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Police Violence and the Underreporting of Crime

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Abstract

This paper examines the relationship between police violence and the reporting of crime. Utilizing original data from a large-scale household survey conducted in Costa Rica from October 2013 to April 2014 (n = 4,200), we find that the observation of police violence significantly reduces citizens' willingness to report crime. The implications of this finding are explored using a game-theoretic model of crime, crime reporting, and police misconduct. The model reveals that although the prospect of police violence against criminals may generate a degree of deterrence for criminal behavior, permissiveness toward police violence also raises expectations about the likelihood of police abuse against law-abiding citizens. Consistent with our empirics, this reduces citizens' propensity to report crime, thereby fostering a climate of impunity for criminal activity.

1 | INTRODUCTION

A requirement for the prosperity and well-being of any society is that it contains policing and judicial institutions willing and able to protect the property and physical security of its citizens. Throughout the developing world, many governments are failing to meet this minimal obligation. This appears to be especially true for a growing number of areas in Latin America and the Caribbean. Overall, the region is the most violent in the world. According to recent estimates, the homicide rate in this region is 21.8 per 100,000 inhabitants. With 9% of the world population, the region registers 33% of the world homicides; followed by Africa (31%) and Asia (28%); and trailed by large margins by Europe (5%) and North America (3%) (Jaitman, 2015; based on UNODC data). Moreover, the region is the only one in which homicides have been increasing since 2005 (Jaitman, 2015). And homicides are just a small part of the story. Although reliable data are difficult to find, robberies have also increased significantly in the last decade and, on average, 6 out of 10 of those robberies are violent (PNUD 2013, cited in Jaitman, 2015). According to recent

victimization surveys, nearly one in five citizens in Latin American and the Caribbean is a victim of some type of crime in a given year (LAPOP 2012). Of these, less than half claim to have reported the crime they experienced to authorities.

A consideration of the extant evidence on the social and economic consequences of crime lays bare the enormous costs of violence in the region. For the case of rural Brazil, Koppensteiner and Manacorda (2013) show that exposure to violence during pregnancy leads to an increased frequency of low birthweight births. Exploiting a natural experiment in Peru, Agüero (2013) finds that instances of domestic violence against women in that country have produced a variety of negative short-term health outcomes in children. A recent study based upon microdata in Brazilian cities estimates that increasing the sense of security of homeowners by one standard deviation (on a survey measure) would increase average home values by US$757, or by about US$13.6 billion total in their sample (Vetter, Beltrão, & Massena, 2013). A similar study conducted in Bogotá, Colombia, finds that households in the highest socioeconomic stratum are willing to pay up to 7% of their house values to avoid a one standard deviation increase in the homicide rate (Gaviria, Medina, Morales, & Núñez, 2010). Such attempts at crime insulation naturally generate important distributional effects: recent work on Argentina finds that the poor are unable to use private sector remedies to mitigate their exposure to crime, so a disproportional amount of the economic suffering during crime waves is borne by them (Di Tella, Galiani, & Schargrodsky, 2010).

Latin Americans seem to be fully aware of the seriousness of the situation. Indeed, crime and public security is identified as the most important problem in the region as a whole (followed by unemployment and economic issues), and in 13 out of 18 countries (Argentina, Bolivia, Chile, the Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay, and Venezuela) (Latinobarómetro, 2015). However, in spite of the very high premium placed on security in the region, instances of direct citizen collaboration with police to reduce crime are rare. The most basic, and in many respects most fundamental, form of collaboration with police would be if crime victims consistently reported their experiences to the police. Unfortunately, many victims and observers of crime are reticent to report illegal activities to the police. As a consequence, crimes reported to police are a fraction of those that are actually experienced by citizens.

Comparing data obtained from victimization surveys and from official records provides a sense of scope of the problem of crime non-reporting. Soares (2004b) compares data from these two sources for three types of crimes: thefts, burglaries, and contact crimes (such as robberies, sexual incidents, and threats/assaults) and the differences are striking. According to official records, victimization rates were 2.1% for thefts, 0.7% for burglaries, and 0.3 for contact crimes. According to the victimization survey, however, the rates were 25.1% for thefts, 6.7% for burglaries, and 7.7 for contact crimes – a remarkable contrast.[1]

In Costa Rica, according to data from the National Household survey, only 29.7% of the crimes committed in 2014 were reported (INEC and PNUD 2015). Our own data from a survey we conducted in Costa Rica shows that 24% (994/4,200) of the respondents or members of their family suffered a theft or attempted theft taking place in the street, their house, or car during the previous year, but only 43% reported the incident to the police. The number of victims of robbery in the home was 9%; of those only 42% reported the crime to the police. In terms of witnessing criminal activities, 38% of our respondents reported having witnessed drug trafficking, but only 24% of those individuals reported it to the police. In sum, we are facing a puzzling situation. Crime and violence are among the

[1] The sources in Soares (2004b) are United Nations Survey of Crime Trends and Operations of Criminal Justice Systems (UNCS) for the official records, and the International Crime Victimization Survey (ICVS) for self-reported victimization. The dataset contains data from 46 countries, with measurements taken in the 1990s.

most serious problems Latin American countries are facing today, and citizens seem to be fully aware of this fact. Yet, the willingness of citizens to themselves collaborate with state authorities by reporting criminal activities does not match the level of concern with the issue.

In this paper, we explore the conditions that affect such collaboration. More specifically, we study the impact of one potentially important inhibitor of crime reporting: the observation of police brutality. We address the relationship between police brutality and crime reporting at both an empirical and theoretical-level.

Empirically, we examine the link between direct observation of police violence and propensity to report crime through the analysis of original survey data from a large-scale household survey conducted in the Gran Área Metropolitana (GAM) of Costa Rica from October 2013 to April 2014 (n = 4,200). This survey is unique in its simultaneous focus on citizens' prior observations of police violence and its extensive battery of questions on willingness to report crime. Holding constant individual demographics, past experiences, social networks, and neighborhood characteristics, the data show that citizens who directly witness police violence are far less likely to report a wide variety of crimes – both when they are victims of crime and when they are witnesses of crime. Given that the institutional features of Costa Rica (discussed below) would tend to weigh against such a finding, we surmise that this relationship is likely to hold for other countries in the region.

Subsequent to establishing the empirical link between police violence and the non-reporting of crime using the Costa Rica data, the paper develops a novel theoretical framework that traces out the implications of our findings for attempts to combat crime. The framework, which consists of a game-theoretic model of crime, crime reporting, and police misconduct, homes in on the question of how institutional arrangements that give police wide latitude to act violently against suspected criminals are likely to affect the incidence of crime in the long run. Our model incorporates the possibility that such latitude may act as a deterrent to criminal activity, yet it nevertheless reveals that – at the limit – high levels of latitude are likely to encourage crime. The key mechanism, following the empirical results, is the non-reporting of crime. Institutionalized permissiveness toward police violence raises expectations about the likelihood of police abuse against law-abiding citizens. This inhibits crime reporting by victims, thereby fostering a climate of impunity.

2 | DETERMINANTS OF CRIME REPORTING

Given the widespread consensus about the seriousness of the problem of crime in Latin America, why do so many victims and witnesses of crime fail to report it when it occurs? Most of what we know today about the determinants of crime reporting is based on research conducted in the developed world. With few exceptions, relatively little has been done to study this issue in middle income and poor countries (cf. Estienne & Morabito, 2016). However, the available evidence suggests that the determinants of crime reporting across developed and developing countries might not be the same. National context seems to be crucial in explaining reporting since huge disparities exist in crime reporting rates across the globe (Estienne & Morabito, 2016; Soares, 2004a,b). For instance, according to the International Crime Victims Survey (ICVS) data, the self-reported rate of victimization for theft in Denmark is 11%; while the rate of theft reported to police is 8%, so around 28% of thefts go unreported. In contrast, Georgia has a rate of self-reporting of thefts of 18.9% and a rate of police-reported thefts of 5.5%, so the rate of unreported thefts is approximately 71%.[2] One can find even more extreme cases. According to a comparison of victimization surveys and administrative records

[2] Calculations based on data reported in Van Wilsem (2004).

in Peru and El Salvador, the rate of non-reporting for theft in those countries is estimated to be a remarkable 99.1% and 99.3%, respectively (UNDP, 2013, pp. 3-4).

Following most of the literature, we understand the decision to report as a result of a cost-benefit analysis conducted by crime victims: individuals report crimes because they expect to receive some benefit from doing so. Such benefits could be material (reporting in order to be able to claim compensation from an insurance company) or psychological (reporting because it fulfills one's perceived civic duty or generates satisfaction from seeing the perpetrator be punished). When individuals decide to report a crime, they consider possible outcomes from reporting and evaluate the costs and benefits of those different outcomes. In terms of the former, the cost of reporting a crime depends mainly on the access to police and the judicial system. In terms of the benefits, these basically depend on the efficiency and trustworthiness of the police and other institutions in charge of enforcing the law (Soares, 2004a). For instance, a citizen is more likely to report a crime if the police station is closer to her home (cost is low) and she believes that the crime is likely to be solved (the potential material or psychological benefit is high).

Costs and benefits of reporting, in turn, are affected by individual and context-level characteristics that have an effect on rates of reporting across individuals, across crimes, and across countries. The literature so far has identified four different types of determinants of crime reporting: the specific characteristics of the crime, victim characteristics, national context, and police-related variables. First, the characteristics of the crime are key. In this regard, the most important factor is the seriousness of the crime. Whether the crime was only attempted or actually consummated, the degree of material or financial loss, the use of a weapon or violence, and the extent of injuries (if any), are all factors that affect the likelihood that a crime is reported to the authorities (Bowles, Reyes, & Garoupa, 2009; Estienne & Morabito, 2016; Gottfredson & Hindelang, 1979; Goudriaan, Lynch, & Nieuwbeerta, 2004; Skogan, 1984; Tarling & Morris, 2010). As noted by Estienne and Morabito (2016), the more serious the crime, the higher the benefits of reporting, such as the benefit of seeing the perpetrator punished and the belief that the crime will be successfully pursued within the system.

