Regional Studies

ISSN: 0034-3404 (Print) 1360-0591 (Online) Journal homepage: www.tandfonline.com/journals/cres20

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To cite this article: René Cabral, André Varella Mollick & Eduardo Saucedo (2026) Crime, economic forces and trucks crossings in the US–Mexico border region, Regional Studies, 60:1, 2657854, DOI: 10.1080/00343404.2026.2657854

To link to this article: https://doi.org/10.1080/00343404.2026.2657854

Published online: 27 May 2026.

REGIONAL STUDIES
2026, VOL. 60, NO. 1, 2657854
https://doi.org/10.1080/00343404.2026.2657854

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Crime, economic forces and trucks crossings in the US–Mexico border region

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ABSTRACT
We investigate northbound loaded truck crossings from Mexico to the United States between 2015 and 2023. A weaker peso, exports and US industrial production positively affect loaded containers. Truck robberies at the municipal level show no statistically significant relationship with truck loadings, whereas truck robberies at the national and state levels present a negative, persistent association. Results suggest that Mexico–US trade would benefit from lower average Mexican crime rates. In addition to comparing Texas with other border states, this study documents the role of crime specific to the transportation sector as a negative relevant driver of truck crossings to the United States.

ARTICLE HISTORY
Received 7 March 2025
Accepted 3 April 2026

KEYWORDS
Border crossings; global value chains; exchange rate; Mexico; United States; trucks

JEL
F16; F22; F31; R12

1. Introduction

In 2023, Mexico became the US economy's leading trading partner. According to US Census Bureau Statistics, the United States and Mexico exchanged US$798.8 billion in merchandise during that year, representing 15.7% of total US trade, surpassing Canada (15.2%) and China (11.3%). At this rate, on average, about US$1.5 million cross the US–Mexico border every minute (Bureau of Transportation Statistics, 2024).

Different factors have accelerated trade between the United States and Mexico in recent years. First, before the COVID-19 pandemic, increasing tariffs on trade between the United States and China started reconfiguring some global value chains (GVCs) (Torres & Jayashankar, 2023). According to Pietrobelli and Seri (2023), the pandemic brought even more pressure on companies in Asia, as the worldwide lockdown of economic activity, and China in particular, further disrupted those GVCs. Alfaro and Chor (2023) refer to data suggesting a 'great reallocation' in supply chains: decreases in direct US sourcing from China, along with gains in import share in low-wage locations (Vietnam) and nearshoring (Mexico).[1] Second, the United States–Mexico–Canada Agreement (USMCA), which replaced the North American Free Trade Agreement (NAFTA) and entered into force in 2020, further intensified this trend by raising the minimum regional value content requirement for products that benefit from preferential duty-free treatment. For instance, light vehicles, trucks and some auto parts went from a minimum regional requirement of 62.5% to 75.0%. These two factors have exacerbated the need to move production closer to their final markets in North America.

Due to its proximity to the United States and its participation in USMCA, Mexico has benefited significantly from these trends – described as *nearshoring* – and might continue to do so in future (Pietrobelli & Seri, 2023).[2] This literature on GVCs has addressed different measures and questions pertaining to the production across different places and the transportation of goods. Gao et al. (2022), for example, propose an approach to simultaneously measuring the magnitude of offshoring, reshoring and re-offshoring, and document what happened to global production location prior to 2014, while Capello and Cerisola (2024) study back-shoring and identify regions that register a decrease in their dependence on GVCs, through a reduction of manufacturing foreign value added of intermediate inputs over time.

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Supplemental data for this article can be accessed online at https://doi.org/10.1080/00343404.2026.2657854

The increase in trade is reflected in the crossings of merchandise through the US–Mexican border by land. According to Mexico's National Institute of Statistics (Instituto Nacional de Estadística, Geografía e Informática – INEGI), 64% of Mexico's trade was carried out by land in 2020 (National Institute of Statistics and Geography (INEGI), 2024). Figure 1 presents the evolution of northbound truck crossings through the US–Mexico border from 2015 to 2023, the period of analysis in this paper. The upward trend in this period is clear, despite the sudden decline caused by COVID-19 in 2020, with truck traffic rising from 5,535,371 in 2015 to 7,356,659 in 2023, a 32.9% increase.

While cargo traffic along the US–Mexico border is highly relevant to trade across North America, it has received little direct attention in the existing literature. Only in the decade of the 2000s, following the 9/11 attacks, did it become a topic of concern for some researchers. Olmedo and Soden (2005) were among the first to examine the impact of the 9/11 attacks on the crossings of pedestrians, vehicles, vehicle passengers and cargo trucks across the US borders with Canada and Mexico. Similarly, Fullerton and Walke (2014) study the impact of transportation costs on the volume of cross-border trade and the impact of 9/11. More recently, investigating the case of border city-pairs along the US–Mexican border, Xue et al. (2013), Fullerton et al. (2022) and Gutiérrez et al. (2021) highlight the importance of looking at crossings at the port(s) of entry (POE) level and their characteristics. Fullerton et al. (2013) and Duarte-Ronquillo and Fullerton (2021) are examples of studies on northbound border traffic focusing on tolls, exchange rates and trade clusters. The latter suggests that the cost of fuel, economic activity on the Mexican side and the real exchange rate influence the crossing of trucks across the POE by looking at Ojinaga, Chihuahua, and Presidio, Texas.

The US–Mexico border is the 10th largest in the world, approximately 1950 miles long and is home to about 14 million people who live primarily in 12 city-pairs.[3] This border area comprises four American states: Texas, New Mexico, Arizona and California, and six Mexican states: Tamaulipas, Nuevo Leon, Coahuila, Chihuahua, Sonora and Baja California. Gonzalez and Hong (2025, p. 1) note, however, that defining the border region is not straightforward: 'The most restrictive approach limits it to the 44 US counties and roughly 80 Mexican municipalities that directly touch the international boundary.' They also use alternative definitions of the US–Mexico border region, such as a broader definition from the 1983 La Paz Agreement, which established a 100-km (62-mile) zone north and south of the boundary to promote joint environmental management, and another from the North American Development

