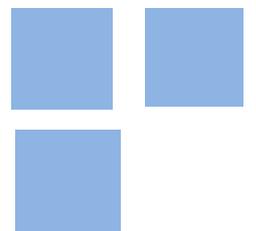# No Country for Exposed Firms: Violent Crime and Business Performance Across Sectors

DANILO SOUZA

No Country for Exposed Firms: Violent Crime and Business Performance Across Sectors

Danilo Souza (danilosouza@usp.br)

Abstract:

Firms are affected by crime either directly, through incidents such as robberies, or indirectly, through reduced foot traffic driven by fear. This paper investigates how firms of different sectors are impacted by the indirect channel. Using a triple-difference specification and data covering the universe of firms in Brazil's most populous state, I find that the retail sector is relatively more likely to experience na increase in firm entry following a decline in local violent crime rates. Retail firms also exhibit increases in total employment and hiring. To rationalize these findings and explore potential mechanisms, I develop a theoretical model in which sectors are differentially affected by violent crime through its impact on competition and markups.

Keywords: Firms, Violence, Business Performance

JEL Codes: D22, K42, L25, O12

No Country for Exposed Firms: Violent Crime and Business Performance Across Sectors

Danilo Souza*

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Firms are affected by crime either directly, through incidents such as robberies, or indirectly, through reduced foot traffic driven by fear. This paper investigates how firms of different sectors are impacted by the indirect channel. Using a triple-difference specification and data covering the universe of firms in Brazil's most populous state, I find that the retail sector is relatively more likely to experience an increase in firm entry following a decline in local violent crime rates. Retail firms also exhibit increases in total employment and hiring. To rationalize these findings and explore potential mechanisms, I develop a theoretical model in which sectors are differentially affected by violent crime through its impact on competition and markups.

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*Department of Economics, University of São Paulo, Brazil (danilosouza@usp.br)

1 Introduction

Violence poses a significant challenge for firms worldwide. It affects markets through multiple channels, including increased mortality, which influences labor supply and consumption decisions, and shifts in the relative profitability of different sectors. By distorting both supply and demand, violent crime imposes additional constraints on firms' optimization decisions, pushing outcomes further from the first-best solution.

The World Bank's Enterprise Survey indicates that approximately 28.8% of top managers across 111 countries identify *crime and disorder* as a major constraint to business growth.[1] To understand why this is the case is straightforward, as 57.9% of these managers reported paying for private security, while reported average losses equivalent to 4.9% of annual sales due to theft and vandalism. Figure 1 shows how managers see crime as a bigger problem than labor regulations, which is usually considered an important constraint to employment and production (Garicano, Lelarge and Van Reenen, 2016; Da-Rocha, Restuccia and Tavares, 2019).
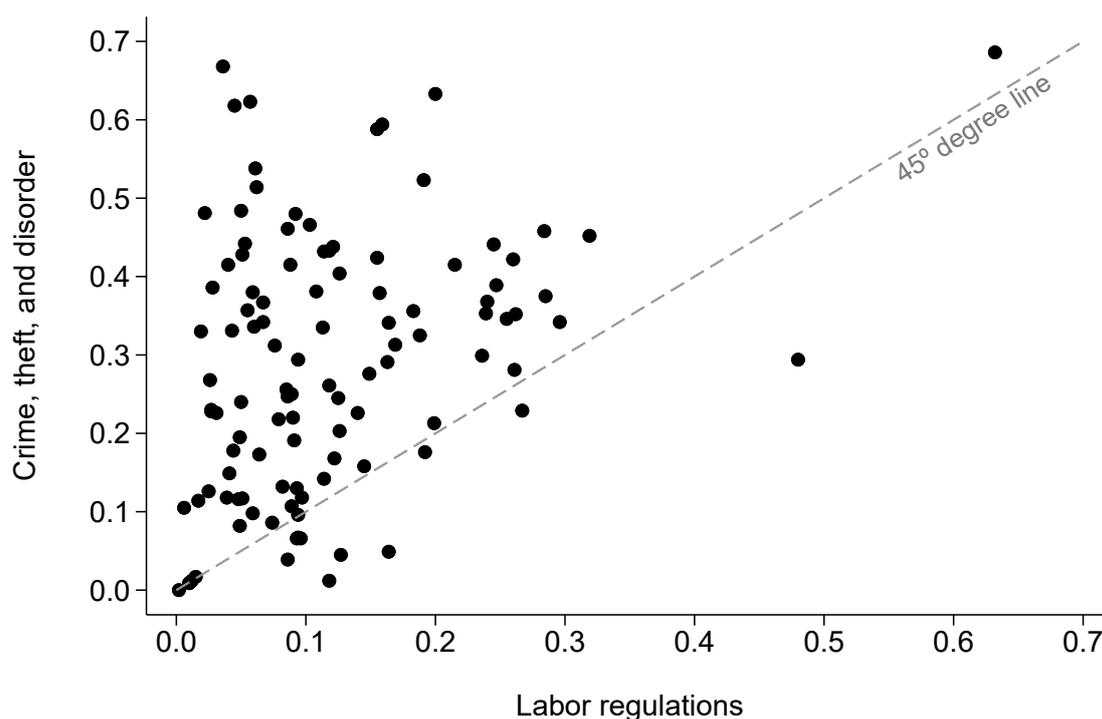

FIGURE 1: MAJOR CONSTRAINTS

While firms are all affected in some manner, sectors differ in their sensitivity to crime. This paper leverages this idea and explores the relative effect of violence changes on firm size, firm entry, and cost structure in sectors more and less sensitive to crime. To do so, I use administrative data on the universe of Brazilian establishments matched with data on the evolution of local crime rates. Specifically, I use data for the $1997 - 2013$ period and focus on the relative effect of violent crime changes between retail and wholesale trade sectors.

As the source of exogenous variation in local crime rates, I use the historic reduction in violent crime rates the state of São Paulo – which accounts for more than 20% of the country's population – experienced during the last decades. Like most of the United States in the early 1990s, the state of São Paulo went through a vast and steady decline in homicide rates since it peaked in 1999. During this period, the homicide rate plunged 83.5%, from 44.1 to 7.3 per 100,000 in 2019, a reduction even higher than the one experienced by New York City during $1990 - 2001$ (Levitt, 2004). Despite some discussion on the potential determinants of this trend (De Mello and Schneider, 2010; Willis, 2015; De Mello, 2015; Biderman et al., 2019), little is known about its effects on firm dynamics.

