The Political Economy of Automation and Fragmented Production in a Global Economy: Evidence from Mexico

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Abstract

A substantial body of research examines how robot adoption impacts economic and political outcomes in advanced economies. However, automation in the Global North also significantly affects countries in the Global South through global production linkages. Foreign robot adoption constitutes a negative economic shock for local labor markets exposed via trade and offshoring, reducing labor demand, migration opportunities, and remittances. We theorize that these shocks increase organized crime—particularly narcocrime—as persistent economic hardship limits legal employment and migration options, pushing individuals toward illicit activities. Additionally, we expect these shocks to bolster support for Left presidential candidates advocating pro-worker policies and expanded social protections.

We test this argument using commuting zone-level data from Mexico between 1990 and 2015. Exposure to U.S. automation is measured by linking initial Mexican export-oriented employment distributions with U.S. industry-level robot adoption trends and import reliance. Regions more exposed to U.S. automation experienced reduced migration and remittance inflows, reflecting decreased foreign labor demand. These areas also saw increased organized crime but no significant rise in property crime, suggesting crime functions as an economic alternative rather than desperation-driven acts. Moreover, increased exposure was associated with heightened support for Left candidates, highlighting automation's broad social and political implications.

Keywords: automation, offshoring, Global South, emigration, violence.

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1 Introduction

The acceleration of automation in the last decades has had momentous consequences for employment, wages, the structure of production systems at the international level, and as result, the political attitudes and partisan alignments of voters. A substantial body of economic research has shown that the adoption of new technologies significantly has boosted domestic firms' productivity (Koch et al., 2021), enhanced labor productivity (Graetz and Michaels, 2018), and increased overall competitiveness (Bonfiglioli et al., 2024). At the same time, however, it has reduced the share of value added from labor, often leading to unemployment and the depression of low-skilled labor's wages (Graetz and Michaels, 2018; Acemoglu and Restrepo, 2019; Dauth et al., 2021). In addition, it has resulted in greater labor market polarization, with middle-wage jobs shrinking in developed countries (e.g., Autor et al., 2003; Goos et al., 2009). For instance, estimates suggest that this wave of technological change accounts for 50–70% of the changes in wage distribution in the United States (Acemoglu and Restrepo, 2022).

The economic impact of automation has arguably reshaped political preferences and disrupted relatively stable electoral cleavages. Research conducted on advanced economies suggests that individuals exposed to automation are more prone to political disengagement or alienation (e.g., Boix, 2019; Gonzalez-Rostani, 2024a) and more likely to support populist or radical-right parties (Owen, 2019; Kurer, 2020; Anelli et al., 2021; Milner, 2021; Gonzalez-Rostani, 2025). Related work shows that anxieties about automation fuel support for redistributive policies, expanded social protection, and even efforts to limit globalization and technological diffusion (Busemeyer et al., 2023; Busemeyer and Tober, 2023; Kurer and Häusermann, 2022; Chaudoin and Mangini, 2025; Gonzalez-Rostani, 2024b). However, these insights are based almost exclusively on high-income countries, where stronger institutions and more generous safety nets help cushion economic shocks—and where these countries typically receive migrants, rather than send them.

We know much less about how changes in production have affected countries in the Global South—particularly in the social and political arenas. In addition to the potential adoption of domestic automation technologies, technological change in a globalized economy generates ripple effects that extend far beyond the border of domestic firms and workers. Global value chains, which rely on an international division of labor to produce inputs and final goods, create complex interdependencies between economies. Although emerging markets have benefited from export opportunities based on fragmented production in the past, recent trends in advanced economies—particularly the push to "bring back manufacturing"—pose new challenges for workers in the Global South. During the early 2000s, input sourcing from developing countries tripled, largely driven by the fragmentation of global production chains through offshoring (Antràs, 2020; Faber et al., 2023). Yet this expansion has slowed since 2011, likely due to technological advances that erode the comparative advantage of low-wage labor in the Global South (Faber et al., 2023; Hidalgo and Micco, 2024). As machines increasingly replace labor in the production of intermediate goods, reshoring is expected to accelerate (De Backer et al., 2016; Rodrik, 2018; Lund et al., 2019), fundamentally altering the structure of global value chains. Several examples illustrate the potential negative effects of the trends in reshoring for emerging markets. In 2016, Carrier, a manufacturer of air conditioners and parts, reversed plans to offshore production from Indiana to Mexico in exchange for government subsidies. However, these funds were eventually used for automation, significantly reducing the workforce in Indiana (Isidore, 2016). Caterpillar, an equipment manufacturer, achieved a 90% cost reduction in production projects after relocating production from China back to the U.S. and adopting 3D printing in 2012 (Rasmussen, 2016). Similarly, Ford reshored 3,250 jobs from Mexico to Michigan and Ohio in 2016 (Rasmussen, 2016).

Thus, emerging economies such as Mexico, India, Bangladesh, and Vietnam—long specialized in routine, labor-intensive tasks—now face heightened vulnerability, given their limited capacity to adopt advanced technologies or buffer the effects of large-scale labor displacement (Faber, 2020; Artuc et al., 2019; Stemmler, 2023). Indeed, recent work has found that foreign robot adoption is associated with lower wages and employment in emerging markets (Artuc et al., 2019; Faber, 2020; Kugler et al., 2020) and mixed evidence on the effect on exports back to the Global North (Artuc et al., 2022; Hidalgo and Micco, 2024).

Understanding these transformations is essential for evaluating the future of global labor markets and the potential for increased economic, social, and political instability in the Global South. In this paper, we develop a political economy theory of how the adoption of automation technology in the Global North impacts political and societal outcomes in the Global South. We argue that automation-driven production shifts in the Global North reduce labor demand in both developed and developing economies (at least in the short to medium term). For many Global South countries, migration plays a critical role in shaping adjustment to labor market shocks. As labor demand contracts in advanced economies due to robot adoption, opportunities for workers from developing countries to migrate there also contract. This exacerbates the adverse economic shock, particularly for communities that are more exposed via global production linkages, because they are unable to shed excess workers. A growing labor surplus then has direct consequences at the social and political level. On the one hand, those seeking work who cannot leave in search of better opportunities may turn to informal or illegal activities. On the other hand, deteriorating economic conditions at home may spark political action and electoral behavior in favor of candidates and political parties that promise pro-worker policies, ranging from redistribution to protection, in response to declining economic opportunities.

Empirically, we examine the effects of foreign robot adoption on migration and violence in Mexico from 1990 to 2015. We also consider their impact on presidential vote from 2006 to 2024. Using data on robot shipments to Mexico, the United States, and nine European countries—along with labor market information at the commuting zone (CZ) level—we follow the methodologies of Acemoglu and Restrepo (2020) and Faber (2020) to construct measures of local exposure to automation by combining the initial distribution of export-oriented employment across Mexican industries with industry-level trends in U.S. robot adoption and initial U.S. reliance on imports from Mexico. We then estimate the impact of these exposure measures on emigration, remittances, violence, and presidential election outcomes.

Our analysis results into three main findings. First, regions in Mexico that are more exposed to foreign, automation-driven labor demand shocks experience a decline in outward migration and remittance inflows. These are important outcomes in and of themselves, but these channels also transmit pressure to other areas of society and politics. Thus, our second set of results shows that foreign-robot adoption contributes to a rise in narcocrime and homicides. Notably, there is not an increase in property-related crimes often associated with the "deaths of despair" literature, suggesting that the rise in violence has an economic rather than a psychological motivation. Finally, we show that these shocks are associated with greater support for left-wing populist presidential candidates promising compensatory policies as well as a more robust state-led industrial policy. Notably, none of these patterns are explained by domestic automation. Overall, these results underscore the broader labor market consequences of technological change in developed countries on developing economies, suggesting that reduced migration opportunities may amplify the local effects of adverse economic shocks.

Our paper thus contributes to the growing literature on the political and social consequences of automation in several ways. We add to current work on the labor market effects of domestic and foreign automation in the Global South (Artuc et al., 2019; Faber, 2020; Kugler et al., 2020; Stemmler, 2023). Above all, however, we offer one of the first systematic analyses of how foreign-driven automation influences migration, violence, and politics in the developing world. We also connect to the political economy literature on advanced economies by showing how similar structural shocks can trigger social unrest, even in very different institutional settings. We contribute to this literature by examining how structural economic shocks reshape the set of exit and voice options available to vulnerable populations in the Global South. When formal employment contracts and migration pathways decrease, individuals may be pushed toward informal or illicit alternatives, including criminal activity. Affected areas may also experience a systematic shift in political support toward pro-worker parties. Our findings show that global technological change can fuel social unrest and constrain mobility in economies that are deeply integrated into global markets but lack the institutional capacity to absorb rapid disruption.

2 The Political Economy of Foreign Automation Shocks

In this section, we first draw on current economic models to understand how automation in the domestic economy and particularly abroad affects employment and wages negatively in the Global South. We then discuss three main social and political consequences of foreign robot adoption. It reduces migration opportunities, exacerbating the negative shock of domestic automation on labor demand and reducing remittances. Citizens may respond to the resulting surplus in the supply of labor by leaving the legal local labor market, leading to a rise in illegal activities and the criminality associated with them. Finally, voters may be more likely to support left-populist candidates that promise pro-redistribution platforms and the redeployment of state-led industrial policies.

2.1 Foreign Automation and Labor Market Disruption in the Global South

To characterize the economic consequences of automation, we rely on the task model of production processes developed by Acemoglu and Autor (2011) and (Autor, 2013). Generally speaking, this work focuses primarily on the impact of robot adoption on domestic automation and labor markets (Acemoglu and Restrepo, 2020). However, because in emerging markets connected via trade (e.g. exports to the Global North market), Global South workers compete with foreign robots— in offshorable tasks (Faber, 2020), we consider in detail the effects of foreign automation in the discussion that follows.

In the tasks framework, the production of a good or service is broken down into a series of tasks (i.e. discrete units of work). A final good is composed of many intermediate goods and services, and each intermediate output requires that its series of tasks be performed. Firms use a combination of inputs in the production process, including capital (e.g. machines, computers) and labor of varying skills, to perform a particular task. Labor may be domestic or foreign via global production. "Domestic" and "foreign" refer to the worker's location (on- or off-shore) relative to the firm, not nationality. The potential movement of workers across borders shapes the supply of labor in the sending and receiving countries.

In a simple example, firms producing a widget can manufacture the widget hiring domestic workers, employing foreign labor, or using a machine. They will assign tasks to the input with the lowest economic cost, determined by technological capability and opportunity cost. Firms will substitute capital for expensive domestic labor. As discussed shortly, they may replace domestic workers with lower-wage foreign labor, and the latter with capital. In equilibrium, inputs specialize in tasks according to their comparative advantage.

Recent technological changes such as automation, digitalization, and computerization have expanded the range of labor-saving options available.[1] Growing empirical work on the impact of domestic automation finds that industrial robots, whose impact is the main focus of this paper, are associated with higher productivity, but a lower share of work by unskilled labor (Graetz and Michaels, 2018), reductions in manufacturing employment (Dauth et al., 2021), declines in local employment (Chiacchio et al., 2018), and greater wage disparity between high- and low-skilled workers (Humlum, 2019) in the advanced economies. In recent work focused on emerging markets, Brambilla et al. (2022) examine the impact of domestic robot adoption on labor market outcomes in Argentina, Brazil, and Mexico, finding that robot adoption leads to greater unemployment and informality.[2] Similarly, Giuntella et al. (2022) find that domestic robot adoption in China is linked to a substantial decline in labor force participation and wages, especially among low-skilled workers.

Global production enables firms to shift labor-intensive tasks offshore to emerging economies.

[1] Digitalization refers to the adoption of ICT (Kurer and Gallego, 2019); computerization is "job automation by means of computer-controlled equipment" (Frey and Osborne, 2017, 254).

[2] The informal sector as a buffer is a distinct characteristic of developing and emerging markets, relative to the advanced economies.