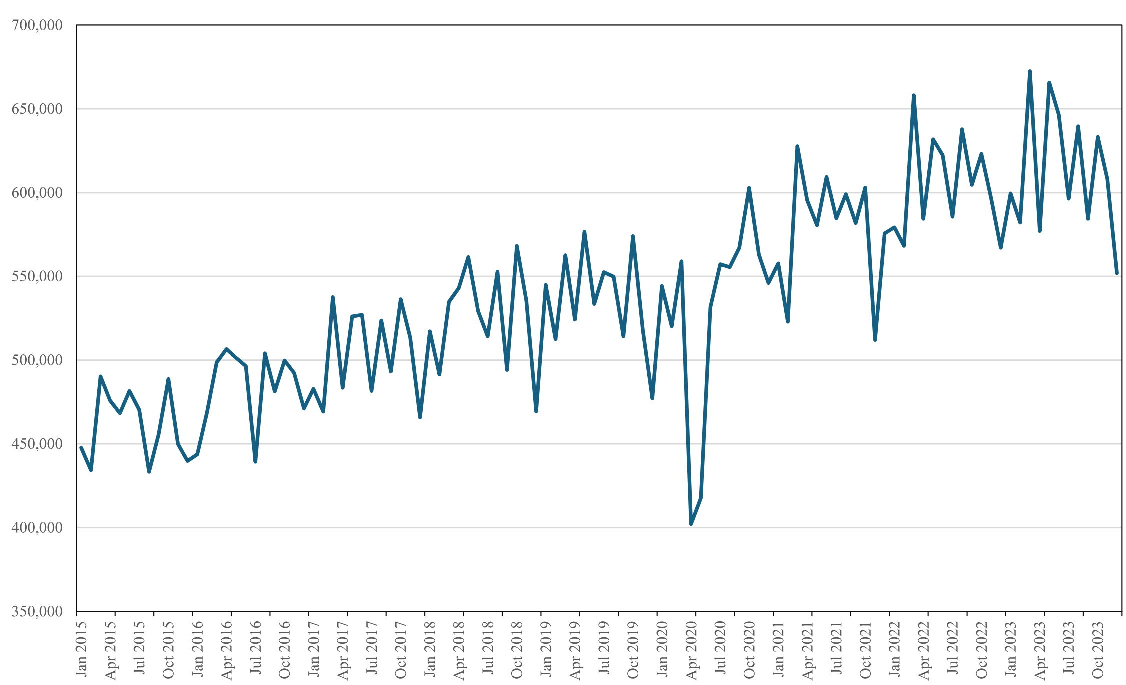

Figure 1. Truck crossings from Mexico to the United States: monthly data, 2015–23.
Source: Elaborated by the authors with data from the US Bureau of Transportation Statistics.

Bank (NADB) expanding this to 100 km north and 300 km south of the border to include major industrial corridors and metropolitan centres.

For quite some time, the literature has been concerned with the impact of violence and crime on crossings by illegal immigrants along this border (e.g., Infante et al., 2012; Vogt, 2017; Leyva-Flores et al., 2019; Torre Cantalapiedra & Hernández Campos, 2023). Meanwhile, Mollick et al. (2022) is one of the few articles to have studied the impact of violence on pedestrian and vehicle movement across the US–Mexican border. Still, little or no attention has been paid to the crossings of goods by land, the most significant trade channel between the United States and Mexico. Burns (2019) investigated this issue from the perspective of preventive measures for illicit trade and human trafficking, but did not address the flow of foreign trade per se.

The present paper is also related to truck transportation literature and trade flows. Earlier studies on cargo shipments out of Mexico include Weissman and Harrison (1998), Ashur et al. (2001) and Fullerton and Tinajero (2002). Gallego et al. (2023), studying the 656.3 km Spanish–French border and its two coastal road freight gateways, conclude that trade intensity depends on relative accessibility to the transportation network. Our paper examines the effects of different types of crime on northbound trucks crossing at all existing POEs along the US–Mexico border. It investigates the impact of crime in Mexico on cargo trucks' northbound border crossings, controlling for the location of truck robberies by using border municipalities, border states and national crime figures. We hypothesise that crime has adverse effects on truck crossings, albeit with dissimilar impacts depending on their geographical location. The evidence in this paper supports this hypothesis. We find that national crime rates present a higher and more significant effect than the crime in the border states region, and relative to crime in Mexican municipalities in the border region. Next, we test whether the impact of crime has differed across the US states' POEs. We compare the impact of crime on Texas POEs versus the rest of POEs in California, Arizona and New Mexico. Lastly, we estimate our model using a more flexible lag structure that captures and separates short- and long-run effects, as well as the inertia or persistence of our dependent variable.

Detotto and Otranto (2010) investigate crime and real gross domestic product (GDP) in Italy. Ballou (2004) suggests that transportation costs are the most critical among companies' logistics costs, accounting for between 25% and 50% of total production costs. This cost becomes more relevant in an environment of insecurity, such that existing in Mexico in recent years. Perez Salas (2013) indicates that, according to FreightWatch, by 2011, Mexico registered the highest risk levels in land logistics chains worldwide (FreightWatch International, 2024). Crime could increase logistics costs and damage firms' competitiveness. Some media reports suggest that the automotive industry is one of the most affected (Juárez, 2023). Pérez et al. (2011), De la Torre et al. (2013), Cedillo-Campos et al. (2014) and Vidales et al. (2019) point out that the high number of highway robberies on cargo transport on Mexican highways could considerably reduce the competitiveness of firms, generate economic losses and reduce efficiencies in the supply chain system.

Distortionary taxes tend to generate market inefficiencies and reduce incentives to produce and invest. In this sense, crime in the form of truck robberies and other crimes that extract welfare from producers (or consumers) can be seen as a distortionary tax. Using a general equilibrium model, Chapa Cantú et al. (2023) study the impact of crime on Mexican firms by modelling the costs imposed by crime as a tax on sales and on the purchase of productive factors. They estimate that the cost of insecurity accounts for about 4–5% of firms' value added.

This paper seeks to fill a gap in the literature by analysing the impact of crime on trucks crossing from Mexico into the United States, with particular attention paid to traffic across the US–Mexico border states where POEs are located. We find that trucks respond differently to financial and economic factors, with exports, the real exchange rate and economic activity in the United States significantly impacting northbound crossings. Crime, in the form of cargo truck robberies, affects different POEs along the US–Mexico border depending on the port's location and the analysed period. Moreover, national and border-state crime rates, but not border-municipal crime (at the POE), affect truck crossings more significantly, with national crime exerting nearly twice the impact of border-state crime. Finally, using a long-run error correction model (ECM) specification with flexible lag lengths, we observe that the long-run impact of truck robberies remains significant only at the national level, and not at the border-municipality or border-state levels.

The rest of this paper is structured as follows. Section 2 analyses the database and variables included in this study. Section 3 describes the empirical models. Section 4 reports the main findings of the econometric models. The last section concludes.

2. Data analysis

Border-crossing data for trucks are obtained from the Bureau of Transportation Statistics. Such data are available monthly for each of the 20 border POEs along the US–Mexico border through which cargo trucks are allowed to cross.[4] All trade transported by land between Mexico and the United States crosses throughout one of these 20 POEs. Table 1 shows how trucks crossing from Mexico to the United States are distributed along the different POEs; Figure 2 illustrates the geographical location along the US–Mexico border. Most of the products that Mexico sends into the United States cross through Texas (68.9%) and a smaller portion through California POE (22.1%), while Arizona and New Mexico capture together less than 10% of total truck crossings. Laredo is the most important POE along the US–Mexico border, accounting for 37.5% of all truck crossings; the second is Otay Mesa in California, which captures 14.9% of all crossings, less than half of those through Laredo.

Table 2 reports the descriptive statistics for each variable included in this study; Table 3 shows the correlation coefficients among those variables. Non-oil exports correspond to the value of international sales registered by municipalities located immediately next to the border, border states and nationwide. Border states and national exports are obtained from Mexico's INEGI, and border-municipal exports from the Ministry of the Economy. Values are reported in real US dollars (deflated using the consumer price index (CPI) 1981–184 = 100).

Another explanatory variable related to the number of northbound trucks crossing the border is the evolution of US industrial production. We use the US industrial production index, which measures real output of US facilities in sectors such as manufacturing, mining, electricity and gas utilities. The index (2017 = 100) is published by the FRED Economic Data of the Federal Reserve Bank of St. Louis, available monthly (Federal Reserve Bank of St. Louis, 2024). The real exchange rate is another relevant factor that can help explain the number of cargo trucks crossing from Mexico into the United States through the 20 different POEs along the border, because it affects the competitiveness of Mexican-traded goods. The real exchange rate is sourced from the BANXICO (Mexico's Central Bank) website and is available monthly (Banco de México, 2024). Variables such as total national exports, the US industrial production index and the real exchange rate are reported monthly at the aggregate country level, which means each of these values is repeated across the border municipalities.