To derive causal effects of this crime reduction on different sectors, the empirical strategy is based on the downward trend of state homicide and two more sources of variation: the prior homicide rate of municipalities and the firms sector. Using a triple-difference specification, I find that firms in the retail trade sector face a relative increase of 3.1% in the likelihood of remaining active, and a 2.7% relative increase in the influx of new competitors. On the intensive margin, the results suggest a relative increase in retail firm size of 0.047 log points, primarily due to a relative increase in hiring intensity. Together, these results indicate that firms in the retail sector are indeed more affected than the wholesale ones, which implies a significant change in the economy's sectoral composition and aggregate productivity.

In order to explore potential mechanisms underlying these effects, I extend the model in Rozo (2018) to include two sectors that differ in how firms' market power is affected by crime. This builds on evidence that violent crime reduces people's propensity to walk in public spaces (Janke, Propper and Shields, 2016) and visit certain types of establishments (Rosenthal and Ross, 2010; Fe and Sanfelice, 2022). By discouraging consumers from searching among competitors and acquiring information about prices, crime can weaken competition among firms, resulting in higher markups. This idea draws from Tommasi (1994), who argues that by increasing the variability of relative prices, increasing inflation reduces the informational value of prices and the effectiveness of predicting future prices with the current ones. In this case, there is a reduction in the consumers' incentive to search for better deals, which makes them more likely to purchase from familiar

sellers. This consumer's *preference for the closest* increases the firm's capacity to charge higher prices, leading to higher markups in equilibrium. I propose a similar mechanism, where high crime rates increase the perceived risk of victimization, thereby discouraging price information acquisition. In this context, firms' local market power increases due to consumers' fear of violence.[2]

Beyond the relative effect on firm size and activity, the model predicts that an increase in crime leads to a relative reduction in both revenues and costs for firms operating in the most affected sector. The former may be explained by a decrease in the number of visits to establishments due to fear of violence, whereas the latter could be the result of lower production and, thus, a reduction in the demand for labor. I intend to test these theoretical results using restricted data from profitability and costs of the commerce sector.

This paper contributes to at least two different branches of the literature. First, this work relates to the literature that studies the causes of misallocation and its impact on the productivity distribution of firms (Hsieh and Klenow, 2009; Restuccia and Rogerson, 2017). Despite not developing a complete theoretical framework on how violence affects the productivity of the average firm, the paper presents theoretical and empirical evidence on the effect of crime rates on competition and markups, one important source of misallocation and welfare loss (De Loecker, Eeckhout and Unger, 2020; Peters, 2020; Edmond, Midrigan and Xu, 2023).

I also contribute to a large empirical literature on the effects of conflict on firms' outcomes (Camacho and Rodriguez, 2013; Bernal et al., 2024). In particular, Del Prete, Di Maio and Rahman (2023) show that exposure to conflict reduces firms' revenues and increases exit during the Second Libyan Civil War. Authors also discuss potential mechanisms driving these effects, with emphasis on the relative availability of production inputs and the weaker market competition. My paper complements these studies by presenting evidence on the effect of a more continuous and daily type of violence, rather than extreme events such as civil wars, on market competition and outcomes such as firm size and entry.

Finally, this paper contributes to the literature that examines how firms are differently affected by crime depending on the sector's characteristics. Rosenthal and Ross (2010) argue that firms in different sectors decide where to locate based on their rel-

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[2]Guidolin and La Ferrara (2007) shows another piece of evidence on how incumbent firms can be positively affected by conflict and violence. They evaluate the case of diamond mining companies holding concessions in Angola during the civil conflict in the country. They show that portfolios constituted by these companies were *negatively* affected by the end of the war, suggesting that the instability created by the war in diamond-rich regions constituted a barrier to entry of new firms in the sector.

ative sensitivity to crime and the degree of violence in each location. By focusing on retail and wholesale trade in US cities, they show that retail firms and employment tend to locate in relatively safer locations. Additionally, Utar (2024) uses an instrumental variable approach to assess how Mexican firms were differently affected by the surge of drug-trade-related violence depending on their characteristics. The negative results on employment are driven entirely by blue-collar employees and are concentrated in labor- and female-intensive firms. My paper adds to this literature by showing that retail and wholesale firms are differently affected by crime on both the intensive (firm size) and the extensive margin (entry/exit).

My paper is probably most similar to Rozo (2018), which examines the impact of violent crime on Colombian firms' production and pricing strategies. Specifically, she analyzes the decline in violence in municipalities that supported Álvaro Uribe in his first presidential election in 2002, leveraging this electoral support as an instrumental variable for homicide rates in the 1995-2010 period. In this setting, firms that faced higher violent crime presented lower production, output prices, and wages. She also develops a theoretical model to assess potential mechanisms, showing that a reduction in firms' costs and workers' declining demand are key to rationalize lower production and prices simultaneously. On the contrary, this paper focuses on the *relative* effect on production, the entry decision, and the cost structure of different sectors. By doing so, the paper expands the understanding of how violent crime affects not only firms on average but also sectoral composition, internal competition, and aggregate productivity. Moreover, the empirical strategy makes it possible to assess the long-term effects of reducing violent crime.

The remainder of the paper is organized as follows. Section 2 provides a theoretical framework from which I derive several predictions of how crime impacts the relative outcome of different sectors. Section 3 provides a background of crime and violence trends in the Brazilian state of São Paulo during the last decades. Section 4 presents the data. In section 5, I discuss the empirical strategy and identifying assumptions. Section 6 presents the main static and dynamic results. Finally, Section 7 concludes the paper.

2   Theoretical Framework

This section proposes a simple two-sector model to understand how sectors are differently affected by changes in crime rates. First, I describe the individuals' problem, which is identical to the one in Rozo (2018). Then, I focus on the production side of the economy, deriving the testable results on the sectors' relative behavior to crime decrease.

2.1 Individuals

Individuals derive utility from the consumption of goods produced in municipality m and are negatively affected by the municipality's level of crime η_m. However, there is an idiosyncratic preference for locations that also affects workers' utility and restricts migration across municipalities (Redding, 2016). This is essential to guarantee that the aggregate labor supply negatively responds to crime rates continuously.