But the latter are also exposed to foreign automation shocks through "reshoring" and trade linkages—defined here to include the offshore production of intermediate and final goods from the Global North (Feenstra and Hanson, 1999a; De Backer et al., 2016). Whether trade and labor market outcomes in the Global South are negatively or positively affected by Northern robot adoption depends on the balance of two competing forces: the displacement and productivity effects. On the one hand, as the cost advantage of Global South labor declines, producing in the Global North becomes more profitable. The adoption of labor-replacing capital in the Global North may reduce the demand for tasks performed by foreign labor and therefore for Global South labor in general. On the other hand, the productivity effect occurs when automation increases the efficiency of firms in the Global North, thus increasing their demand for imports of non-automated inputs from the Global South (Artuc et al., 2019; Hidalgo and Micco, 2024). Employment might be preserved or even grow as firms in the Global North expand production and are better able to bear the costs of offshoring.[3]

In the short- to medium-term, we expect that there will be a fall in labor demand with corresponding negative labor market effects, including reduced employment, lower wages, and shifts toward the informal sector. Recall that labor markets in the Global South often operate with some slack or labor surplus, which can limit the ability of low-skilled workers to benefit from globalization (Rudra, 2005). A negative shock means that the adjustment process will be even more difficult.[4] This effect is greater in communities that are more exposed via global production linkages. Existing research links U.S. robot adoption to job losses and wage reductions, disproportionately affecting women, older workers, and those in small enterprises (Faber, 2020; Kugler et al., 2020; Artuc et al., 2019). The impact of automation on labor markets in exposed countries is further compounded by the shift away from manufacturing and toward sectors like mining, reflecting broader shifts in global supply chains (Stemmler, 2023).

Foreign robot adoption can also reshape trade in the Global South. Trade flows are related to the phenomenon known as reshoring, where production is moved back "on-shore" in the Northern economy. Findings regarding the impact of foreign robot adoption on trade are mixed. In an analysis of U.S. robot adoption on Mexican labor markets, Artuc et al. (2019) find that each additional robot per thousand US workers results in a 6.7% reduction in the growth rate of Mexican exports per worker (p.16). Faber (2020) documents the negative impacts of robotization in developed countries on exports from developing nations. However, other scholars, such as Stapleton and Webb (2020) and Artuc et al. (2023), highlight that automation can also boost trade by improving productivity, which may lead to an increase in imports from the Global South, despite overall shifts in global production patterns (Stapleton and Webb, 2020; Artuc et al., 2023). Stemmler (2023) addresses these seemingly contradictory findings by highlighting the impact of automation in the Global North on the deindustrialization of the Global South. The study shows that while automation

[3] Pinheiro et al. (2023) for a discussion of how automation can facilitate offshoring and/or restoring. *Note* here or elsewhere as appropriate, automation reallocates market share to larger more productive firms; may drive lower, less productive, more labor intensive firms out of business.

[4] Stemmler (2023) Automation in trade-partner countries reduces the employment share in manufacturing and can shift to other sectors.

reduces the demand for manufactured goods (fewer exports of intermediate inputs), it may simultaneously increase demand for primary goods, such as those from the mining sector. In a meta-analysis of 24 studies, Pinheiro et al. (2023) find that automation does facilitate reshoring.

2.2 Blocked Exit: How Foreign Automation Constrains Migration

One possible response in the face of negative economic shocks is for workers to seek opportunities elsewhere through internal or external migration. When labor is mobile across geographies, excess workers leave, thus allowing for some positive adjustment in the local labor market. However, when a shock affects both the sending and destination countries, this process is interrupted. Indeed, foreign robot adoption generates two competing effects on international migration from South to North because it affects labor demand in both places. On the one hand, reduced domestic labor demand encourages emigration as workers seek better opportunities abroad. On the other hand, there is also a reduction in labor demand in destination countries, which means that there are fewer and less attractive opportunities for potential migrants.[5]

The net effect on international migration–that is whether push or pull factors dominate–depends on the relative strength of these opposing forces. We argue that at least in the short- to medium-term, the reduction of demand in the Global North is likely to outweigh domestic push factors, thus limiting emigration despite deteriorating local conditions. This is consistent with previous research demonstrating that labor demand shocks in destination countries influence migration. For instance, during the U.S. Great Recession, employment declines reduced emigration from Mexico among young, low-skilled men, decreasing remittances and increasing return migration (Caballero et al., 2023; Villarreal, 2014). Broader evidence also suggests that economic downturns in receiving economies reduce out-migration (Becker et al., 2005; Fidrmuc, 2004; Huang et al., 2011), heighten return migration (Castles and Vezzoli, 2009), disrupt migrant networks (Mitchneck and Plane, 1995), and dampen remittance flows (Jha et al., 2010; Koser, 2009). Moreover, in the U.S., robot exposure uniquely prompted local population decline in affected communities, attributed to extensive sectoral spillovers (Faber et al., 2022).

Therefore, we expect that, in general, a contraction of the Northern labor markets diminishes a primary pull factor for South–North migration, leading to a decline in migration from exposed communities. An important additional implication is that we also expect to see lower remittances. Thus, we test the following empirical implications:

H1a: Communities that are more exposed to foreign robot adoption will have lower out-migration to the foreign country.

H1b: Communities that are more exposed to foreign robot adoption will have lower remit-

[5] Additionally, weaker labor markets in the North may foster anti-immigration sentiment and policies, a point addressed further in the conclusion.

tances from migrants in the foreign country.

H1c: Communities that are more exposed to foreign robot adoption will have greater return migration from the foreign country.

Recent evidence aligns with this theoretical perspective. In China, robot adoption has been shown to reduce internal migration inflows among young, low-skilled manufacturing workers (Bian and Zhou, 2024). In the U.S., although both trade and automation depressed manufacturing employment, only exposure to robots triggered local population decline—a pattern attributed to wider spillover effects across sectors (Faber et al., 2022). While these studies focus on internal migration, they highlight mechanisms—-declining labor demand, constrained mobility, and labor market adjustment—-that are likely to apply across borders. We extend this logic to international migration, arguing that foreign automation can suppress emigration from the Global South and, in doing so, reshape the broader economic and social responses to labor market shocks—including increased involvement in informal or illicit activity.

This has further implications for politics and society, because the lack of migration (and concomitant decline in remittances) hampers economic adjustment in exposed Global South communities. This exacerbates economic distress in previously offshoring-dependent Global South regions.

2.3 From Labor Market Shock to Criminal Activity

When workers in the Global South experience negative employment shocks and cannot respond through emigration, they may resort to alternative adjustment mechanisms – either of an economic or a political nature. The first one consists of entering the informal economy and, in some instances, participating in illegal activities which may result in violent actions. This argument builds on a well-established

Negative labor shocks have been long associated with increases in violence, particularly under conditions of weak institutions and limited state capacity. Prior research has shown that commodity price declines and other income shocks in labor-intensive sectors may push individuals toward illicit activities and increase violence (Dube and Vargas, 2013; Dube et al., 2016). Similarly, environmental disruptions, including reduced vegetation or rainfall, have been associated with higher narcocrime rates, especially in vulnerable rural areas (Cavazos Hernandez and Sivakumar, 2022).

This logic extends to labor market shocks driven by global trade and technological change. Dix-Carneiro et al. (2018) find that Brazilian regions more exposed to trade liberalization experienced greater crime rates due to deteriorating labor markets and weakened state service provision.[6] Likewise, Dell et al. (2019) show that Mexican municipalities exposed to U.S.–China import competition suffered job losses and subsequent violence increases.

[6]This result holds in the medium term (1991–2000), but not over the full period (1991–2010); see p. 174.

As a negative economic shock, we expect that foreign robot adoption will lead to more violence in exposed communities. When workers confront diminishing opportunities both domestically and internationally, their adjustment options shrink. Involvement in illicit activities may become an increasingly necessary alternative, particularly where criminal networks and weak enforcement already exist and social protections are weak. Critically, this mechanism is reinforced by restricted mobility, as discussed in Section 2.2. Constraints on cross-border migration exacerbate the effects of automation-induced shocks, leaving displaced workers trapped in deteriorating local economies. Under these conditions, the opportunity cost of engaging in illicit activities declines, potentially escalating violence and allowing organized criminal groups to deepen their regional influence. We thus hypothesize

H2: Communities exposed to the foreign robot shock will experience higher levels of violence and organized crime.

As we discuss in more detail in subsection 4.2, the relationship between economic dislocation and violent and organized crime is rooted in a direct economic motivation: engaging in informal and illicit activities. This explanation contrasts with the "deaths of despair" literature, which links automation to rising property crimes through deteriorating mental health outcomes and substance abuse (Liang et al., 2025).

2.4 Political impact

Finally, we consider how a foreign robot shock can influence political outcomes by shifting citizens' political preferences and their political behavior. As noted earlier, a substantial literature demonstrates political effects, including increased support for populist or far-right parties and decreased engagement, in advanced economies. However, the dynamics in Global South countries may differ due to different economic positioning in the global economy, as well as typically less well-developed and well-resourced social safety nets. Thus, for countries that rely on global trade in the form of exports, a broad protectionist platform may not be attractive.[7] Xenophobic, anti-immigrant platforms may also not be relevant depending on the specific country.

We expect that the decline in labor market conditions will lead to a leftward shift in citizens' political preferences, as voters increasingly demand pro-worker policies such as social protection, job guarantees, and redistribution. In regions with high exposure to foreign automation, the closure of foreign-affiliated plants and the decline in remittances can generate anger toward both domestic elites and foreign capital. In this context, left-leaning political parties that advocate for a greater role of the state in economic management may gain traction. This leftward shift may not reflect a generalized ideological transformation, but rather an instrumental response to economic hardship, with voters seeking more immediate compensation or protection through targeted policies or clientelist redistribution. In short, we expect the emergence of a particularistic, state-led response to economic dislocation, not

[7] But see **?**.

necessarily a universalist or institutionalized welfare expansion.

We hypothesize:

H3: Communities more exposed to foreign robot shock will be more likely to support Left political parties.

3 Research Design

3.1 Empirical Strategy

The empirical strategy follows the work of Acemoglu and Restrepo (2020) and Faber (2020). First, the exposure to domestic robots is measured as:

$$\text{Exposure to domestic robots}_{c(t_0,t_1)} = \sum_{i \in I} \ell_{ci,1990} \left(\frac{R^{MX}_{i,t_1} - R^{MX}_{i,t_0}}{L_{i,1990}} \right)$$

where R^{MX}_{i,t_1} and R^{MX}_{i,t_0} represent the number of robots in industry i at time t_1 and t_0 in Mexico, respectively, while $\ell_{ci,1990}$ is the share of employment in industry i out of total employment in the region c in 1990, and $L_{i,1990}$ is the total employment in industry i in 1990.[8] This measure captures the penetration of robots in the industry in Mexican labor markets following (Acemoglu and Restrepo, 2020).

Next, the exposure to foreign robots is defined as:

$$\text{Exposure to foreign robots}_{c(t_0,t_1)} = \sum_{i \in I} \ell^{f}_{ci,1990} \left(\frac{\left(R^{US}_{i,t_1} - R^{US}_{i,t_0}\right) O_{i,1992}}{L^{f}_{i,1990}} \right)$$

where R^{US}_{i,t_1} and R^{US}_{i,t_0} are the estimated number of robots in industry i at times t_1 and t_0 in the US, respectively, $\ell^{f}_{ci,1990}$ is the share of export-producing employment in industry i out of total CZ in 1990, $L^{f}_{i,1990}$ is the total foreign employment in industry i, and $O_{i,1992}$ is the initial share of inputs into industry-good i that are offshorable.[9] Since the robot-industry aggregation does not allow for offshoring-specific identification, and offshoring refers to the relocation of production or sourcing of inputs from abroad rather than domestic production, offshoring intensity is proxied as: $O_{i,1992} = \frac{I^{MXUS}_{i,1992}}{Y^{US}_{i,1992}}$ where $I^{MXUS}_{i,1992}$ represents industry i's share of Mexican imports to the United States, and $Y^{US}_{i,1992}$ represents total output of industry i in

[8]The use of 1990 employment data (instead of more recent figures) reduces concerns about endogeneity, meaning that current economic conditions or policies are less likely to influence this measure.

[9]The first available industry-level data on U.S. imports from Mexico dates back to 1992.

the United States. This measure reflects the extent to which an industry in the U.S. depends on imported inputs from Mexico.