Crime data at the municipal, state and national levels are from the Secretariado Ejecutivo de Seguridad Pública (SESP) (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública, 2015), a Mexican government agency responsible for measuring crime in the country. Such data are available monthly at the municipality level and can be aggregated at the state and national levels. The period analysed in this

Table 1. Northbound border crossings by port of entry, 2015–23.

State	Port	Observations	Sum (9 years)	Mean (monthly)	SD	%
Arizona (*n* = 5)	Nogales	108	3,215,778	29,776	9456	5.58%
	Other four crossings	432	641,286	5938	312	1.02%
	Total Arizona	**540**	**3,857,064**	**7143**	**12,154**	**6.70%**
California (*n* = 3)	Calexico East	108	3,554,196	32,909	3955	6.17%
	Otay Mesa	108	8,605,534	79,681	8594	14.93%
	Tecate	108	560,569	5190	683	0.97%
	Total California	**324**	**12,720,299**	**39,260**	**31,268**	**22.10%**
New Mexico (*n* = 2)	Columbus	108	156,297	1447	856	0.27%
	Santa Teresa	108	1,214,574	11,246	2636	2.11%
	Total New Mexico	**216**	**1,370,871**	**6347**	**5286**	**2.40%**
Texas (*n* = 10)	Brownsville	108	2,485,060	23,010	4918	4.31%
	Eagle Pass	108	1,611,613	14,922	2181	2.80%
	El Paso	108	6,482,515	60,023	16,274	11.25%
	Hidalgo	108	5,775,193	53,474	5341	10.02%
	Laredo	108	21,585,474	199,866	27,973	37.45%
	Other five crossings	540	1,747,574	16,181	651	3.03%
	Total Texas	**1080**	**39,687,429**	**36,748**	**59,039**	**68.90%**
Total northbound crossings		**2160**	**57,635,663**	**26,683**	**46,252**	**100%**

Note: Arizona ports of entry (POEs) are Douglas, Lukeville, Naco, Nogales, San Luis; and Texas POEs are Brownsville, Del Rio, Eagle Pass, El Paso, Hidalgo, Laredo, Presidio, Progreso, Rio Grande City and Roma.
Source: Authors' own estimations using data from the Bureau of Transportation Statistics.

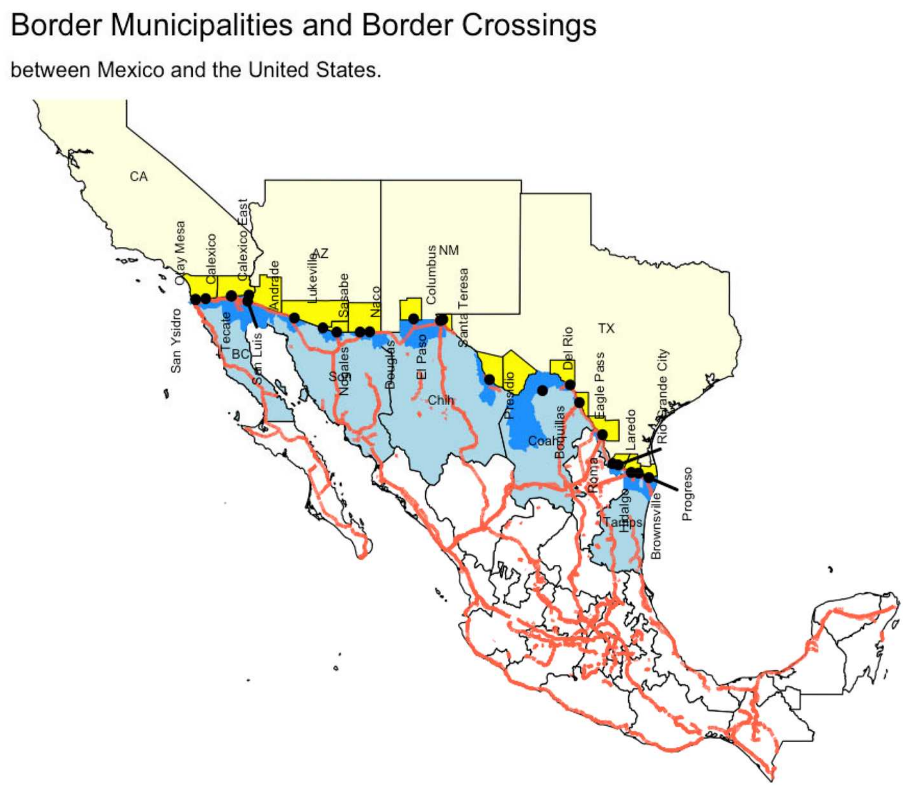

Figure 2. Ports of entry at the US–Mexican border.
Source: Elaborated by the authors using data from INEGI and the United States Census Bureau.

study spans from January 2015 to December 2023, since a different methodology was used before 2015 for collecting and classifying crime data. Crimes are included in the database based on the number of delinquencies per 100,000 people. The crime variables included in this study are truck robberies and a few other crime types to illustrate the uniqueness of truck robberies when examining truck crossings. Our identification strategy follows a sequential inductive approach by looking first at the impact of crime that occurs closer to the POEs (municipal crimes rates), then on a broader region along the Mexican states

Table 2. Descriptive statistics.

Variables	Observations	Mean	SD
Trucks	2160	26,683	46,252
Border municipal exports	1840	273,334	496,630
Border state exports	2160	1,035,993	547,950
National exports	2160	13,770,261	1,660,351
US industrial production index	2160	100.79	3.36
Real exchange rate	2160	677.87	61.55
Municipal trucks robberies	2160	0.03	0.16
State trucks robberies	2160	0.05	0.06
National trucks robberies	2160	0.65	0.14
Municipal bank robberies	2160	0.01	0.06
State bank robberies	2160	0.02	0.03
National bank robberies	2160	0.02	0.01
Municipal extortions	2160	0.24	0.64
State extortions	2160	0.20	0.18
National extortions	2160	0.52	0.13
Municipal sexual abuse	2160	2.74	3.81
State sexual abuse	2160	1.97	1.17
National sexual abuse	2160	1.51	0.56
Municipal abortions	2160	0.07	0.33
State abortions	2160	0.05	0.06
National abortions	2160	0.04	0.01

Note: All crime rates (robberies of trucks and banks, extortions, sexual abuse, and abortions) are reported by 100,000 people.
Source: Author's estimations using data from different sources.

Table 3. Correlation matrix.

