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ABSTRACT

Unbundling the Relationship between Economic Shocks and Crime

Intuitively, by increasing the opportunity cost of engaging in criminal activities, positive economic shocks should reduce crime. However, the empirical evidence on the relationship between economic shocks and criminal behavior is at best ambiguous. This may be because certain types of shocks make the booty more attractive and thus constitute an incentive to predate. Beyond this basic distinction between an "opportunity cost" and a "rapacity" mechanism that may mediate the effect of economic shocks on crime, this chapter proposes a simple conceptual framework to understand this nuanced relationship. We posit that the way that economic shocks shape criminal behavior depends on three factors: i) whether the shock comes from a legal or an illegal source, ii) the extent to which the shock source is more or less lootable, and iii) the presence of contextual factors that shape the relative importance of the opportunity cost and the rapacity effect, such as the underlying level of economic inequality, the institutional strength and law enforcement capacity of the state, and whether there are instances of accelerated and hazardous economic growth that likely create social disorganization and institutional unbalance. We use this taxonomy to review the seemingly inconclusive empirical evidence, and close by highlighting current persisting puzzles as well as areas where additional research on the relationship between economic shocks and crime would be welcome.

JEL Classification: K42, J30, D74, F16

Keywords: economic shocks, crime, opportunity cost, rapacity, illegal activity, inequality, institutions, social disorganization

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I. Introduction

The most basic intuition suggests that improvements in employment and wages should reduce crime. This negative relationship between income --or broadly speaking wellbeing-- and crime is not only instinctual but also supported by a large empirical evidence from a range of contexts and historical periods. It is also at the core of the pioneer theoretical models of crime (Becker, 1968 and Ehrlich, 1973). Formally, increases in the income that is derived from legal sources make illegal appropriation activities less attractive, and thus reduce the supply of potential criminals.

However, the relationship between changes in people's income or wealth (which we broadly and somewhat loosely define as 'economic shocks') is actually much more nuanced. Crucially, at the core of the classic theories of crime there is also the idea that certain types of economic shocks, even within the realm of legal sources, make criminal activity *more* attractive. Thus, in addition to the afore-explained "opportunity cost effect", whereby increases in income make criminal enterprises less attractive, there is also a potential "rapacity effect", by which income surges increase the value of the booty and thus promote crime (Tornell and Lane, 1999; Dube and Vargas, 2013).

The extent to which one such channel dominates the other --thus making income and crime either positively or negatively related-- depends on at least three key factors. The first one is the legality of the income source. Because property rights over illegal goods and services cannot be enforced by legal institutions (such as courts), property disputes that arise in illegal markets tend to be resolved by violent means.

The second is the source of the economic shock. Goods that are easily lootable because their production is concentrated in just a few geographical areas (such as oil), or because they concentrate very high values in small volumes (such as gold, diamonds or emeralds), or because they are capital intensive so that their associated revenue disproportionally benefits capital owners (like most natural resources) are likely to attract plunder and crime especially during periods when their price is high. Instead, goods that are produced over a much more widespread space, that have a lower value per unit of volume, or that are labor intensive so that their associate revenue disproportionately benefits workers are more likely to dissuade criminal activities when their price is higher.

The third are the contextual factors that shape the relative importance of the opportunity cost and the rapacity effect. Salient examples of such factors include the level of inequality and the strength of the institutional environment. In highly unequal societies, positive economic shocks that increase the income of the rich make them more vulnerable to be targets of (property) crime. Alternatively, to the extent that income shocks do not affect everybody in the same way, they may also have distributional consequences that in turn exacerbate crime. Moreover, institutional environments characterized by weak property rights and a fragile rule of law tend to promote criminal behaviors insofar as positive economic shocks translate more easily into plunder and appropriation. Relatedly, instances of accelerated and disorganized growth, such as those driven by unexpected favorable changes in the terms of trade, commodity booms or the discovery of

natural resources make the rapacity effect more likely to dominate. This is because such economic shocks may create social disorganization and take place at a pace that can rarely be followed by institutional adjustments to obtain revenue out of booms and to provide public goods that benefit a broad base of society.