We address potential endogeneity arising from the correlation between robot adoption and unobserved factors affecting local labor markets by employing an instrumental variable approach, using the increase in robots in the rest of the world as an instrument for robot adoption in Mexico.

$$\text{External exposure to domestic robots}_{c(t_0,t_1)} \equiv \sum_{i \in I} \ell_{ci,1990} \left(\frac{R^{WLD}_{i,t_1} - R^{WLD}_{i,t_0}}{L_{i,1990}} \right)$$

$$\text{External exposure to foreign robots}_{c(t_0,t_1)} \equiv \sum_{i \in I} \ell^{f}_{ci,1990} \left(\frac{\left(R^{WLD}_{i,t_1} - R^{WLD}_{i,t_0}\right) \hat{O}_{i,1990}}{L^{f}_{i,1990}} \right)$$

The superscript WLD denotes the sum over European countries that are also incorporating technology (i.e, excluding the US and Mexico) for which industry-level data are available from 1993 onward.[10] To address potential endogeneity in our initial offshoring to Mexico proxy, we follow Feenstra and Hanson (1999b) and Faber (2020) in defining it as the share of imported intermediate inputs from the same industry over total non-energy intermediates in U.S. industry i in 1990 (across all source countries).[11]

The equation we will estimate is as follows:

$$\begin{aligned} \Delta \mathrm{Y}_{c(t_1)} = {} & \alpha + \beta^{d} \text{Exp. to domestic robots}_{c(t_0,t_1)} + \beta^{f} \text{Exp. to foreign robots}_{c(t_0,t_1)} \\ & + \ \mathbf{X}_{c,t_0} \gamma + \delta_t + \varepsilon_{c(t_0,t_1)} \end{aligned}$$

where the dependent variable is the level of emigration at time t post shock, or alternatively, the incidence of crime. The independent variables, exposure to domestic and foreign robots, are treated as instruments for technological changes, and the equation controls for the influence of other relevant covariates ($\mathbf{X}_{c,t_0}$), time-period fixed effects (δ_t), and other regional characteristics (e.g., city-specific trends). The unit of analysis are units of Mexican local labor market (i.e., commuting zones, CZs). CZs are clusters of municipalities that feature strong commuting ties within, and weak commuting ties across CZs.

[10] These countries include Denmark, Finland, France, Germany, Italy, Norway, Spain, Sweden, and the United Kingdom.

[11] Outsourcing (narrow) = (imported intermediate inputs in the same two-digit industry as the buyer) / (total non-energy intermediates) $\times$ 100.

3.2 Background: The Mexican Case

Mexico presents a unique case to explore how automation-driven disruptions in the Global North affect developing economies, due to its long-standing migration ties with the U.S., deep trade integration, and the persistent influence of organized crime on politics. As neighboring countries at different stages of development and technological advancement, Mexico and the U.S. are closely linked through trade: in 2024, 83% of Mexico's exports went to the U.S. (López and Vázquez, 2025), accounting for roughly 15% of U.S. imports (Mann, 2024). Much of this exchange occurs in sectors like automotive manufacturing, which are rapidly automating in the U.S. These industries are crucial to employment in many Mexican regions, making them especially vulnerable to structural shifts in the North.

Additionally, migration has historically connected the two countries, shaping the economic and social fabric of numerous Mexican communities (González, 2022; García, 2018). While net migration from Mexico has declined and return migration has risen in recent decades (García, 2018), transnational ties remain strong. In 2023, remittances totaled \$63.3 billion—around 4.5% of Mexico's GDP, surpassing revenues from U.S. FDI, tourism, or manufacturing exports (Berg et al., 2025). These flows act as a private safety net, supporting household consumption and public goods provision in migrant-sending areas (Adida and Girod, 2011; Germano, 2013), and shaping political attitudes by reducing economic discontent among recipients (Germano, 2013) and mobilization (García, 2018; Ley et al., 2022).

As automation in the Global North reduces demand for low-skilled labor and curtails offshoring (e.g., Artuc et al., 2019; Acemoglu and Restrepo, 2020; Faber, 2020), communities in Mexico-—many of which rely heavily on migration and remittances-—are especially exposed to the downstream effects of these global changes. Crucially, Mexico's context of entrenched criminal organizations and their involvement in local governance amplifies the potential for economic shocks to trigger violence. Cartels have historically taken advantage of institutional weaknesses and economic distress, escalating attacks particularly during electoral cycles to assert territorial and political control (Dube et al., 2013; Trejo and Ley, 2021). These intersecting dynamics—strong migration ties, economic dependence on tradable sectors, and a volatile security environment—make Mexico a particularly valuable case for studying how labor market disruptions abroad can generate broader political and social consequences in the Global South.

3.3 Data

In this section, we describe our main data sources.

Independent Variable: Exposure to Robots A key independent variable in our analysis is exposure to robots, which is sourced from Faber (2020). He combined census data, trade data, and robot data from the International Federation of Robotics (IFR). The IFR has collected data on the shipments and operational stocks of industrial robots by country and industry since 1993. These robots are defined as reprogrammable, multipurpose manipulators used in various industrial automation tasks, including manufacturing, agriculture, and utilities (IFR, 2015). In constructing the exposure to robots measures, Faber (2020) used the distribution of employment across industries and CZs, estimating local exposure to robots without relying on actual robot installation data, which is unavailable at the CZ level.

Since most firms produce for both domestic and foreign markets, isolating export-related employment is challenging. However, Maquiladoras are primarily export-oriented; for example, they accounted for nearly half of Mexico's exports in 2005, making them a reliable proxy. Thus, export-producing employment ($\ell^{f}_{ci,1990}$) is measured using Maquiladora employment data from the non-digitized CEPAL (1994) report, processed by Faber (2020).

Exposure to domestic robots is measured using a Bartik-style approach. This method captures variation in exposure driven by the initial conditions of the CZs, including their industrial composition. The formula incorporates the number of robots in each industry and the distribution of employment across CZs, reflecting how industrial concentration influences exposure, rather than relying on direct robot installations within each CZ.

The exposure to foreign robots is calculated based on offshoring. This is done by dividing the value of Mexican imports to the US in each industry (sourced from the UN Comtrade database) by the total output of the corresponding US industry (from the US Bureau of Labor Statistics) in 1992. In this external exposure measure, the offshoring indicator for US industries, $O_{i,1990}$, represents the share of imported intermediate goods in each industry relative to total non-energy intermediates within the US industry in 1990. This measure, inspired by the outsourcing index of Feenstra and Hanson (1999), typically used for the 4-digit SIC72 classification, is adjusted to the broader IFR industry classification. Faber (2020) mapped each SIC72 industry to an IFR industry and calculated the employment-weighted average for each IFR industry, using employment data from the County Business Patterns (CBP) dataset.

Figure 1 shows commuting-zone-level exposure to domestic (blue) and foreign (red) robots across Mexico between 2000 and 2015. Exposure to foreign robots, highlighted in red, is largely concentrated in the northern region, reflecting nearshoring dynamics and proximity to U.S. manufacturing centers. Cities with high foreign robot exposure include Ciudad Juárez, Tijuana, Monterrey, and Reynosa. In contrast, exposure to domestic robots, depicted in blue, shows a more balanced distribution across the country, with substantial robotization observed in central areas including Mexico City, Guadalajara, León, and other industrial hubs. This pattern underscores a broader integration of domestic automation compared to the geographically concentrated foreign robot exposure in northern industrial zones.

Dependent Variable: Emigration and Crime For the dependent variables in this analysis—emigration and crime—we use data from various sources, which have been merged

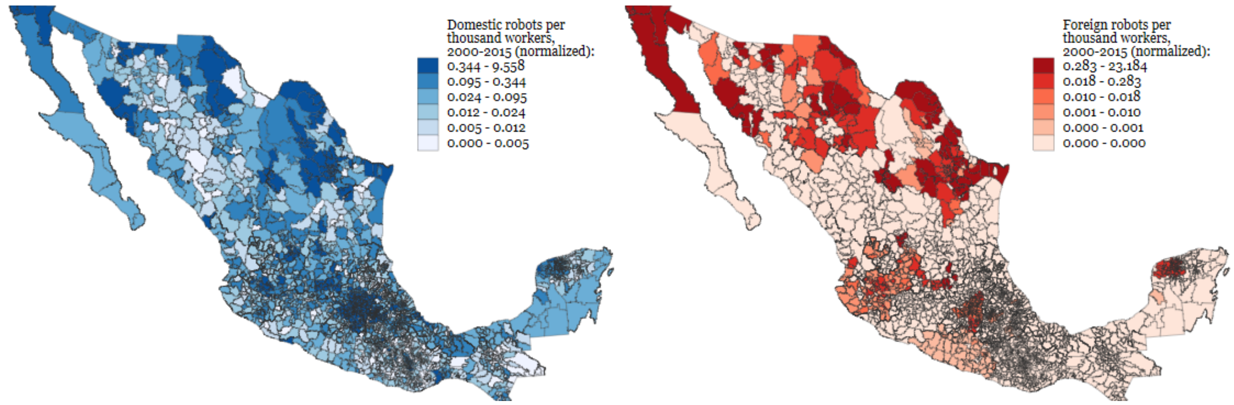

Figure 1: Commuting zone-level variation in exposure to domestic and foreign robots, 2000–2015.

to create the final dataset for analysis. The data was initially collected at the municipality level and subsequently aggregated at the commuting zones (CZ) level using a crosswalk between municipalities and CZs.

The emigration data comes from the National Population Council (CONAPO), which provides an index of emigration intensity by municipality, based on the Mexican Census conducted by the National Institute of Statistics and Geography (INEGI). Additionally, CONAPO offers state- and municipal-level survey data on the number of households receiving remittances in 2020, the number of households with an emigrant in the United States, and the number of households experiencing circular migration. These variables are expected to operationalize emigration in different ways. A clear measure is the number of households with emigrants or circular emigrants. However, in these economies, remittances are a crucial aspect of the economy, so observing the number of households receiving remittances can serve as another proxy for emigration. Finally, CONAPO provides an emigration intensity index derived from these variables, capturing the general migration trend in each municipality. To construct the final emigration variables, we merge the CONAPO emigration data with the municipality-level data and the crosswalk between municipalities and CZs.

Crime data is also sourced from CONAPO and the Mexican National Institute of Statistics and Geography (INEGI). We obtained the 2018 homicide rate, which represents the number of homicides per 10,000 population by municipality. Additionally, we obtained detailed municipal-level crime data from the Center for Research and National Security (CISEN) for the years 2015-2019, with a focus on 2016. This dataset provides the total number of various types of crime, offering insights into criminal activity at the local level. From this data, we extract information on organized crime, specifically narcocrime, and calculate the rate of incidents per 10,000 population in each CZ.

We use general homicide data in Mexico, as official statistics do not consistently track or publish information on drug-related homicides. Given that drug cartels are the primary perpetrators of these killings, previous research frequently relies on overall homicide data as a proxy (BenYishay and Pearlman, 2013; Dell, 2015; Cavazos Hernandez and Sivakumar, 2022).

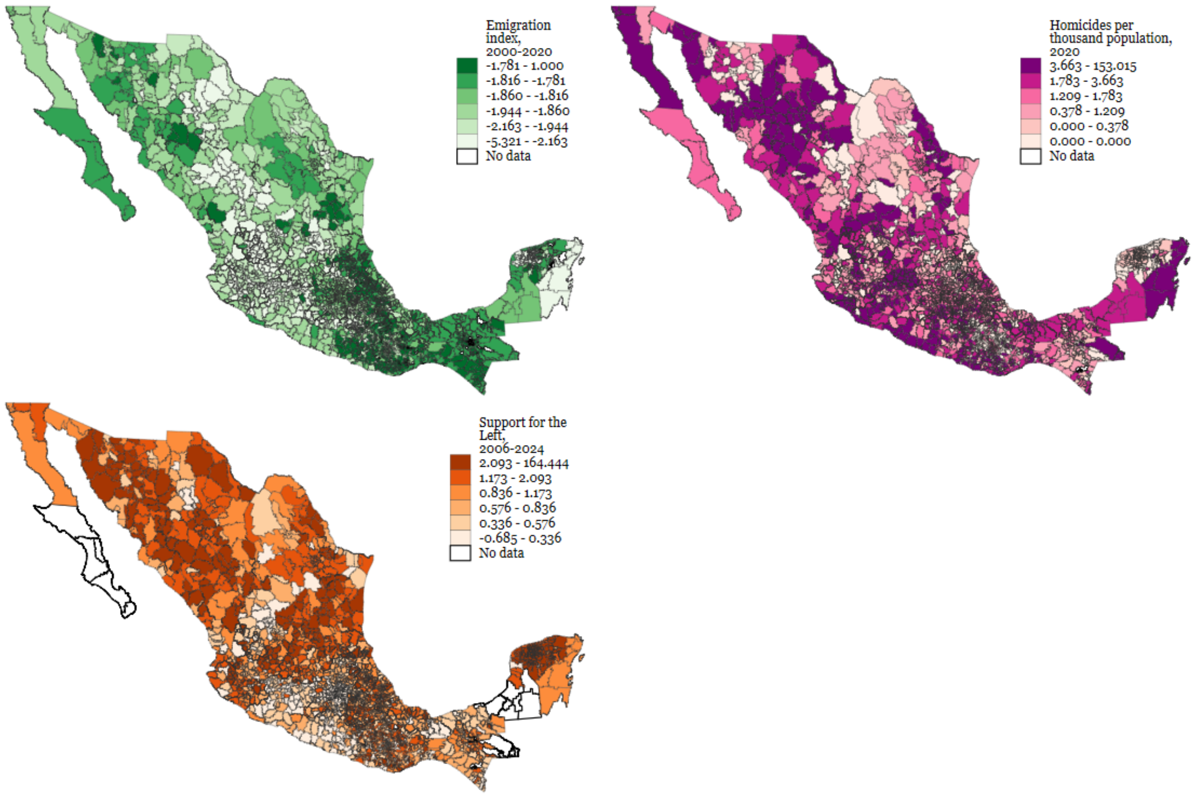

Figure 2: Commuting zone-level variation in the dependent variables.
Notes: The maps represent the variation in the emigration index between 2000 and 2020 (green), homicides per thousand people in 2020, and the variation in support for the Left from 2006 to 2024. Refer to Figure A.3 for a map illustrating the variation in organized crime between 2000 and 2018.