Second, victim characteristics can also explain differences in reporting. For instance, women (Tarling & Morris, 2010) and older victims (Bosick, Rennison, Gover, & Dodge, 2012; Skogan, 1984; Tarling & Morris, 2010) are more likely to report crimes. Third, national contextual variables have also been associated with crime reporting. The most significant of these variables is economic development (usually measured as income per capita). Since development generally increases the benefits of reporting and reduces its cost, richer countries tend to have significantly higher levels of reporting (Soares, 2004a,b). Greater development lowers costs of reporting because it leads to more police presence, more police stations, better transportation to access these police stations, higher levels of urbanization, and so on. It increases the benefits because wealthier countries typically have more professional and less corrupt police departments and judicial systems.

This leads to the fourth main group of determinants of crime reporting: citizen perceptions of the police. A contingent of scholars examining diverse populations around the world has presented evidence showing that perceived police competence, effectiveness, and fairness have a positive effect on the likelihood of crime reporting. Utilizing ICVS data for 16 advanced industrial democracies, Goudriaan et al. (2004) find that the perceived competence of the police plays an important role in the reporting of property crimes. Xie, Pogarsky, Lynch, and McDowall (2006) examine data from the National Crime Victimization Survey in the United States and find that the professionalism of police in handling crime reports, in particular, the effort they dedicate to investigating the crime, positively affects the likelihood of subsequent crime reporting by victims. In a study of in-person interviews of citizens conducted in Trinidad and Tobago, Kochel, Parks, and Mastrofski (2013) report that decisions to report crime appear to be driven by perceptions of the legitimacy of the police.

Just as police professionalism appears to encourage crime reporting, existing evidence suggests that malfeasance by the police may reduce it. Along these lines, survey work conducted in Ghana by Justice Tankebe suggests that the perceptions of police efficacy play an important role in crime reporting, and that knowledge of incidents of police malfeasance erodes the said perceptions (Tankebe, 2009, 2010). Similarly, in a cross-national study of 33 countries, Soares (2004b) finds that perceptions of corruption are a significant factor in explaining non-reporting for theft, burglaries, and contact crimes.

Studies on the specific impact of police violence remain relatively scarce, although this appears to be a topic of increasing scholarly concern. Most work on the issue provides evidence consistent with the notion that police violence may dampen collaboration with the police, including crime reporting. In interviews conducted with high-risk youth in Philadelphia, Carr, Napolitano, and Keating (2007) report that crime non-reporting among their subjects appeared to have been driven by adverse interactions with the police, including the excessive use of force. In a recent study of residents of Lagos, Nigeria, Akinlabi (2016) finds that both the experience and perception of police abuse and brutality are associated with cynicism toward and non-compliance with the law.

Event studies examining the impact of widely publicized incidents of police violence in the United States also suggest that brutality may erode collaboration with the police. For instance, Weitzer (2002) utilizes panel surveys to examine attitudes toward the police before and after high-profile incidents of police violence in Los Angeles and New York, finding that such incidents erode confidence in the police. Desmond, Papachristos, and Kirk (2016) employ 911 call data by city blocks and an interrupted time series design to examine how the public dissemination of information about the beating of an unarmed Black man by police affected crime reporting in the city of Milwaukee. They find a significant reduction in 911 calls from Black neighborhoods in the weeks following the dissemination of the incident.

Our paper builds upon and extends this literature in three important ways. Firstly, our paper provides the first examination of police misconduct on crime reporting in Latin America, as well as the first large-scale study of this topic in a developing country context that draws upon the tools of modern program evaluation. Given Latin America's status as the world's most violent region and its exceptional challenges in encouraging crime reporting, in-depth examinations of the factors inhibiting such reporting within the region are sorely needed. Moreover, the large scale of the survey we conducted in Costa Rica permits us to match observers of police violence to non-observers in a fine-grained and highly exact way, thereby buttressing the credibility of our conclusion that police violence inhibits the willingness to report crime. A second contribution of the paper is the fact that our empirical analysis is based upon an assessment of willingness to report across a wide variety of different types of crime. Given the extensive evidence suggesting that the nature of the crime plays an important role in crime reporting, the fact that we gauge the inclination to report across various types of crimes imbues our analysis with a degree of robustness that many studies lack. Finally, our paper extends the existing literature by developing the first general theoretical model of the interplay between institutional permissiveness toward police violence, the reporting of crime, and decisions by potential criminals to engage in criminal activity.

3 | POLICE VIOLENCE AND CRIME REPORTING IN COSTA RICA

We begin our investigation with an empirical analysis of how personal observation of incidents of police violence affect individuals' willingness to report crime, focusing on the Central American

country of Costa Rica. The country is a particularly apt unit of analysis, since in many ways it is a "least likely" case for a finding that police violence erodes citizen collaboration with police. Crime and police brutality are low by regional standards and democratic institutions and the rule of law are strong. According to the estimates of Jaitman (2015, based on UNODC data) mentioned above, the homicide rate in Costa Rica is 8.5 per 100,000, whereas the regional average is 20 per 100,000 inhabitants.[3] In terms of the frequency of the most commonly perpetrated street crimes, Costa Rica is more representative of the region, with 14.3% of Costa Ricans claiming to have been victims of burglary or theft, and 11.3 of contact crimes (robberies, sexual incidents, and assaults) (Soares & y Naritomi, 2010). Yet, these numbers are only slightly worse than what one finds in industrialized nations such as the United States, where 8.4% have been victims of burglary, 9.5 of thefts, and 9.6 of contact crimes (ibid.).

In terms of its institutions, Costa Rica is among the best performers in the region. An uninterrupted democracy since 1949, the country has one of the oldest and strongest democratic systems in Latin America. According to the Freedom House measure of democracy, Costa Rica scores 90/100, with only Uruguay (98/100) and Chile (95/100) getting better scores. This institutional strength appears to generally apply to the country's police forces as well. A recent study on police abuse in Latin America found that the rate of victimization at the hands of the police was the fourth lowest in the region, with 2.8% of Costa Ricans experiencing police abuse in a given year (Cruz, 2009). Given these characteristics of the Costa Rican case, there is reason to believe that a finding of a strong link between witnessing police violence and the non-reporting of crime in this country would extend to other countries in the region where concerns about police abuse are likely to be even more salient.[4]

3.1 | Data

To assess the effect of police violence on crime reporting, we conducted a face-to-face household survey during October 2013–April 2014 in the Gran Área Metropolitana (GAM) of Costa Rica. The GAM is the principal urban center in the country and it includes 30 cantons in the provinces of San José, Heredia, Cartago, and Alajuela. With approximately 2.6 million residents, it contains 60% of the total population. The survey targeted residents of this area 18 years or older. The sample size of the survey was 4,200 respondents. To sample the population, we used a two-stage stratified random sampling design (with fixed proportions defined for gender and age groupings). Additional details about the survey methodology are provided in the Appendix.

[3] By comparison, the highest rates in the region are found in Honduras (90.4) and Venezuela (53.7), while the lowest are in Cuba (4.2) and Chile (3.1). The UNODC data cited by Jaitman (2015) is from 2012. A different local source reports a homicide rate in Costa Rica of 8.7 per 100,000 inhabitants for that same year, and a rate of 10.0 per 100,000 for the year 2014 (Poder Judicial de Costa Rica 2016).

[4] Our characterization of Costa Rica as a hard case for our theory is based on the assumption that in a low crime/good institutions environment, citizens who witness police brutality would be more inclined to believe that it was a rare occurrence and therefore less likely to change their priors. In contrast, it could be argued (and we thank one of the anonymous reviewers for calling our attention to this) that precisely in a low crime/good institutions environment, where citizens priors about police violence are "good," it might be easier to move those priors when witnessing an instance of police violence. In that case, Costa Rica would be an easy case, instead of a hard one as we argue. In our empirical analysis (see section 3.3), we find that the negative effect of police violence on crime reporting is present among respondents in both low and high crime areas, suggesting that our findings may be indeed be relevant to other countries with more/less crime than Costa Rica. In the end, whether our results travel to other settings with more crime and worse institutions is an empirical question that requires future research for a definitive answer.

Our independent variable of interest is an indicator variable denoting a citizen's direct observation of police violence. This variable takes on a value of 1 for individuals who reported that over the previous 12 months they had observed police violence being committed against citizens, 0 otherwise. Approximately 11% of the respondents in our sample, 468 in total, had observed police violence according to this standard.[5] Our dependent variables consist of a series of responses to seven questions about willingness to report crime. These questions present scenarios where the respondent is the victim of a crime as well as scenarios where the respondent witnesses crimes being committed. The incidents described in the questions were selected to reflect the most common types of crime that citizens in Costa Rica grapple with in their daily lives: robbery of valuables on the street, theft of valuables from one's home, drug sales, gang activity, and gun shots. Responses were coded on a four-point scale (highly likely, likely, unlikely, highly unlikely) indicating the respondent's stated likelihood of reporting the incident in question to the authorities. Table 1 presents the wording for these questions.

In our statistical analysis, we condition on an extensive set of covariates that may affect an individual's likelihood of observing police violence and that could also be related to her inclination to collaborate with authorities. In particular, we condition on four types of different covariates: individual demographic variables, indicators of relevant past experiences, indicators of social networks that may be relevant to crime and crime reporting, and variables capturing neighborhood characteristics.

In terms of individual demographics, we include the respondent's sex, age, level of education (primary or less, secondary incomplete, secondary complete, some technical education, some university education), citizenship status, an indicator variable for head of household, and several indicators of material wealth (ownership of a car, laptop, tablet, internet connection in the home). Our experience variables include an indicator variable denoting direct contact with a

TABLE 1 Questions on willingness to report crime

I am going to present to you a list of hypothetical situations. They deal with different types of criminal activities. For each situation, please tell me how likely it would be that you would report the incident in question to the police (either as a victim or a witness)
Ql. Imagine that you are walking on the street and someone snatches your purse or wallet. How likely is it that you would report this incident to the authorities?
Q2. Consider the same situation, but now the person who snatches your wallet threatens you with a weapon (a gun, knife, or any other). How likely is it that you would report this incident to the authorities?
Q3. Now imagine that thieves break into your house to rob it. How likely is it that you would report this incident to the authorities?
Q4. How inclined would you be to call the police to report a crime or suspicious activities in your neighborhood?
Q5. More specifically, if said crime consisted of someone selling drugs in the street, how inclined would you be to call the police?
Q6. And if the crime consisted of gangs or groups disturbing the peace, how inclined would you be to call the police?
Q7. And if you were in your home and heard gun shots, how inclined would you be to call the police?

