



# Shifts in property crime patterns during the COVID-19 pandemic in Mexico

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## Abstract

**Objectives** To estimate the dynamic effects of the COVID-19 pandemic on property crime in Mexico. We do so for a longer time horizon than the existing literature and for two types of property crime: on-line and on-site.

**Methods** A retrospective ecological analysis during the COVID-19 pandemic using an event study methodology. This paper uses administrative data from Mexico's National Public Security System from January 2017 to December 2022. Our data is structured as a monthly series covering all 2457 Mexican municipalities.

**Results** We find heterogeneity in the pandemic's impact by type of property crime and a dynamic, permanent effect for both types of property crime. Namely, our results point to a drop and quick recovery of fraud—property crime mostly committed on-line—, which in the medium run surpasses pre-pandemic levels by 44%. Further, our results point to a significant drop in robbery, theft, domestic burglary, and motor vehicle theft—all property crimes committed on-site—, with a slight recovery after the end of the national lockdown, even though rates for these crimes never reached pre-pandemic levels.

**Conclusions** The 2020 pandemic caused a permanent shift in property crime from on-site to on-line spaces. Potential mechanisms point to disruptions in mobility in retail and recreational areas, residential zones, and workplaces as important mediating factors.

**Keywords** Crime · COVID-19 · Event-study · Mexico · Mobility

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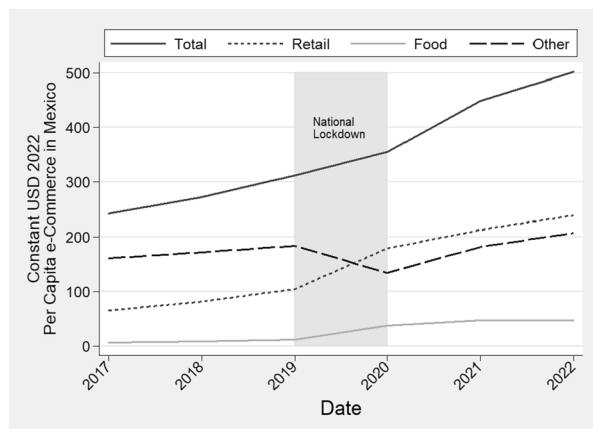
## Introduction

Pandemics bring about profound transformations in human behavior, and the COVID-19 pandemic clearly illustrates this. Within markets, there is a remarkable shift in consumer behavior. For instance, the pandemic accelerated e-commerce in Mexico, particularly in the retail and food-service industries.

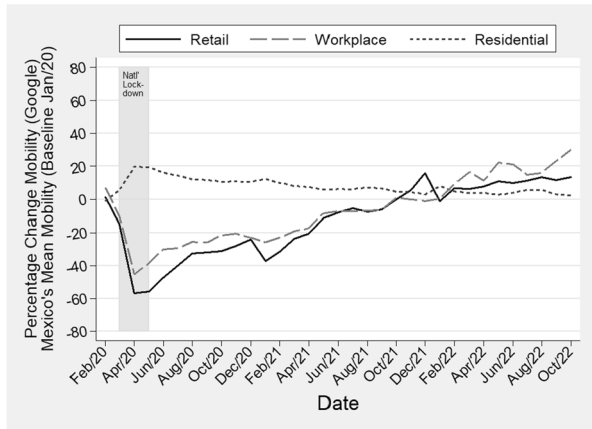
Figure 1 shows the acceleration of per capita e-commerce consumption after the national lockdown imposed by the government to contain the spread of the novel virus. Except for traveling (within the “other” category in Fig. 1), all industries in Mexico expanded business activities through electronic channels. As of 2022, Mexicans spent on average \$500 US dollars per capita annually through electronic channels, compared to only \$250 from 6 years before. Conversely, brick-and-mortar stores greatly suffered once the pandemic hardened. In Mexico, formal sector employment contracted a whopping 5% during the first few months of the pandemic, particularly in small- and medium-sized firms (Hoehn-Velasco et al., 2021).

Figure 2 depicts the mobility patterns in different places using Google’s mobility report data at the national level (Google, 2022). Mobility reports indicate that, during the lockdown, Mexicans significantly decreased their visits to retail and recreational areas and workplaces (Google, 2022). In particular, mobility patterns in retail and recreational areas and workplaces closely follow the same trajectories throughout the period of analysis. The decrease’s magnitudes at their lowest points were  $-60\%$  and  $-45\%$  for retail and recreational areas and workplaces, respectively. Further, the recovery to pre-pandemic levels took a long time; in both cases, it took almost 2 years (until January 2022). Instead, Mexicans spent much more time at home, a trend that persisted even after the pandemic eased off in 2022. Namely, at its maximum level, Mexicans mobilized 20% more at home, while in 2022, this level was around 5% above the baseline (January 2020).