Other Variables: Employment and Demographic Characteristics of each CZ Several characteristics of the CZ may affect levels of emigration and crime. We build on Faber's (2020) replication data, which incorporates information from the census conducted by the National Institute of Statistics and Geography (INEGI) in Mexico at the municipality level. The individual-level census data is available through IPUMS International (IPUMS). To integrate the census data with the geographic units relevant to this study, we use a crosswalk that links municipalities to CZs.

One important factor to consider is the share of workers in occupations usually classified as routine tasks. This measure is derived from occupation-level data and a crosswalk with the US case (Autor, 2013). We rely on the matching and aggregation performed by Faber (2020).

Two additional variables related to the economic context are also included. First, NAFTA exposure, which captures the effects of the North American Free Trade Agreement, came into effect in 1994 and altered industry-level tariffs for many sectors. The variable measures each CZ's exposure to NAFTA based on its initial employment shares and the tariff changes induced by the agreement. It is proxied as $\sum_{i \in I} \ell_{ci,1990} \Delta \tau_i$, where $\ell_{ci,1990}$ represents the share of employment in industry i out of total CZ employment in 1990, and $\Delta \tau_i$ represents the NAFTA-induced tariff change in industry i.

Second, exposure to Chinese import competition is included to account for the impact of increased Chinese imports to both Mexico and the US. This control accounts for changes in Mexican imports from China as well as the indirect competition in foreign markets, using a Bartik-style measure that incorporates industry-specific changes in Chinese imports to both countries. It is defined as:

$$\text{Exp. to Chinese import competition}_{c(t_0,t_1)} = \sum_{i \in I} \ell_{ci,t_0} \left[\frac{I_{i,t_1}^{CNMX} - I_{i,t_0}^{CNMX} + O_{i,t_0} \left(I_{i,t_1}^{CNUS} - I_{i,t_0}^{CNUS} \right)}{L_{i,t_0}} \right]$$

where I_{i,t_1}^{CNMX} and I_{i,t_0}^{CNMX} represent the value of imports from China to Mexico in industry i at times t_1 and t_0, respectively, and I_{i,t_1}^{CNUS} and I_{i,t_0}^{CNUS} represent the same for imports to the US. L_{i,t_0} is the total employment in industry i at time t_0, and O_{i,t_0} is the initial share of imported intermediate goods in US industry i.

In addition to these economic and occupational-level variables, we include demographic characteristics of each CZ. Specifically, we consider pre-shock characteristics such as the share of men and the share of people with primary education as their highest level of education in 1990. For example, a CZ with a high share of people with primary education as the highest educational level may be more likely to experience emigration after the shock. We also include industry employment shares in manufacturing and the share of employment relative to the population in 1990. Moreover, we incorporate dynamic variables, such as the changes in the employment-to-population ratio between 2000 and 2015 (the same period during which robot exposure changed). Finally, we include fixed effects for two time periods and eight broad regions in Mexico.

4 Results

4.1 Effects of Domestic and Foreign Robots on Emigration

Table A.1 presents the main results regarding the impact of domestic and foreign robots on emigration. Column 1 shows that exposure to foreign robots has a negative effect on the number of households receiving remittances, with this effect being statistically significant at the 5% level. In contrast, the effect of domestic robots is positive, but we cannot reject the null hypothesis of no effect. However, when examining an alternative proxy for exposure, namely the share of routine workers in 1990, we find that a greater proportion of workers in occupations exposed to technological change prior to the shock is positively correlated with a higher number of households receiving remittances.

Since receiving remittances may also be associated with the economy of the host country of emigrants, columns 2 to 4 present alternative proxies for emigration. In columns 2 and 3, we observe similar patterns. While changes in domestic robot exposure between 2000 and 2015 do not significantly affect the number of emigrants, CZs with a higher share of routine occupations prior to the shock experience greater levels of emigration. Additionally, foreign robots have a negative impact on emigration. Finally, column 4 further confirms these findings using the emigration index as an alternative measure.

To address potential endogeneity concerns, we re-estimate the effects using an instrumental variable approach, where exposure to robots is instrumented by changes in the rest of the world. Table A.2 presents the results, which exhibit similar patterns to those obtained from the OLS estimations.

Regarding the magnitude of these effects, focusing on column 1 of Table A.1, a one standard deviation increase in exposure to foreign robots (1.18) results in a about three (2.839) percentage point (pp) decrease in the number of households receiving remittances, which is approximately a 21% decrease relative to the overall variation in remittances. In contrast, a one standard deviation increase in the share of routine workers (0.073) prior to the shock leads to an 11.65 pp increase in the number of households receiving remittances.

Substantively, these results suggest two counteracting forces that shape the pattern of emigration. First, regions with a greater share of routine workers—those occupations exposed to technological change—before the shock show higher levels of emigration post-shock. This finding supports the expectation that when local conditions worsen and job opportunities shrink (due to the exposure of workers to automation), individuals may seek out opportunities abroad as a means of survival and economic mobility. The evidence indicates that routine jobs were particularly vulnerable, and areas with more workers in these occupations were likely to experience higher levels of migration.

On the other hand, the effect of foreign robots—particularly in the US, the primary destination for Mexican emigrants—appears to exert a countervailing influence. As technology adoption and exposure to robots increased in the US, we observe a reduction in the movement of emigrants. This suggests that the spread of automation in the US may have signaled fewer opportunities for migrants, particularly in industries where robots could displace low-skilled workers, such as manufacturing and agriculture. The implication here is that as the US economy becomes more automated, the perceived opportunities for low-skilled labor diminish, possibly deterring migration.

In summary, while technological changes in the form of automation and robot adoption in Mexico's partner countries (especially the US) initially drive labor displacement and emigration, the rise of automation in the destination country itself may reduce the incentives to migrate. This interaction between local labor market conditions and external technological shocks reflects the complex dynamics of migration patterns, where the push and pull factors—local economic hardship and foreign technological change—can either reinforce or counteract each other. This highlights the need to consider both the domestic and interna-

OLS	(1) Remittance	(2) Emigrants	(3) Circulate	(4) Emigration
External exposure to domestic robots	8.009	1.618	0.405	0.0601
	(8.809)	(1.624)	(0.382)	(0.0897)
External exposure to foreign robots	-2.408**	-0.505**	-0.202***	-0.0609**
	(0.903)	(0.204)	(0.0641)	(0.0230)
Share of routine workers in 1990	159.3*	34.18**	11.53**	6.136***
	(78.75)	(16.38)	(5.182)	(2.130)
Demographics	✓	✓	✓	✓
Industry	✓	✓	✓	✓
Region	✓	✓	✓	✓
Observations	1805	1805	1805	1796
R^2	0.712	0.693	0.802	0.519
IV	(1) Remittance	(2) Emigrants	(3) Circulate	(4) Emigration
Exposure to domestic robots	7.526	1.519	0.378	0.0551
	(8.149)	(1.501)	(0.353)	(0.0821)
Exposure to foreign robots	-2.664***	-0.559***	-0.223***	-0.0672***
	(0.914)	(0.204)	(0.0612)	(0.0234)
Share of routine workers in 1990	157.1**	33.75**	11.47**	6.146***
	(77.01)	(16.04)	(5.055)	(2.087)
Demographics	✓	✓	✓	✓
Industry	✓	✓	✓	✓
Region	✓	✓	✓	✓
Observations	1805	1805	1805	1796
R^2	0.714	0.696	0.806	0.522
F	280.2	130.9	135.1	116.7
Kleibergen-Paap Wald F-stat	172.7	172.7	172.7	172.7

Table 1: Impact of exposure to robots on emigration.

Notes: The dependent variable in columns 1 to 3 refers to the number of households either receiving remittances, having emigrants in the family, or experiencing circular migration. In column 4, the dependent variable refers to the intensity of the emigration index. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively. Refer to the full Tables in Appendix A.1-A.2. Refer to Table A.3 for results examining changes in emigration between 2000 and 2020.

tional technological landscape when analyzing migration and emigration trends.

4.2 Effect of Domestic and Foreign Robots on Violence

Shifting our focus to an alternative exit option, particularly in the Global South, is the involvement in organized crime. Table A.4 and A.5 present the results from the OLS and IV estimations, respectively. For instance, looking at column 2, we observe that the number of homicides is positively correlated with exposure to foreign robots and negatively correlated with exposure to domestic robots. Similar patterns are observed for narcocrime with respect to foreign robots.

To better understand the magnitude of these results, a one standard deviation increase in domestic robot exposure leads to a decrease of 0.296 homicides per 10,000 population, which corresponds to a 5.13 percentage pp relative to the standard deviation of the homicide rate. In contrast, a one standard deviation increase in foreign robot exposure results in an increase of 0.25 homicides per 10,000 population, equating to a 4.33 pp increase relative to the standard deviation of the homicide rate. For narcocrime, a one standard deviation increase in foreign robots corresponds to a 28% increase in the rate of narcocrimes per 10,000 population, relative to the SD of narcocrime rates.

Substantively, the positive relationship between foreign robot exposure and both homicides and narcocrime may suggest a scenario where technological advancements abroad, particularly in countries like the US, may exacerbate inequalities and drive crime in developing countries, for instance, by the decline of offshoring from the North. Relating this to our results on emigration, one possible explanation is that as robots and automation are increasingly adopted in high-income countries, they may reduce the demand for labor in traditional industries that have historically served as migration routes for lower-skilled workers from the Global South. This reduction in job opportunities abroad may increase the frustration and economic vulnerability of potential migrants, pushing some individuals to engage in illegal activities or organized crime as an alternative means of income.

Furthermore, foreign robots could lead to a shift in the global supply chain, affecting the economic viability of industries in developing countries. As foreign firms increasingly adopt automation, they may reduce the demand for intermediate goods from the Global South, causing disruptions in local economies. This economic disruption may increase poverty and social instability, which can be linked to higher levels of crime.

The rise in narcocrime in particular might be related to the fact that criminal organizations often emerge as a response to reduced economic opportunities, particularly when legal channels for income generation are closed off by external factors, like technological changes abroad. in contexts like Mexico-—where organized criminal groups have a sustained presence and operate alongside weak or contested state institutions—economic shocks do not merely generate violence as a byproduct; they open strategic opportunities for criminal actors to assert and expand their power. These organizations actively exploit economic vulnerability, particularly during political transitions, using violence to influence electoral outcomes, capture local governments, and renegotiate control over territories (Dube et al., 2013; Trejo and Ley, 2018, 2021). In many cases, they form informal arrangements with politicians or target dissident candidates to ensure favorable governance outcomes (Hernández Huerta, 2020). When these arrangements are disrupted or contested, violence often intensifies.