[5] Policing in Costa Rica is divided among a number of units, with the three units most relevant to the everyday experiences of Costa Ricans being the Fuerza Pública (a national police force), the Transit Police, and the municipal police. As our question about police violence did not specify the particular unit of the perpetrator, the observed police violence reported by respondents should not be attributed to any specific police force.

police officer in the previous 12 months and an indicator variable denoting whether or not the respondent had been the victim of a crime in the previous 12 months.[6] The network variables include an indicator variable denoting whether or not the respondent personally knows a police officer and an indicator variable denoting whether or not the respondent knows someone indicted or convicted of a crime. Our neighborhood indicators are recorded at the level of the district. In Costa Rica, these are postal code areas and they are the smallest administrative units for which census data are available. Our district-level variables, measured in the 2011 census, include the percentage of households for which basic necessities are being unmet, population density, percentage of individuals with higher education, percentage of households with a laptop, percentage of households with a car, percentage of households with internet access, and percentage of homes deemed to be in poor condition.[7]

3.2 | Identification and estimation

Our estimand of interest is the average treatment effect for the treated (ATT), the average impact of witnessing police violence for those who observed it. In estimating this quantity, we employ the so-called exogeneity assumption (cf. Imbens, 2004). The assumption requires that the analyst be able to observe and condition on all factors that contribute both to the likelihood that an individual observes police violence and to her willingness to report crime. In our study, exogeneity implies that conditional on an individual's demographic and socioeconomic background, personal experiences, social networks, and the characteristics of her neighborhood, whether or not she actually observes police violence in a given year is effectively random.

Although we acknowledge that exogeneity is a strict (and unverifiable) assumption that is difficult to satisfy in any observational setting, including ours, we would submit that the rich covariate set that we bring to bear in the analysis makes it a plausible basis for our analysis. The demographic characteristics utilized capture personal aspects of respondents potentially associated with the likelihood of witnessing police violence and which very likely would affect respondents' comfort level in reaching out to authorities after observing or being a victim of crime. The experience variables measure past instances of police contact or opportunities for said contact, thereby likely affecting the observation of police violence. The network variables represent aspects of familial and/or community relations which are likely to color views of police and the judicial system, and, through that channel, affect reporting behavior. Finally, the district variables capture aspects of a respondent's neighborhood likely to be associated with police activity and presence, elements crucial to the witnessing of police violence. While it is certainly possible that there remain unmeasured features of respondents correlated with both the likelihood of witnessing police violence and the propensity to report crime, it seems highly likely that these unmeasured features would be fairly strongly correlated with the features we do observe and condition on. Thus, we would expect that any violation of exogeneity – if present – is likely to be fairly minor.

Given the exogeneity assumption, estimating the ATT requires the implementation of a covariate conditioning strategy. We condition on the covariates using (one-to-one) nearest neighbor matching based on an estimated propensity score. This algorithm contains two steps. In the first, a

[6] An individual was classified as a crime victim if she or a family member had experienced one of the following: attempted robbery in the street, home, or of one's car, robbery of valuables in one's home, robbery in the street, robbery of one's car or of valuables contained therein.

[7] These data come from the website of Costa Rica's National Institute for Statistics and the Census (INEC), www.inec.go.cr.

logistic regression model is estimated that captures the propensity to observe police violence given the respondent and district characteristics captured by the set of covariates. In the second step, each respondent who observed police violence is matched to the single respondent not having observed violence who is most similar to the first in terms of the estimated probability of having observed violence based on the covariates. After creating a matched subset of the data in this way, we calculate the average differences in willingness to report crime across the matched pairs.[8] More specifically, given that we have four categories for each outcome variable, we calculate the proportion of responses in each category for the respondents who observed police violence, then subtract from this quantity the proportion of responses in the corresponding category among the matched respondents who did not observe police violence.[9]

We conduct the analysis in this way for two reasons. Presuming the exogeneity assumption is satisfied, the use of matching permits one to unbiasedly estimate the average treatment effect of interest without having to correctly specify the functional form relationship between the outcome and the covariates. Moreover, analyzing outcome categories separately similarly obviates concerns about functional form misspecification while also providing greater transparency in the data analysis (allowing the analyst to detect differences in the degree to which each category of response is affected by police violence). In any case, we supplement our matching analysis with estimations from regression-based approaches, generating findings that are highly similar in terms of the substantive conclusions that they support.

3.3 | Main results

Table 2 presents descriptive statistics on the unconditional relationships between respondents' previous observations of police violence and their willingness to report crime. Across every type of crime, individuals who had observed an instance of police violence in the previous year were less inclined to report crime than individuals who had not observed an instance of violence. Thus, a first look at the data is indeed consistent with the view that aggressive and violent policing may lead citizens to be more reluctant to collaborate with authorities on matters of crime enforcement. Of course, individuals who have observed police violence may be fundamentally different from those who have not in terms of personal characteristics, experiences, and environment in ways that could be associated with a disinclination to report crime. For this reason, we base our inferences about the impact of observing police violence upon our matching analysis that holds constant the potentially confounding influence of the respondents' characteristics and those of their communities.

Matching can only be considered successful in holding constant the influence of covariates if it creates balance in the distribution of covariates across the groups of primary interest in a study. To verify that our matching algorithm was indeed successful in creating balance in covariate values between the individuals who observed police violence and the matched individuals who did not, we calculated

[8] Our matching analysis utilizes the package Matching (Sekhon, 2015), written for the R statistical environment. Since missingness in our sample due to question non-response is very low (around 3%), we conduct complete case analyses throughout. Also, since we analyze each outcome variable separately and only remove observations with missingness pertinent to the particular outcome being studied, there are very slight variations in the set of observations utilized in the complete case analyses across outcomes.

[9] Unfortunately, we did not have enough observations by district to conduct matching within districts. (In our sample, approximately one third of respondents are in districts where the number of respondents is less than 30.) To deal with district effects, we incorporated district characteristics directly as covariates with which to match our respondents on (see Table 3).

TABLE 2 Descriptive statistics

	How likely is it that you would call the police in the case of [event]?							
	Observed police violence				Did not observe police violence			
Event	H. Likely	Likely	Unlikely	H. Unlikely	H. Likely	Likely	Unlikely	H.Unlikely
Robbery w/o weapon	0.21	0.22	0.29	0.28	0.25	0.30	0.25	0.19
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Robbery w/ weapon	0.34	0.25	0.23	0.18	0.37	0.30	0.21	0.12
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Robbery of home	0.54	0.27	0.12	0.07	0.56	0.30	0.09	0.05
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
Suspicious activity	0.33	0.28	0.24	0.15	0.35	0.42	0.16	0.08
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Drug sales	0.27	0.24	0.23	0.26	0.29	0.35	0.21	0.15
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Gang activity	0.32	0.29	0.21	0.18	0.31	0.41	0.17	0.10
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Gun shots	0.30	0.28	0.20	0.22	0.32	0.36	0.18	0.14
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
	n = 468				n = 3,722			

Note: Standard errors in parentheses.

standardized differences in covariate means between these groups in the full sample (pre-matching) as well as our matched sample. The results of this exercise are presented in Table 3.[10]

An often employed rule-of-thumb is that a standardized difference of greater than 0.25 indicates serious imbalance in a covariate. According to this standard, there were several serious imbalances in the full sample. In particular, men were more likely than women to observe police violence, younger individuals were more likely to observe violence than older individuals, individuals who personally knew a police officer were more likely to observe violence than those who did not, individuals who personally knew someone prosecuted by the justice system were more likely to observe violence than those who did not, individuals who had had direct contact with the police were more likely to observe violence than those without direct contact, and those who had been victims of crime were more likely to observe violence than non-crime victims. (The interested reader is referred to Table A3 in the Appendix, which displays the results from the propensity score estimating equation and corroborates the present discussion about imbalance on the aforementioned characteristics in the full sample). Fortunately, the nearest neighbor matching algorithm was able to select a matched sample among the respondents not observing police violence that had very similar background characteristics to those respondents who did observe violence. As the table shows, after employing the matching algorithm, all covariate means were balanced across the two groups.

[10] Shown in the table are standardized differences calculated using a complete case sample where the dependent variable was the response to Q1 in Table 1. The results obtained using complete case samples based on the other dependent variables are nearly identical (see footnote 8). These are available upon request. Simple differences in covariate means are displayed in Table A2 of the Appendix.

TABLE 3 Standardized differences in covariate means (before and after matching)

Covariate		Before matching	After matching
Male		0.30	0.04
Age		−0.46	−0.02
Education:	Primary school or less	−0.09	0.04
	Secondary school incomplete	0.15	0.00
	Secondary school complete	0.08	−0.01
	Some technical education	−0.06	0.02
Costa Rican national		0.10	−0.04
Head of household		0.01	−0.01
Material wealth	Laptop	0.05	0.01
	Tablet	0.14	−0.01
	Car	−0.02	−0.04
	Internet connection in home	0.05	−0.01
Knows police officer		0.29	−0.00
Knows someone prosecuted		0.49	0.01
Direct contact with police		0.48	−0.04
Crime victim		0.26	−0.03
District characteristics	Unmet basic necessities (% households)	0.07	0.08
	Population density	0.05	−0.01
	Higher education (% population)	−0.12	−0.09
	Laptop (% households)	−0.11	−0.09
	Car (% households)	−0.10	−0.08
	Internet connection (% households)	−0.09	−0.08
	Homes in poor condition (% households)	0.06	0.06

Figure 1 presents the results of our matching analysis. The dot plots contained in the figure display the point estimates (circles) and 95% confidence intervals (bolded lines) of the ATT associated with witnessing police violence for each response category for each hypothetical scenario presented in Table 1. In other words, these plots show how witnessing police violence affects the probability of each response. There is a strong degree of consistency in our findings. For all of the scenarios of experiencing and witnessing crime, observing police violence made respondents more reticent to report crime. Generally speaking, "likely to report" and "highly unlikely to report" were the categories most strongly affected by police violence. Observing police violence had a negative and statistically significant impact on the probability of being "likely to report" for all types of crime, save for robbery with a weapon and a home robbery. Similarly, observing police violence had a positive and statistically significant impact on the probability of being "highly unlikely to report" for all types of crime, again save for robbery with a weapon and a home robbery (for which the effects were at the threshold of statistical significance).[11]

[11] The relative inelasticity of reporting to observed police violence in the case of a home robbery could very well be due to an "insurance effect," that is, citizens whose homes are insured can obtain compensation for the valuables stolen only if they formally file a report with authorities. Thus, these individuals would be likely to report such a robbery irrespective of their exposure to police violence. The high level of stated willingness to report for this crime is consistent with such an interpretation.