**Fig. 1** E-commerce spending in Mexico by industry. SOURCE: Passport Euromonitor Digital Consumer (E-Commerce Goods And Services)



**Fig. 2** Mobility by place in Mexico during the COVID-19 pandemic. SOURCE: Google COVID-19 Community Mobility Reports (National-Level)



Crime patterns also adapt to a new routine during and after the pandemic. Early studies show a general decrease in crime as mobility restrictions were imposed by most governments (Ashby, 2020; Balmori de la Miyar et al., 2020; Hodgkinson and Andresen, 2020; Mohler et al., 2020; Payne et al., 2020; Poblete-Cazenave, 2020). However, these patterns are not universal, permanent, or homogeneous across crime typologies. A global study using 27 cities from 23 different countries shows a positive relation between stringency in mobility restrictions and a drop in urban crime, with some cities experiencing a larger drop in crime than others (Nivette et al., 2021). Hence, the drop in urban crime is not universal, as some cities did not restrict mobility. Even within cities, certain areas saw larger shifts in crime than others. For instance, in Montevideo, Uruguay, neighborhoods with more residents who worked from home during the pandemic saw bigger drops in reported thefts compared to those with fewer (Díaz et al., 2022). Similarly, in Detroit, Michigan, burglaries stayed flat in areas full of homes but jumped in zones with mixed land use (Felson et al., 2020).

Further, the drop is not permanent; many types of crimes recovered their pre-pandemic levels after restrictions ceased (Balmori de la Miyar et al., 2021). Last, the drop in crime is not homogeneous across typologies. In Mexico, crimes depending on the flow of people, such as robberies and theft, declined much more than those linked to organized crime, which depends on institutional structures (Balmori de la Miyar et al., 2020). Also, as people stayed more at home, crimes such as burglary or motor vehicle theft (MVT) dropped significantly, as there was more guardianship and supervision of houses and parked vehicles (Frith et al., 2022). However, crimes in which the perpetrator and the victim remained at home—such as domestic violence—saw an increase in incidence (Piquero et al., 2021), even though these crimes were not always reported to the police (Silverio-Murillo et al., 2023).

In this paper, we study the dynamic effects of the COVID-19 pandemic on property crime in Mexico to test for the permanency and heterogeneity of the pandemic's impact across crime typology. We do so for a longer time horizon than the existing literature employing an event study. Mexico offers a unique quasi-experimental

setting (Balmori de la Miyar et al., 2021; Stickle & Felson, 2020) as the national lockdown was uniformly applied throughout the country. Further, no economic relief programs in Mexico were used to mitigate the loss of income from the disruption of normal activities (Hale et al., 2020). This allows us to have a clean identification strategy in which an exogenous factor—the national lockdown—disrupted routine activity and ambient guardianship without any other governmental intervention.

Moreover, many economic sectors, such as e-commerce, have permanently changed, letting us explore whether these shifts have any consequence on property crime. We find that, in the medium run, property crime committed on-line surpasses pre-pandemic levels by 44%, while property crime committed on-site drops and never reaches pre-pandemic levels. Finally, we regress mobility changes by placing shifts in property crime to describe potential mechanisms. This paper contributes to the existing literature (Díaz et al., 2022; Felson et al., 2020; Frith et al., 2022; Halford et al., 2020; Nivette et al., 2021) by providing evidence of a permanent shift in property crime on both on-site and on-line spaces after the COVID-19 pandemic. Most importantly, this paper contributes to new insights for the environmental criminology literature (Cohen and Felson, 1979; Felson et al., 1995) in the context of a late e-commerce adopter country—accelerated by the COVID-19 pandemic—, regarding diverging trends in on-line and on-site property crime.

## Related literature

Several existing environmental criminology theories, such as *routine activity* (Cohen and Felson, 1979) or *ambient guardianship* (Felson et al., 1995), predict changes in crime patterns during and after a pandemic. According to the *routine activity* theory, crimes occur when motivated offenders come across suitable targets, depending on routine contexts (Cohen and Felson, 1979). Similarly, the *ambient guardianship* hypothesis theorizes that more crimes occur in environments lacking capable guardianship. In the case of COVID-19, the routine activity and ambient guardianship theories seem to fit better than other theories, such as the *therapeutic community*, which also predicts a drop in crime due to pro-social behavior and social cohesion across classes after catastrophes (Fritz, 1996). If applicable, this last theory would forecast a homogeneous drop in crime across typologies, something we do not see for the COVID-19 pandemic. On the contrary, most of the existing literature points to heterogeneity in the drop of different types of crime (Balmori de la Miyar et al., 2020; Nivette et al., 2021; Piquero et al., 2021).

To understand why some crimes are increasing after COVID-19 while others are not, it is important to review the existing literature on the pandemic's effect on crime, particularly papers that analyze property crime. Much of the literature on the effects of the COVID-19 pandemic on property crime focuses on on-line and on-site property crimes separately. Whereas many papers analyzing on-line property crimes use fraud as a proxy, literature researching patterns of on-site property crimes use robbery, theft, and burglary as subjects of study.