Notice that ours is a structural and economic explanation. When job displacement occurs in

OLS	(1) Crimes	(2) Homicides	(3) Kidnapping	(4) Narco	(5) Human Traffic
External exposure to domestic robots	-7.021**	-0.781**	-0.0107	-0.790	0.00186
	(3.353)	(0.322)	(0.0189)	(0.558)	(0.00616)
External exposure to foreign robots	0.749	0.212**	0.0101**	0.593**	0.00336**
	(0.718)	(0.100)	(0.00388)	(0.285)	(0.00154)
Share of routine workers in 1990	25.44	-1.178	-0.222	11.58	0.113
	(67.36)	(7.637)	(0.374)	(9.700)	(0.0680)
Demographics	✓	✓	✓	✓	✓
Industry	✓	✓	✓	✓	✓
Region	✓	✓	✓	✓	✓
Observations	1802	1802	1802	1802	1802
R^2	0.167	0.198	0.129	0.455	0.127
IV	(1) Crimes	(2) Homicides	(3) Kidnapping	(4) Narco	(5) Human Traffic
Exposure to domestic robots	-6.642**	-0.734**	-0.00983	-0.731	0.00187
	(3.103)	(0.298)	(0.0175)	(0.543)	(0.00581)
Exposure to foreign robots	0.835	0.234**	0.0111***	0.654*	0.00370**
	(0.768)	(0.114)	(0.00397)	(0.336)	(0.00183)
Share of routine workers in 1990	28.18	-0.950	-0.223	11.59	0.110
	(65.78)	(7.505)	(0.366)	(9.645)	(0.0668)
Demographics	✓	✓	✓	✓	✓
Industry	✓	✓	✓	✓	✓
Region	✓	✓	✓	✓	✓
Observations	1802	1802	1802	1802	1802
R^2	0.170	0.203	0.132	0.409	0.123
F	12.29	9.461	21.01	6.289	16.01
Kleibergen-Paap Wald F-stat	172.7	172.7	172.7	172.7	172.7

Table 2: Impact of exposure to robots on violence.

Notes: The dependent variable in column 1 refers to the homicide rate, while column 2 refers to the number of homicides per 10,000 population, both sourced from CONAPO. Column 3 refers to the number of narcocrimes per 10,000 population, sourced from CISEN. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively. Refer to the full Tables in Appendix A.4-A.5. Refer to Table A.6 for results examining changes in organized crime between 2000 and 2018.

tandem with restricted labor mobility, the opportunity cost of participating in illicit activities declines. Under these conditions, the likelihood of violence may rise, and organized criminal networks can deepen their influence in economically vulnerable regions. In the U.S. context, Liang et al. (2025) document too a positive association between automation and crime rates. However, they attribute this relationship to psychological mechanisms—specifically, increased mental health challenges—rather than changes in economic incentives.

4.3 The Effect of Domestic and Foreign Robots on Electoral Outcomes

Table 3 presents the results of our analysis of the 2024 Mexican presidential elections. We examine the effect of exposure to robot adoption—both domestic and foreign—on electoral outcomes, including vote shares for the three major candidates and the rate of null votes.

Our results show that exposure to foreign robots is positively associated with support for Sheinbaum, the left-wing candidate from Morena. The IV estimates indicate that a one standard deviation increase in exposure to foreign automation corresponds to a statistically significant increase of approximately 0.79 percentage points in Sheinbaum's vote share. In contrast, foreign automation exposure has no statistically significant effect on support for Gálvez, the center-right candidate, or on the share of null votes. There is some weak evidence of a negative relationship between foreign automation and support for Alvarez, the centrist candidate, although the magnitude of this effect is smaller and less robust.

Interestingly, exposure to domestic robots is not significantly associated with support for any candidate in most models, suggesting that the political consequences we observe are driven by foreign, rather than domestic, technological change. This finding is consistent with our broader theoretical framework: foreign automation, by reducing remittance flows and disrupting employment and migration channels, generates localized economic grievances that feed political preferences. Domestic automation, in contrast, may be more spatially diffuse or more limited in scope.

The results are consistent with our hypothesis that foreign robot shocks, by triggering economic displacement without the possibility of exit through migration, drive support for candidates offering redistributive and state-led industrial policies. This aligns with the literature showing that voters facing dislocation tend to demand protection from the state and may shift their support toward parties perceived as pro-worker or anti-elite.

Overall, our results reinforce the idea that foreign automation, even when occurring abroad, can have direct and meaningful consequences for political behavior in the Global South.

4.4 Indirect Effects of Technology: Domestic vs. Foreign Robots in the Global South

In both our analyses, we observe that the direct incorporation of technology within the Global South may not fully capture the breadth of technological impacts. The effects of technological changes in the Global North, particularly through offshoring, seem to be just as significant, if not more so. While exposure to domestic robots appears to have a relatively minor role in influencing emigration or violence in the Global South, foreign robots—which indirectly affect the labor markets of offshoring countries like Mexico—play a much more crucial role.

OLS	(1) Sheinbaum (Left)	(2) Galvez (Right)	(3) Alvarez (Center)	(4) Null
External exposure to domestic robots	0.0192	-0.0164	-0.00280	0.000837
	(0.0119)	(0.0132)	(0.00443)	(0.000602)
External exposure to foreign robots	0.00716**	-0.00446	-0.00267*	0.000172
	(0.00275)	(0.00282)	(0.00150)	(0.000191)
Share of routine workers in 1990	-0.580***	0.682***	-0.104	-0.00225
	(0.143)	(0.148)	(0.0842)	(0.0178)
Demographics	✓	✓	✓	✓
Industry	✓	✓	✓	✓
Region	✓	✓	✓	✓
Observations	1800	1800	1800	1800
R^2	0.534	0.420	0.292	0.328
IV	(1) Sheinbaum (Left)	(2) Galvez (Right)	(3) Alvarez (Center)	(4) Null
Exposure to domestic robots	0.0184*	-0.0157	-0.00275	0.000800
	(0.0107)	(0.0120)	(0.00414)	(0.000558)
Exposure to foreign robots	0.00786***	-0.00489*	-0.00294*	0.000189
	(0.00279)	(0.00296)	(0.00159)	(0.000202)
Share of routine workers in 1990	-0.593***	0.692***	-0.101	-0.00274
	(0.139)	(0.145)	(0.0817)	(0.0173)
Demographics	✓	✓	✓	✓
Industry	✓	✓	✓	✓
Region	✓	✓	✓	✓
Observations	1800	1800	1800	1800
R^2	0.544	0.428	0.294	0.328
F	44.48	51.58	16.85	17.36
Kleibergen-Paap Wald F-stat	172.7	172.7	172.7	172.7

Table 3: Effect of Robot Exposure on Electoral Outcomes in 2024 elections

Notes: The dependent variables in columns 1–3 represent each candidate's share of valid votes. Column 4 reports the share of null votes relative to the total number of votes cast. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively. Refer to the full Tables in Appendix A.10-A.11. Refer to Table A.14 and Table A.15 for results examining changes between the 2006 and 2024 elections.

When referring to foreign robots, we are particularly considering the dynamics of reshoring and the impact of technology adoption in countries like the US. The rise in automation in these countries can lead to a reduction in labor demand abroad, particularly in developing economies where workers were once employed in industries vulnerable to offshoring. Our results show that foreign robots significantly influence both emigration and violence in the Global South, even more so than domestic robots. This suggests that changes in the North, driven by the adoption of robots and automation, have profound ripple effects on local economies in developing countries.

Based on Faber's estimations, between 1993 and 2015, 234,000 robots were installed in the US, and each robot installed in the US corresponds to a loss of slightly more than one job in Mexico. This indicates that the technological changes in the North not only directly impact employment in their own countries but also create significant indirect effects on labor markets in the South. The competition between US-installed robots and Mexican labor further underscores the importance of foreign technological advances in shaping emigration and violence patterns in developing economies.

Thus, our findings highlight the need to account for the indirect effects of technology—specifically the automation and reshoring trends in the North—when analyzing the broader consequences of technological change in the Global South. These results suggest that the effects of foreign robots, particularly in reshoring and offshoring countries, are crucial to understanding the broader socio-economic outcomes in developing regions.

5 Structural Changes in the Labor Market – Employment and Exports

To contextualize our primary findings on reduced emigration, increased homicides, and rising support for left-wing populism, this section investigates how foreign automation influences local employment outcomes and export performance, derived primarily from replication data from Faber (2020). This analysis elucidates the underlying economic mechanisms connecting foreign automation to pronounced social and political transformations. Figure 3 presents coefficient estimates illustrating the effects of exposure to domestic and foreign automation on employment across various demographic groups (left panel) and exports across distinct industry sectors (right panel).

Overall, exposure to foreign automation is associated with negative employment outcomes, as clearly indicated by the aggregated *Overall* coefficient, whereas domestic automation appears to enhance employment. Gender-specific analysis reveals that male employment experiences a slightly larger negative impact compared to female employment due to exposure to foreign automation. Further disaggregation by educational attainment demonstrates that individuals with tertiary education levels are most adversely affected, suggesting heightened vulnerability among skilled workers.

An industry-specific examination of exports underscores substantial sectoral variation in susceptibility to foreign automation. The automotive sector notably benefits from enhanced domestic technology integration, demonstrating increased export capacity. In contrast, exposure to foreign robots significantly reduces exports in sectors such as automobiles, food products, and electronics. These outcomes highlight a critical mechanism: increased technological adoption in the US reduces demand for Mexican-produced inputs, adversely impacting export-dependent sectors.

These structural shifts in employment and export patterns provide essential insights into the socio-political dynamics discussed previously. Employment displacement and export decline triggered by foreign automation intensify local economic distress, potentially motivating emigration. However, diminished migration opportunities in the US context constrain this exit strategy, fostering alternative social and political responses such as heightened violence

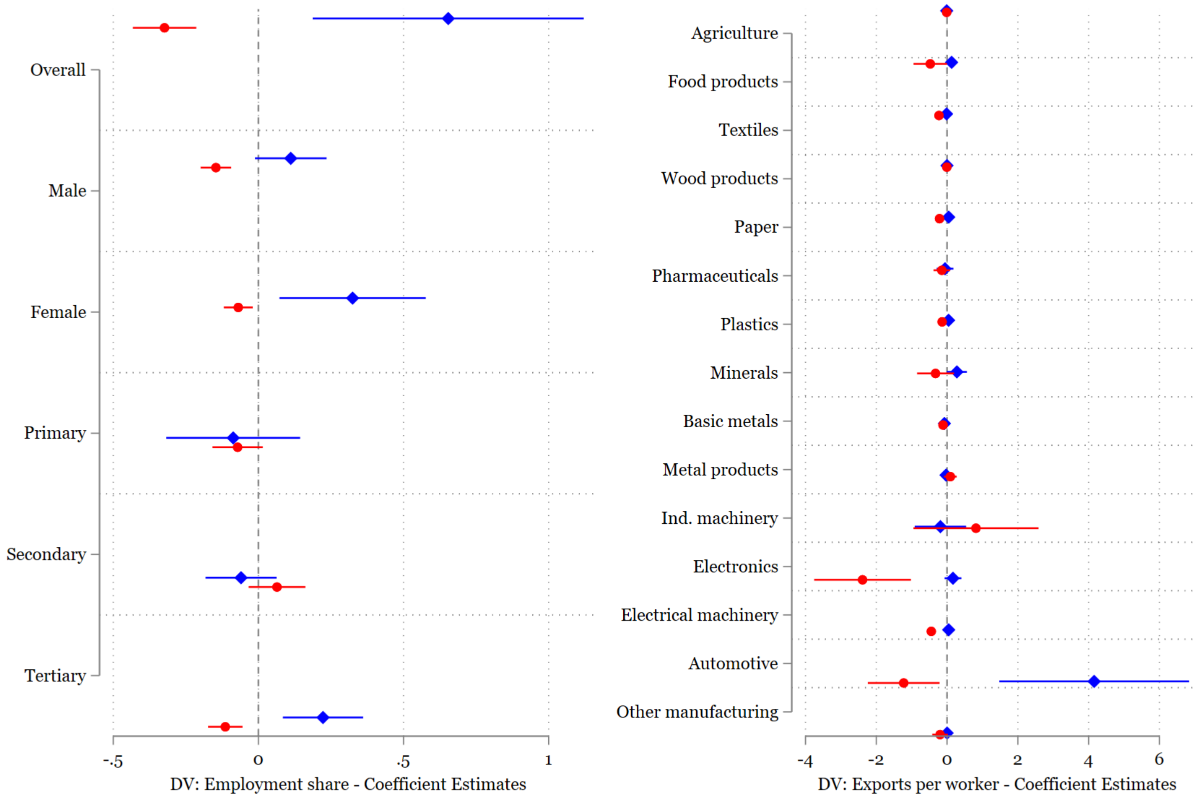

Figure 3: Changes in employment (left panel) and exports (right panel) in relation to exposure to domestic and foreign robots, 2000–2015. Blue coefficients indicate exposure to domestic robots; red coefficients indicate exposure to foreign robots.