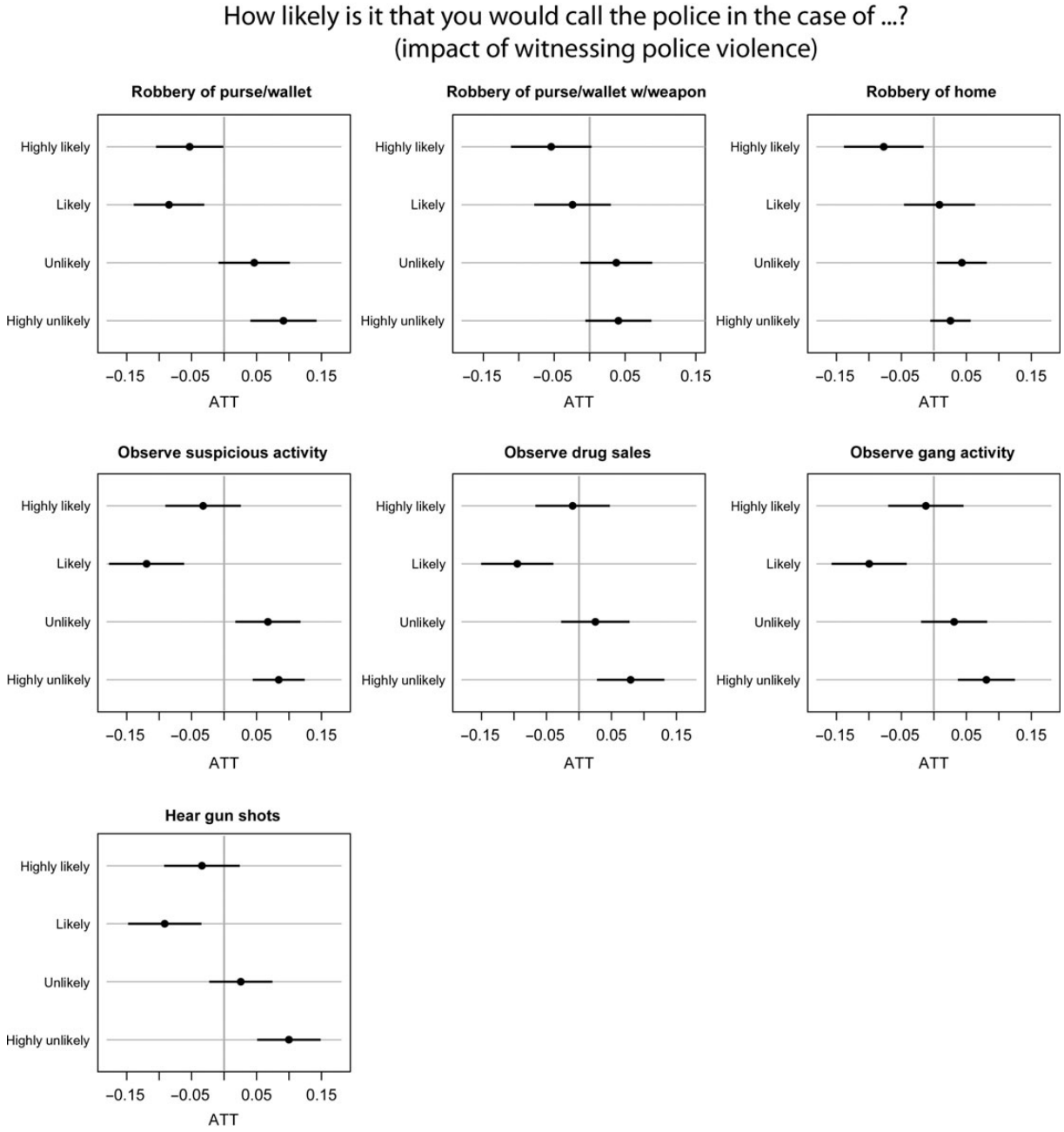

FIGURE 1 Impact of police violence on willingness to report crime.

Notes: The ATT for the observation of police violence for each response category for each crime reporting outcome is arrayed on the x-axes in the panels in the figure. The estimated ATT is the difference in the probability of a given response category for treated units as compared to matched control units. Point estimates are denoted by black dots. Ninety-five percent confidence intervals are denoted by horizontal black lines.

The magnitude of the effects were substantial. For instance, in the case of robbery of one's valuables in the street (without a weapon present), having previously observed police violence reduced the probability of the "likely to report" response by 8 percentage points and increased the probability of the "highly unlikely to report" response by 9 percentage points. In the case of observing suspicious activity, the estimated effect was a reduction of the probability of the "likely to report" response of 12 percentage points and an increase in the probability of the "highly unlikely to report" response of 8 percentage points. For witnessing drug sales, the effect was a reduction of the probability of the "likely to report" response of 9 percentage points and an increase of the probability of the "highly

unlikely to report" response of 8 percentage points. For the observation of gang activity, the estimated effect was a reduction of the probability of the "likely to report" response of 10 percentage points and an increase in the probability of the "highly unlikely to report" response of 8 percentage points. Finally, in the case of hearing gun shots, having previously observed police violence reduced the probability of the "likely to report" response by 9 percentage points and increased the probability of the "highly unlikely to report" response by 10 percentage points.

How robust are these findings? To address this question, we began by evaluating the sensitivity of our causal effect estimates to the precise specification of our covariate set. In particular, we re-estimated our ATT estimates for one particular outcome – robbery in the street without a weapon – using a large number of randomly selected subsets of the full covariate set employed in the analysis above.

The algorithm had three steps. First, we randomly selected a subset of covariates from the full set, with each covariate assigned a probability of 0.5 for inclusion in the subset. Second, using the randomly selected subset, we estimated the ATT using the nearest neighbor matching procedure. Finally, we repeated this process 10,000 times and graphed the resulting histograms (one for each category of the dependent variable). Figure 2 presents the histograms.

The key point to notice about the histograms is that the sign of the effect of police violence on reporting behavior is highly insensitive to the specification of the covariate subset. For the outcomes "highly likely to report," "likely to report," and "highly unlikely to report," *none* of the ATTs estimated using the randomly selected covariate subsets differed in sign from those estimated with the full covariate set. This implies that our findings enjoy a strong degree of covariate specification robustness, at least relative to the total set of covariates included in this paper. The fact that the sign of the estimated effect of police violence on reporting behavior is so strongly invariant to covariate specification gives us added confidence in our finding that witnessing police violence reduces the inclination to report crime.

We also examined the robustness of our findings to different strategies for modeling the behavior of the dependent variable. Our first step in this regard was to collapse the information contained in our seven reporting outcomes into a single index representing the respondents' reticence to report crime. To do this in a principled fashion, we utilized an item response theory approach (cf. Johnson & Albert, 1999). First, using the Graded Response Model for ordinal polytomous data, we estimated the relationship between the seven reporting outcomes and respondents' latent propensity against reporting crime. The results of this estimation are presented in Table A4 in the Appendix. As expected, all reporting outcomes were related to latent propensity in the same way: all had positive discrimination parameters and all of these were statistically significant by any reasonable standard. Second, we created our index by estimating factor scores from the fitted model.[12] With the unidimensional index in hand, we then utilized both nearest neighbor matching and ordinary least squares to examine the relationship between the observation of police violence and a respondent's latent propensity against reporting crime.

The results are presented in Tables A5–A6 in the Appendix. In both analyses, the observation of police violence was found to be a powerful and highly statistically significant deterrent to reporting crime. In the matching analysis, the estimated ATT was 0.25, with a standard error of 0.06 ($p < .001$). To give a sense of scale, this estimated treatment effect is equal to 0.29 standard deviations of the dependent variable among the control group. The coefficient on police violence using OLS was quite similar: it was estimated as 0.23, with a standard error of 0.04 ($p < .001$). Thus, treating the seven reporting outcomes as observable manifestations of an underlying reticence to report crime only strengthens our conclusion that observing police violence dampens crime reporting.

[12] Factor scores were estimated using the Empirical Bayes Method.