In terms of on-line property crimes, also known as cyber-property crimes, an early study for the USA finds that stay-at-home orders did not significantly change

cyber-routines, and overall victimization rates remained nearly identical before and after the pandemic (Hawdon et al., 2020); nevertheless, the main outcome of the said study is victimization in the past 12 months, which includes months prior to the beginning of the pandemic in the USA (Hawdon et al., 2020). A later paper using police data for the UK indicates that cyber-enabled fraud and cyber-dependent crime showed a rise during the lockdowns—possibly due to changes in on-line habits during the pandemic—and remained higher than before COVID-19, suggesting that the pandemic accelerated the long-term upward trend in on-line property crime (Buil-Gil et al., 2021). Another paper also for the UK demonstrates that, during the pandemic, total cybercrime and fraud increased beyond expected levels; however, these changes in victimization were not homogeneous across types of frauds; namely, reduced on-site retail activity correlated with increased on-line shopping fraud, while decreased on-site leisure and transport activities led to a decrease in ticket fraud (Kemp et al., 2021). Yet, another paper for the UK finds that, after accounting for other influencing factors, on-line crime rates were positively linked to variations in monthly on-line activities and negatively linked to changes in mobility (Johnson & Nikolovska, 2022). Conversely, research for China shows a decrease in cyber-fraud for the first part of the lockdown, returning to pre-pandemic levels once restrictions were relaxed (Chen et al., 2021). Other papers suggest a positive effect of the COVID-19 pandemic on romance fraud (Buil-Gil & Zeng, 2022) and fraudulent emails or “phishing” (Hoheisel et al., 2023).

Regarding on-site property crimes, one of the first papers on the effects of COVID-19 on crime in the UK suggests that shoplifting and other thefts were inelastic but responsive to reduced mobility in the retail sector (Halford et al., 2020). At the same time, burglary dwelling was elastic, which means it was responsive to increases in mobility in residential areas (Halford et al., 2020). Another UK study, using a longer time horizon, also finds that residential and attempted residential burglaries showed significant decreases, particularly during daytime; as expected, the main driver was fluctuations in household occupancy (Frith et al., 2022). Research for the city of Los Angeles during the highest restriction period of 2020 concludes that the COVID-19 pandemic increased burglaries in industrial areas while it reduced burglaries in residential zones (Hill et al., 2023). A paper using data from China finds that on-site property crimes, such as motor vehicle theft, electromobile theft, motorcycle theft, bicycle theft, theft from automobiles, pickpocketing, and residential burglary, experienced significant reductions at the start of the stay-at-home order (Chen et al., 2021). Then, these crimes remained at low levels until the end of the stay-at-home period (Chen et al., 2021). Evidence from India points to a sharp decline in property offenses during the first lockdown phase, a decrease and subsequent rise in property offenses during the second lockdown period, and a surge in robberies once all restrictions on mobilities were lifted by the government (Paramasivan et al., 2022). Further evidence for a decrease in on-site property crime after the COVID-19 pandemic for the cities of Lima, Rio de Janeiro, Mendoza, Mexico City, Guayaquil, Sao Paulo, and Montevideo mirror both broader regional trends and existing literature on Latin America (Díaz et al., 2022; Hoeboer et al., 2023; Nivette et al., 2021).

As a consequence of the pandemic, the overall evidence suggests an increase in on-line property crimes and a decrease in on-site property crimes. On-line property crime decreased in the early period of the pandemic (Chen et al., 2021; Hawdon et al., 2020), but then increased in the long run (Buil-Gil et al., 2021; Kemp et al., 2021). Conversely, on-site property crime, including robbery, theft, and burglary, sharply decreased at the beginning of the pandemic, even though there was a surge after much of the routine activity resumed (Frith et al., 2022; Halford et al., 2020; Paramasivan et al., 2022).

## Empirical strategy

### Data

To study the dynamic effects of the COVID-19 pandemic on on-line and on-site property crime in Mexico, we use police reports throughout Mexico for the 2017–2022 time period at the municipality level. The property crime data comes from the *National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública or NPSS)*. This database contains reports for property crimes, including fraud, robbery, theft, domestic burglary, and motor vehicle theft (Security Secretariat, 2022).

We provide a general taxonomy of property crime based on the space in which the crime is committed: on-line and on-crime. Fraud in Mexico is the main *on-line* property crime and consists of felonious deception for financial gain. According to the National Commission for Protection of Users of Financial Services (CONDUSEF)—an agency of the Mexican government that serves as an advocate for financial users—60% of all frauds in Mexico are committed electronically by smishing, phishing, pharming, or spamming (CONDUSEF, 2018); in fact, the share of electronic fraud continues to expand dramatically overtime (CONDUSEF, 2018). On the other hand, robbery and theft are the main *on-site* property crimes, which are defined as the felonious taking of property by forceful and non-forceful actions, respectively. Similarly, domestic burglary is the unlawful entry of a residential place to steal property inside the building; thus, it is an *on-site* crime. Last, motor vehicle theft is the criminal taking—*on-site*—of a motorized property by forceful or non-forceful means.

Our data is structured as a monthly series covering all 2457 Mexican municipalities. Each observation contains the incidence of crimes per month, measured as the number of crimes per 100,000 inhabitants at the municipality level. The population data originates from the *National Population Council (CONAPO)*. In particular, CONAPO uses data from the decennial Population Censuses and, based on statistical techniques, generates annual population estimates at the municipal level (García-Vilchis, 2012). Each analysis year contains 29,484 observations (2457 municipalities  $\times$  12 months). The database contains 176,094 observations as the analysis period (2017–2022) includes 6 years (2457 municipalities  $\times$  12 months  $\times$  6 years).