This discussion implies that, while the relationship between economic shocks and crime is theoretically complex (and thus empirically elusive), a comprehensive taxonomy of it must include the three mentioned factors. Such taxonomy determines the structure of this chapter. Specifically, in section 2 we lay down a simple and stylized theoretical model of economic shocks and crime, and show that the nuanced relationship between these variables can be easily derived from very few assumptions that speak to the three determinants described above. This implies that, far from discouraging researchers, the wide variability of the empirical estimates of the relationship between economic shocks and crime can well be accounted for by a simple modified Beckerian framework. The subsequent sections of the chapter review the existing empirical evidence in the light of the suggestive taxonomy, thus distinguishing between economic shocks that pertain to legal versus illegal markets and between different income sources, as well as accounting for the contextual factors that push the relationship in one direction or the other. We conclude the chapter highlighting persisting puzzles such as why is violent crime often related to economic shocks the way property crime is, as well as areas that need additional research to complement our current understanding about the relationship between economic shocks and crime.

II. A simple model of criminal participation

We develop a down to the bone version of a criminal participation model. The objective of the model is simply to provide a conceptual background for our discussion on the potential effects of economic shocks on crime. The model helps structure this discussion and put in concrete terms the different competing mechanisms that we want to highlight in our ensuing discussion of the empirical literature.

Consider a simple framework inspired by the original contributions of Becker (1968) and Ehrlich (1973). Potential criminals decide on whether to take part in illegal activities by comparing the expected utility from crime, C, with the expected utility from leading an honest life, V.

The expected utility from crime is given by

$$C = g + \theta \times (-s),$$

where g represents the monetary gain from crime, θ is the probability that a criminal is caught and convicted once he commits a crime, and s is the welfare loss associated with punishment (sentence length or some other form of punishment) in case the criminal is caught and convicted. One could also consider the psychological or moral cost of committing a crime, but we abstract from this dimension here to keep the framework as simple as possible.

Individuals who choose not to commit crimes become potential victims. The expected utility of potential victims is given by

$$V = (1 - \pi) \times u(y) + \pi \times [u(y - g) - p],$$

where π is the probability that the individual is victim of a crime, $u(.)$ indicates the instantaneous utility function from consumption, y is legal income (and consumption) when the individual is not victimized, and p is a psychological or physical cost of victimization, associated with the trauma from the event and the possibility of physical injury. The gain g from crime to criminals corresponds to the amount g of the good stolen when an honest individual is victimized.

Individuals decide to commit crimes if $C > V$. The framework assumes, for simplicity, that crime and legal work are mutually exclusive alternatives and, therefore, there is only an extensive-margin choice to engage in crime. Also, we abstract from criminal effort – either to better target potential victims or to evade police capture – and consider a single type of crime.

Finally, it is worth highlighting, for later reference, that both the probability of apprehending a criminal θ and the probability of victimization π are endogenous equilibrium objects. These are functions of the number of individuals who decide to engage in crime, the number of potential victims, and the size and effectiveness of the police force. We believe this basic framework is enough to shed light on the main channels that we have in mind.

The model is framed with common economic crimes – such as robbery and thefts – in mind. It could be easily adapted to the case of trade in illegal goods, such as illegal drugs for example. In this case, we would not have victims and, instead, would have two sides of a market, both subject to punishment from the state, though potentially at different levels. Gains from crime g from the perspective of sellers in this scenario would reflect the market price of the illegal good net of its retail cost. A similar framing would apply as well to sellers along the supply chain of illegal goods or to exporters, such as international drug traffickers. For consumers of illegal goods in the domestic market, in turn, utility would be simply the consumer surplus from engaging in the transaction, netted out from the expected punishment (probability of being caught times the punishment) and potential psychological costs of being involved in an illegal trade.

We use this framework to illustrate conceptually how different types of economic shocks may affect individual decisions to engage in crime and, therefore, the equilibrium crime rate in the economy. Any effect on the crime rate in this simple setting must work through relative changes in the net benefits and opportunity cost of crime, C and V, respectively.