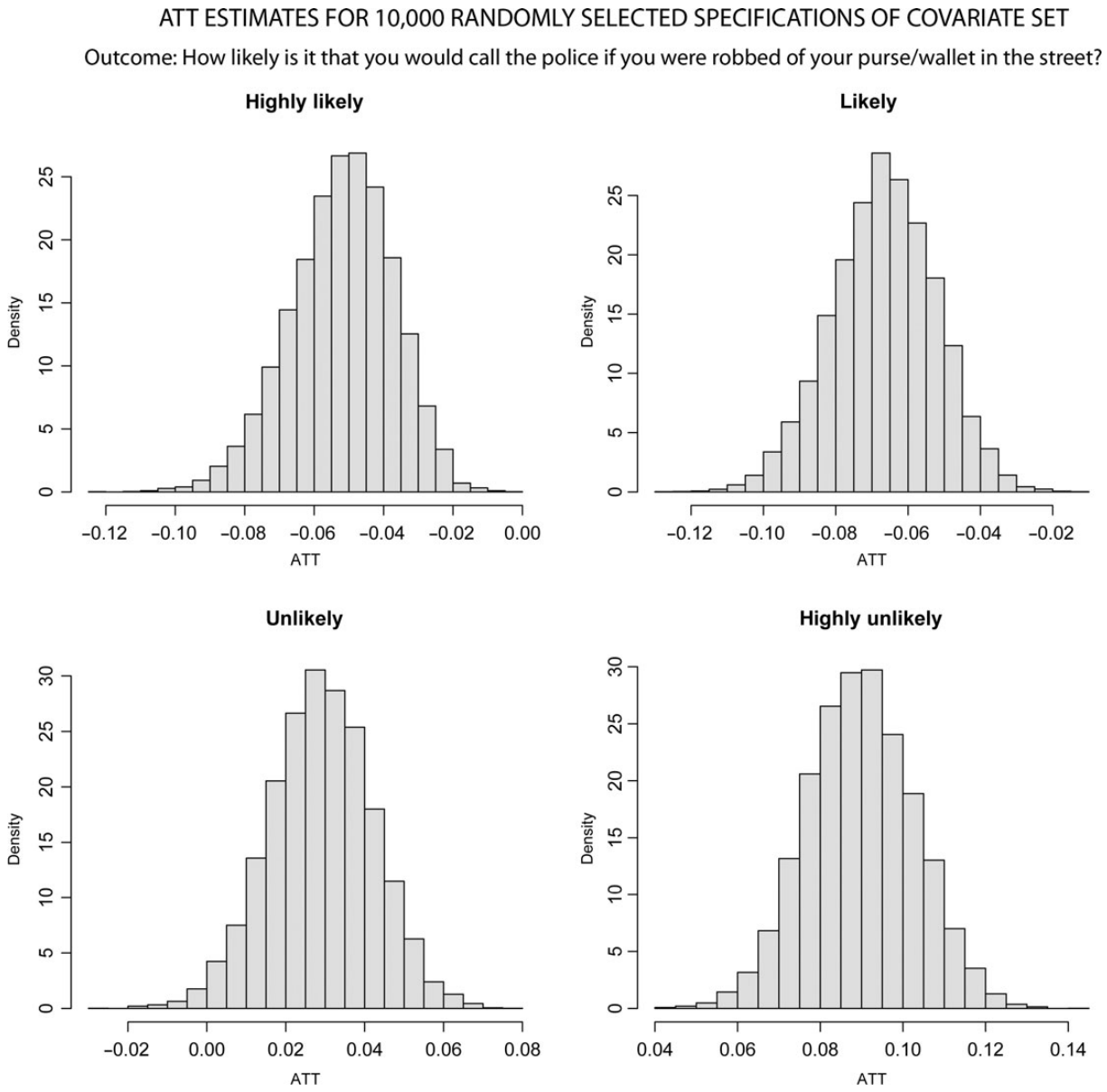

FIGURE 2 Robustness of ATT estimates to specification of covariate set.

Notes: Displayed are the histograms of the ATT estimates for the observation of police violence. Each ATT estimate is based on the application of nearest neighbor matching to a randomly selected subset of the full covariate set, where each covariate in the full set has a probability of 0.5 of inclusion in any given subset.

Finally, we conducted a set of analyses in which we examined each of the seven reporting outcomes separately, but imposed greater structure than in the analysis displayed in Figure 1. We did so by modeling the outcomes using both ordinary least squares and ordered probit. The results of this exercise are presented in Tables A7–A8 in the Appendix. The results are entirely consistent with the findings presented thus far. For every reporting outcome examined using either regression specification, the coefficient on the observation of police violence is positive (indicating that violence increases respondents' reticence to report) and statistically significant by any reasonable standard. Indeed, the *p*-values on these coefficients were less than .001 for every outcome, save for reporting a robbery in the home, and even for this outcome – for which the baseline predilection to report is relatively high – the *p*-value was less than .01.

Another issue we considered in our analysis concerns the external validity of our findings. Although this is an issue which can only be definitively addressed by replicating our study in other countries, one can get a rough sense of the potential of the findings presented here to extend to other settings by examining the degree of context specificity of the effect of police violence on crime reporting *within* our sample from Costa Rica. Since a key aspect in which Costa Rica differs from its neighbors is the level of crime, we performed a set of supplementary analyses specifically examining how levels of crime in a respondent's neighborhood shape the relationship between the observation of police violence and crime reporting. We did this in three steps. First, we calculated the crime victimization rate in each district contained in our sample by using the responses of our survey respondents to a series of questions about crime (see footnote 5 for the definition of crime victimization). Second, we divided our sample into two groups: a group of respondents living in low crime districts (districts with a victimization rate at or below the median for districts in the sample) and a group of respondents living in high crime districts (districts with a victimization rate above the median).[13] Third, we estimated the ATT for observing police violence using nearest neighbor matching within the two subgroups.

Figures A1–A2 in the Appendix display the results of this exercise. The figures show that the negative effect of police violence on crime reporting is clearly present among respondents in both the low crime and high crime areas. This suggests that our findings may have relevance for developed countries where crime rates are generally lower than those (on average) in Costa Rica as well as other Latin American countries where crime rates tend to be higher. Indeed, if there is any difference in the effects of police violence across the two groups, it would appear that they are a bit pronounced in the high crime areas. As such, for countries in the region with higher levels of crime than Costa Rica, the dampening effect of police violence on crime reporting may very well be even larger than we have estimated here.

3.4 | Mechanisms

The findings presented thus far leave open the question as to precisely why witnessing police violence erodes the inclination of individuals to report crime. More specifically, they undercover the consequence of observing police brutality but are silent about the cognitive mechanisms by which this consequence emerges.

There are three potential mechanisms that merit evaluation. Firstly, following the literature on procedural justice, the observation of police violence may erode reporting because witnesses to violence no longer consider the police to be a legitimate institution that deserves respect (cf. Sunshine & Tyler, 2003). Secondly, the observation of police violence may erode reporting because witnesses to violence come to view the police as being ineffective in carrying out their duties (Tankebe, 2009). Finally, and particularly relevant to the context of Latin America, the observation of police violence may erode reporting because witnesses to violence come to view the police as potentially dangerous and unbound by the strictures of the law, such that future interactions with the police – including crime reporting – could entail a risk of violence or mistreatment by police for those contemplating such an action. Instances of this type of mistreatment by the police are not hard to find in newspapers around the world. For instance, in February 2014 a woman in Argentina went to report domestic violence to a local police station and ended up being beaten by the police.[14] More recently, an Australian

[13] There were 1,780 respondents in the low crime group (179 observed police violence, 1,595 did not) and 2,420 in the high crime group (289 observed police violence, 2,127 did not).

[14]Clarín, Feb 12, 2014. Accessed at: https://www.clarin.com/sociedad/denunciar-violencia-genero-pegaron- comisaria 0 Hyx8 jJjPXe.html.

woman was fatally shot by a police officer in Minneapolis after she called 911 to report what she thought was a sexual assault occurring near her house.[15]

In order to assess the relevance of these mechanisms, we reran our nearest neighbor matching analysis utilizing as our dependent variables a battery of seven attitudinal questions about the respondent's perceptions of Costa Rica's police. To tap into views about legitimacy, respondents were queried about the extent to which the police inspire confidence. To tap into views about police efficacy, respondents were queried about the extent to which they view the police as being well trained and whether or not they respond quickly to the calls of citizens. Finally, in order to tap into views about the potential risk of abuse or mistreatment at the hands of police, respondents were queried about the extent to which they view the police as respecting the law, treating people with respect, engaging in corrupt activity, and being involved in crime. Figure 3 presents the results of the analysis.

For all questions, observation of police violence led to significantly more negative views of the police force. In particular, observing police violence decreased the extent to which the police inspired confidence among respondents, decreased the perception that police were well trained, decreased the perceived responsiveness of police, decreased the perception that the police respect the law, decreased the perception that police are respectful in their interactions with citizens, increased the perception that the police are corrupt, and increased the perception that the police are involved in criminal activities. In general, the effects of violence on attitudes were very large, shifting category probabilities by more than 20 percentage points in several cases.

The overall negative impact of observed violence notwithstanding, the largest effects were recorded for views that reflected the potential riskiness of engaging police officers. In particular, the attitudinal measures most strongly affected by the observation of police violence were beliefs about the degree to which police respect the law and the degree to which they treat people with respect. In the aggregate, observing police violence increased the probability that a respondent would strongly disagree with the statement that police respect the law by 25 percentage points; it decreased the probability of agreement with that same statement by 19 percentage points. For expectations regarding respectful treatment, observing police violence also increased the probability that a respondent would strongly disagree with the statement that police treat people with respect by 25 percentage points and it similarly decreased the probability of agreement with that statement by 19 percentage points. Thus, although the evidence suggests that legitimacy, efficacy, and the perceived riskiness of engaging police are all effected by witnessing police violence, it appears the latter category – riskiness – was the one most strongly impacted by such an experience. In what follows, we explore how the operation of such a mechanism may affect the relationship between policing strategies and dynamics of crime.

4 | A GENERAL THEORY OF POLICE VIOLENCE AND CRIME

In this section of the paper, we trace out some of the logical implications of our findings in order to better understand the relationship between institutional permissiveness toward violent policing and the prevalence of crime. We do so through the use of a simple game-theoretic model that

[15] The Washington Post, July 14, 2017. Accessed at: https://www.washingtonpost.com/news/morning- mix/wp/2017/07/17/bride-to-be-called-911-for-help-and-was-fatally-shot-by-a-minneapolis-police- officer/?hpid=hp hp-top-table-main minneapolis-1150am%3Ahomepage%2Fstory&utm term=.c41686515e10.