In particular, the utility generated by the consumption of goods is assumed to be a function of the victimization probability associated with each sector. This captures the idea that sectors differ in terms of how exposed they are to crime and how consumption from these different sectors affects consumers' utility. These goods are then combined through a CES function with equal shares and elasticity of substitution given by σ. Also, individuals have one unit of labor, which is supplied inelastically and perfectly mobile across sectors within each municipality. Specifically, the individual's optimization problem is given by

$$\max_{c_{im1},c_{im2}} U_{im} = \left(\left[\frac{c_{im1}}{\eta_m^{\gamma_1}} \right]^{\frac{\sigma-1}{\sigma}} + \left[\frac{c_{im2}}{\eta_m^{\gamma_2}} \right]^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \epsilon_{im}$$

$$s.t. \quad p_{m1}c_{im1} + p_{m2}c_{im2} = w_m$$

where $\gamma_1, \gamma_2 > 0$, and ϵ_{im} is the idiosyncratic component that captures an individual's preference for municipality m over alternatives. This characterization implies that the ratio of consumption between sector 1 and sector 2 is the same for all individuals and such that

$$\frac{c_{m1}}{c_{m2}} = \left(\frac{p_{m1}}{p_{m2}} \right)^{-\sigma} \eta_m^{(\gamma_1-\gamma_2)(1-\sigma)} \tag{1}$$

2.2 Firms

I assume that sector $s = \{1, 2\}$ operates under monopolistic competition, where each firm j within sector s acts as a monopolist of its variety in the short-run but makes zero profits in the long-run as free-entry occurs. Firms are located in municipalities that differ in the crime rates they face. Also, firms are immobile across municipalities and use only labor to produce.

Firm j require the following quantity of labor to produce y_{jms} units of output:

$$l_{jms} = MC(\eta_m) \cdot y_{jms} \tag{2}$$

where $MC(\eta_m)$ is the labor cost to produce one unit of output. The marginal cost is a function of crime such that $\partial MC/\partial \eta_m > 0$. This captures the idea that increasing production becomes more difficult and expensive as the municipality becomes more violent.

As usual in this framework, profit maximization in the short run implies that, in equilibrium, the optimal price equals the marginal cost multiplied by a markup. I assume that this markup is sector-specific and a function of crime rates. This simple modification captures the idea that violent crimes, such as homicides, reduce people's propensity to walk on the streets (Janke, Propper and Shields, 2016) and visit some type of establishments (Rosenthal and Ross, 2010; Fe and Sanfelice, 2022). This change in consumer behavior could hinder competition among firms in the most affected sectors by a decrease in consumers' search for the lowest price, leading to higher markups. There is an old literature that relates price uncertainty from high and increasing inflation to decreasing consumer price-search, which in equilibrium leads to higher markups (see Benabou and Gertner (1993) and Tommasi (1994)). I use a similar idea, but with consumers' low level of price-search coming from a different source: fear of violence.

In this framework, the optimal price p_{ms} in the short-run is the same for all j

$$p_{ms} = MC(\eta_m) \cdot \mu_{ms}(\eta_m) \tag{3}$$

where $\mu_{ms}(\eta_m)$ denotes the markup of sector s in municipality m as a function of crime rates.

There is an entry cost c_e, which has to be paid by entrants upfront. In the long run, the free-entry condition guarantees that firms enter each sector until expected profits are identical to c_e. Since incumbent profits are the same each period, the expected value that entrants face in sector s is given by:

$$E\left[\pi_{ms}\right] = \frac{y_{jms} \cdot MC(\eta_m) \cdot (\mu_{ms}(\eta_m) - 1)}{1 - \theta} \tag{4}$$

where θ is the intertemporal discount rate.

Using equation (2) and the fact that $E\left[\pi_{ms}\right]$ equals c_e in the long run yields the equilibrium output and each firm's labor demand

$$y^{\star}_{jms} = y^{\star}_{ms} = \frac{c_e(1 - \theta)}{MC(\eta_m) \cdot (\mu_{ms}(\eta_m) - 1)} \tag{5}$$

$$l^{\star}_{jms} = l^{\star}_{ms} = \frac{c_e(1 - \theta)}{\mu_{ms}(\eta_m) - 1} \tag{6}$$

2.3 Crime impact on firms' decisions and cost structure

I assume that sector 1 relies upon consumers' frequent visits and people passing by, such as retailers, entertainment companies, and restaurants. Sector 2, on the contrary, operates with orders placed before product delivery, such as large wholesalers and distributors. This difference in how sectors function also implies a different impact of crime rates on cost structure and demand.

Assumption 1. *Sector* 1 *is the sector most affected by crime, such that*

$$\mu'_{m1} > \mu'_{m2} \quad and \quad \gamma_1 > \gamma_2$$

For simplicity, I also assume that sector 2 does not react to violence at all, such that $\mu'_{m2} = 0$. The following proposition establishes how each firm's labor demand in sector 1 reacts – relatively to sector 2 – when the crime rate changes.

Proposition 1. *The elasticity of relative labor demand in sector* 1 *firms increases (decreases) as the crime rate decreases (increases).*

$$\xi_{l,\eta} = \frac{\partial(l_{m1}/l_{m2})}{\partial \eta_m} \frac{\eta_m}{(l_{m1}/l_{m2})} = -\frac{\mu'_{m1}}{(\mu_{m1}-1)} \cdot \eta_m < 0$$

As crime decreases, the sector's 1 markup also decreases, which is the result of increasing competition within the industry. Intuitively, as firms move far from the short-run monopoly, the optimal labor demand approaches the perfect competition result, usually defined by a production level higher than the one in monopoly. Thus, we should expect an increase in the firm's relative size in sector 1.

However, to say something about how likely sectors are to experience an increase in the entry of new firms, we need to evaluate how expected profits are affected by crime rates. The equilibrium ratio of expected profits in sector 1 relative to sector 2 is a function of markups and given by

$$\frac{E[\pi_{m1}]}{E[\pi_{m2}]} = \frac{\mu_{m1}^{-\sigma}(\mu_{m1}-1)}{\mu_{m2}^{-\sigma}(\mu_{m2}-1)} \cdot \eta_m^{(\gamma_1-\gamma_2)(1-\sigma)}$$

The next proposition establishes how individuals' preferences and the level of competition in sectors relate to this ratio and entry of new firms

Proposition 2. *The elasticity of expected profits with respect to violence depends on the substitutability between goods produced by sector* 1 *and* 2 *and the level of competition within each sector. In particular, more firms are entering sector* 1 *if the elasticity of*

substitution σ is high enough. Also, the closer the sector 1 is to perfect competition, the higher σ must be.

$$\sigma > \frac{\mu_{m1}}{\mu_{m1} - 1} \implies \xi_{\pi,\eta} = \frac{\partial(E\left[\pi_{m1}\right]/E\left[\pi_{m2}\right])}{\partial \eta_m} \frac{\eta_m}{(E\left[\pi_{m1}\right]/E\left[\pi_{m2}\right])} < 0$$

Unlike the straightforward result on firms' relative size, the entry of new firms is subject to opposing forces. On the one hand, more crime leads to a higher markup in sector 1, making this sector more attractive to potential entrants. On the other hand, crime reduces visits to firms in the most exposed sector, negatively affecting expected profits. To define which effect prevails depends on how consumers can substitute one good for another. Intuitively, Proposition 2 defines that the more substitute goods are, the more relevant is the second effect on the entry decision, leading to a negative relation between crime and relative entry in sector 1.