As mentioned in the introduction, the most traditional perspective considers the effect of changes in legal labor market opportunities, through changes in wages and unemployment, on crime. This view posits that increased economic activity is associated with better labor market opportunities for individuals, therefore increasing the opportunity cost of crime and reducing criminal participation. It can be interpreted in our setting through relative changes in y and g. The key requirement in this scenario is that the effect of increased economic activity through y is greater

than that through *g*. One justification for this, not incorporated explicitly in our model, is that *y* is directly linked to ongoing wages and unemployment, while *g*, the booty from crime, depends also to a great extent on the stock of wealth, which does not respond so much to short-term economic fluctuations in economic activity. So cyclical changes in economic activity would tend to increase the opportunity cost of crime more than proportionally to its benefits, therefore reducing equilibrium crime rates.

The discussion from the previous paragraph already anticipates part of the limitations of the view that associates positive economic shocks unequivocally to reductions in crime. In general, different economic shocks may have different compositions in terms of their effects on *y* and *g* and, therefore, may have different implications for equilibrium crime rates. From a market perspective, for example, increases in the price of illegal goods are completely analogous to increases in the price of legal goods, so they can both be seen as representing positive economic shocks from the perspective of production. But their implications for crime rates can be vastly different. Increases in the price of illegal goods should increase the value of *g* with only minor equilibrium effects, if any, on *y*. More generally, economic shocks concentrated on what Dube and Vargas (2013) call contestable income, or rents subject to poorly enforced property rights, should affect mostly the gains from criminal activity *g*, leading to increases in crime through what they call the *rapacity effect*.

The discussion in the previous two paragraphs, however, assumes the perspective of individual agents considering whether to engage in crime, taking as given equilibrium variables at the economy level. But, in reality, several of the economic shocks explored in the empirical literature are aggregate shocks affecting not only individual incomes, but also other variables that may interfere in the individual decision to engage in crime. This point is discussed extensively by Dix Carneiro et al. (2018) in the context of shocks to local labor markets. Local shocks that reduce employment and wages, for example, typically also reduce local government revenues, potentially disrupting the provision of local public goods. Reductions in the provision of public security might change the probability θ of punishment, making crime relatively more attractive at the margin. Reductions in the provision of schooling for teenagers could reduce the incapacitation effect of schooling in the short term and reduce long-term earnings of affected cohorts. Both these effects would tend to increase crime through channels that are different from the immediate short-term effect of the economic shock on legal employment opportunities. Aggregate shocks can also affect different parts of the income distribution in different ways. Shocks that increase inequality, for instance, tend to increase the share of the population for which *y* is relatively small in comparison to *g* and, therefore, for which crime becomes relatively more attractive. In summary, potential aggregate effects of economic shocks on crime are also relevant dimensions that should be kept in mind when discussing this relationship.

Finally, these aggregate – or contextual – factors do not necessarily work in the same direction as the original income shock. A long tradition in criminology is concerned about the role of social disorganization in determining crime rates (see, for example, Wilson and Kelling, 1982). Positive economic shocks that lead to very accelerated and disorganized urban growth in the short-term can be interpreted as representing settings where public good provision does not respond fast

enough. In these contexts, reductions in θ and in other mechanisms of social control, coupled with increases in g due to increased local demand for illegal goods, can lead to increases in crime amid positive shocks to legal economic activities (y). These settings can generate the somewhat surprising result that increases in local incomes and, by all measures, economic development are accompanied by short term increases in crime.

In the next sections of this chapter, we review the literature on economic shocks and crime. We argue that the different mechanisms discussed in this section are not only theoretical curiosities but in fact are essential for us to understand the wealth of evidence currently available on the response of crime and violence to different types of economic shocks.

III. Economic shocks in legal and illegal markets

The relationship between labor market opportunities and crime is one of the most traditional topics in the research on socioeconomic determinants of criminal participation (see, for example, Jones, 1932 and Simpson, 1932; a review of this topic from the criminology perspective is available from Bushway and Reuter, 2001; Mustard, 2010 provides a more recent review from the economics of crime perspective). Public policy concerns related to the potential criminogenic effect of economic downturns are at least as old. Fishback et al. (2010), for example, document that the work relief efforts of US President Roosevelt during the Great Depression of the 1930s were partly motivated by concerns related to potential increases in crime, and that they indeed seem to have contributed to reducing property crime during the ensuing period.