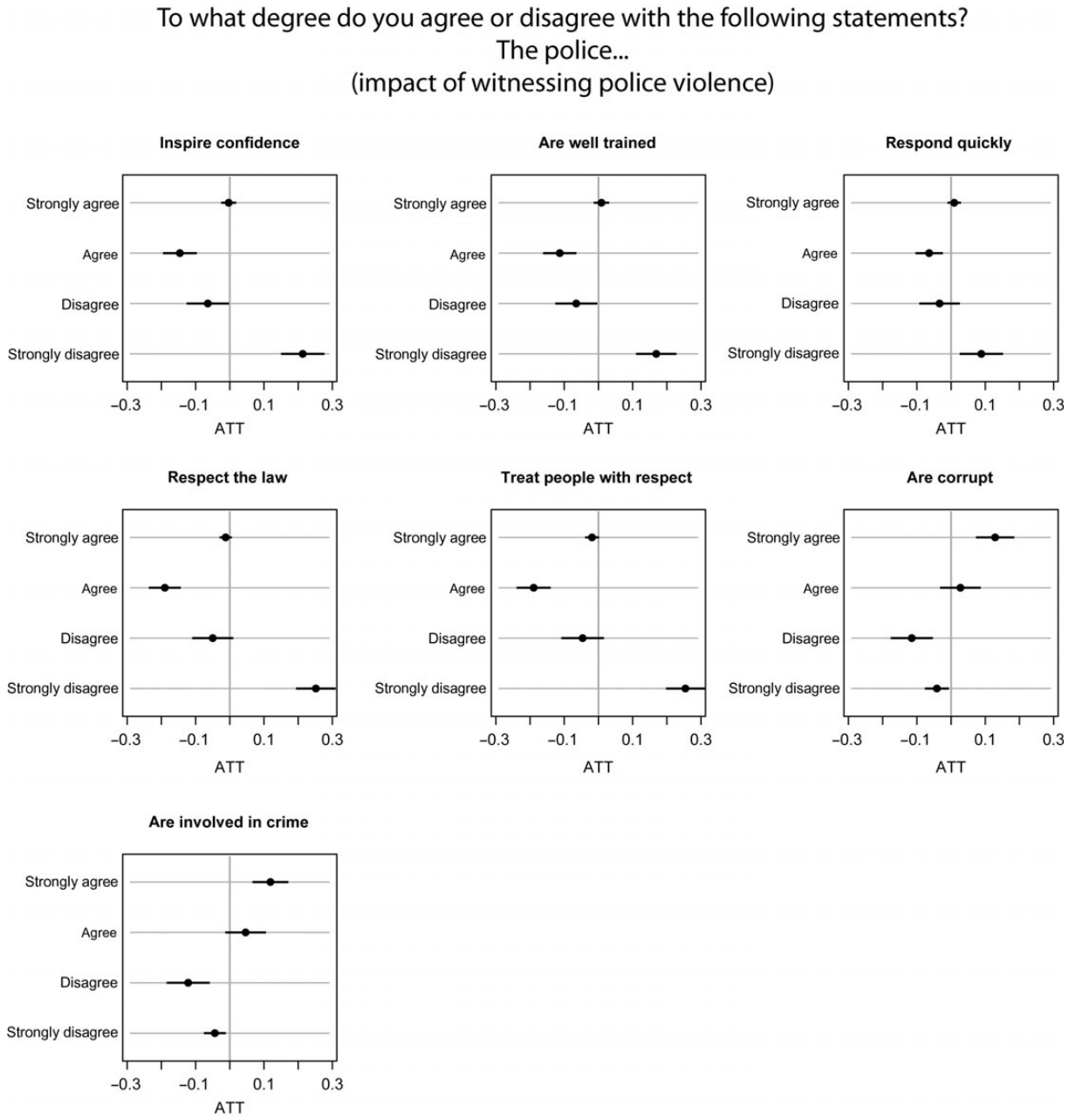

FIGURE 3 Impact of police violence on attitudes toward police force.

Notes: The ATT for the observation of police violence for each response category for each attitudinal outcome is arrayed on the x-axes in the panels in the figure. The estimated ATT is the difference in the probability of a given response category for treated units as compared to matched control units. Point estimates are denoted by black dots. Ninety-five percent confidence intervals are denoted by horizontal black lines.

concentrates on what we view as the three central facets of the relationship between police violence and crime reporting: the initial decision to engage in criminal activity, the decision of victims to report crime, and police treatment of suspected criminals and civilians. In line with the arguments of some proponents of aggressive policing strategies, we incorporate into the model the prospect that police violence against criminals may generate a degree of deterrence for criminal behavior. At the same time, we also incorporate into our model the empirically derived insight that institutional tolerance for violent policing may augment the perceived riskiness of engaging the

police. Reflecting the inherent uncertainties of crime and crime reporting, both insights are woven into an incomplete information framework in which police officers come in good and bad types, with neither potential criminals nor crime victims knowing a priori what type of officer they will encounter.

4.1 | Players, timing, and actions

There are three actors in our model: a (potential) criminal (C), a law-abiding citizen (L), and a police officer (P).

At the beginning of the game, Nature chooses P's type, denoted by $v \in \{0, 1\}$. If $v = 1$, then the officer is *prone toward violence*. If $v = 0$, then the officer is *not prone toward violence*. The officer's type is private information: it is known to him but unknown to the criminal or law-abiding citizen.

The probability that P is violence prone is equal to $q(\sigma) \in [0, 1]$, where q is an increasing function of σ with $q(0) = 0$ and $q(+\infty) = 1$. The parameter σ is the central policy variable in the model. It represents the permissiveness within police departments, the judiciary, and other state institutions toward violence committed by officers in the course of their duties. Permissiveness in this sense may be manifested in promotion policies within police departments that reward officers involved in police shootings or in patterns of prosecutorial and judicial decision-making that effectively shield officers from punishment for unnecessary use of force (Brinks, 2003, 2008).

The fact that q is increasing in σ reflects a selection mechanism for police officers. Formal and informal policies that tolerate or encourage violence among those in uniform make a career in law enforcement relatively attractive to individuals with an innate propensity toward violence. As a consequence, the likelihood that any particular officer will be violence prone will be higher in such polities than in those where the unnecessary use of force is actively discouraged. This dynamic is widely understood in the polities in which it operates. In our model, this broad societal understanding is reflected by the fact that q is known by all actors in the model.

In the second stage of the game, C chooses an action $s \in \{0, 1\}$, where $s = 1$ denotes that C steals from L and $s = 0$ denotes that C refrains from stealing from L. If C chooses not to steal, then the status quo (SQ) outcome obtains and utilities are disbursed accordingly.

If C does steal from L, then L subsequently must decide whether or not to report the crime to the police officer, $r \in \{0,1\}$, where $r = 1$ indicates that L reports the crime to P and $r = 0$ indicates that L does not report the crime to P. If C steals from L but L does not report it, then the crime without punishment (CWP) outcome obtains and utilities are disbursed accordingly.

P enters the game only upon receiving a report of crime from L. If P receives a report, he is able to locate and detain C with certainty. Thus, P can choose to act in one of three different ways, with his action denoted by $a \in \{1, 2, 3\}$. First, P can act professionally, arresting C without unnecessary violence and subsequently submitting C to the judicial system to receive the official sanction for his crime ($a = 1$). In this case, the service with professionalism (SWP) outcome obtains. Alternatively, P can act with deliberate and unnecessary aggression against C during his arrest, subjecting him to physical violence in addition to the official sanction the judicial system will mete out for his crime ($a = 2$). This is the targeted violence outcome (TV). Finally, P can act with generalized abusiveness, arresting C with unnecessary violence and simultaneously subjecting L to hostility and mistreatment during the investigative process ($a = 3$). This is the indiscriminate violence outcome (IV). The game tree for this model is displayed in Figure 4.

The distinction between targeted vs. indiscriminate violence, while subtle, is crucial to the logic of the model. The prospect of the indiscriminate violence outcome raises the possibility that

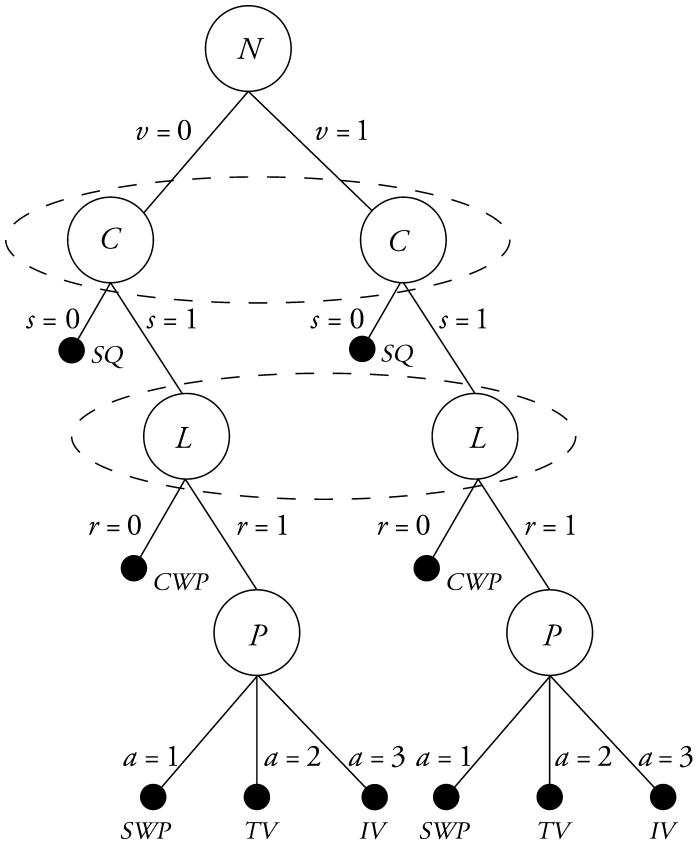

FIGURE 4 Game tree for the police violence and crime reporting game.
Note: Information sets denoted by dashed lines.

citizens not involved in crime may themselves suffer abuse should they come into contact with violence-prone police officers. As such, it reflects the notion that institutional tolerance for police brutality generates negative spillovers that extend well beyond the set of proven or suspected criminals for whom such violence is ostensibly targeted. As will be discussed more fully in what follows, this implies that law-abiding citizens may in certain circumstances be apprehensive about reporting crime, even if they have no particular qualms about violence being visited upon those who have committed crime.