These effects on firms' entry and size might be the result of changes in revenues, total costs, or both. The final proposition describes the impact of crime on these objects.

Proposition 3. *An increase (decrease) in crime leads to relatively lower (higher) revenues and costs. This can be represented by the sign of elasticities such that*

$$\xi_{R,\eta} < 0 \quad and \quad \xi_{C,\eta} < 0$$

where $\xi_{R,\eta}$ and $\xi_{C,\eta}$ represent the elasticities of relative revenues and costs, respectively.

Interestingly, violence affects sectors' cost structure and revenues in two opposing directions: increasing crime reduces visits and demand for the goods produced by the most affected sector, but also reduces the demand for labor given the lower production. As a result, revenues and costs are relatively affected by crime in the same way. In the next sections, I present empirical evidence on this prediction on relative revenues and costs, but also on relative size and entry likelihood.

3 Institutional background and Data

3.1 Crime and Violence in São Paulo

Although Brazil's absolute number of intentional homicides and its share of the global total have remained relatively stable in the last decades (Figure A.1), the regional dynamics of violent crime within the country reveal considerable heterogeneity. While the South-east region and several major urban centers have experienced a substantial decline in

violence in the 21st century, smaller municipalities and the North and Northeast regions
have faced a significant increase in violent crime (Cerqueira, 2010).

In fact, the country's homicide rate would have been significantly higher by the end
of the 2010s were it not for the historic decline in the number of homicides reported by
the state of São Paulo, the most populous in the country. As previously discussed, the
state has undergone a sharp and sustained reduction in homicides since the first year of
the 21st century. Following a period of relative stability at approximately 40 homicides
per 100,000 inhabitants, São Paulo's homicide rate declined by an average of 8.6% per
year, reaching a rate of 7.3 in 2019. This trajectory closely mirrors the downward trend
in violent crime observed in the United States during the 1990s (Levitt, 2004). Unlike
the US experience, however, the decline in São Paulo was concentrated entirely in violent
crimes, with property crime rates remaining largely unchanged. Figure 2 illustrates this
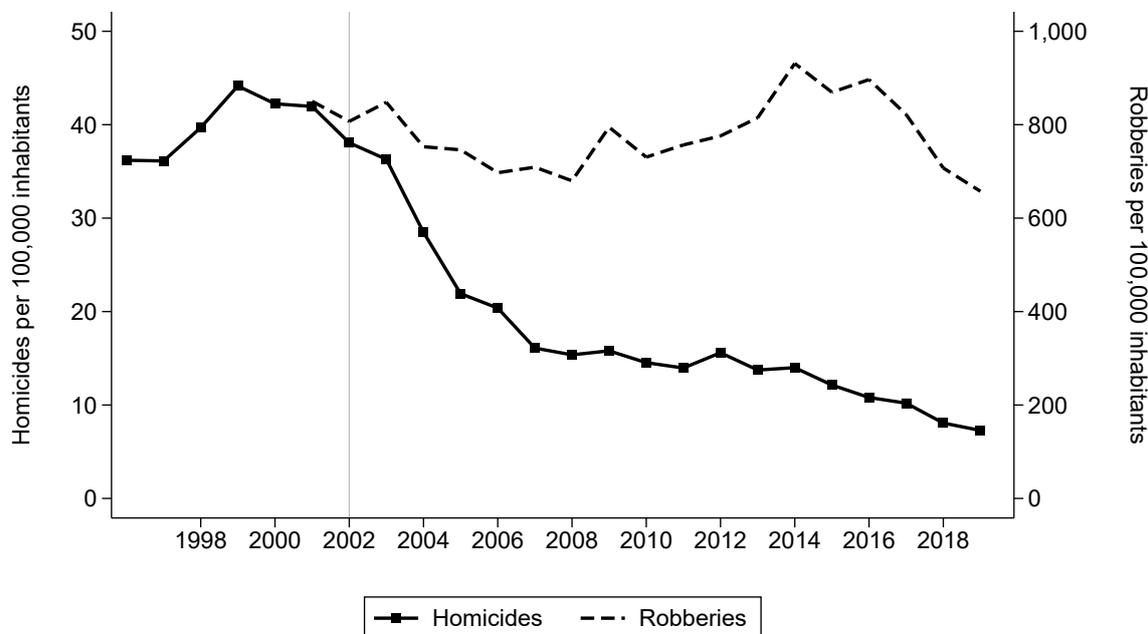pattern for the 1997-2019 period.

FIGURE 2: CRIME RATES IN SAO PAULO STATE, 1997-2019

Despite the overall decline in the state's homicide rate, municipalities exhibited het-
erogeneous trends. Figure 3 suggests that crime shifted towards the smaller cities, largely
reducing the crime concentration within the capital's metropolitan area. In particular,
while *Diadema*, one of the most dangerous and populous municipalities in the state, ex-
perienced a decline of around 91% in its homicide rate, from 142.3 to 12.3 homicides
per 100,000 inhabitants, smaller municipalities that used to be safer witnessed significant
increases in violence. This degree of heterogeneity suggests that the statewide decline af-