	Trucks	Border municipal exports	Border state exports	National exports	US industrial production index	Real exchange rate	Municipal trucks robberies	State trucks robberies	National trucks robberies	Municipal bank robberies	State bank robberies	National bank robberies	Municipal extortions	State extortions	National extortions	Municipal sexual abuse	State sexual abuse	National sexual abuse	Municipal abortions	State abortions	National abortions
Trucks	1.000																				
Border municipal exports	0.104	1.000																			
Border state exports	0.024	0.528	1.000																		
National exports	0.058	0.095	0.343	1.000																	
US industrial production index	0.026	0.048	0.174	0.545	1.000																
Real exchange rate	0.015	0.017	0.045	0.080	−0.393	1.000															
Municipal trucks robberies	0.011	0.027	0.062	−0.007	0.007	0.013	1.000														
State trucks robberies	−0.053	0.092	0.215	−0.070	−0.040	−0.010	0.308	1.000													
National trucks robberies	0.000	−0.002	0.002	0.008	0.137	0.294	0.081	0.150	1.000												
Municipal bank robberies	0.035	0.042	−0.009	−0.094	0.018	−0.148	0.011	0.080	−0.057	1.000											
State bank robberies	0.033	−0.028	−0.092	−0.282	−0.014	−0.306	0.033	0.150	−0.107	0.428	1.000										
National bank robberies	−0.043	−0.060	−0.205	−0.623	−0.048	−0.363	0.010	0.113	0.149	0.145	0.374	1.000									
Municipal extortions	−0.020	−0.019	−0.023	0.028	−0.037	0.054	0.055	0.013	−0.039	0.022	−0.010	−0.059	1.000								
State extortions	0.203	−0.285	−0.153	−0.060	−0.015	−0.053	0.041	0.049	−0.051	0.111	0.171	0.098	0.265	1.000							
National extortions	0.052	0.077	0.278	0.806	0.338	0.261	−0.008	−0.077	−0.085	−0.099	−0.261	−0.614	0.039	−0.057	1.000						
Municipal sexual abuse	−0.112	0.166	0.220	0.214	0.135	0.042	0.046	0.002	−0.014	−0.053	−0.075	−0.147	0.034	0.000	0.249	1.000					
State sexual abuse	−0.038	0.373	0.781	0.478	0.206	0.129	0.051	0.146	−0.012	−0.090	−0.260	−0.359	0.036	−0.128	0.494	0.332	1.000				
National sexual abuse	0.060	0.084	0.297	0.884	0.347	0.257	−0.017	−0.098	−0.082	−0.122	−0.334	−0.701	0.044	−0.071	0.908	0.262	0.548	1.000			
Municipal abortions	−0.005	0.009	0.077	0.027	0.038	0.027	0.064	0.042	0.041	−0.012	−0.010	−0.016	0.062	0.142	0.022	0.035	0.090	0.015	1.000		
State abortions	0.236	−0.145	0.055	0.047	0.066	0.002	0.033	−0.033	0.093	0.060	0.060	−0.017	0.129	0.516	0.047	0.034	0.037	0.062	0.248	1.000	
National abortions	0.052	0.067	0.210	0.649	0.298	0.155	−0.001	−0.064	−0.094	−0.101	−0.238	−0.471	0.028	−0.030	0.724	0.189	0.407	0.752	0.037	0.110	1.000

Note: See the notes to Table 2.

Figure 3. Real exchange rate period, 2015–23.
Source: Authors' own estimations using data from BANXICO.

located across the border, and finally at the impact of overall national crime rates.[5] In the absence of data on the origin of truck cargo, this approach allows us to sequentially disregard alternative geographical locations where crimes occur, from points closer to the border to those farther from it.

Table 2 shows that cargo trucks and export volumes increase over time. This trend contrasts with the measure of crime truck robberies, which have declined in border states (mean drops from 0.05 to 0.04) and at the national level (mean drops from 0.67 to 0.64), and remained about the same in border municipalities (mean of 0.03). From a long list of 46 types of crime, we select a few to compare with truck robberies as our measure of crime of interest in the robustness section and apply falsification tests. Bank robberies have declined as well, while extortions, sexual abuse and abortions have increased.

Figure 3 plots the Mexican peso real exchange rate throughout our sample period. The base year of the index is 1990, as calculated by BANXICO, weighting trade on a basket of 49 currencies. In January 2015, which is the first month included in this study, the index was 521.8, while in December 2023, the last month in this study, it was 612.4, which implies a 17.3% real depreciation of the Mexican peso against the US dollar and the rest of the world. This depreciation of the Mexican peso could have increased the

Table 4. Unit root tests, 2015–23.

	Augmented Dickey–Fuller test		Phillips–Perron test		Levin, Lin, Chu test	
Variables	Chi2 statistic	*p*-value	Inverse normal statistic	*p*-value	Adjusted *t*-statistic	*p*-value
Trucks	22.61	(0.000)	−20.71	(0.000)	−15.87	(0.000)
Border municipal exports	12.06	(0.000)	−20.49	(0.000)	−19.97	(0.000)
Border state exports	8.71	(0.000)	−25.61	(0.000)	−30.21	(0.000)
National exports	2.78	(0.002)	−23.21	(0.000)	−28.93	(0.000)
US industrial production index	12.90	(0.000)	−8.23	(0.000)	−9.60	(0.000)
Real exchange rate	20.17	(0.000)	−0.53	(0.699)	−8.19	(0.000)
Municipal homicides per 100k	26.52	(0.000)	−26.97	(0.000)	−22.59	(0.000)
Municipal truck robberies per 100k	34.51	(0.000)	−27.33	(0.000)	−31.59	(0.000)
State homicides per 100k	14.51	(0.000)	−16.07	(0.000)	−12.04	(0.000)
State truck robberies per 100k	28.65	(0.000)	−26.03	(0.000)	−22.82	(0.000)
National homicides per 100k	18.97	(0.000)	−8.41	(0.000)	−6.90	(0.000)
National truck robberies per 100k	12.26	(0.000)	−1.85	(0.032)	−4.11	(0.000)

Note: All variables were estimated using natural logarithms.
Source: Authors' own estimations using data from sources mentioned in the data section.

incentive to export from Mexico to the United States. Abundant literature has studied this relationship. For example, Cabral et al. (2019a), in a panel data study analysing the different POEs located at the border between Mexico and the United States, find that a real appreciation of the Mexican peso has adverse, statistically significant effects on northbound crossings of personal vehicles.

Table 4 shows the unit root test. All series are tested in logarithms to identify the presence of unit roots. The unit root tests for panel data used are the augmented Dickey–Fuller and Phillips–Perron Fisher-type tests and the Levin–Lin–Chu test. The null hypothesis for each test refers to the presence of a unit root. All tests refer to p-values < 0.05, indicating that all of them are stationary; hence, no further transformations were required.

3. Empirical model

The empirical methods used in this study connect insights across various disciplines, such as economics, sociology and transportation studies. We address this research question in regional economics: what influences the northbound truck crossings from Mexico to the United States through the land POEs along the US–Mexico border? We provide evidence below that the real value of the Mexican peso, the level of exports and US industrial production have positive effects on truck container traffic to the United States. Crime rates, however, have negative and persistent regional effects on truck loadings only when measured by truck robberies. When using unrelated types of crimes, there are no statistically significant findings. The US–Mexico border region is examined, which brings relevance to the case of Mexico benefiting from trends in *nearshoring* and the vast literature on GVCs regarding the transportation of goods across places. In addition, our empirical specification also captures the impact of the COVID-19 pandemic on truck crossings.[6]

Since nearly two-thirds of Mexico's exports to the US economy are transported by trucks, this study models the determinants of their northbound traffic along the US–Mexico border. To do so, we follow the empirical specification of Anderson et al. (2014) and Cabral et al. (2019a) to describe our model:

$$\begin{aligned}\text{Log}(\mathit{Truck\ Cargo\ Crossings})_{it} = {} & \alpha_i + \beta_1(\log \mathit{Exports})_{it-1} + \beta_2(\mathit{IPI}_{US})_{it-1} \\ & + \beta_3(\log \mathit{Real\ Exchange\ Rate})_{it-1} + \beta_4(\log \mathit{of\ crime})_{it-1} \\ & + \beta_5(\mathit{COVID\ dummy}) + u_{it} \qquad (1)\end{aligned}$$

where the subscript i refers to one of the lands POEs located along the US–Mexico border, and t denotes one of the months.