The pandemic timeline in Mexico unfolded as follows: COVID-19 was declared a pandemic by the World Health Organization (WHO) on March 11, 2020, after the novel virus outbreak in China (WHO, 2020). Subsequently, Mexico's Council of General Health (CSG) issued an official stay-at-home order on

March 23, 2020, which applied nationwide (CSG, 2020). The official national stay-at-home order continued until May 30, 2020. Starting in June 2020, each state adopted a traffic-light methodology to ease the restrictions imposed during the lockdown. Most businesses reopened, but schools and social clubs remained closed throughout Mexico during 2021. All activities, including in-person schools, resumed after 17 months from the national stay-at-home order, meaning that in 2022, all businesses were opened throughout Mexico.

## Summary statistics

Table 1 displays the summary statistics for all kinds of property crime over the pre- and during-pandemic periods. The pre-pandemic period includes all months of 2017, 2018, and 2019, and the first 3 months of 2020. On the other hand, the during-pandemic period includes April through December 2020 and all months of 2021 and 2022. We report the following summary statistics: mean and standard deviation.

The first type of property crime in Table 1 is fraud, which increases from 4.53 frauds per 100,000 inhabitants to 5.96 after the start of the pandemic. As mentioned above, this crime is mostly committed on-line. On the contrary, property crimes committed on-site, such as robbery, theft, burglary, and motor vehicle theft, decline after the start of the pandemic by  $-4.07$  robberies per 100,000 inhabitants,  $-3.13$  thefts per 100,000 inhabitants,  $-1.79$  domestic burglaries per 100,000 inhabitants, and  $-4.42$  motor vehicle thefts per 100,000 inhabitants, respectively. *Prima facie*, summary statistics show a pattern shift for different types of property crime: while on-line property crimes increase, on-site decrease. In what follows, we describe our empirical strategy to infer causality.

**Table 1** Descriptive statistics

	Pre-/post-pandemic			
	Pre-COVID		During-COVID	
	Mean	Std. dev	Mean	Std. dev
Fraud	4.53	6.41	5.96	8.11
Robbery	14.09	16.46	10.02	11.22
Theft	19.14	23.38	16.01	18.35
Domestic burglary	5.72	6.49	3.93	4.29
Motor vehicle theft	13.48	13.29	9.06	8.70
<i>N</i>	93,366		83,538	

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública)

Crimes are measured per 100,000 persons. The specification is weighted by the municipal-level population

## Methods

We analyze the dynamic effects of the COVID-19 pandemic on property crime in Mexico using an event study methodology. The event study allows us to calculate the dynamic impact of the COVID-19 pandemic on different types of property crime in Mexico and, thus, to test for the permanency of the effects. Namely, this methodology shows the trajectory of the effect of the pandemic on property crime every month by type of property crime. More importantly, plotting the pre-pandemic months of property crimes lets us test for pre-parallel trends, which render evidence in favor of the necessary assumption of parallel trends to infer causality. Specifically, the parallel trends assumption posits that prior to the event (in this case, the pandemic), there should be no significant difference in the outcome, so it should be close to zero.

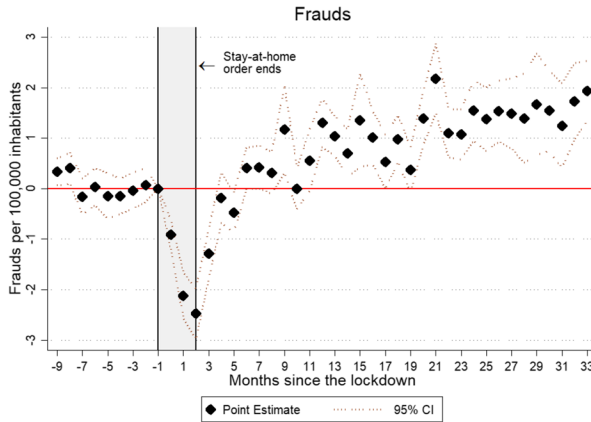
Formally, the event-study specification is as follows:

$$P_{imy} = \alpha + \sum_{\substack{q=-9 \\ q \neq 1}}^{33} \beta_q \text{COVID} - 19_{yq} + a_i + \gamma_m + \eta_y + e_{imy} \quad (1)$$