Notes: The dependent variables related to employment measure changes in employment levels between 2000 and 2015, either overall, by gender, or by education level. The dependent variable related to exports captures exports per worker by industry between 2004 and 2014. All specifications include the following control variables: (1) Region: fixed effects for eight broad regions in Mexico; (2) Demographics: 1990 commuting zone (CZ) characteristics, including the share of men and the share of individuals whose highest level of education is primary; and (3) Industry: the share of employment in manufacturing in 1990 and the 1990 employment-to-population ratio. All regressions are weighted by each CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered at the state level.

(e.g., increased homicide rates) or growing support for pro-worker political platforms.

6 Final Remarks

This paper sheds light on how foreign technological change—particularly automation in advanced economies—reshapes economic, social, and political life in the Global South. By analyzing the Mexican case, we show that foreign robot adoption not only reduces labor demand and remittances but also disrupts coping mechanisms that have long buffered the effects of economic shocks, such as emigration.

In Mexico and similar economies, migration has historically functioned as a safety valve, and remittances have played the role of an informal welfare system. When technological change in the North constrains both employment and mobility, these traditional safety mechanisms weaken. Our findings reveal that reduced migration opportunities amplify local distress, especially in areas tightly integrated into global value chains. As households lose access to external income and face restricted options for exit, pressures on the domestic economy intensify.

This erosion of migration-based coping strategies is not politically neutral. In contexts where the state is weak or contested, such as parts of Mexico, criminal organizations can fill the void. We find evidence that automation-induced economic shocks are associated with rising organized crime and narcoviolence—but not with property crime—suggesting that participation in illicit networks may represent a rational response to constrained economic options, rather than a manifestation of despair.

Moreover, these dynamics feed into political outcomes. We show that increased exposure to foreign robot adoption is associated with greater support for left-wing populist candidates, consistent with rising demand for protection and redistribution. In this sense, foreign automation not only displaces labor, but also reconfigures political alignments and challenges democratic accountability. As emigration becomes less viable, citizens are more likely to direct their grievances inward—toward the state and its economic policies.

Taken together, our findings suggest that global automation shocks have far-reaching consequences in the Global South. They constrain both exit and voice, destabilizing economic and social systems and shifting the foundations of political engagement. These results underline the need to consider the transnational dimensions of technological change—and to develop domestic institutions capable of responding to its disruptive impacts.

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A Online Appendix

Contents

A.1 Descriptive: Robots

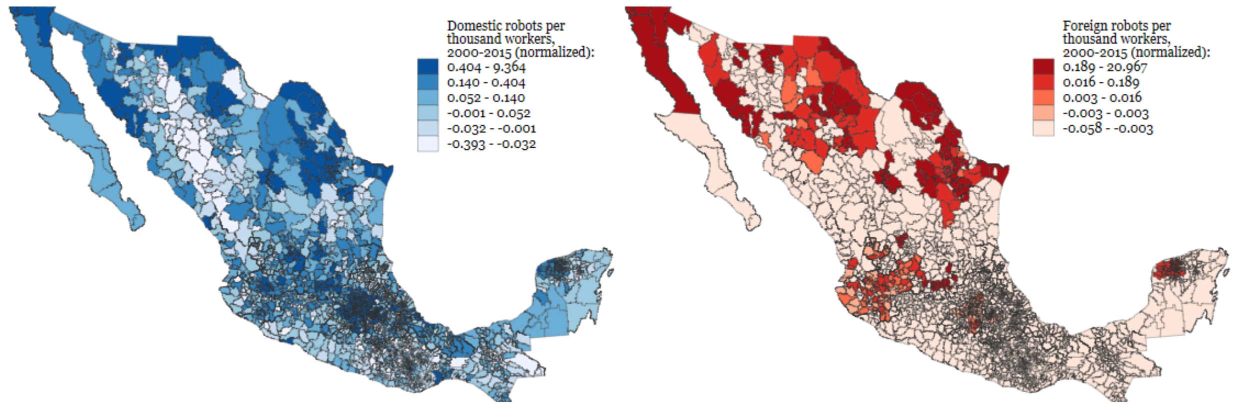

Figure A.1: Commuting zone-level variation in exogenous exposure to domestic and foreign robots, 2000–2015.

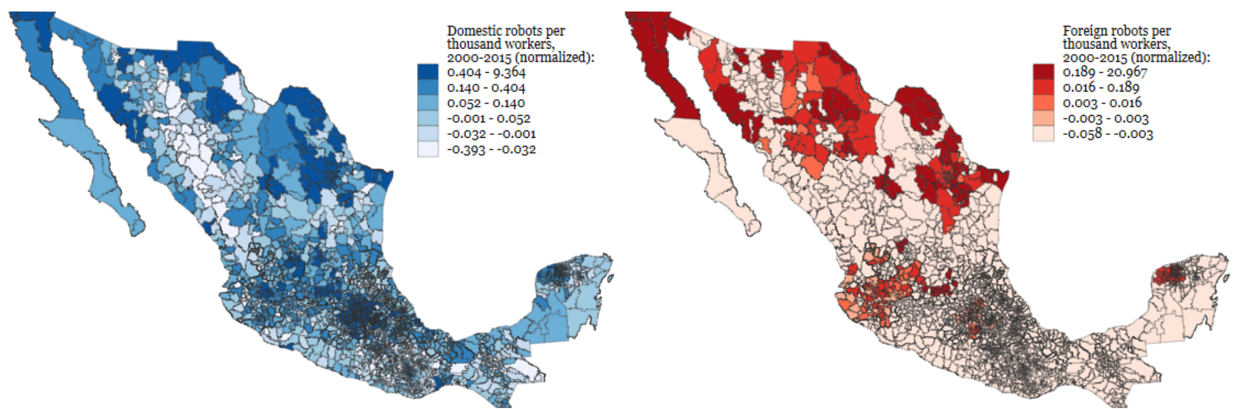

Figure A.2: Commuting zone-level variation in exogenous exposure to domestic and foreign robots, 1993–2015.

	(1) Remittance	(2) Emigrants	(3) Circulate	(4) Emigration
External exposure to domestic robots	8.009	1.618	0.405	0.0601
	(8.809)	(1.624)	(0.382)	(0.0897)
External exposure to foreign robots	-2.408**	-0.505**	-0.202***	-0.0609**
	(0.903)	(0.204)	(0.0641)	(0.0230)
Share of routine workers in 1990	159.3*	34.18**	11.53**	6.136***
	(78.75)	(16.38)	(5.182)	(2.130)
Exposure to Chinese import competition	0.0838	0.150	0.0980	-0.0289
	(1.680)	(0.357)	(0.129)	(0.0479)
Exposure to tariff changes from NAFTA	-38.10	-7.501	-3.561	1.731
	(404.5)	(84.23)	(25.86)	(9.725)
Change in employment-to-population ratio 00-15	-0.773	-0.134	-0.0596	-0.0493***
	(0.583)	(0.105)	(0.0368)	(0.0174)
Share of men in 1990	-349.3**	-50.29*	-7.888	20.96***
	(163.8)	(29.04)	(8.041)	(4.198)
Share of people with primary education in 1990	83.20*	10.86	2.560	-2.040
	(43.26)	(7.560)	(1.791)	(1.373)
Share of manufacturer workers in 1990	13.41	1.468	-0.603	0.409
	(37.84)	(7.367)	(2.025)	(0.874)
Employment to population 1990	-0.740	-0.157*	-0.0336	0.0408**
	(0.437)	(0.0812)	(0.0258)	(0.0187)
Region	✓	✓	✓	✓
Observations	1805	1805	1805	1796
R^2	0.712	0.693	0.802	0.519

Table A.1: Impact of exposure to robots on Emigration (OLS).

Notes: The dependent variable in columns 1 to 3 refers to the number of households either receiving remittances, having emigrants in the family, or experiencing circular migration. In column 4, the dependent variable refers to the intensity of the emigration index. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1) Remittance	(2) Emigrants	(3) Circulate	(4) Emigration
Exposure to domestic robots	7.526	1.519	0.378	0.0551
	(8.149)	(1.501)	(0.353)	(0.0821)
Exposure to foreign robots	-2.664***	-0.559***	-0.223***	-0.0672***
	(0.914)	(0.204)	(0.0612)	(0.0234)
Share of routine workers in 1990	157.1**	33.75**	11.47**	6.146***
	(77.01)	(16.04)	(5.055)	(2.087)
Exposure to Chinese import competition	0.557	0.248	0.135	-0.0181
	(1.583)	(0.338)	(0.122)	(0.0466)
Exposure to tariff changes from NAFTA	-16.39	-3.067	-2.250	2.009
	(395.4)	(82.35)	(25.15)	(9.481)
Change in employment-to-population ratio 00-15	-0.759	-0.131	-0.0583	-0.0489***
	(0.572)	(0.103)	(0.0360)	(0.0170)
Share of men in 1990	-353.5**	-51.14*	-8.150	20.90***
	(159.2)	(28.13)	(7.788)	(4.125)
Share of people with primary education in 1990	80.84*	10.36	2.362	-2.100
	(42.93)	(7.498)	(1.779)	(1.343)
Share of manufacturer workers in 1990	12.47	1.257	-0.748	0.350
	(36.74)	(7.110)	(1.924)	(0.854)
Employment to population 1990	-0.727*	-0.154*	-0.0334	0.0406**
	(0.427)	(0.0795)	(0.0252)	(0.0183)
Region	✓	✓	✓	✓
Observations	1805	1805	1805	1796
R^2	0.714	0.696	0.806	0.522
F	280.2	130.9	135.1	116.7
Kleibergen-Paap Wald F-stat	172.7	172.7	172.7	172.7

Table A.2: Impact of exposure to robots on Emigration (IV).

Notes: The dependent variable in columns 1 to 3 refers to the number of households either receiving remittances, having emigrants in the family, or experiencing circular migration. In column 4, the dependent variable refers to the intensity of the emigration index. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1)	(2)
	Δ Emigration	Δ Emigration
External exposure to domestic robots	0.0252*	
	(0.0129)	
External exposure to foreign robots	-0.0117**	
	(0.00467)	
Exposure to domestic robots		0.0236*
		(0.0123)
Exposure to foreign robots		-0.0129**
		(0.00548)
Nafta/China Shock	✓	✓
Demographics	✓	✓
Industry	✓	✓
Region	✓	✓
Observations	1724	1724
R^2	0.259	0.257
F	23.98	23.56
Kleibergen-Paap Wald F-stat		173.3

Table A.3: Impact of exposure to robots on Changes in Emigration 2000-2020.

Notes: The dependent variable in columns 1 to 3 refers to changes in the intensity of the emigration index between 2000 and 2020. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	Crimes	Homicides	Kidnapping	Narco	Human Traffic
External exposure to domestic robots	-7.021**	-0.781**	-0.0107	-0.790	0.00186
	(3.353)	(0.322)	(0.0189)	(0.558)	(0.00616)
External exposure to foreign robots	0.749	0.212**	0.0101**	0.593**	0.00336**
	(0.718)	(0.100)	(0.00388)	(0.285)	(0.00154)
Share of routine workers in 1990	25.44	-1.178	-0.222	11.58	0.113
	(67.36)	(7.637)	(0.374)	(9.700)	(0.0680)
Exposure to Chinese import competition	0.746	0.136	-0.00377	-0.154	-0.00138
	(1.481)	(0.116)	(0.00465)	(0.188)	(0.00127)
Exposure to tariff changes from NAFTA	289.8	50.03	2.681**	-91.89*	0.904
	(259.8)	(30.42)	(1.263)	(47.33)	(0.662)
Change in employment-to-population ratio 00-15	0.435	0.0419	-0.00139	0.0496	0.000670**
	(0.342)	(0.0353)	(0.00181)	(0.0315)	(0.000283)
Share of men in 1990	25.43	5.320	-0.0299	-1.855	-0.0766
	(177.1)	(21.34)	(0.469)	(17.74)	(0.180)
Share of people with primary education in 1990	1.383	1.196	0.124	3.541	-0.00513
	(23.17)	(2.371)	(0.130)	(3.176)	(0.0551)
Share of manufacturer workers in 1990	-4.302	-0.317	-0.201	3.678	-0.0986*
	(35.95)	(3.471)	(0.243)	(4.724)	(0.0501)
Employment to population 1990	-0.127	-0.0125	-0.00122	0.0772	0.000187
	(0.463)	(0.0480)	(0.00190)	(0.0514)	(0.00107)
Region	✓	✓	✓	✓	✓
Observations	1802	1802	1802	1802	1802
R^2	0.167	0.198	0.129	0.455	0.127

Table A.4: Impact of exposure to robots on Violence (OLS).