All variables are expressed in natural logs except for the US industrial production index. The model in equation (1) comprises key features linking the two economies: Mexican exports are primarily destined for the United States, whose economic strength is represented by the industrial production index (IPI_{US}). Bergin et al. (2009) provide evidence that, compared with the United States, Mexico experiences greater employment volatility: *maquiladora* industries in Mexico associated with US offshoring experience twice the employment fluctuations as the corresponding industries in the United States. Global production sharing accounts for a large portion of Mexican trade, and this makes the exchange rate link the home to the foreign economy. Theoretically, Blanchard and Sheen (2013), for instance, contain a standard macroeconomic model with foreign income and exchange rates. Initially, we lag all the right-hand-side variables by one period to minimise endogeneity problems. The dependent variable is the number of cargo trucks crossing from Mexico into the United States at the 20 different POEs along the border. Following Anderson et al. (2014) and Maoh et al. (2016), the explanatory variables considered are exports, the US industrial production index, the real exchange rate and the different types of crime. De León et al. (2009) use similar explanatory variables in their linear transfer functions autoregressive integrated moving average models (ARIMA) methodology selecting different lag-lengths for each series in cross-border bridge traffic between El Paso and Ciudad Juarez.

We expect β_1 to be positive, as exports through which a POE is located should exert an additional stimulus (relative to macro-factors and crime in local regions) to the number of trucks crossing the border. The US industrial production indexes should also positively affect northbound crossings. When US economic activity is more vigorous, the demand for goods produced in Mexico should rise. Similarly, an increase in the real exchange rate means the Mexican peso is depreciating against the US dollar, Mexican exports are more competitive and the number of cargo trucks should increase. Therefore, the expected sign in β_3 is positive. Lastly, β_4 it is expected to be negative as crime increases cargo costs, reduces the competitiveness of Mexican exports, shifts production to other POEs and, ultimately, diverts demand to suppliers in different parts of the world.

We estimate equation (1) by employing fixed effects models to assess the impact of exports and crime at the municipal, state and national levels. We simultaneously control for truck robbery crime at the three geographical levels and exports individually. As shown in Table 3, the correlation coefficients for truck robberies at the three levels are small, ranging from 0.081 between municipal and national truck robberies to 0.15 between state and national truck robberies, and to 0.308 between municipal and state truck robberies.

Since the way dynamics are incorporated into equation (1) may be affected by a richer lag structure, following Pesaran et al. (1995, 1999), we move next to estimate a more flexible long-run autoregressive distributed lag model (ARDL) error correction model (ECM). From an ARDL dynamic specification of the form:

$$y_{it} = \mu_i + \sum_{j=1}^{p} \lambda_{ij} y_{it-j} + \sum_{j=0}^{q} \delta_{ij}^{'} \Delta X_{it-j} + \varepsilon_{it} \tag{2}$$

where y_{it} is the log of truck cargo crossings, x_{it} is the vector of control variables, including the log of exports, the US industrial production index, the real exchange rate and truck robberies at the municipal, state and national levels. Reparameterisation (differencing, manipulation and rearranging) to obtain the long-run ECM equation leads to:

$$\Delta y_{it} = \phi_i (y_{it-1} - \theta_i^{'} X_{it}) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta y_{it-j} + \sum_{j=0}^{q-1} \delta_{ij}^{'} \Delta X_{it-j} + \varepsilon_{it} \tag{3}$$

The ARDL ECM equation in equation (3) separates the long-run equilibrium, $y_{it-1} - \theta_i^{'} X_{it}$, from the short-run dynamics, Δy_{it-j} and ΔX_{it-j}, grouped by the summations. For a long-run equilibrium to exist, we expect the ECM speed of adjustment term, ϕ_i, to be negative.[7] Pesaran et al. (1999) propose an estimation of equation (3) by employing a pooled mean group (PMG). Their method estimates the model separately for each group, combining the pool and average estimators (Blackburne et al., 2007). Under the PMG specification, the ECM short-run coefficients and the speed-of-convergence parameter are allowed to be heterogeneous across groups, whereas the long-run coefficients are constrained to be equal across groups.

4. Results

Our explanatory variable accounts for (the log of) the number of trucks crossing between Mexico and the United States through all existing POEs. To assess the effect of crime on truck crossings, we simultaneously control for exports individually and for all crime geographical levels.

The estimation results for our first specification are shown in Table 5. All models include as independent variables the first lag of Mexican exports and crime (truck robberies) at the municipal level, columns (1) and (4); state, columns (2) and (5); and national levels, columns (3) and (6), respectively. The Breusch–Pagan (BP) Lagrange multiplier (LM) test's null hypothesis is that the random effects are zero, which is rejected for the random effects model. As usual, to compare the random versus fixed effects model, the Hausman test rejects the null hypothesis that the random effects model is the true model. We thus proceed with columns (4) to (6) as the preferred fixed effect model specification of (1).

Exports are positive and statistically significant across the models in each specification, and the coefficient estimates increase as we move from border municipalities to border states and then to the national level. This finding indicates that, on average, a 1% increase in municipal, state or national exports leads to a rise in the number of trucks crossing into the United States of about 0.107%, 0.240% and 0.492%, respectively. The US industrial production index also positively impacts at 0.18% in

Table 5. Fixed and random effects estimates.

	Random effects			Fixed effects		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Border municipal exports	0.112**			0.107***		
	(0.049)			(0.019)		
Border state exports		0.246			0.240***	
		(0.150)			(0.059)	
National exports			0.492***			0.492***
			(0.181)			(0.076)
US industrial production	0.018***	0.018***	0.009**	0.018***	0.018***	0.009***
	(0.004)	(0.006)	(0.004)	(0.002)	(0.003)	(0.003)
Real exchange rate	1.143***	1.320***	1.219***	1.141***	1.323***	1.219***
	(0.270)	(0.369)	(0.331)	(0.099)	(0.123)	(0.129)
Municipal truck robberies per 100k	−0.763***	−0.766***	−0.766***	0.005	0.008	0.013
	(0.251)	(0.271)	(0.263)	(0.107)	(0.104)	(0.102)
State truck robberies per 100k	−0.392	−0.394**	−0.353*	−0.387**	−0.391**	−0.352*
	(0.265)	(0.194)	(0.182)	(0.165)	(0.187)	(0.186)
National truck robberies per 100k	0.007	0.009	0.014	−0.762***	−0.767***	−0.766***
	(0.130)	(0.125)	(0.121)	(0.106)	(0.117)	(0.116)
COVID pandemic dummy	−0.160***	−0.187***	−0.203***	−0.160***	−0.187***	−0.203***
	(0.033)	(0.045)	(0.049)	(0.042)	(0.046)	(0.048)
Constant	−0.828	−4.722	−8.003	−0.167	−3.347***	−6.698***
	(2.417)	(4.085)	(5.107)	(0.805)	(1.166)	(1.273)
Observations	1823	2140	2140	1823	2140	2140
Adjusted R^2				0.136	0.120	0.130
R^2 between	0.556	0.108	0.001	0.557	0.108	0.000
R^2 overall	0.489	0.073	0.004	0.487	0.072	0.004
R^2 within	0.140	0.122	0.133	0.140	0.123	0.133
Breusch–Pagan (BP) Lagrange multiplier (LM) test for random effects	79,494.82	1.00E+05	1.00E+05			
	(0.000)	(0.000)	(0.000)			
Hausman				15.38	21.13	12.55
p-value				(0.032)	(0.000)	(0.002)

Note: Newey–West standard errors robust to heteroscedasticity and serial correlation are shown in parentheses. ***, ** and * denote 1%, 5% and 10% significance levels, respectively. Crime variables are per 100,000 people. All variables, except the industrial production index, are in logarithms. Therefore, we are estimating the lag of the logarithms. The BP null hypothesis is that the random effects are zero. The Hausman test null hypothesis suggests that the random effects are the true model.

columns (4) and (5) and at 0.09% in column (6). The real exchange rate has a positive and statistically significant effect, indicating that when the Mexican peso depreciates by 1%, the number of Mexican cargo trucks that cross the border into the United States increases by approximately between 1.141% and 1.323% in columns (4) and (5), which is a considerable elasticity to the pass-through of currency markets to border crossings.