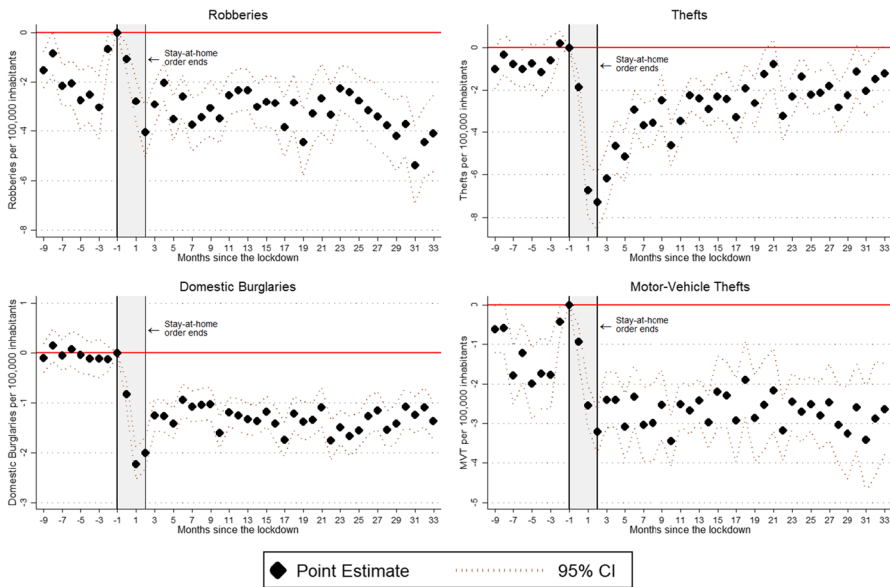
where  $P_{imy}$  is a given property crime outcome for municipality  $i$  in month  $m$  and year  $y$ . Our property crime outcomes include the rates of fraud, robbery, theft, burglary, and motor vehicle theft. Each unit of the independent variables corresponds to linear rates per 100,000 inhabitants.

The variables of interest,  $\text{COVID} - 19_{yq}$ , are a set of dummies that take the value of 1 in each respective period (month) before and after the pandemic and are zero otherwise. For this paper, March 2020 is the first month of the during-pandemic period ( $q=0$ ) because it is the month in which the pandemic began in Mexico. The final during-pandemic period is December 2022 ( $q=33$ ), the last observation in our dataset. To avoid multicollinearity in our regressions, we omit February 2020 ( $q=-1$ ), the month before the pandemic's start. This is common practice in the event study literature examining the effects of the pandemic on different socio-economic outcomes such as crime, domestic violence, or corruption (Balmori de la Miyar et al., 2020; Gallego et al., 2020; Leslie & Wilson, 2020).  $\gamma_m$  and  $\eta_y$  correspond to month and year-fixed effects, respectively, and help to control for seasonality and macroeconomic shocks. For the term  $\eta_y$ , we combine the years 2020, 2021, and 2022 into a single dummy to avoid perfect collinearity, as the event study fully saturates our regressions.  $a_i$  is a vector containing municipality-fixed effects, while  $e_{imy}$  corresponds to the error term. We use cluster standard errors at the municipality level to control for serial correlation (Bertrand et al., 2003). Also, the specification is weighted by the municipal-level population.





**Fig. 3** Event study results: Property crime committed on-line (fraud). Source: Mexico's National Public Security System (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*) Notes: Plotted coefficients are event-study dummy variables,  $\beta_t$ . Each plotted point represents the number of months before and after the lockdown. Solid lines represent point estimates. Dashed and dotted lines display the 95% confidence intervals. Baseline fixed effects are included at the municipality, month, and year. Crimes are measured per 100,000 persons. The specification is weighted by the municipal-level population. Robust standard errors are clustered at the municipal level.



**Fig. 4** Event study results: Property crime committed on-site (robbery, theft, domestic burglary, and motor vehicle theft). Source: Mexico's National Public Security System (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*) Notes: Plotted coefficients are event-study dummy variables,  $\beta_t$ . Each plotted point represents the number of months before and after the lockdown. Solid lines represent point estimates. Dashed and dotted lines display the 95% confidence intervals. Baseline fixed effects are included at the municipality, month, and year. Crimes are measured per 100,000 persons. The specification is weighted by the municipal-level population. Robust standard errors are clustered at the municipal level.

## Results

### Event-study findings

Figures 3 and 4 show the event-study results for the two types of property crime, on-line and on-site. The black diamonds in these figures represent the point estimates of the dynamic effect of the pandemic. The dashed lines surrounding the point estimates depict the 95% confidence interval.

First, Fig. 3 presents the dynamic effect of the pandemic on fraud rates, a property crime mostly committed *on-line*. Before COVID-19, all points remained near the horizontal red line, meaning that the pre-treatment data for this particular property crime shows parallel pre-trends, evidence in favor of the parallel trends assumption. During the stay-at-home order (the shaded area), fraud rates drop dramatically by 1 to 2.5 fewer frauds per 100,000 inhabitants. Namely, fraud rates declined by almost 55% in June 2020—at the end of the lockdown. Then, fraud rates begin to recover immediately, reaching pre-pandemic levels just two months after the end of the stay-at-home order. It is important to remember that, at this point, vaccinations for COVID-19 remain unavailable to the public. Four months after the end of the stay-at-home order and only 7 months into the pandemic, fraud rates per 100,000 inhabitants surpass pre-pandemic levels (horizontal red line). Worse yet, the trajectory of the effect maintains a positive slope, reaching the highest point estimates towards the end of the analysis period, specifically, towards the end of 2022. The maximum magnitude of these points is 2 additional frauds per 100,000 inhabitants, meaning an increase of 44% from the pre-pandemic mean (4.53). This magnitude points to a significant transformation of the property crime market.