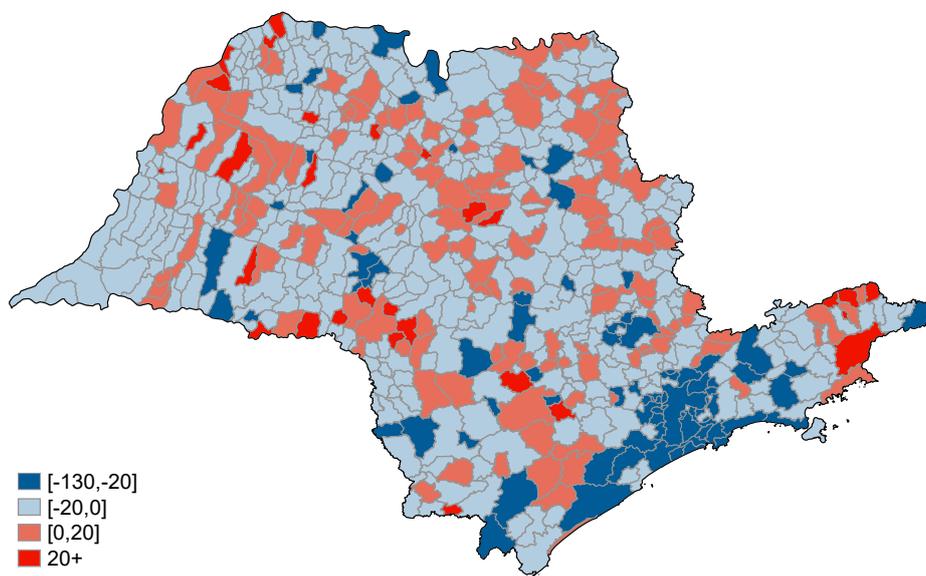fected municipalities differently, providing a valuable source of variation for the empirical analysis.

FIGURE 3: VARIATION OF HOMICIDE RATES, 1997-2019

3.2   Dataset Construction and Summary Statistics

I collect data from several sources to build a balanced panel of firms in São Paulo state from 1997 to 2013.[3] The primary source of data is the *Relação Anual de Informações Sociais* (RAIS), a yearly matched employer-employee administrative dataset from the Brazilian Ministry of Labor providing information on the universe of formal labor contracts and establishments in the country. I gather information about firm size, sector, and workers' characteristics from this dataset. I focus on establishments from the retail and wholesale trade sectors that were active for at least one year within the 1997-2013 period.

Second, I use an administrative dataset from the Brazilian Federal Tax Authority, the *Cadastro Nacional da Pessoa Jurídica*, that provides information on firm creation and enables the measurement of firm entry across treated and non-treated locations. The third source of data is the Brazilian Ministry of Health's administrative records (DATASUS–

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[3]Brazil experienced its most severe recession in decades during the 2014–2016 period. To avoid potential contamination arising from differential impacts of the economic crisis across sectors and municipalities, I exclude data from 2014 onward.

SIM), which contain detailed information on deaths from homicides and other causes classified according to the International Statistical Classification of Diseases and Related Health Problems (ICD). Together with data on population estimates from the Brazilian Census Bureau (IBGE), I build local homicide rates, which are used to define those firms that were most affected by the downward trend of state violence.

The final sample consists of 9,719,988 firm-year observations, corresponding to 571,764 unique firms. Table 1 reports basic summary statistics separately for retail and wholesale firms. Panel A shows that before the historic decrease in São Paulo's homicide rate, wholesale firms were initially more likely to remain active and to enter the market. In the 2001-2013 period, however, retail firms became relatively more likely to remain active and keep reporting RAIS. In terms of size and wages, wholesale firms initially had more workers, were hiring more, and paid higher salaries. In the later period, these differences were still present but relatively smaller. This pattern suggests that the retail and wholesale sectors were differently affected by the decrease in the state's violence, with retail firms growing relatively more.

TABLE 1: SUMMARY STATISTICS

	Wholesale (# of firms = 57, 454)		Retail (# of firms = 514, 310)	
	Mean	Std. Dev.	Mean	Std. Dev.
Panel A: 1997-2000 period				
Firm in RAIS	0.237	[0.425]	0.226	[0.418]
Firm entry	0.428	[0.495]	0.401	[0.490]
Number of workers	2.2	[13.0]	1.3	[9.2]
New hires	1.0	[8.4]	0.8	[5.1]
Average wage (in minimum wages)	1.12	[3.26]	0.77	[1.73]
Average wage of new hires (in minimum wages)	0.67	[2.60]	0.48	[1.36]
Panel B: 2001-2013				
Firm in RAIS	0.289	[0.453]	0.313	[0.464]
Firm entry	0.780	[0.414]	0.760	[0.427]
Number of workers	3.1	[19.9]	2.3	[15.0]
New hires	1.6	[13.2]	1.5	[9.5]
Average wage (in minimum wages)	1.00	[2.93]	0.69	[1.31]
Average wage of new hires (in minimum wages)	0.62	[2.22]	0.46	[1.05]

Notes: Panel A reports the averages within wholesale and retail trade firms in the 1998-2000 period. In Panel B, I calculate the same averages but for the period of historical decrease in homicide rates. All averages are weighted by the municipality's population in 2000.

Nevertheless, sectors are not uniformly distributed across municipalities. It could be the case that retail firms were disproportionately located in municipalities that were

more affected by the decrease in violence. In fact, Figure 3 shows that São Paulo's municipalities were differently affected during the period, with some even showing an increase in crime, especially in the state's smaller municipalities. In the next sections, I leverage several sources of variation, including differences in municipalities, to formally analyze the difference in how retail and wholesale firms were affected by the decreasing violence.

4   Empirical Strategy

The model yields many specific predictions I can test using the dataset on the universe of São Paulo's establishments. Specifically, I assess the relative impact of crime reduction in retail trade activity, revenues, and cost structure by exploiting three different sources of variation in the data and using a triple-difference estimator (Gruber, 1994). First, I compare the years before and after 2001, the first year of the historic reduction in the state of São Paulo's homicide rate (Figure 2). Then, I rely on the cross-sectional variation of local homicide rates in 2000 to define the group of municipalities arguably most affected by the statewide downward trend. Specifically, I include in the treated group those firms located in municipalities that were initially riskier (top quartile of the homicide rate), while the control group is composed of firms located in all the other safer locations. Finally, given the interest in how different sectors react, I compared retail and wholesale trade.

Similar to Deschenes, Greenstone and Shapiro (2017) and Burga et al. (2025), I estimate the following triple-difference (DDD) specification:

$$Y_{ismt} = \beta_0 + \beta_1(Treated_m \times Post_t \times Retail_s) + \gamma_{ms} + \eta_{st} + \lambda_{mt} + \epsilon_{ismt} \tag{7}$$

where Y_{ismt} is the outcome variable for firm i in sector s, municipality m, and year t. $Post_t$ and $Retail_s$ are dummy variables indicating the post-2000 period and a firm from the retail trade sector, respectively. $Treated_m$ is also a dummy variable that indicates a municipality from the top quartile of the 2000 homicide rate. I include a full set of fixed effects combinations to isolate and focus only on the relative effect on retail trade. γ_{ms}, η_{st}, and λ_{mt} represent, respectively, sector-municipality, sector-year, and municipality-year fixed effects.