For the response to crime, specific robberies of cargo trucks show significant and adverse effects at the border-states and national levels, but not at the municipal level. In columns (4) to (6), a 1% increase in the rate of state (national) truck robberies per 100,000 people implies a reduction of between 0.387% and 0.391% (0.762–0.767%) in truck crossings, using the 5% significance level. We expect that if crime matters for reducing flows of goods, then increases in violence in Mexico–US city-pairs should decrease the number of truck crossings. However, the estimated coefficients from the FEM in columns (4) to (6) support this statement at the state and national levels, but not at the municipal level. The pandemic dummy, as expected, is always associated with lower truck crossings.

4.1. Robustness checks

We carry out three exercises to assess the robustness of the results. First, we examine the evolution of the impact over time by estimating panel rolling windows. Second, we explore the effects of crime across different POEs according to their location in the states on the US side of the border. Third, we proceed to conduct ‘falsification tests’ using alternative, unrelated forms of crime to illustrate the adequacy of truck robberies as a crime measure relevant to truck border crossings.

4.1.1. Assessing crime effects over time

Rolling windows allow us to assess whether the model coefficients remain unaltered after Mexico’s drug policy shift. We start our window using information from 2015 to 2018, the years before former president

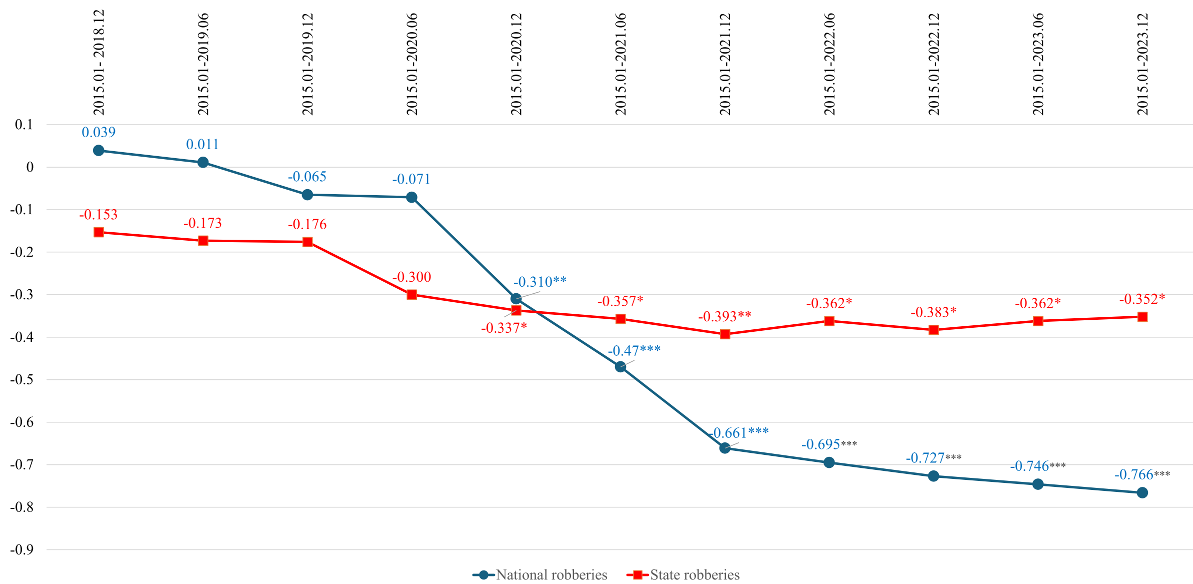

Figure 4. Evolution of the impact of robberies on truck crossings using expanding windows.
Note: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. For the regressions that produce these coefficients, see Appendix A.1 in the supplemental data online.
Source: Authors' own estimations using data from sources mentioned in the data section.

Andres Manuel López Obrador's administration took office. Thereafter, in each regression, we move our windows forward by six months until we reach the whole sample period. Figure 4 plots the evolution of the elasticity of truck crossings with respect to the rate of cargo truck robberies. Appendix A1 in the supplemental data online contains the full table of estimates. We note that for the first four windows, up to mid-2020, the coefficients for border-state and national robberies are not statistically significant. Both coefficients become negative and statistically significant in the fifth window, when the entire year 2020 is incorporated into the sample. From this point forward, the coefficient for national robberies becomes negative and statistically significant, reaching its maximum impact by the end of the sample period (−0.766***). Border-state robberies also become statistically significant in the fifth window (−0.337*), but their impact remains stable through the end of the sample period (−0.352*) and are only statistically significant at the 10% level.

We conjecture that many factors may underlie the more stable and less significant effect of crime in border states relative to the national level. The result might be due to the more substantial efforts of federal and state authorities to reduce the impact of robberies, relative to those made by states in the rest of the country. Another potential explanation is that since more than half of Mexico's exports are produced in the six border states, companies in the region might have invested more in prevention (e.g., Global Positioning System (GPS) systems, dashcams, insurance) and other security measures to deter truck robberies.

4.1.2. Assessment across the US's POEs

As a second robustness check, Table 6 presents estimates based on a sample partition of US states' POEs along the border. As described in Table 1, Texas accounts for half of the POEs across the border available for cargo crossings. Additionally, 68.9% of the trucks crossing northbound from Mexico to the United States use one Texas POE. Given its location closer to Mexico's main motorways, its proximity to the centre of Mexico (Figure 1) and the relevance of Texas for cargo crossings along the US–Mexico border, we split the sample into crossings along Texas versus all other states (i.e., California, Arizona and New Mexico). The results for exports, US industrial production and the real exchange rate remain consistent with those reported above. In the case of national truck robberies, we observe a clear pattern with negative and statistically significant coefficients across the POEs of Texas, California, Arizona and New Mexico. Border-state robberies, however, show statistically significant effects only across the Texas POEs.

The reasons why POEs in Texas display negative and significant effects might be several, including the larger and more lucrative market that the 10 POEs crossing to Texas represent for criminal organisations,

Table 6. Estimates across the US states' ports of entry.

Variables	Texas			California, Arizona and New Mexico		
	(1)	(2)	(3)	(4)	(5)	(6)
Border municipal exports	0.348***			0.627***		
	(0.093)			(0.121)		
Border state exports		−0.073			0.481***	
		(0.070)			(0.086)	
National exports			0.076***			0.160***
			(0.022)			(0.031)
US industrial production	0.015***	0.027***	0.023***	0.003	0.009**	0.010***
	(0.004)	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)
Real exchange rate	1.169***	1.305***	1.315***	1.230***	1.181***	0.823***
	(0.156)	(0.147)	(0.148)	(0.204)	(0.197)	(0.126)
Municipal truck robberies per 100k	−0.013	−0.011	−0.049	0.001	−0.017	0.008
	(0.158)	(0.154)	(0.159)	(0.115)	(0.114)	(0.115)
State truck robberies per 100k	−0.602**	−0.638**	−0.703***	−0.294	−0.242	0.024
	(0.250)	(0.250)	(0.265)	(0.256)	(0.253)	(0.212)
National truck robberies per 100k	−0.828***	−0.836***	−0.752***	−0.701***	−0.647***	−0.877***
	(0.151)	(0.151)	(0.151)	(0.181)	(0.182)	(0.147)
COVID pandemic dummy	−0.180***	−0.176***	−0.185***	−0.225***	−0.189**	−0.132**
	(0.056)	(0.053)	(0.056)	(0.076)	(0.075)	(0.066)
Constant	−10.287	−6.808	1.417	−10.287	−6.808	1.417
	(7.333)	(6.202)	(1.880)	(7.333)	(6.202)	(1.880)
Observations	1070	1070	995	1070	1070	828
Adjusted R^2	0.143	0.133	0.144	0.121	0.129	0.163
R^2 between	0.019	0.016	0.740	0.414	0.215	0.337
R^2 overall	0.007	0.010	0.613	0.002	0.196	0.280
R^2 within	0.149	0.139	0.150	0.126	0.134	0.170

Note: See the notes to Table 5.
Source: Authors' own estimations using data from sources mentioned in the data section.

the more substantial presence of some cartels in the north-east of Mexico (Beittel, 2012; Lopez-Vallejo & del Pilar Fuerte-Celis 2021) and their diversification beyond drug smugglings in the last couple of decades (Fondevila et al., 2025).