Most of the contemporaneous literature on the topic has focused on the relationship between aggregate local labor market conditions and local crime rates. Some of the older papers in this literature rely on time-series or panel correlations, without explicit sources of exogenous identification. These include, for example, Cook and Zarkin (1985), who analyze the cyclical patterns for different types of crimes in the US for a period of over 50 years (1930 to 1982), Machin and Meghir (2004), who look at panel data and analyze the correlation between changes in wages at the bottom of the distribution and crime rates, focusing on police force areas of England and Wales, and Edmark (2005), who looks at unemployment rates and property crime across Swedish counties. The main concerns in this correlational evidence are the endogeneity of labor market conditions to crime—as when a region experiences economic decay because of increased violence—and the presence of unobserved factors determining simultaneously local labor market prospects and criminal dynamics.

More recent work has typically relied on Bartik instruments or on some type of natural experiment based on sectoral shocks to try to improve the identification of causal effects. Raphael and Winter-Ebmer (2001) and Gould et al. (2002) are early examples of these efforts. Raphael and Winter-Ebmer (2001) look at US state-level data and use defense contracts and exposure to oil shocks to identify the effects of unemployment on crime, while Gould et al. (2002) look at state- and county-level US data and build a Bartik instrument based on the initial industrial composition of the different areas to analyze the effect of both wages and unemployment on crime. Fougère et

al. (2009) adopt an empirical strategy very similar to the latter to analyze the case of 95 départements of metropolitan France. Lin (2008), in turn, builds an instrument inspired by Raphael and Winter-Ebmer's, in his case based on real exchange rate movements and union membership, and explores state-level US data. Finally, Axbard et al. (2019) show that increases in international mineral prices are associated with increases in employment opportunities and reductions in crime in mining areas of South Africa (mostly property crime). They also show that the crime response to mineral price fluctuations was minimized once an employment guarantee program was introduced by the government. Most of this evidence, dominantly from developed countries, indicates a robust relationship between local labor market conditions and property crime, with less consistent results for violent crime, and particularly, no effect for homicides.

Dix-Carneiro et al. (2018) follow a similar strategy for the case of Brazil, but rely on the unilateral Brazilian trade liberalization from the early 1990s for identification. This shock is arguably more exogenous than some of those used before in the literature, and it is also a one-time policy change, which allows the authors to characterize its dynamic implications more clearly. They document a significant effect on homicides, differently from the previous literature from developed countries. But, in addition, they argue and show that the types of aggregate shocks explored in this literature may affect many relevant dimensions of local economies: local government spending and revenue, public good provision, and inequality, among others. So, in principle, it is difficult to attribute their criminogenic effects particularly to the labor market. This conclusion calls into question the labor market interpretation present in most of the previous literature and calls for a cleaner identification of the labor market channel. Dix-Carneiro et al. (2018) follow on in this direction and propose a partial identification strategy that imposes theoretical restrictions on the criminogenic effect of the different potential mechanisms. They conclude that, in their context, most of the effect on crime seems indeed to work through the labor market.

As surprising as it may sound, truly clean identification of the individual level response of criminal involvement to labor market opportunities was achieved only recently by a set of papers exploring administrative employment records and courts data. Grogger (1998) had already explored the individual level correlation between wages and criminal involvement among youth in the context of the US using the NLSY, but without using a clear source of causal identification for variations in wages. More recently, Bennett and Ouazad (2020) use individual-level data from Norway to analyze the relationship between unemployment and crime. Linking labor market data with individual crime records and unemployment benefits, they show that workers fired during mass layoffs display permanently higher levels of involvement in crime (as proxied by convictions) during several years following the lay-off, and that these effects are not driven by aggregate shocks to local economies. They also show that the peaks in the later involvement in crime match closely the timing of termination of (or reduction in) unemployment benefits. Along the same lines, Britto et al. (2020) look at plant closures in Brazil and document analogous patterns, showing in addition that the effects are driven mostly by young and low-tenured workers. They also show a similar minimizing effect of eligibility to unemployment insurance. Relative increases in crime following termination of employment, when compared to baseline crime rates, are of similar magnitude across these two studies (of the order of 20-30%). Though focused mostly on migration, Pinotti (2017) also provides individual level evidence of this same effect but considering

improvements in legal labor market prospects. Relying on a regression discontinuity design based on the timing of applications for legalization of residence status in Italy, he shows that access to the legal labor market reduces immigrants' probability of criminal involvement (based on criminal records) by more than 50% of the baseline value. This set of papers provides what is possibly the cleanest evidence on the direct relationship between individual-level legal labor market opportunities and crime.[1]