In settings where treatment is at the municipality level, but only a subset of the population of firms within municipalities is potentially affected, the usual diff-in-diff identification hypothesis of parallel trends can be relaxed. In fact, when estimating such models, we are implicit assuming that the outcome of the group of affected firms relative to non-affected firms in treated municipalities to trend in the same way as the relative outcome of

these groups of firms in control municipalities were it not for the historic reduction in the São Paulo state's homicide rate (Olden and Møen, 2022; Baker et al., 2025).[4] I provide evidence on the validity of this conditional parallel trends assumption by estimating an analogous version of the equation (7) in an event-study framework. Formally, I estimate the following regression:

$$Y_{ismt} = \alpha_0 + \sum_{t=1998}^{2013} \alpha_t(Treated_m \times Year_t \times Retail_s) + \lambda_{mt} + \eta_{st} + \gamma_{ms} + \theta_i + \epsilon_{ismt} \quad (8)$$

where $Year_t$ is a dummy variable equal to 1 for year t and all other variables are defined as before. The $Year_t$ variable for 2001 is omitted, so that the first year prior to the crime rate historic decrease is the reference point in the event-study analysis. Our parameters of interest in this case are the year-specific coefficients α_t.

In the next section, I start by documenting the impact of the violence reduction on firms' average size and the entry decision. These exercises shed some light on the crime's effect on firms' outcomes, but not on how these outcomes emerge. To test potential mechanisms, I pretend to use data on operating margins, sales, and costs in the next version of the paper.

5   Main results

5.1   Firms' size and entry

Tables 2 and 3 report estimates for β_1 from equation (7). While the former explores the effect of crime reduction on the intensive margin of the retail trade sector relative to wholesale by looking at the employment level and hiring intensity, the latter looks to the extensive margin and the entry likelihood. In both tables, columns (1) and (3) include sector-municipality, sector-year, and region-year fixed effects, whereas columns (2) and (4) include municipality-year instead of region-year. In all columns, observations are weighted by the municipality's population in 2000.

Estimates from Table 2 suggest that retail firms in treated municipalities become relatively larger regarding the number of workers after 2001. Columns (1)-(2) show that the employment level is higher in the retail sector and treated locations, while

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[4]In settings in which treatment adoption is non-staggered, the DDD estimator can be viewed as the difference between two usual diff-in-diff estimators. In this case, as long as the potential bias in diff-in-diff estimators is the same, the DDD estimator will have a causal interpretation (Olden and Møen, 2022).

columns (3)-(4) suggest that this increase is coming almost entirely from an increase in the hiring intensity and not from a reduction in layoffs. In both cases, point estimates are remarkably stable across specifications. The most comprehensive specification, presented in columns (2) and (4), suggests that retail firms located in the most violent municipalities experienced a relative increase of 4.7% in total employment and 3.9% in new employees.

These results are consistent with the theoretical prediction from Proposition 1. The increase in competition in the retail sector, motivated by the crime reduction in the state, has led to an optimal increase in the production of firms from this sector. This higher output induces an increase in labor demand relative to wholesale firms' demand.

TABLE 2: RELATIVE EFFECT OF CRIME DECREASE ON RETAIL EMPLOYMENT

	Log of Employment		Log of New Hires	
	(1)	(2)	(3)	(4)
Treated Municipality	0.0222***	0.0470***	0.0173***	0.0386***
× Post 2001	[0.0061]	[0.0072]	[0.0048]	[0.0053]
× Retail Firm				
Sector × Municipality	X	X	X	X
Sector × Year	X	X	X	X
Region × Year	X		X	
Municipality × Year		X		X
Observations	9,719,988	9,719,988	8,576,460	8,576,460
Adj. R-squared	0.01	0.01	0.01	0.01

Notes: In brackets, standard errors are clustered at the municipality level. Regressions are weighted by the municipality's population in 2000. Significance at the 10% level is represented by ∗, at the 5% level by ∗∗, and at the 1% level by ∗∗∗.

Table 3 presents results on the extensive margin. Columns (1)-(2) show that retail firms in treated municipalities become relatively more likely to remain active after 2001. Moreover, using data on firm creation, columns (3)-(4) show that the entry likelihood is relatively higher in the retail sector and treated locations. Similar to results on the intensive margin, point estimates are remarkably stable across specifications and precisely estimated. In particular, columns (2) and (4) suggest that retail firms experienced a relative increase of 3.1% in the probability of remaining active, while the sector itself experienced an increase of 2.7% in the entry of new firms.

This relative increase in the entry likelihood of retail firms is a particular case of the model, in which retail and wholesale goods are sufficiently substitutable (Proposition 2). When goods from the two sectors are close substitutes, a reduction in the local market power of retail firms, driven by declining violence, should be associated with a relative

TABLE 3: RELATIVE EFFECT OF CRIME DECREASE ON RETAIL ACTIVITY

	Firm active in t		Firm Entry	
	(1)	(2)	(3)	(4)
Treated Municipality	0.0106**	0.0305***	0.0144***	0.0266***
× Post 2001	[0.0046]	[0.0047]	[0.0028]	[0.0048]
× Retail Firm				
Sector × Municipality	X	X	X	X
Sector × Year	X	X	X	X
Region × Year	X		X	
Municipality × Year		X		X
Observations	9,719,988	9,719,988	9,719,988	9,719,988
Adj. R-squared	0.02	0.01	0.20	0.20

Notes: In brackets, standard errors are clustered at the municipality level. Regressions are weighted by the municipality's population in 2000. Significance at the 10% level is represented by ∗, at the 5% level by ∗∗, and at the 1% level by ∗ ∗ ∗.

rise in new firm entry. Conversely, if the goods are not substitutable, a decrease in the perceived risk of victimization associated with visiting retail establishments would not necessarily lead to a shift in consumer demand from wholesale to retail goods. In such a scenario, the relative attractiveness of the retail sector to potential entrants would respond less strongly to improvements in public safety.