4.1.3. 'Falsification tests'

An anonymous referee suggested we consider deploying a 'falsification test' to determine whether unrelated crime types affect truck crossings (Table 7). We accomplish this in two ways. First, we lag and lead the main variable of interest, truck robberies, by five years and test its statistical significance in model (1). The evidence is very weak in terms of statistical significance: only one coefficient for municipal truck robberies five years forward is significant at the 10% level in column (1). Testing all 46 crime types available in the dataset, we report four that have low correlation coefficients with truck robberies: bank robberies, extortions, sexual abuse and abortions. Only in one case, and again at the 10% level (state bank robberies) in column (7), is there a rejection of the null of no statistical significance for one of the alternative forms of crime. We interpret this as evidence that alternative and unrelated crime types do not drive Mexican truck crossings.

4.2. ARDL error correction model

Another way to test the robustness of the results for the presence of more complex dynamics is to adopt a more flexible modelling technique capable of handling short- and long-run dynamics. The ARDL ECM in (3) allows us to capture the dependent variable's persistence (or inertia) and to separate the long-run from the short-run dynamic coefficients. In addition, the methodology provides a long-run relationship and the error-correcting speed of adjustment towards the long-run equilibrium.

Table 8 reports the ARDL ECM long-run coefficients using two lag-selection criteria: Schwarz information criterion (SIC) and Hannan–Quinn information criterion (HQIC). Both information criteria impose a more flexible lag-length structure that complements the fixed lag-length in FEM.[8] The SIC (HQIC) suggests that two (three) lags of the dependent variable and one lag of each explanatory variable are required to achieve the optimal lag structure. Overall, the results are consistent with FEM in Tables 5–7. National exports have generally positive effects, as well as industrial production and the peso depreciation measured by the real

Table 7. Falsification tests with alternative forms of crime.

	5 Years forward ahead			5 Years lagged			Violent bank robbery			Extortions			Sexual abuse			Abortion		
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
National trucks robberies	−0.171	0.138	0.252															
	(0.360)	(0.361)	(0.360)															
State trucks robberies	−0.059	0.050	0.039															
	(0.228)	(0.234)	(0.233)															
Municipal trucks robberies	0.169*	0.133	0.128															
	(0.095)	(0.095)	(0.089)															
National trucks robberies				0.155	0.096	0.109												
				(0.124)	(0.129)	(0.132)												
State trucks robberies				−0.163	−0.140	−0.126												
				(0.183)	(0.199)	(0.200)												
Municipal trucks robberies				−0.136	−0.119	−0.121												
				(0.167)	(0.161)	(0.161)												
Municipal bank robberies							0.052	0.059	0.059									
							(0.076)	(0.076)	(0.076)									
State bank robberies							0.012*	0.007	0.008									
							(0.007)	(0.007)	(0.007)									
National bank robberies							−0.029	−0.020	−0.021									
							(0.018)	(0.020)	(0.020)									
Municipal extortions										0.009	0.013	0.011						
										(0.015)	(0.015)	(0.014)						
State extortions										−0.004	−0.005	−0.005						
										(0.014)	(0.014)	(0.014)						
National extortions										−0.066	−0.008	0.003						
										(0.077)	(0.074)	(0.073)						
Municipal sexual abuse													−0.001	−0.010	−0.010			
													(0.015)	(0.016)	(0.016)			
State sexual abuse													0.038	0.061	0.059			
													(0.036)	(0.038)	(0.038)			
National sexual abuse													−0.007	−0.002	0.012			
													(0.067)	(0.067)	(0.066)			
Municipal abortions																0.005	0.003	0.003
																(0.010)	(0.010)	(0.010)
State abortions																0.002	−0.001	−0.001
																(0.007)	(0.007)	(0.007)
National abortions																0.016	0.007	0.009
																(0.056)	(0.057)	(0.056)
Constant	6.421***	3.045*	4.067**	8.291***	7.635***	7.734***	7.742***	7.490***	7.720***	8.503***	7.704***	7.753***	8.366***	7.703***	7.966***	8.567***	7.791***	7.782***
	(0.988)	(1.592)	(1.904)	(1.478)	(1.672)	(1.802)	(1.487)	(1.691)	(1.803)	(1.429)	(1.681)	(1.789)	(1.437)	(1.643)	(1.736)	(1.446)	(1.648)	(1.764)
Observations	781	920	920	820	960	960	820	960	960	820	960	960	820	960	960	820	960	960
Adjusted R^2	0.048	0.039	0.035	0.085	0.063	0.062	0.092	0.067	0.066	0.078	0.059	0.058	0.077	0.062	0.061	0.076	0.059	0.057
R^2 between	0.588	0.125	0.118	0.516	0.067	0.114	0.510	0.049	0.284	0.502	0.028	0.472	0.493	0.056	0.020	0.511	0.071	0.243
R^2 overall	0.531	0.093	0.003	0.445	0.024	0.000	0.436	0.012	0.000	0.432	0.013	0.002	0.431	0.027	0.005	0.444	0.027	0.000
R^2 within	0.055	0.045	0.041	0.093	0.070	0.069	0.100	0.074	0.073	0.086	0.066	0.065	0.085	0.069	0.068	0.084	0.065	0.064

Note: Newey–West robust standard errors are shown in parentheses. ***, ** and * denote 1%, 5% and 10% significance levels, respectively. Crime variables are per 100,000 people. All explanatory variables, except the industrial production index, are in logarithms. Due to space constraints, we report only the coefficients for the alternative crime measures used in the falsification tests and omit those on the control variables.

Source: Authors' own estimations using data from sources mentioned in the data section.

Table 8. Long-run autoregressive distributed lag model (ARDL) error correction model equation.

