and more who are literate, total population, and the share of employment in the primary, secondary and tertiary sectors of economic activity (all variables in the year 2000). Total and average labor incomes are expressed in 2015 Mexican pesos using the National Consumer Price Index.

*** p < .01 ** p < .05 * p < .1

Table 8. Impact of Exports on Migration patterns

a. Impact on the number of immigrants from other Mexican states or countries

	IV			
	All	Unskilled	Semi-skilled	Skilled
log (Exports per worker), change	74.84***	52.73***	11.36***	7.694***
	(19.09)	(13.13)	(3.516)	(2.307)
Observations	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	YES	YES	YES	YES
Median income control (year 2000)	YES	YES	YES	YES

b. Impact on the number of immigrants from other Mexican states

	IV			
	All	Unskilled	Semi-skilled	Skilled
log (Exports per worker), change	51.65***	37.19***	8.245***	6.342***
	(15.66)	(11.34)	(3.184)	(2.067)
Observations	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	YES	YES	YES	YES
Median income control (year 2000)	YES	YES	YES	YES

c. Impact on the number of immigrants from other countries

	IV			
	All	Unskilled	Semi-skilled	Skilled
log (Exports per worker), change	23.19***	15.54***	3.112***	1.352***
	(5.760)	(3.463)	(0.642)	(0.442)
Observations	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	YES	YES	YES	YES
Median income control (year 2000)	YES	YES	YES	YES

d. Impact on the size of the working age population

	IV			
	All	Unskilled	Semi-skilled	Skilled
log (Exports per worker), change	1,296***	864.0***	303.3***	122.8***
	(269.0)	(202.8)	(56.89)	(27.38)
Observations	1,982	1,982	1,982	1,982
Demographic and employment controls (year 2000)	YES	YES	YES	YES
Median income control (year 2000)	YES	YES	YES	YES

Note: Robust standard errors in parentheses. The dependent variable is the change from 2005 to 2015 for the group specified in the column header in: the number of residents who lived in another state of Mexico or abroad 5 years before (panel a); the number of residents who lived in another state of Mexico 5 years before (panel b); the number of residents who lived abroad 5 years before (panel c); the total working age population (aged 14-55) (panel d). The explanatory variable is the change in the log of exports-to-workers from 2004 to 2014. Demographic and employment controls include the proportion of rural population, the proportion of population aged 15 and more who are literate, total population, and the share of employment in the primary, secondary and tertiary sectors of economic activity (all variables in the year 2000). Unskilled: Primary completed or less; Semi-skilled: Secondary completed; Skilled: University completed.

*** p < .01 ** p < .05 * p < .1

Table 9. Impact of Exports on Migration patterns (United States only)

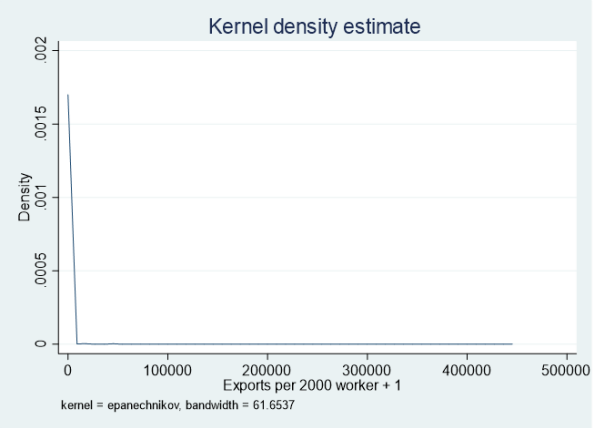
	IV		
	Emigration to USA	Returning migrants from USA	Remittances from USA
log (Exports per worker), change	-95.46**	151.1***	-1.963***
	(37.88)	(32.68)	(0.630)
Observations	1,981	1,981	1,981
Demographic and employment controls (year 2000)	YES	YES	YES
Median income control (year 2000)	YES	YES	YES