Heterogeneous effects on the intensive margin. I also investigate whether the observed effects on employment and firm size vary by employee gender. The idea is to capture the effect of crime reduction on the main victim group of violent crime and homicides in Latin America: young men. Appendix Table A.1 shows that the effects are almost entirely concentrated on employment and hiring of male workers, particularly those aged 18 to 25. This pattern suggests that the relative increase in retail firms' size is driven not only by increased labor demand but also by a rise in labor supply from the demographic group most affected by homicides.[5]

5.2 Dynamic Effects

I provide evidence that parallel trends hold in my DDD setting by using an event-study framework, which also allows me to assess the relative dynamic effect on retail firms during

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[5]Appendix Figure A.2 shows the event study results for the employment effect decomposed by gender.

the entire period of decreasing crime. Figures 4 and 5 present the estimated coefficients graphically, together with the respective 90% cluster-robust confidence intervals, for the results on both margins.

Figure 4 suggests that before 2001, the year in which the state's homicide rate began to fall, total employment and admissions displayed similar trajectories across retail and wholesale firms. As soon as the violence started decreasing, these trends decoupled. By the end of 2013, retail firms were experiencing a relative increase in employment of around 0.12 log points, which seems to be almost entirely concentrated in a relative increase of hiring intensity.
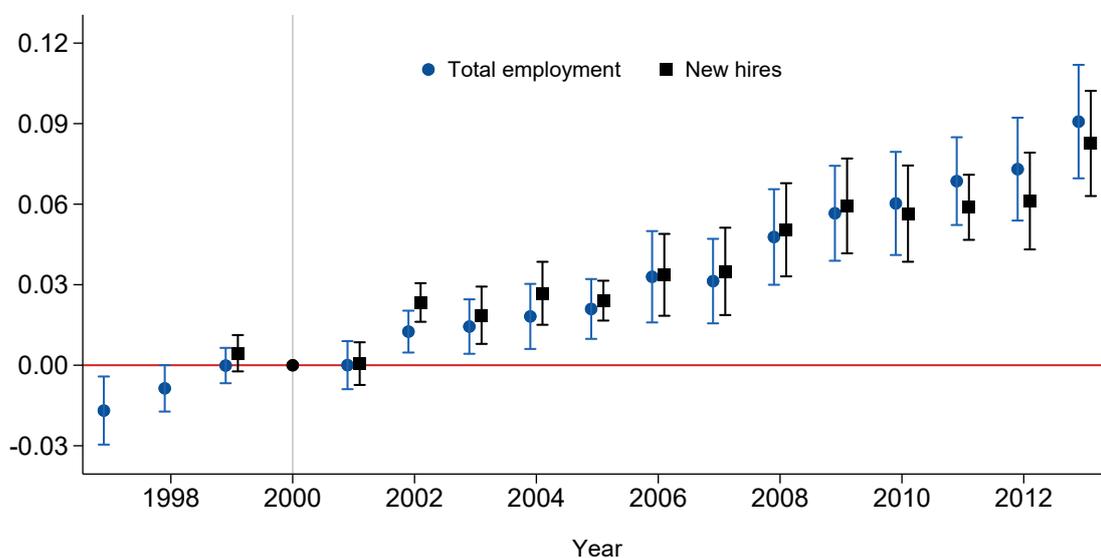

FIGURE 4: DYNAMIC EFFECTS ON RETAIL EMPLOYMENT

Despite less robust evidence on the validity of parallel trends, Figure 4 suggests that the decrease in the state's crime rates increased the influx of entrants in the retail sector during the 2000s. Contrary to the effect on the intensive margin, however, it took a couple of years for the positive effect on entry to become statistically significant.

Together, Figures 5 and 4 suggest that entrants took more time than incumbents to incorporate the costs and benefits of violence reduction. The evidence of a positive effect in the extensive margin already in the first year after 2001, while the intensive margin took a couple of years to react, is consistent with the idea that entrants needed time to acquire information about the new context before paying the entry cost.

Appendix Table A.2 indicates that the positive effect on the logarithm of employment was concentrated on incumbent firms, defined as those that entered the market before
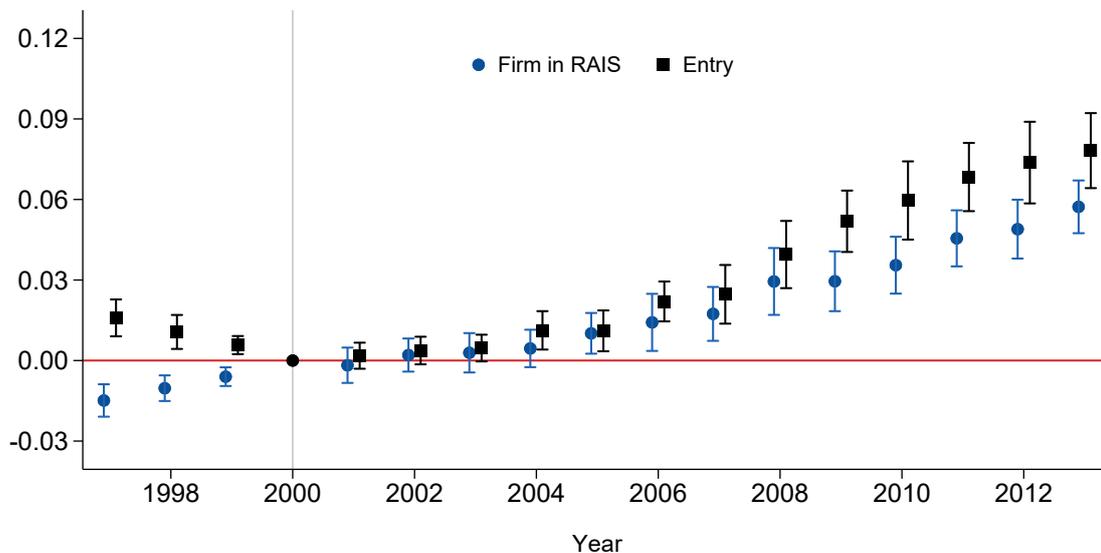
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FIGURE 5: DYNAMIC EFFECTS ON RETAIL ACTIVITY

2001. Furthermore, the effect appears to be driven entirely by initially larger firms, as the coefficient on the interaction of $(Treated \times Post \times Retail)$ with a dummy for firms with fewer than six employees is negative and statistically significant. This also suggests that smaller, and potentially less productive, retail firms were negatively affected by the reduction in violent crime, consistent with the assumption that lower levels of violence intensify competition within the sector.