Second, Fig. 4 contains four panels for property crimes committed *on-site*. Namely, the top-left panel corresponds to robberies, the top-right panel to thefts, the bottom-left panel to domestic burglaries, and the bottom-right panel to motor vehicle thefts. These crimes are of great importance as the routine activities of most Mexicans changed dramatically during the pandemic and because these are the crimes with the highest frequencies in the country. One drawback for this particular property crime type is that robberies and motor vehicle theft do not pass the parallel trends assumption, as most points are not on or near the red vertical line, before the pandemic. Hence, we have to rely on the analysis for thefts and domestic burglaries, which data comply with the parallel trends assumption, to make sense of the patterns for this property crime type. Regarding theft rates, we find a significant drop of around  $-7$  thefts per 100,000 inhabitants during May and June 2020, right in the middle of the stay-at-home order. Thereafter, theft rates begin to recover slowly but never quite reach pre-pandemic levels during the analysis period. Most point estimates for theft rates are statistically significant after the beginning of the pandemic and stabilize right between  $-2$  and  $-3.5$  fewer thefts per 100,000 inhabitants, which account for a drop between 10 and 18% from the pre-pandemic mean (19.14).

For the case of domestic burglaries, we find a huge drop in rates that never recovers throughout the analysis period. In particular, the lowest point for

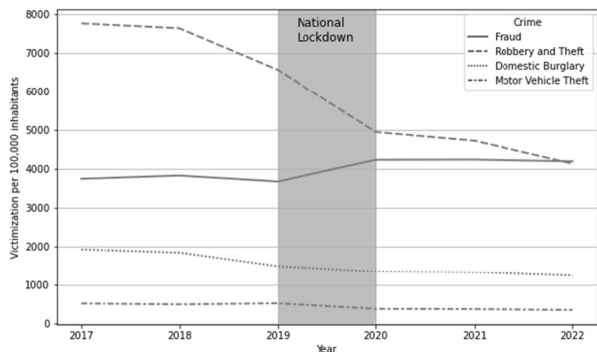
domestic burglary rates occurred in May 2020, with an estimate of  $-2.25$  fewer domestic burglaries per 100,000 inhabitants. Then rates recover very slowly to  $-2$  in June 2020 to stabilize ever after between  $-1$  and  $-1.8$  fewer domestic burglaries per 100,000 inhabitants throughout the analysis period. Overall, this accounts for an effect between  $-17$  and  $-31\%$  of the pre-pandemic mean (5.72). Using the analysis for the trajectory of the dynamic effects of the pandemic on thefts and domestic burglaries, we can make sense of the trajectories for robberies and motor vehicle theft, even if we cannot give a precise estimation of the effects. In both cases, robbery and motor vehicle theft rates approximate the same tendency as domestic burglaries. Once the national lockdown begins, rates for both crimes drop dramatically and never really recover to pre-pandemic levels.

To verify that the rates of property crime reported to the police correspond to actual victimization, we employ the National Survey of Victimization and Perception of Public Safety from Mexico's Statistics Office (INEGI). We conduct this robustness check visually, examining victimization trends annually. Namely, Fig. 5 shows an increase in on-line property crime victimization through fraud, which spikes during the national lockdown and remains at a higher victimization level than during the pre-pandemic years. Fraud becomes the most prevalent property crime experienced by Mexican victims in 2022. Conversely, on-site property crime victimization through robbery and theft, domestic burglary, and motor vehicle theft drop after the national stay-at-home order and do not recover in the medium run. This evidence for victimization trends matches our results. One caveat, however, is that the victimization survey is representative only at the state level and not at the municipality level.

## Potential mechanisms

Next, we explore potential mechanisms that may be driving the dynamic effects of the COVID-19 pandemic on different types of property crime. In particular, we employ the *routine activity* (Cohen and Felson, 1979) and the *ambient guardianship* (Felson et al., 1995) theories to inform on potential mechanisms. We rely on data from Google COVID-19 Community Mobility Reports at the subnational level (state level). These reports measure daily mobility based on cellphone tracking,

**Fig. 5** Robustness checks: Victimization surveys of property crime. Source: Encuesta Nacional de Victimización y Percepción sobre Seguridad Pública, Instituto Nacional de Estadística y Geografía (INEGI, 2022)



taking the activity levels from January 3rd, 2020, to February 6th, 2020, as the baseline. We collapse these daily reports into monthly observations at the state level. The said mobility reports are available until October 2022 thus, providing information for 33 months (February 2020 to October 2022) for all 32 states in Mexico (1056 observations in total). We employ the following three categories of places to measure potential mechanisms: (i) retail and recreation areas (e.g., restaurants, coffee shops, malls, amusement parks, museums, libraries, movie theaters), (ii) residential zones, and (iii) workplaces. These three mobility variables help us proxy for the *routine activity* theory through availability of possible victims (Cohen and Felson, 1979) and for the *ambient guardianship* theory (Felson et al., 1995) through timely supervision of property.