Note: Robust standard errors in parentheses. The dependent variables are: Emigration to USA = change in the number of households with emigrants to the US from the previous five-year period, from 2000 to 2010; Returning migrants from USA = change in the number of households with returning migrants to the US in the previous five-year period, from 2000 to 2010; Remittances from USA = change in the percentage of households receiving remittances from US, from 2000 to 2010. The explanatory variable is the change in the log of exports-to-workers from 2004 to 2014. Demographic and employment controls include the proportion of rural population, the proportion of population aged 15 and more who are literate, total population, and the share of employment in the primary, secondary and tertiary sectors of economic activity (all variables in the year 2000).
*** p < .01 ** p < .05 * p < .1

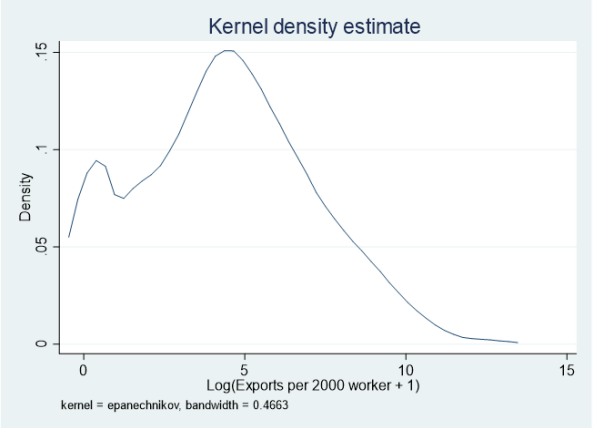
Figures

Figure 1. Kernel density estimates of municipal exports per 2000 worker

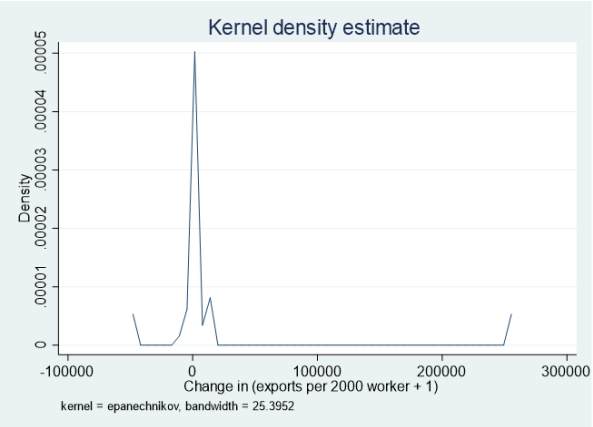
a. Exports per worker + 1



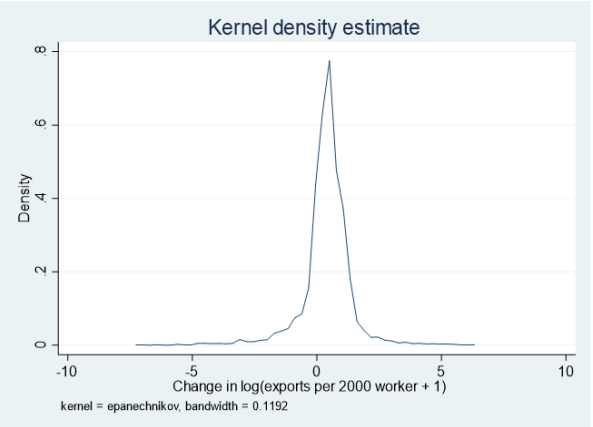
b. Log (exports per worker + 1)