But positive shocks to local economic activity and labor markets do not always come from legal sources. Increased international demand for illegal goods or regulatory changes coupled with poor enforcement can generate local economic booms driven by increased rents from illegal goods. A traditional literature in criminology associates illegal markets intrinsically with violence (Reuter, 2009). Without access to the legal justice system, agents operating in illegal markets tend to resort to violence to enforce contracts, settle labor and competition disputes, and enforce property rights. In these contexts, expanded illegal activities not only increase crime through the illegal activity itself, but also bring together increased violence. This highlights that, as discussed in the context of the model from the previous section, the impact of economic shocks on crime rates should depend crucially on the legal or illegal status of the relevant market. Recent research has repeatedly documented that increased demand for illegal goods tends to increase violence in areas associated with production, most of the time focusing on the illegal drugs market.

Angrist and Kugler (2008), for example, document how the reallocation of coca production from Bolivia and Peru to Colombia in the 1990s was followed by increased violence in cultivating areas. Similarly, Mejía and Restrepo (2014) show that coca production booms in Colombia due to changes in repressive policies in other countries were associated with relative increases in violence in areas adequate for cultivation. Dube et al. (2016) document how increases in the cultivation of marijuana and opium poppies driven by exogenous variation in the price of alternative crops are associated with increases in killings by drug-trafficking organizations in Mexico. Also in the Mexican context, Castillo et al. (2020) present evidence that increased rents in the cocaine market driven by seizures in Colombia (Mexico's main supplier) increased violence in municipalities closer to the US border, which are likely to be involved in the international drug-trafficking routes, and also in municipalities that were contested by different drug-trafficking organizations.

Evidence on the interaction between illegal booms and violence is not restricted to the drugs market. Poorly enforced environmental regulations can also lead to increased illegal activity and violence. Idrobo et al. (2014), for example, show that, when the international price of gold increases, violence also tends to increase in reservations and environmental protection areas of Colombia that contain gold deposits (it is very difficult to obtain permits to mine gold legally in these areas). In a similar vein, Pereira and Pucci (2021) show that a relatively modest change in the regulation for raw gold purchases in Brazil—which effectively reduced the incentives for private monitoring of the gold's origin—ended up increasing the demand for illegally extracted

[1] Additional recent causal evidence on how better labor market opportunities reduce crime includes Gelber et al. (2016), Freedman et al. (2018), Schnepel (2018), Modestino (2019), Khanna et al. (2021) and Galbiati et al. (2021).

gold. They then show that this increased demand generated violence in reservations and environmental protection areas (where the mineral could not be mined legally), but not in areas with legal gold mines. Finally, Chimeli and Soares (2017) show that the transition of the mahogany market in Brazil from legal to illegal in the late 1990s and early 2000s—followed by what seemed to be an increase in extraction—led to an explosion in violence in areas of natural occurrence of mahogany. They also show that, later on, once the illegal market shrank because of increased monitoring capabilities on the part of the Brazilian government, so did the violence.

The discussion in this section suggests that one should not expect economic booms to have unequivocal effects on crime and violence. We highlighted that the nature of the market experiencing the boom—whether legal or illegal—should be key in determining the expected effects on crime and violence. From the perspective of the model discussed previously, the key aspect is the relative effect of the shock on the opportunities in legal and illegal activities. More generally, this depends not only on the legal and illegal nature of the market, but also on other aspects that we discuss in the next sections of this chapter.