To estimate the effect of changes in mobility on shifts in property crime, we run the following fixed-effects model:

$$P_{smy} = \alpha + \beta \text{Mobility}_{smy} + \chi P_{s(m-1)y} + \varphi \text{Lockdown}_{smy} + \nu_s + \gamma_m + \eta_y + e_{smy} \quad (2)$$

where  $P_{smy}$  is the rate of property crimes for state  $s$  in month  $m$  and year  $y$ .  $\text{Mobility}_{smy}$  is the difference in mobility from the baseline (January 2020) for all months from February 2020 to October 2022.  $P_{s(m-1)y}$  is the first lag of the outcome of interest to control for the autoregressive behavior of property crime and to estimate the effects on shifts in rates.  $\text{Lockdown}_{smy}$  is a dummy variable that takes the value of one for March, April, and May of 2020 and zero for all other months. We also add  $\nu_s$ , which are state-fixed effects that control for time-invariant differences across states.  $\gamma_m$  are month fixed-effects.  $\eta_y$  are yearly-specific fixed effects. We cluster standard errors at the state level, represented in our model by  $e_{smy}$ . To accommodate variations in crime rate variance between states with high and low populations, we adjust the specification by factoring in population weights.

Table 2 displays the mediating factors for the dynamic effect of the COVID-19 pandemic on shifts in property crime rates by typology. The first of the mobility variables we test as a potential mechanism is visits to retail and recreational areas. The top panel of Table 2 shows that more mobility in physical retail and recreational areas leads to a decrease in frauds—property crime mostly committed on-line—, and an increase in robberies, thefts, domestic burglaries, and motor vehicle thefts—all property crimes committed on-site. These results make sense as less physical retail and recreational activities during the pandemic lead to more on-line retail and recreational activities. Hence, a shift of spaces provides a larger pool of victims on-line, but fewer on-site.

The second panel of Table 2 checks for residential mobility trends as a potential mechanism for the dynamic effect of the COVID-19 pandemic on shifts in property crime rates. Staying-at-home decreases significantly the rates of robberies, thefts, domestic burglaries, and motor vehicle thefts—property crimes committed on-site. We do not find any statistically significant effects of fraud. These findings corroborate that active guardianship at home provides fewer domestic burglaries and motor-vehicle theft opportunities.

Finally, the bottom panel of Table 2 verifies workplace mobility as a mediating factor from the event-study results above. In this case, we observe that more mobility

**Table 2** Potential mechanisms

RATES PER 100,000 INH	Fraud (1)	Robbery (2)	Theft (3)	Burglary (4)	MVT (5)
Panel A: Mobility to retail and recreation	-0.007** (0.002)	0.010 (0.007)	0.021*** (0.007)	0.005* (0.003)	0.015*** (0.004)
<i>N</i>	1,056	1,056	1,056	1,056	1,056
Adjusted R-squared	0.932	0.974	0.973	0.929	0.970
Baseline FE	X	X	X	X	X
Panel B: Mobility in residential areas	0.005 (0.015)	-0.014 (0.025)	-0.120** (0.051)	-0.022** (0.010)	-0.046*** (0.012)
<i>N</i>	1,056	1,056	1,056	1,056	1,056
Adjusted R-squared	0.931	0.974	0.973	0.929	0.970
Baseline FE	X	X	X	X	X
Panel C: Mobility to workplace	-0.011*** (0.004)	0.009 (0.010)	0.032*** (0.010)	0.007* (0.003)	0.017*** (0.004)
<i>N</i>	1,056	1,056	1,056	1,056	1,056
Adjusted R-squared	0.932	0.974	0.973	0.929	0.970
Baseline FE	X	X	X	X	X

Source: Mexico's National Public Security System (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Google's COVID-19 Community Mobility Reports (subnational-level). These reports measure daily mobility based on cellphone tracking, taking the activity levels from January 3rd, 2020, to February 6th, 2020, as the baseline. We collapse these daily reports into monthly observations at the state level. The said mobility reports are available until October 2022, thus, providing information for 33 months (February 2020 to October 2022) for all 32 states in Mexico (1056 observations in total)

Controls include the first lag value of the dependent variable and a dummy for the lockdown period. Crimes are measured per 100,000 persons. Baseline fixed effects are included at the state, month, and year. The specification is weighted by the state-level population. Robust standard errors are clustered at the state level. Significance levels: \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

to workplaces decreases fraud and increases thefts, domestic burglaries, and motor vehicle thefts. Based on these results, the availability of victims who commute to their workplaces is largely affected by the pandemic, which brings about shifts in property crime rates on-line and on-site. On the one hand, on-line property crimes are more common as the home-office becomes widespread. On the other hand, on-site property crimes decrease as fewer people commute to their workplaces. In all, the *routine activity* (Cohen and Felson, 1979) and the *ambient guardianship* (Felson et al., 1995) theories seem to inform rather well on potential mechanisms.

## Discussion

The findings of this research add to the current body of empirical evidence exploring the effects of the COVID-19 pandemic on crime, particularly property crimes. Our results point to a drop and quick recovery of fraud—property crime mostly committed on-line—, which in the medium run surpasses pre-pandemic levels by 44%.

Conversely, we find a significant drop in robbery, theft, domestic burglary, and motor vehicle theft—all property crimes committed on-site. Much of the drop occurs during the national lockdown, and then rates for these crimes slightly recover, even though these never reach pre-pandemic levels. The magnitude of the overall effects of thefts and domestic burglary drops by 10–18% and 17–31%, respectively. Although similar to the effects of domestic burglary, we cannot infer a precise pandemic impact on robbery and motor vehicle theft, as these crimes do not pass the parallel trends assumption.