c. Change in exports per worker + 1



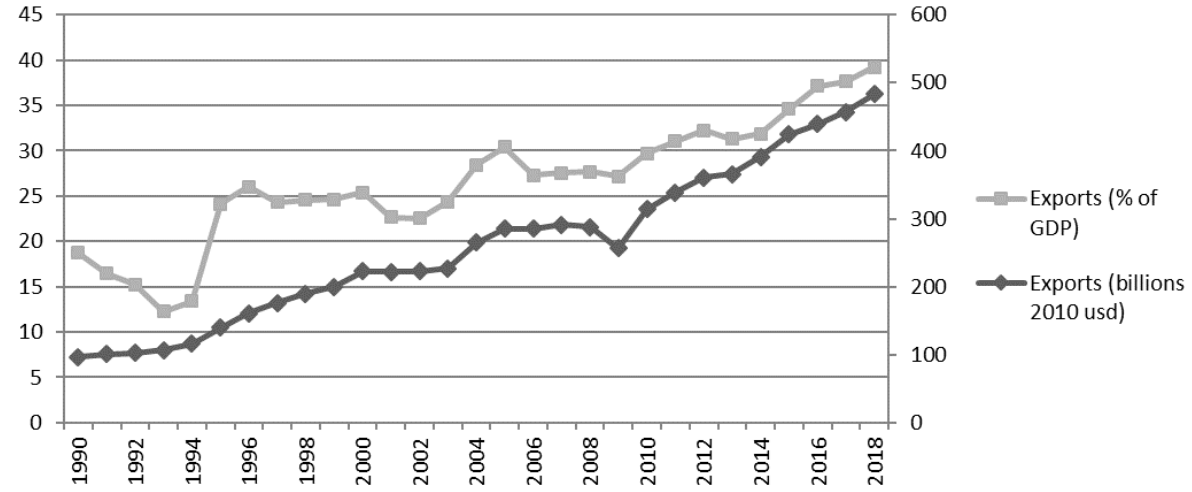
d. Change in Log (exports per worker + 1)



Source: Elaboration based on customs data (exports) and population census (workers).

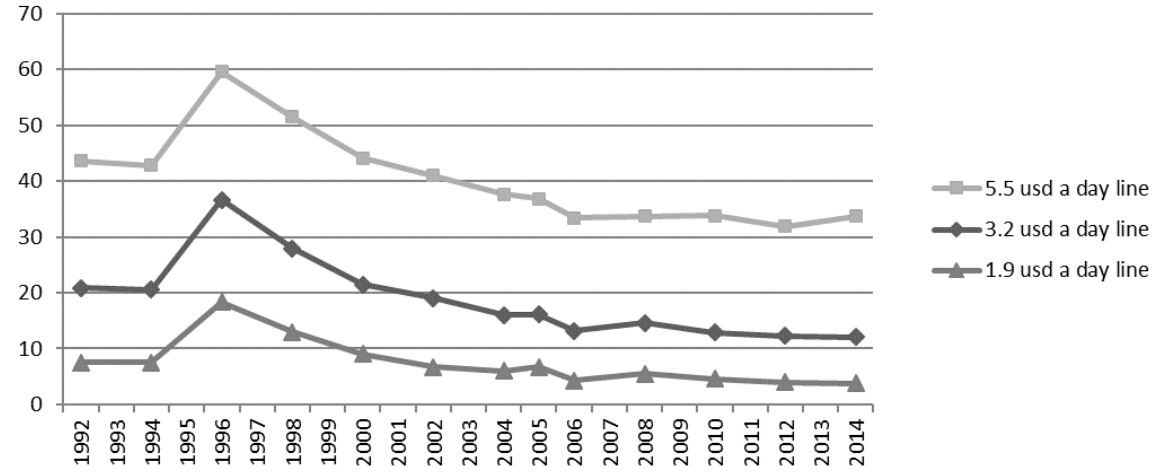
Note: The sample is restricted to the urban and semiurban municipalities with complete data.