6   Concluding Remarks

This paper examines, both theoretically and empirically, how violence differentially affects firms across sectors. Leveraging multiple sources of variation during the sharp decline in violent crimes in the Brazilian state of São Paulo in the 2000s, I show that firms in the retail trade sector experienced a relative increase in size, hiring intensity, and entry likelihood compared to wholesale firms. These results are consistent with the idea that retail firms are more vulnerable to crime due to their reliance on physical customer visits and the fact that crime reduces people's propensity to walk in public spaces.

In addition to effects on the intensive and extensive margins, the proposed model predicts that both the relative revenue and costs are negatively related to violence. A reduction in violent crime could trigger an increase in sales (more people passing by), while simultaneously raising costs (more production leading to a higher demand for labor).

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The overall effect on profits depends on the degree of substitutability between goods produced by retail and wholesale firms. As a next step, to explore empirically these relative effects on revenues and cost structure, I will use data from a representative sample of the Brazilian commerce sector.

These findings contribute to the existing evidence on the relationship between violence and firm performance by highlighting sectoral heterogeneity in responses to crime. To assess how crime affects aggregate productivity through sectoral reallocation and incorporate these ideas in a formal model of misallocation is a potentially fruitful avenue of future research.

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Online Appendix for "Firm Performance, Sectoral Composition, and Violence"

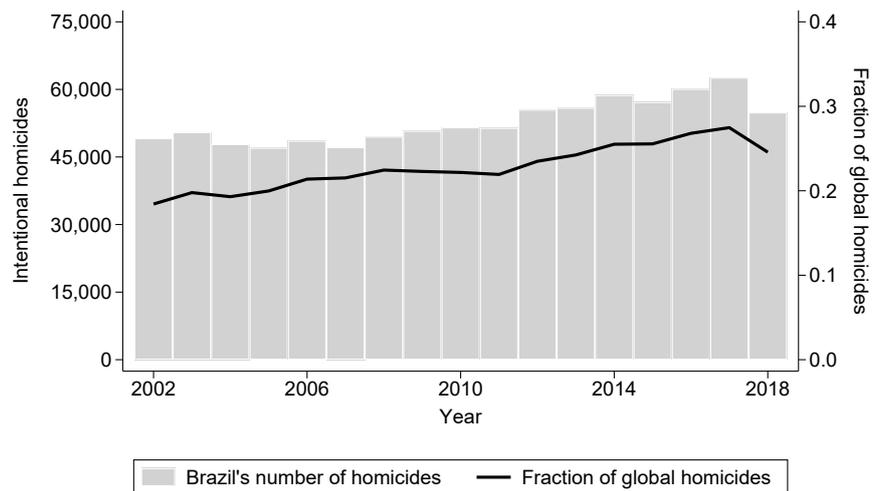Danilo Souza[1]

A   Additional Tables and Figures

FIGURE A.1: BRAZIL PARTICIPATION IN GLOBAL VIOLENCE, 2002-2018
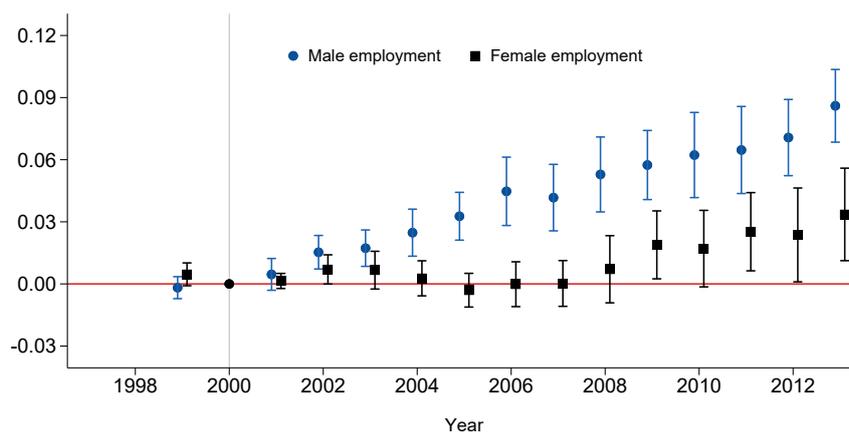
Source: World Development Indicators, World Bank.

FIGURE A.2: DYNAMIC EFFECTS ON RETAIL EMPLOYMENT - GENDER

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[1]Department of Economics, University of São Paulo, Brazil (danilosouza@usp.br)

TABLE A.1: EMPLOYMENT DECOMPOSITION BY GENDER AND AGE

	Log of Employment			Log of New Hires		
	Total Male	Males Aged 18-25	Total Female	Total Male	Males Aged 18-25	Total Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treated Municipality × Post 2001 × Retail Firm	0.0451*** [0.0082]	0.0214*** [0.0034]	0.0085 [0.0063]	0.0418*** [0.0069]	0.0201*** [0.0047]	0.0103** [0.0051]
Sector × Municipality	X	X	X	X	X	X
Sector × Year	X	X	X	X	X	X
Municipality × Year	X	X	X	X	X	X
Observations	8,576,460	8,576,460	8,576,460	8,576,460	8,576,460	8,576,460
Adj. R-squared	0.01	0.00	0.01	0.01	0.00	0.01

Notes: In brackets, standard errors are clustered at the municipality level. Regressions are weighted by the municipality's population in 2000. Significance at the 10% level is represented by ∗, at the 5% level by ∗∗, and at the 1% level by ∗∗∗.

TABLE A.2: RELATIVE EFFECT OF CRIME DECREASE ON RETAIL SECTOR - HETEROGENEITY

	Log of Employment			Log of New Hires		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated Mun. × Post × Retail	0.0470*** [0.0072]	−0.0148** [0.0072]	0.0827*** [0.0074]	0.0386*** [0.0053]	0.0433*** [0.0054]	0.0921*** [0.0055]
Treated Mun. × Post × Retail × Incumbent		0.1332*** [0.0004]			−0.0102*** [0.0006]	
Treated Mun. × Post × Retail × Small			−0.1358*** [0.0021]			−0.2029*** [0.0022]
Sector × Municipality	X	X	X	X	X	X
Sector × Year	X	X	X	X	X	X
Municipality × Year	X	X	X	X	X	X
Observations	9,719,988	9,719,988	9,719,988	8,576,460	8,576,460	8,576,460
Adj. R-squared	0.01	0.02	0.02	0.01	0.01	0.02

Notes: In brackets, standard errors are clustered at the municipality level. Regressions are weighted by the municipality's population in 2000. Significance at the 10% level is represented by ∗, at the 5% level by ∗∗, and at the 1% level by ∗∗∗.