	Schwarz information criterion (SIC)			Hannan–Quinn information criterion (HQIC)		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Border municipal exports	0.044			0.044		
	(0.036)			(0.036)		
Border state exports		0.103			0.136*	
		(0.080)			(0.080)	
National exports			0.557***			0.589***
			(0.090)			(0.039)
US industrial production	0.015***	0.014***	0.001	0.015***	0.013***	−0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Real exchange rate	0.629***	0.631***	0.475***	0.629***	0.692***	0.302***
	(0.105)	(0.108)	(0.089)	(0.105)	(0.111)	(0.069)
Municipal truck robberies per 100k	0.072	0.063	0.078	0.072	0.043	0.031
	(0.094)	(0.097)	(0.076)	(0.094)	(0.093)	(0.068)
State truck robberies per 100k	0.301	0.225	0.118	0.301	0.215	−0.083
	(0.195)	(0.198)	(0.157)	(0.195)	(0.195)	(0.124)
National truck robberies per 100k	−0.481***	−0.403**	−0.331***	−0.481***	−0.360***	−0.197***
	(0.119)	(0.124)	(0.098)	(0.119)	(0.125)	(0.068)
Speed of adjustment coefficient (ϕ_i)	−0.331***	−0.329***	−0.364***	−0.332***	−0.350***	−0.419***
	(0.060)	(0.059)	(0.059)	(0.060)	(0.071)	(0.065)
Lag structure	(2, 1, 1, 1, 1, 1, 1)	(2, 1, 1, 1, 1, 1, 1)	(2, 1, 1, 1, 1, 1, 1)	(3, 1, 1, 1, 1, 1, 1)	(3, 1, 1, 1, 1, 1, 1)	(3, 1, 1, 1, 1, 1, 1)
Root mean square error (MSE)	3.3	2.2	2.3	3.3	14.1	2.1
Standard error (SE) of regression	3.4	2.3	2.4	3.4	14.8	2.2
Sum squared of residual	14,597	6742.6	7644.8	14,597.1	279.0	6166.4
Log-likelihood	1089.5	1080.6	1091.6	1089.5	1101.5	1125.8

Note: SEs are shown in parentheses. ***, ** and * denote 1%, 5% and 10% significance levels, respectively. Crime variables are per 100,000 people. All variables, except the industrial production index, are in logarithms. Therefore, we are estimating the lag of the logarithms. We report the long-run coefficients of the ARDL error-correction model, omitting the short-term coefficients due to space constraints.

exchange rate. Looking at the long-run equation, we find adverse, statistically significant effects from truck robberies only at the national level, not at the state or municipal levels. We interpret this as evidence that the long-run impact of crime is not observed near the POEs – in municipalities or in the border states – but somewhat below them. For the speed-of-adjustment parameter, the reported negative coefficients range from −0.329 to −0.419 under both specification criteria. This confirms the existence of a long-run relationship and implies that between 33.1% and 41.9% of the disequilibrium in the previous period is corrected in the current period.

5. Conclusions

This paper investigates northbound crossings of ground exports (loaded containers on trucks) from Mexico to the United States during the period 2015–23. The analysis uses alternative empirical models to explain the freight on loaded trucks crossing monthly from Mexico to the United States at all the existing US–Mexico land POEs. Besides crime-related variables, the explanatory variables in our traditional trade model are the real exchange rate, US industrial production and exports during the sample period at various geographical levels (municipalities, states and national levels). We find the flow of trucks responds differently to financial and economic factors, with the real exchange rate playing a very significant positive impact on northbound crossings. When the peso depreciates against the US dollar, Mexicans feel a decline in purchasing power. Still, Mexican exports have become more competitive, and thus more containers are being sent to the United States.

We show that crime affects POEs along the US–Mexico border, depending on the location of the crime. Although we cannot control the origin of the cargo crossing the border, we detect the geographical location of crime affecting cargo trucks in the form of robberies at the border municipality, border-state and national levels. We observe that truck robberies at the national and border-state levels, but not at the municipal or state levels, have a consistent negative and significant effect on truck crossings. National robberies are statistically more significant and have a greater impact than those at the border-state level. Applying the regional perspective to truck cargo crossings, we document here that the average national measure of truck robberies has negative effects. This is less noted at the state level and absent at the municipality level. In addition, falsification tests validate the exclusive role of robberies in truck crossings.

Our analysis also shows that crime affects POEs differently, depending on their location along the US–Mexico border. Splitting our sample across Texas POEs and the rest of the border states (California, Arizona and New Mexico), we observe a clear trend in which all POEs are affected by national robberies, but where POEs in Texas are also affected by robberies at the border-state geographical level and no effects of crime at the municipal level are observed across any of the different POEs.

Since crime activity could be considered a distortionary tax imposed on an economic region that creates uncertainty, inefficiencies and reductions in regional competitiveness (Chapa Cantú et al., 2023; Detotto & Otranto, 2010), Mexico will benefit from higher trade with the United States by developing policies to reduce truck robberies, especially across the states that lie below those in the border region.

Notes

1. Freund et al. (2024) also document a US–China bilateral trade decoupling that benefitted US–Mexico bilateral trade. Similarly, Utar et al. (2023) find that the relocation of GVC to Mexico has increased net exports from Mexico to the United States.
2. Lábaj et al. (2023, p. 4) identify the regionalisation of GVCs as a key factor in the reversion of the trend of relatively constant global shares of manufacturing activities. For the United States, they observe a steeper decline in offshoring: ‘It peaked in 2014, when it was 40%, but fell to 17% in 2020.’
3. City-pairs include Tijuana–San Diego, Mexicali–Imperial City, Matamoros–Brownsville, Ciudad Juárez–El Paso, Nuevo Laredo–Laredo and Reynosa–McAllen.
4. According to the Bureau of Transportation Statistics, there are 27 POEs along the US–Mexico border. Of these, only 20 POEs are consistently used by cargo trucks (Arizona POEs are Douglas, Lukeville, Naco, Nogales and San Luis; California POEs are Calexico East, Otay Mesa and Tecate; New Mexico POEs are Columbus and Santa Teresa; and Texas POEs are Brownsville, Del Rio, Eagle Pass, El Paso, Hidalgo, Laredo, Presidio, Progreso, Rio

Grande City and Roma). The other seven POEs report zero crossings for this type of vehicle because they are mainly used for passenger vehicle and pedestrian crossings.

5. Initially, we focused on homicides for illustrative purposes because it is the variable most studies about crime in Mexico use to show its growth (e.g., Cabral et al., 2019b; Caulkins et al., 2023; Zepeda Gil & Pérez Ricart, 2023). However, identify unrelated types of crime to highlight the role of truck robberies is more appropriate for our research question covering the transport of goods by land.
6. We follow the official National Bureau of Economic Research (NBER) definition for the pandemic recession in the United States as February–April 2020 (Wall & Ricketts, 2022). Other alternative definitions of the pandemic recession provided very similar results.
7. In a previous version of this paper, an alternative specification controls for exports and crime rates individually at the municipal border, border state and national levels. Other approaches have also been attempted. Because exports might potentially be an endogenous regressor in equation (1), we also carry out our estimations using instrumental variables (IV), employing different lags of imports, the US industrial production index and exports as instruments. The Kleiberg–Paap Lagrange multiplier (LM) test allows us to detect that there are no under-identification problems and no weak identification problems. The Hansen *J*-test indicates no problems of over-identification. All tests suggest that the instruments employed in each of the models are valid. After confirming the validity of our instruments, Durbin–Wu–Hausman tests suggest that exports are exogenous and the coefficient estimates have no serious bias. We then continue our analysis employing fixed effects.
8. We discard the possibility of using the Akaike information criterion (AIC) because it yields longer lag dynamics (possibly unconverging) with lower performance (higher root mean square error (MSE), higher standard error of regression and higher sum of squared residuals).

Acknowledgements

The authors thank the two anonymous referees for their helpful comments. Miguel Flores, James Hollifield, Carolina Marin-Cadavid, Pia Orrenius, Francisco Pedraza, Raymond Robertson, the seminar participants at the 99th Western Economic Association International Meeting, the 2025 Allied Social Science Association, the 2025 British Academy of Management Conference, the 2025 Regional Studies Latin America Conference and the SMU Texas–Mexico 9th Annual Integration Symposium also provided valuable comments on the first version of this paper. We also thank Cristina Acosta Soto for assistance in gathering the data and producing the map employed in this study.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The authors thank the Mission Foods Texas–Mexico Center at the Southern Methodist University for its kind financial support during the elaboration of this paper.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon request.

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