Regarding the mediating factors, we find that fewer visits to retail and recreational areas lead to an increase in fraud and a decrease in robberies, thefts, domestic burglaries, and motor vehicle thefts. Further, an increase in mobility in residential areas decreases significant rates of robberies, thefts, domestic burglaries, and motor vehicle thefts but does not affect fraud. Finally, declining mobility to workplaces increases fraud and decreases robberies, thefts, domestic burglaries, and motor vehicle thefts. Overall, mobility is an important mediating factor for the dynamic effects of the COVID-19 pandemic on the different types of property crime.

The previous findings go hand in hand with the *routine activity* theory (Cohen and Felson, 1979), which predicts that crime increases with more suitable victims' availability. For instance, if people shop more on-line, there are greater chances for criminals to commit fraud electronically. Also, if there is a larger presence of victims in stores and recreational places, the supply of suitable victims increases for criminals that are on-site. These results can also be explained by the *ambient guardianship* theory (Felson et al., 1995), in which a rise in the presence of capable guardians within households drives down property crimes committed on-site, namely, robberies, thefts, domestic burglaries, and motor vehicle thefts. Further, the *routine activity* theory also fits well with these results as there are fewer potential victims on the streets because people interrupt their activities to protect themselves from getting COVID-19.

With regards to fraud, the empirical evidence in the short run is similar to what happens in the UK (Buil-Gil et al., 2021; Johnson & Nikolovska, 2022; Kemp et al., 2021) and China (Chen et al., 2021), in which rates first drop during the lockdown and then recover immediately after restrictions eased off, surpassing pre-pandemic levels. Hence, a similar conclusion for Mexico can be derived: the pandemic accelerated the long-term upward trend in on-line crime (Buil-Gil et al., 2021). Further, on-site property crimes, such as robberies, thefts, domestic burglaries, and motor vehicle thefts, follow a similar pattern to other empirical studies such as in Los Angeles, where there is a sharp decrease in domestic burglaries (Hill et al., 2023); in the UK, where theft and domestic burglary are both responsive to increases in mobility in residential areas (Frith et al., 2022; Halford et al., 2020); in China, where motor vehicle theft and domestic burglary experienced both significant reductions at the start of the stay-at-home order, and then the crimes remained at low levels until the end of the stay-at-home period (Chen et al., 2021), and in India, where robberies decreased during the lockdown (Paramasivan et al., 2022). One difference with this last study is that our findings do not point to a surge in robberies once the government lifts all restrictions on mobilities.

An important limitation of our study pertains to the level of detail in our data and the reliability of the reporting to the police. Most municipalities require citizens to report crimes in person, even though certain cities like Mexico City now allow for on-line reporting. Unfortunately, we cannot cross-examine whether victimization matches reports to the police at the same rates pre- and during-pandemic at the municipality level. This limitation is present in most of the existing literature. However, an annual national victimization survey (National Survey of Victimization and Perception of Public Safety) conducted by Mexico's Statistics Office (INEGI) points to the same pattern depicted in our results, even though evidence for this survey is only representative at the state level. Future research should continue to expand the time horizon of the effects of the COVID-19 pandemic to depict the trajectory for the long-term impact (5 or more years) and not only for the short- and medium-horizon. More observations should allow us to conduct the analysis at the state-level and match those results with victimization surveys in Mexico and other countries with such data.

## Conclusion

This paper analyzes the dynamic effects of the COVID-19 pandemic on property crime in Mexico by crime typology. We find heterogeneity in the pandemic's impact on different types of property crime and a dynamic, non-permanent effect for most types of property crime. Namely, our results point to a drop and quick recovery of fraud—property crime mostly committed on-line—, which in the medium run surpasses pre-pandemic levels by 44%, and a significant drop in robbery, theft, domestic burglary, and motor vehicle theft—all property crime committed on-site—, with a slight recovery, even though these never reach pre-pandemic levels. Potential mechanisms point to shifts in mobility in retail and recreational areas, residential zones, and workplaces as important mediating factors for the dynamic effects of the COVID-19 pandemic on the different types of property crime.

In conclusion, these results enhance our comprehension of how responses to pandemics can affect crime trends in the medium term. Additionally, they shed light on the potential long-term consequences of the pandemic on crime, which can be instrumental in shaping future policies and practices. Furthermore, the findings highlight the influence of changes in on-line and on-site activities. From a policy perspective, Mexico's Security Apparatus should take into consideration the shifts in property crime trends during the pandemic to reallocate resources to where they are mostly needed. Our results indicate that more attention must be paid to the on-line space through cyber-policing.

**Data availability** The code and data that support the results of this paper are available in Harvard Dataverse at <https://doi.org/10.7910/DVN/ZDUWXO>. These data were mainly derived from the following resources available in the public domain: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública), <https://www.gob.mx/sesndelictiva>.

## Declarations

**Ethics approval** This paper did not require IRB approval as data comes from a publicly available source.

**Competing interests** The authors declare no competing interests.

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