Notes: The dependent variable in column 1 refers to the homicide rate, while column 2 refers to the number of homicides per 10,000 population, both sourced from CONAPO. Column 3 refers to the number of narcocrimes per 10,000 population, sourced from CISEN. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1) Crimes	(2) Homicides	(3) Kidnapping	(4) Narco	(5) Human Traffic
Exposure to domestic robots	-6.642**	-0.734**	-0.00983	-0.731	0.00187
	(3.103)	(0.298)	(0.0175)	(0.543)	(0.00581)
Exposure to foreign robots	0.835	0.234**	0.0111***	0.654*	0.00370**
	(0.768)	(0.114)	(0.00397)	(0.336)	(0.00183)
Share of routine workers in 1990	28.18	-0.950	-0.223	11.59	0.110
	(65.78)	(7.505)	(0.366)	(9.645)	(0.0668)
Exposure to Chinese import competition	0.562	0.0938	-0.00556	-0.261	-0.00194
	(1.524)	(0.116)	(0.00451)	(0.214)	(0.00144)
Exposure to tariff changes from NAFTA	274.4	47.98	2.634**	-94.98**	0.899
	(251.3)	(29.38)	(1.221)	(46.89)	(0.641)
Change in employment-to-population ratio 00-15	0.432	0.0407	-0.00146	0.0457	0.000646**
	(0.336)	(0.0345)	(0.00179)	(0.0324)	(0.000277)
Share of men in 1990	28.20	5.711	-0.0200	-1.216	-0.0751
	(172.7)	(20.85)	(0.463)	(17.89)	(0.178)
Share of people with primary education in 1990	2.125	1.404	0.134	4.121	-0.00184
	(22.90)	(2.352)	(0.125)	(3.229)	(0.0548)
Share of manufacturer workers in 1990	-5.142	-0.255	-0.191	4.203	-0.0940*
	(34.74)	(3.407)	(0.231)	(4.803)	(0.0496)
Employment to population 1990	-0.147	-0.0139	-0.00120	0.0779	0.000213
	(0.456)	(0.0469)	(0.00187)	(0.0514)	(0.00104)
Region	✓	✓	✓	✓	✓
Observations	1802	1802	1802	1802	1802
R^2	0.170	0.203	0.132	0.409	0.123
F	12.29	9.461	21.01	6.289	16.01
Kleibergen-Paap Wald F-stat	172.7	172.7	172.7	172.7	172.7

Table A.5: Impact of exposure to robots on Violence (IV).

Notes: The dependent variable in column 1 refers to the homicide rate, while column 2 refers to the number of homicides per 10,000 population, both sourced from CONAPO. Column 3 refers to the number of narcocrimes per 10,000 population, sourced from CISEN. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1) Δ Org. Crime	(2) Δ Org. Crime
External exposure to domestic robots	-2.660**	
	(1.249)	
External exposure to foreign robots	2.640***	
	(0.681)	
Exposure to domestic robots		-2.453*
		(1.282)
Exposure to foreign robots		2.925***
		(0.851)
Nafta/China Shock	✓	✓
Demographics	✓	✓
Industry	✓	✓
Region	✓	✓
Observations	1033	1033
R^2	0.459	0.418
F	13.33	8.468
Kleibergen-Paap Wald F-stat		169.2

Table A.6: Impact of exposure to robots on Changes in Organized Crime 2000-2018.
Notes: The dependent variable is the difference in the number of organized crime reported by Osorio and Beltran (2020). All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1)	(2)	(3)
	Sexual Crime	Family Violence	Property Crimes
Exposure to domestic robots	-0.234	-1.529	0.357
	(0.157)	(1.017)	(1.420)
Exposure to foreign robots	0.00658	-0.0426	-0.113
	(0.0472)	(0.521)	(0.390)
Share of routine workers in 1990	0.845	-10.90	24.14
	(3.346)	(20.54)	(16.15)
Exposure to Chinese import competition	0.161**	1.000***	0.460
	(0.0594)	(0.361)	(0.723)
Exposure to tariff changes from NAFTA	12.20	144.0*	-1.928
	(15.23)	(82.60)	(67.68)
Change in employment-to-population ratio 00-15	-0.00856	-0.000150	0.145*
	(0.0157)	(0.0934)	(0.0794)
Demographics	✓	✓	✓
Industry	✓	✓	✓
Region	✓	✓	✓
Observations	1802	1802	1802
R^2	0.499	0.587	0.522

Table A.7: Impact of exposure to robots on other crimes associated with the Death of Despair hypothesis (OLS).

Notes: The dependent variable in column 1 refers to the homicide rate, while column 2 refers to the number of these types of crimes per 10,000 population, both sourced from CONAPO. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1) Sexual Crime	(2) Family Violence	(3) Property Crimes
Exposure to domestic robots	-0.248	-1.592	0.214
	(0.152)	(1.011)	(1.342)
Exposure to foreign robots	0.0309	0.126	-0.184
	(0.0500)	(0.547)	(0.402)
Share of routine workers in 1990	1.076	-9.278	23.32
	(3.270)	(19.85)	(15.86)
Exposure to Chinese import competition	0.143**	0.873**	0.534
	(0.0597)	(0.389)	(0.776)
Exposure to tariff changes from NAFTA	11.75	140.5*	1.131
	(15.01)	(81.17)	(66.84)
Change in employment-to-population ratio 00-15	-0.00705	0.0102	0.141*
	(0.0153)	(0.0900)	(0.0777)
Demographics	✓	✓	✓
Industry	✓	✓	✓
Region	✓	✓	✓
Observations	1802	1802	1802
R^2	0.498	0.586	0.521
F	26.11	10.43	9.364
Kleibergen-Paap Wald F-stat	172.7	172.7	172.7

Table A.8: Impact of exposure to robots on other crimes associated with the Death of Despair hypothesis (IV).

Notes: The dependent variable in column 1 refers to the homicide rate, while column 2 refers to the number of these types of crimes per 10,000 population, both sourced from CONAPO. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

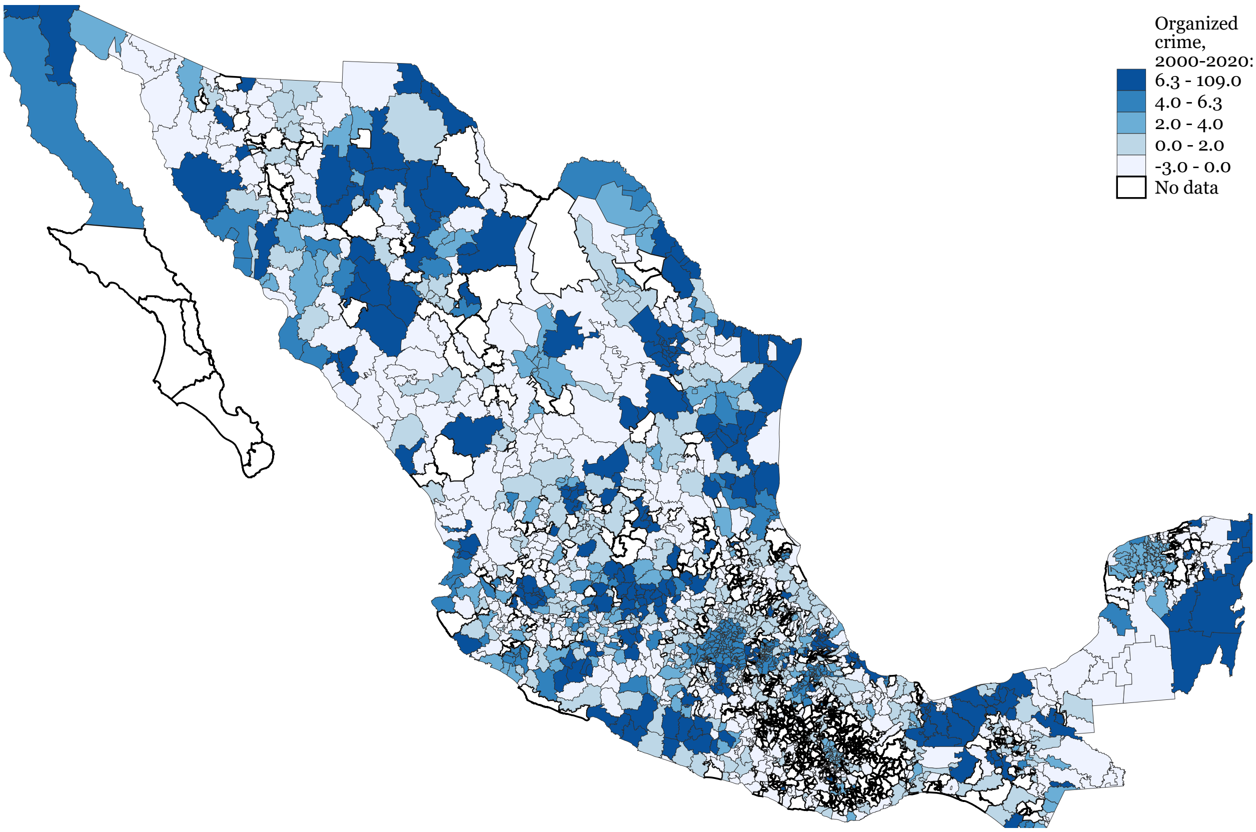

Figure A.3: Commuting zone-level variation in exogenous exposure to domestic and foreign robots, 1993–2015.

A.2 Descriptive: Violence

A.3 Results: Emigration

A.4 Results: Violence

A.4.1 Results: Death of Despair?

A.5 Results: Blocked Exit Options

The structural equation model is presented by equations 1-3, where index i refers to subjects. The terms α are intercepts, while ϵ are zero-mean error terms reflecting the impact of unobservable variables. The total effect of X on Y is indicated by c, the direct effect of X on Y is given by d, and the mediated effect can be estimated using the product-of-coefficients method ab or the difference $c - d$. Then, the proportion of the treatment effect explained by each mediator is just the indirect effect divided by the total treatment effect.

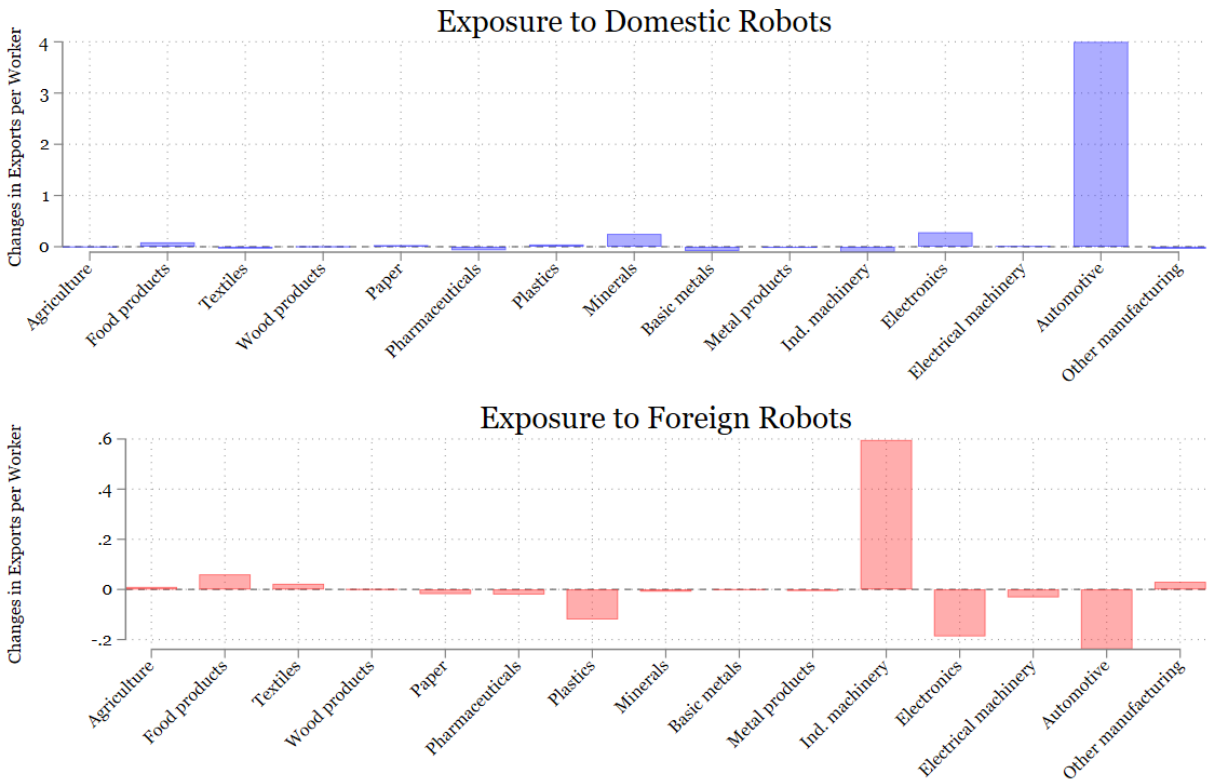

Figure A.4: Changes in exports per worker by industry and their relationship with exposure to domestic and foreign robots, 2000–2015.