4.2 | Utility

We adopt a quantal response framework, an approach that treats agent choice as stochastic and which generates smooth comparative statics (Goeree, Holt, & Palfrey, 2016; McKelvey & Palfrey, 1995, 1998). Let $\pi_h \in \Pi$ represent a decision to be taken by a generic agent j at information set h. According to the framework, the utility j associates with choosing $\pi_h = k$ is equal to $u_j^*(\pi_h = k) = u_j(\pi_h = k)+e_{jkh}$, where e_{jkh} is a random error representing an idiosyncratic shock to preferences that is known only to player j. Adopting the nomenclature of Signorino (1999), we refer to the quantity $u_j^*(\pi_h = k)$ as the direct (true) utility to j of choosing option k at information set h and $u_j(\pi_h = k)$ as the indirect utility of the same. Agent choice is rational in the sense that agents choose the option that provides them with the highest direct utility among the options available at a given information set. However, since each agent's direct utility is unobservable to

other agents, any agent's choices are ex ante probabilistic from the vantage point of all other players. In particular, when the preference shocks are independently and identically distributed according to a log Weibull distribution, then the probability that agent j chooses $\pi_h = k$ is written:

$$\Pr(\pi_h = k) = \frac{\exp(\lambda u_j(\pi_h = k))}{\sum_{l \in \Pi} \exp(\lambda u_j(\pi_h = l))}. \quad (1)$$

In the random utility framework, the ex ante probability that an agent chooses a particular action is a function of the indirect utility of that action relative to the indirect utilities associated with the other actions available to her. The parameter $\lambda \geq 0$, often referred to as a responsiveness parameter, captures the importance of the relative value of indirect utilities in agent choice. If $\lambda = 0$, then the probability of each choice is equal, irrespective of the corresponding indirect utilities. If $\lambda = +\infty$, then agents always choose the action which gives them the greatest indirect utility.

We consider an elementary preference structure for the indirect utility functions. Police officers who are prone to violence prefer apprehending suspected criminals with violence than doing so peacefully. Moreover, the amount of utility they are able to derive from violent policing is an increasing function of the institutional permissiveness parameter, σ. Violence-prone officers most highly value the indiscriminate violence outcome, as this state of affairs allows them to maximize their coercive behavior by assaulting suspected criminals and abusing citizens. The preference structure for non-violence-prone officers is the opposite. These individuals most highly favor the service with professionalism outcome, as it affords them the opportunity to enforce justice and serve their community with respect. Least favored for these individuals is the indiscriminate violence outcome, followed by targeted violence against suspected criminals.

This discussion leads to the following expressions for P's indirect utility function:

$$\begin{aligned} u_P(a = 1) &= 0 \\ u_P(a = 2) &= v\sigma - (1 - v)\theta \\ u_P(a = 3) &= v(\sigma + \eta) - (1 - v)(\theta + \eta), \end{aligned} \quad (2)$$

where $\theta > 0$ parameterizes the distaste of non-violence-prone officers to discharging their duties with unnecessary violence against criminals and η is the utility gain (loss) that violence-prone (non-violence prone) officers associate with abusing citizens. Note that, according to the above, institutional permissiveness toward police violence only affects the utility of violence-prone police officers; non-violence prone officers find unnecessary violence against suspected criminals and citizens distasteful irrespective of the level of institutional permissiveness.

All else equal, law-abiding citizens receive a civic, material, and/or psychological return from reporting crime to authorities when they are victimized. However, the utility associated with reporting crime is inherently connected to how they are treated by police in the investigative process. If a law-abiding citizen is treated well in the process, she receives positive utility equal to $\mu > 0$ from reporting crime. If she is instead mistreated by police, then the utility from reporting crime is negative. More specifically, the magnitude of the disutility she receives from police abuse is increasing in σ since the same types of institutional shields that permit officers to engage in excessive violence against suspected criminals also limit protection against police mistreatment more broadly.

This suggests the following indirect utility function for L:

$$\begin{aligned} u_L(r=0) &= 0 \\ u_L(r=1) &= [1 - I(a=3)]\mu - I(a=3)\mu(1+\sigma) \end{aligned} \tag{3}$$

where I (.) is an indicator function equal to 1 if its argument is true, 0 otherwise.

Since the indirect utility to L from choosing to report is a function of the anticipated actions of P and these, in turn, are inherently probabilistic, the expression $u_L(r = 1)$ must be recast as an expected utility. Applying the expectations operator gives:

$$u_L(r=1) = [1 - \mathbb{E}I(a=3)]\mu - \mathbb{E}I(a=3)\mu(1+\sigma) \tag{4}$$

where

$$\mathbb{E}I(a=3) = \Pr(a=3|v=1)q(\sigma) + \Pr(a=3|v=0)(1-q(\sigma)). \tag{5}$$

The indirect utility function for the criminal follows standard cost-benefit models of crime (cf. Becker, 1968). If C abstains from engaging in theft, then he receives utility based on the wage, $\varpi > 0$, that he commands in the (licit) private sector. If he does engage in theft, his utility depends on the subsequent actions of L and P. If L does not report the theft, then C gets away with his crime and receives the value of the resulting loot, $\tau > \varpi$. If L does report the crime, then C's utility depends on the action taken by P. If P acts with professionalism, then C receives a return equal to the official sanction for his crime, $-\gamma < 0$. If P chooses either of the two actions that entail violence against C, then C receives the official sanction as well as the disutility associated with physical violence, which is an increasing function of institutional permissiveness toward police brutality, $-\beta\sigma$. All told, the criminal's indirect utility function is:

$$\begin{aligned} u_C(s=0) &= \varpi \\ u_C(s=1) &= \tau I(r=0) - \gamma I(r=1 \cap a=1) - (\gamma + \beta\sigma) I(r=1 \cap a \neq 1). \end{aligned} \tag{6}$$

Here again indirect utility is a function of the anticipated and probabilistic actions of other actors, namely L and P. Applying the expectations operator to u_C $(s = 1)$ gives the expected utility:

$$u_C(s=1) = \tau \Pr I(r=0) - \gamma \Pr I(r=1 \cap a=1) - (\gamma + \beta\sigma) \Pr I(r=1 \cap a \neq 1), \tag{7}$$

where

$$\begin{aligned} \Pr I(r=1 \cap a=1) &= \Pr(r=1)[\Pr(a=1|v=1)q(\sigma) + \Pr(a=1|v=0)(1-q(\sigma))] \\ \Pr I(r=1 \cap a\neq 1) &= \Pr(r=1)[\Pr(a\neq 1|v=1)q(\sigma) + \Pr(a\neq 1|v=0)(1-q(\sigma))] \end{aligned} \tag{8}$$

4.3 | Equilibrium impunity

We consider here how tolerance for police violence against suspected criminals affects the incentives for crime reporting and, *ipso facto*, overall citizen security. To this end, we derive the equilibrium probability of the crime without punishment outcome, which represents impunity for criminal activities, and then proceed to describe how the likelihood of this outcome changes with greater permissiveness toward police violence.

The probability of crime without punishment is simply the product of the probability that C chooses to steal and the probability that L chooses not to report the crime:

$$\Pr(\text{CWP}) = \Pr(s = 1)\ \Pr(r = 0) \tag{9}$$

Given the assumed distribution of the random choice errors, the probability that L fails to report is equal to:

$$\Pr(r = 0) = \frac{1}{1 + \exp(\lambda u_L(r = 1))}, \tag{10}$$

where

$$u_L(r = 1) = \mu[(1 - 2\ \Pr(a = 3)) - \sigma\ \Pr(a = 3)]. \tag{11}$$

Intuitively, these expressions reveal that the probability of crime reporting is inversely related to L's assessment of the likelihood of being mistreated by the police.

The probability that C chooses to steal is equal to:

$$\Pr(s = 1) = \frac{\exp(\lambda u_C(s = 1))}{\exp(\lambda u_C(s = 1)) + \exp(\lambda \varpi)}, \tag{12}$$

where

$$u_C(s = 1) = \Pr(r = 0)\tau - (1 - \Pr(r = 0))[\gamma + \beta\sigma(1 - \Pr(a = 1))]. \tag{13}$$

The above demonstrates that the probability of crime is inversely related to C 's assessment of the likelihood that L would report crime. It is also inversely related to C 's assessment of the likelihood that P would act with targeted or generalized violence, since these outcomes impose special hardship on C .

In order to complete the characterization of the probability of crime without punishment, one must derive the probabilities that P acts with professionalism or generalized violence. Note that for any action $k \in \{1, 2, 3\}$ taken by P, one can write

$$\Pr(a = k) = \Pr(a = k|v = 1)q(\sigma) + \Pr(a = k|v = 0)(1 - q(\sigma)). \tag{14}$$

In words, the probability that P takes a particular action is equal to the sum, across P 's two potential types, of the probability of the action given a specific type multiplied by the probability that P is of that type. The relevant conditional probabilities, in turn, are equal to:

$$\begin{aligned}
\Pr(a = 1|v = 0) &= \frac{1}{1 + \exp(-\lambda\theta) + \exp(-\lambda(\theta + \eta))} \\
\Pr(a = 1|v = 1) &= \frac{1}{1 + \exp(\lambda\sigma) + \exp(\lambda(\sigma + \eta))} \\
\Pr(a = 3|v = 0) &= \frac{\exp(-\lambda(\theta + \eta))}{1 + \exp(-\lambda\theta) + \exp(-\lambda(\theta + \eta))} \\
\Pr(a = 3|v = 1) &= \frac{\exp(\lambda(\sigma + \eta))}{1 + \exp(\lambda\sigma) + \exp(\lambda(\sigma + \eta))}.
\end{aligned} \tag{15}$$

These expressions demonstrate four important points: (1) a non-violence-prone officer is more likely to act professionally (not use unnecessary violence at all) than a violence-prone officer; (2) a non-violence-prone officer is less likely to abuse a law-abiding citizen than a violence-prone officer; (3) the probability that a violence-prone officer acts professionally is decreasing in institutional tolerance for violent policing; and (4) the probability that a violence-prone officer abuses a law-abiding citizen is increasing in institutional tolerance for violent policing.

Taken together, equations 9–15 provide a complete characterization of the equilibrium likelihood of crime without punishment in terms of the fixed parameters of our model. Using this characterization, we are able to establish the following proposition linking institutional tolerance for police violence and impunity for criminal activity.