Figure 2. Trends in exports of goods and services in Mexico, 1990–2018



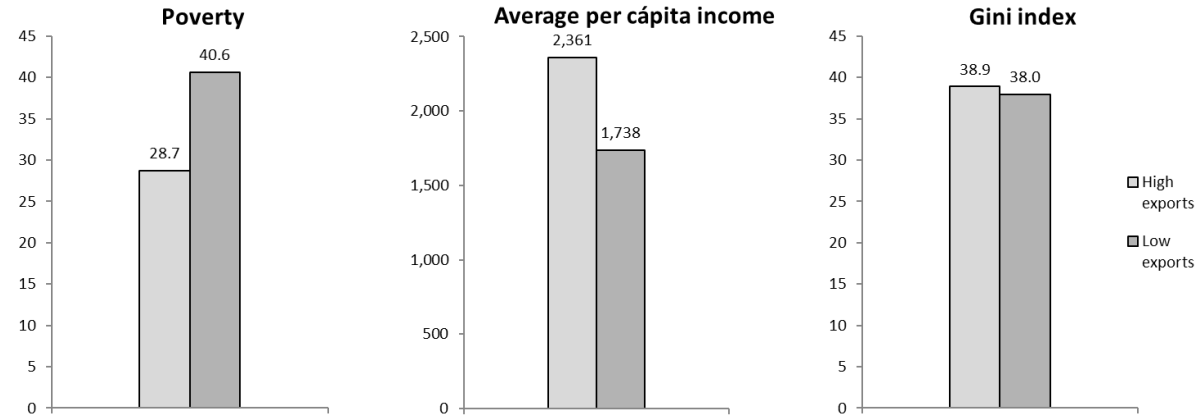
Source: Calculations based on World Development Indicators.

Figure 3. Trends in the poverty headcount ratio at international 2011 PPP lines in Mexico, 1992–2014



Source: Calculations based on SEDLAC (CEDLAS and the World Bank).

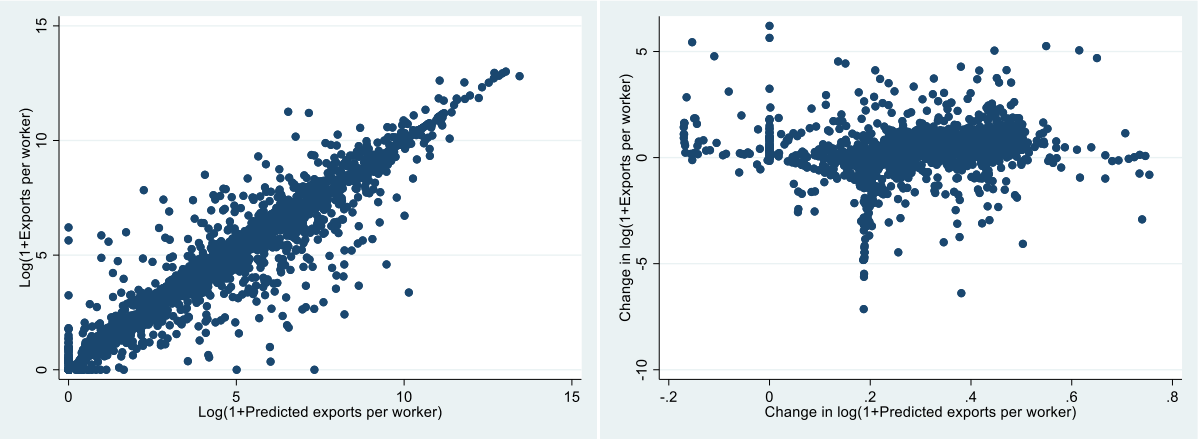
Figure 4. Poverty, per capita income and inequality in municipalities with relatively high and low levels of exports, 2015



Source: Elaboration based on household surveys (poverty, average per capita income and Gini), population census (workers) and customs data (exports).
Note: The sample is restricted to the urban and semi-urban municipalities with complete data. A municipality has relatively high (low) exports if its exports/(workers in year 2000) ratio is above (below) the median at municipality level.

Figure 5. Correlation between the instrument and the endogenous variable

a. In levels **b. In differences**



Source: Elaboration based on customs data, population census and BACI.
Note: The sample is restricted to the urban and semiurban municipalities with complete data.