$$M_i = \alpha_1 + aX_i + \epsilon_{i1} \tag{1}$$

$$Y_i = \alpha_2 + cX_i + \epsilon_{i2} \tag{2}$$

$$Y_i = \alpha_3 + dX_i + bM_i + \epsilon_{i3} \tag{3}$$

A.6 Results: Politics

	(1) Emigrants	(2) Homicides	(3) Homicides
External exposure to foreign robots	-0.505***	0.212***	0.189***
	(0.0716)	(0.0328)	(0.0331)
Emigrants			-0.0454***
			(0.0108)
Demographics	✓	✓	✓
Industry	✓	✓	✓
Region	✓	✓	✓
Observations	1805	1802	1802
R^2	0.693	0.198	0.206

Table A.9: Multi-equation regression framework following the Baron-Kenny mediation approach

Notes: The dependent variable in column 1 refers to the share of households with emigrants explained by foreign robots; column 2 refers to the number of homicides per 10,000 population; column 3 has the same DV as column 2. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1) Sheinbaum (Left)	(2) Galvez (Right)	(3) Alvarez (Center)	(4) Null
External exposure to domestic robots	0.0192	-0.0164	-0.00280	0.000837
	(0.0119)	(0.0132)	(0.00443)	(0.000602)
External exposure to foreign robots	0.00716**	-0.00446	-0.00267*	0.000172
	(0.00275)	(0.00282)	(0.00150)	(0.000191)
Share of routine workers in 1990	-0.580***	0.682***	-0.104	-0.00225
	(0.143)	(0.148)	(0.0842)	(0.0178)
Exposure to Chinese import competition	-0.00679	0.00169	0.00499*	-0.000132
	(0.00585)	(0.00579)	(0.00267)	(0.000328)
Exposure to tariff changes from NAFTA	1.427**	-1.370**	-0.0561	-0.00429
	(0.603)	(0.586)	(0.302)	(0.0716)
Change in employment	-0.000698	-0.0000398	0.000743	-0.0000801
	(0.00101)	(0.000949)	(0.000487)	(0.0000812)
Share of men in 1990	0.420	-0.179	-0.240**	0.0558
	(0.425)	(0.404)	(0.115)	(0.0449)
Share of people with primary education in 1990	0.119	-0.210**	0.0922*	-0.0272**
	(0.110)	(0.0966)	(0.0510)	(0.0122)
Share of manufacturer workers in 1990	-0.0307	0.0448	-0.0136	-0.00160
	(0.0874)	(0.0714)	(0.0481)	(0.00742)
Employment to population 1990	0.00133	-0.00172	0.000375	-0.000325***
	(0.00149)	(0.00126)	(0.000623)	(0.000110)
Region	✓	✓	✓	✓
Observations	1800	1800	1800	1800
R^2	0.534	0.420	0.292	0.328

Table A.10: Effect of Robot Exposure on Electoral Outcomes in 2024 elections (OLS Estimates)

Notes: The dependent variables in columns 1–3 represent each candidate's share of valid votes. Column 4 reports the share of null votes relative to the total number of votes cast. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1)	(2)	(3)	(4)
	Sheinbaum (Left)	Galvez (Right)	Alvarez (Center)	Null
Exposure to domestic robots	0.0184*	-0.0157	-0.00275	0.000800
	(0.0107)	(0.0120)	(0.00414)	(0.000558)
Exposure to foreign robots	0.00786***	-0.00489*	-0.00294*	0.000189
	(0.00279)	(0.00296)	(0.00159)	(0.000202)
Share of routine workers in 1990	-0.593***	0.692***	-0.101	-0.00274
	(0.139)	(0.145)	(0.0817)	(0.0173)
Exposure to Chinese import competition	-0.00785	0.00231	0.00542**	-0.000155
	(0.00557)	(0.00572)	(0.00269)	(0.000335)
Exposure to tariff changes from NAFTA	1.444**	-1.389**	-0.0542	-0.00315
	(0.577)	(0.566)	(0.291)	(0.0695)
Change in employment	-0.000754	-0.00000311	0.000763	-0.0000816
	(0.000973)	(0.000916)	(0.000477)	(0.0000787)
Share of men in 1990	0.418	-0.176	-0.241**	0.0557
	(0.413)	(0.394)	(0.113)	(0.0439)
Share of people with primary education in 1990	0.126	-0.214**	0.0896*	-0.0270**
	(0.106)	(0.0940)	(0.0500)	(0.0119)
Share of manufacturer workers in 1990	-0.0172	0.0353	-0.0175	-0.00118
	(0.0826)	(0.0688)	(0.0461)	(0.00723)
Employment to population 1990	0.00144	-0.00180	0.000349	-0.000321***
	(0.00146)	(0.00123)	(0.000605)	(0.000107)
Region	✓	✓	✓	✓
Observations	1800	1800	1800	1800
R^2	0.544	0.428	0.294	0.328
F	44.48	51.58	16.85	17.36
Kleibergen-Paap Wald F-stat	172.7	172.7	172.7	172.7

Table A.11: Effect of Robot Exposure on Electoral Outcomes in 2024 elections (IV Estimates)

Notes: The dependent variables in columns 1–3 represent each candidate's share of valid votes. Column 4 reports the share of null votes relative to the total number of votes cast. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1)	(2)	(3)
	Morena (Left)	Pan - PRI (Right)	Null
External exposure to domestic robots	0.00200	-0.00430	0.000598
	(0.00391)	(0.00391)	(0.000493)
External exposure to foreign robots	0.00277***	-0.00337***	0.000254**
	(0.00100)	(0.00100)	(0.000127)
Share of routine workers in 1990	-0.440***	0.486***	-0.00905
	(0.0684)	(0.0685)	(0.00865)
Exposure to Chinese import competition	0.00273*	-0.00178	-0.000437**
	(0.00145)	(0.00145)	(0.000183)
Exposure to tariff changes from NAFTA	1.482***	-1.469***	-0.0744*
	(0.319)	(0.319)	(0.0403)
Change in employment-to-population ratio 00-15	0.000188	-0.000628	-0.000119*
	(0.000527)	(0.000527)	(0.0000666)
Demographics	✓	✓	✓
Industry	✓	✓	✓
Region	✓	✓	✓
Observations	1802	1802	1802
R^2	0.717	0.591	0.538

Table A.12: Effect of Robot Exposure on Electoral Outcomes in 2018 and 2024 elections pooled (OLS Estimates)

Notes: The dependent variables in columns 1–3 represent each candidate's share of valid votes. Column 4 reports the share of null votes relative to the total number of votes cast. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1)	(2)	(3)
	Morena (Left)	Pan - PRI (Right)	Null
Exposure to domestic robots	0.00213	-0.00437	0.000591
	(0.00367)	(0.00367)	(0.000464)
Exposure to foreign robots	0.00302***	-0.00368***	0.000278**
	(0.00108)	(0.00108)	(0.000136)
Share of routine workers in 1990	-0.440***	0.487***	-0.00927
	(0.0675)	(0.0675)	(0.00853)
Exposure to Chinese import competition	0.00228	-0.00124	-0.000477**
	(0.00151)	(0.00151)	(0.000191)
Exposure to tariff changes from NAFTA	1.481***	-1.470***	-0.0738*
	(0.314)	(0.314)	(0.0397)
Change in employment-to-population ratio 00-15	0.000164	-0.000598	-0.000121*
	(0.000520)	(0.000520)	(0.0000657)
Demographics	✓	✓	✓
Industry	✓	✓	✓
Region	✓	✓	✓
Observations	1802	1802	1802
R^2	0.718	0.593	0.539
F	112.0	63.96	51.32
Kleibergen-Paap Wald F-stat	16449.2	16449.2	16449.2

Table A.13: Effect of Robot Exposure on Electoral Outcomes in 2018 and 2024 elections pooled (IV Estimates)

Notes: The dependent variables in columns 1–3 represent each candidate's share of valid votes. Column 4 reports the share of null votes relative to the total number of votes cast. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1)	(2)	(3)
	Δ Left	Δ Right	Δ Null
External exposure to domestic robots	0.0141	-0.00204	0.00228
	(0.0661)	(0.0144)	(0.0261)
External exposure to foreign robots	0.0615***	-0.0118**	-0.00297
	(0.0188)	(0.00490)	(0.00630)
Share of routine workers in 1990	3.195*	0.778***	0.311
	(1.598)	(0.237)	(0.355)
Exposure to Chinese import competition	-0.0841**	0.00525	-0.00960
	(0.0391)	(0.00725)	(0.00604)
Exposure to tariff changes from NAFTA	-11.85	-0.974	-2.242
	(7.999)	(0.582)	(1.760)
Change in employment-to-population ratio 00-15	0.00810	-0.00108	0.000791
	(0.0117)	(0.00152)	(0.00244)
Demographics	✓	✓	✓
Industry	✓	✓	✓
Region	✓	✓	✓
Observations	1792	1792	1788
R^2	0.295	0.579	0.327

Table A.14: Effect of Robot Exposure on Electoral Outcomes in Changes between 2000 - 2024 elections pooled (OLS Estimates)

Notes: The dependent variables in columns 1–3 measure the change in each party family's share of valid votes between 2000 and 2024. Column 4 reports the change in the share of null votes relative to total votes cast. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.

	(1)	(2)	(3)
	Δ Left	Δ Right	Δ Null
Exposure to domestic robots	0.0183	-0.00289	0.00194
	(0.0624)	(0.0132)	(0.0241)
Exposure to foreign robots	0.0672***	-0.0129**	-0.00324
	(0.0203)	(0.00531)	(0.00674)
Share of routine workers in 1990	3.198**	0.777***	0.310
	(1.537)	(0.227)	(0.338)
Exposure to Chinese import competition	-0.0945**	0.00724	-0.00908
	(0.0386)	(0.00699)	(0.00652)
Exposure to tariff changes from NAFTA	-11.93	-0.957*	-2.232
	(7.776)	(0.554)	(1.689)
Change in employment-to-population ratio 00-15	0.00758	-0.000975	0.000815
	(0.0113)	(0.00146)	(0.00238)
Demographics	✓	✓	✓
Industry	✓	✓	✓
Region	✓	✓	✓
Observations	1792	1792	1788
R^2	0.295	0.582	0.327
F	241.2	15.86	128.7
Kleibergen-Paap Wald F-stat	384.0	384.0	384.0

Table A.15: Effect of Robot Exposure on Electoral Outcomes in Changes between 2000 - 2024 (IV Estimates)

Notes: The dependent variables in columns 1–3 measure the change in each party family's share of valid votes between 2000 and 2024. Column 4 reports the change in the share of null votes relative to total votes cast. All specifications include the following control variables: 1) Region: fixed effects for eight broad regions in Mexico; 2) Demographics: 1990 CZ demographics, including the share of men and the share of people with primary education as their highest level; 3) Industry: shares of employment in manufacturing in 1990 and the 1990 level of employment-to-population ratio. All regressions are weighted by a CZ's share of the national working-age population in 1990. Standard errors are robust to heteroskedasticity and clustered by state. The coefficients marked with $***$, $**$, and $*$ are significant at the 1%, 5%, and 10% confidence levels, respectively.