Proposition 1: *The relationship between crime without punishment and tolerance for police violence is potentially non-monotonic. At very low levels of initial permissiveness toward violent policing, an increase in the same may – for certain combinations of parameter values – lead to a decrease in the probability of crime without punishment. This is because the reduction in the attractiveness of crime due to the prospect of police violence may overwhelm the effect of the growing non-reporting of crime. However, as institutional permissiveness toward violent policing becomes sufficiently great, the likelihood of non-reporting of crime reaches a point such that the attractiveness of crime increases even as the cost associated with police violence becomes more extreme. At the limit, extremely high levels of permissiveness toward police violence generate a high equilibrium probability of crime without punishment (greater than 1/2) in which the criminal chooses to steal based on the returns to theft vs. the private sector wage and the law-abiding citizen never reports the crime (see Appendix).*

Figure 5 displays a figure providing the key intuitions underlying Proposition 1. The figure displays the equilibrium probability of crime (i.e., the probability that *C* chooses to steal), the

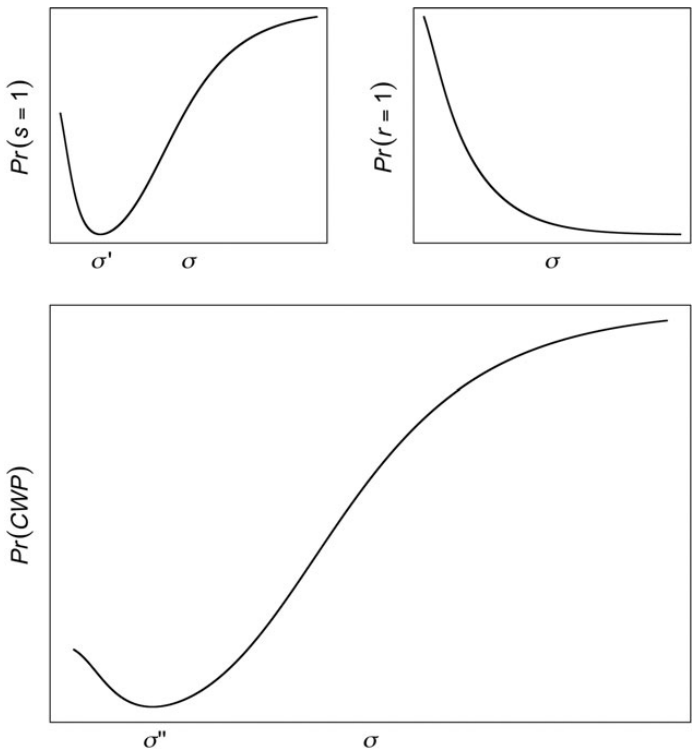

FIGURE 5 The impact of increasing permissiveness of police violence.

Notes: The upper left-hand side panel depicts the relationship between permissiveness and the probability of crime. The upper right-hand side panel depicts the relationship between permissiveness and the probability of crime reporting. The lower panel depicts the relationship between permissiveness and the probability of the crime without punishment outcome.Graphs shown are for $q = 1 - \exp(-\sigma)$, $\lambda = 1$, $\theta = 0.5$, $\eta = 0.7$, $\mu = 0.5$, $\varpi = 0.2$, $\tau = 0.8$, $\gamma = 0.9$, and $\beta = 3$. The parameter σ varies from 0 to 20, with $\sigma' = 3.12$ and $\sigma'' = 2.65$.

equilibrium probability of crime reporting, and the equilibrium probability of the crime without punishment outcome as the value of σ varies. The total effect of permissiveness toward police violence on the probability of crime without punishment can be decomposed into two distinct effects: the effect of permissiveness on crime and the effect of permissiveness on reporting of crime. Echoing our empirical findings from Costa Rica, the effect of violent policing on reporting is unambiguous: it monotonically reduces the likelihood that the law-abiding citizen will report crime if she is victimized (see upper left-hand side panel of Figure 5). This is so for two reasons. First, an increase in permissiveness produces a perverse *incentive effect* : violence-prone officers get greater utility from abusing citizens the greater is permissiveness, so contingent on the officer being violence prone, this increases the probability of abuse and reduces the attractiveness of reporting. Second, an increase in permissiveness generates a negative *selection effect*. Greater permissiveness makes it more likely that the police officer will be violence-prone in the first place: since violence-prone officers are more inclined to abuse citizens than non-violence-prone officers, this, too, reduces the attractiveness of reporting.

The subtlety of the result emerges from the strategic calculus of the criminal. The impact of an increase in permissiveness toward police violence on the utility the criminal receives from engaging in crime consists of two separate effects that pull in different directions: the *sanction severity effect* and the *non-reporting effect*.

The most obvious of the two, and the one that undergirds most arguments in favor of more violent policing, is sanction severity. This effect captures the increasing disutility from crime the criminal receives due to the increasing magnitude of physical violence that can be perpetrated by the police officer. Sanction severity grows with permissiveness because more permissiveness implies greater suffering if the police officer chooses to use violence (holding the likelihood of violence constant) and because the likelihood of violence also increases with permissiveness.

The second effect is the non-reporting effect. As described above, increasing permissiveness toward police violence decreases the probability of crime reporting by the law-abiding citizen. From the vantage point of the criminal, this leads to an increase in the likelihood of capturing the benefits from crime and a decrease in the likelihood of assuming its potential costs. As such, the non-reporting effect, driven by the citizen's fears of engaging with the police officer, increases the attractiveness of crime.

The fact that there are these two countervailing effects of permissiveness toward police violence on the utility of crime is the reason for the non-monotonicity exhibited in the upper left-hand side and bottom panel of Figure 5. At low levels of permissiveness, the sanction severity effect may dominate and further increases in permissiveness may reduce the probability of crime – at least up to a point. However, at high levels of permissiveness, the non-reporting effect comes to dominate, and further increases serve to stimulate crime, thereby making the crime without punishment outcome more likely.

The reason the non-reporting effect dominates sanction severity at high levels of permissiveness is because the sanction severity effect is inherently *dependent on the probability of reporting*. Intuitively, if the law-abiding citizen will surely not report the theft to the police officer, then the prospect of even extreme violence perpetrated by the police officer is irrelevant since the crime will never come to be investigated in the first place. Since the probability of crime reporting approaches zero as permissiveness grows very large, the probability of crime without punishment eventually reaches a steady state in which the criminal ignores completely the sanction associated with police violence and decides to engage in crime based on the relative value of theft vs. the licit wage. If the difference between these is large, or, alternatively, if the rationality parameter λ is large, then the probability of crime without punishment approaches 1 as permissiveness reaches an extreme level.

The novelty of our framework rests with the emphasis it places on crime reporting and, by extension, citizen collaboration with police more generally, as a fundamental lynchpin underlying any plausible attempt to reduce crime. Although it is true that giving police officers wide latitude to impose physical hardship on suspected criminals might deter some set of potential criminals, the policies that make such latitude possible are likely to spill over into police interactions with non-criminals, thereby heightening the risk law-abiding members of the public associate with engaging with the police. Criminals, being rational and forward looking, will naturally take into consideration the reluctance of law abiding citizens to report crime at the moment when they decide whether or not to engage in crime. As a consequence, giving officers relatively free reign to abuse suspected criminals, rather than quelling outbreaks of crime, is actually more likely to promote a situation of equilibrium impunity for crime.

5. | CONCLUSION

In this paper, we have examined the manner in which police violence affects citizens' willingness to report crime and therefore collaborate with authorities in reducing crime. Our analysis proceeded in two steps. First, we empirically assessed the relationship between the observation of police violence and crime non-reporting through the analysis of a large-scale household survey we conducted in urban Costa Rica. According to the empirics, citizens who witness police violence are far less likely to indicate a willingness to report crime – both crimes for which they are the victim as well as crimes for which they are a witness. Subsequent analysis of attitudes suggested that a significant driver of the reticence to report was the perception that engaging the police would be a potentially risky endeavor. We interpret these findings as fairly solid evidence in favor of the proposition that police violence erodes critical linkages with communities afflicted by crime, making effective policing that much more difficult. After presenting the empirics, we proceeded to develop a general theoretical framework that outlined logically the ways in which expectations of violence may shape crime reporting and, by extension, the prevalence of crime. The model revealed that although the prospect of police violence against criminals may generate a degree of deterrence for criminal behavior, the larger consequence of having a violent police force will be an increase in law-abiding citizens' reticence to report crime. This non-reporting effect can diminish the risks associated with crime and increase the expected returns to such a degree that high expectations of police violence may generate effective impunity for crime – what we dub crime without punishment.

Herein lies the fundamental irony at the heart of our paper. Apologists for police violence often justify their position based on the notion that some evils must be tolerated in order to achieve a greater societal good. But our empirics and theoretical analysis suggests that there is no such good to be had from permissiveness toward police brutality. To the contrary, in the long run bad means also produce bad outcomes.

The logical flaw here resides in a failure to properly comprehend the link between security and community engagement. Effective policing, at its heart, is about gathering pertinent information and being able to separate the wheat from the chaff in communities where some actors are dedicated criminals, some are law-abiding citizens, and some go back and forth between these worlds. Doing so requires carefully cultivating mutual respect and trust between members of the community and the forces of law and order. When the police engage in acts of violence that exceed the strictures of the law, this erodes community trust and marks the forces of law and order as a potential threat to both criminals and law-abiding citizens alike. Information channels from communities to the police cease to function, the latter rendered incapable of properly fulfilling their duties to the public.

Any improvement in this state of affairs requires a change within state institutions in the level of permissiveness toward police violence. Unfortunately, these changes take time. While we think that the ultimate goal must be to restore the trust between citizens and the forces of law and order – which requires the aforementioned change in permissiveness toward police brutality – we recognize that some short-term measures might help to mitigate the incidence of non-reporting due to fear or distrust of police. In this regard, the use of innovative reporting platforms that allow the anonymous reporting of crime, such as Disque-Denúncia (established in 1995 in Rio de Janeiro, Brazil) and www.seguridadenlinea.com (established in 2013 in Medellín, Colombia), strike us as particularly promising.

Of course, we are fully cognizant that police violence is only one obstacle to establishing such trust. Combatting corruption and promoting professionalism are also crucial components of any strategy to cultivate greater collaboration between citizens and their police forces. However, in an age of growing calls for an iron fist in order to combat crime, we find it necessary to point out that this dark road will likely lead to disappointment.

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SUPPORTING INFORMATION

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