IV. The opportunity cost and the rapacity effect

While in the previous chapter we discussed the importance of the legal or illegal nature of economic shocks regarding their relationship with the incidence of crime, in this section we focus on a different --but complementary--taxonomy of economic shocks: Irrespective of whether they pertain to legal or to illegal markets, positive shocks may reduce crime by improving the opportunities that potential criminal face in the legal sector, or they may make the profits of crime more attractive. If the first mechanism dominates, positive shocks will be crime-reducing; but if the second is more salient, they will be criminogenic.

In terms of the model of section II, positive economic shocks may change either y or g, or both; but if the crime-reducing incentive that comes from an increase in y more than compensates the criminal incentive associated with an increase in g then the shock will end up reducing crime. The opposite holds if the criminogenic incentive associated with a higher g more than compensates the crime attenuation that stems from a larger y. Following Dube and Vargas (2013), we call the first mechanism the *opportunity cost* effect and the second the *rapacity* effect.

Dube and Vargas (2013) study how the dynamics of the Colombian internal armed conflict responded to economic shocks during the period 1988-2005.[2] In particular, they study the relationship between commodity-driven economic shocks and the intensity of the Colombian conflict across municipalities. Their findings suggest that the direction of this relationship critically

[2] Even if civil conflict is in principle a different social phenomenon than the type of small-scale crime that we conceptualize in section II, we argue that such a simple theoretical framework can account for some of the stylized facts of civil conflict. In that respect, while conflict may be conceptually closer to large scale organized crime and more valid theoretical frameworks should complement the individual-level determinants of the decision of potential fighters with the industrial organization of insurgencies, some of the claims that we make in the chapter about the relationship between economic shocks and crime also apply to civil conflicts.

depends on the type of commodity. While exogenous increases in the value of agricultural products such as coffee decreased the activity of illegal armed groups as well as the number of conflict-related casualties, positive shocks to the value of natural resources such as oil increased conflict-related activity. Dube and Vargas (2013) argue that this heterogeneity is a function of the relative labor intensity of different commodities. Growing and harvesting agricultural products, especially in developing countries --which are also most likely to be affected by internal conflicts-- tend to be labor intensive activities. On the other hand, the exploitation of natural resources tends to be more capital intensive. As suggested by the Stolper-Samuelson trade theorem, this implies that, for the first type of commodities, exogenous price surges tend to translate in higher wages more than proportionally than in higher capital rates of return. On the contrary, for the latter, price increases translate more than proportionally in higher capital rates of return. In turn, this implies that the effects of economic shocks that affect agricultural products are much more likely to be mediated by the opportunity cost effect, because they affect the legal wages of agricultural workers (y).[3] By the same token, the effects of economic shocks that affect natural resources are potentially driven by the rapacity effect, as they influence the size of vulnerable rents (g).[4]

More generally, the *opportunity cost* effect is determined by the extent to which economic shocks affect the opportunity cost of committing a crime. Thus, all else equal, economic shocks that translate into higher wages or better employment prospects in the legal sector should discourage individuals from engaging in criminal activities (or from joining criminal organizations for that matter). This occurs because such shocks increase the opportunity cost of crime. The opportunity cost effect is thus the main mechanism that explains the evidence discussed in the previous section on how higher wages and better employment prospects are negatively associated with crime.

On the other hand, the *rapacity* effect is the extent to which economic shocks increase the value of a potential booty or target, and thus the incentive to engage in criminal efforts to appropriate at least part of those additional rents. To put it differently, more income also means there is more to fight for and thus more economic opportunities may also attract more looting.[5] The rapacity effect is thus the main mechanism that explains the evidence presented in the previous section on how economic shocks in illegal markets tend to be criminogenic. This is especially salient for the case of illegal substances that create addiction, such as cocaine or heroin. The interplay between illegality (and thus prohibition which comes hand in hand with supply suppression efforts) and an inelastic demand curve makes these types of products extremely profitable, especially in the wake

[3] These are precisely the people who could potentially join the ranks of illegal organizations when facing limited alternatives in the legal sector, thus the similarity to the model presented in section II.

[4] There is a large empirical literature that has documented a positive association between valuable resources and civil conflict. This association is so pervasive and robust that scholars refer to it with the concept of “conflict resource curse.” Ross (2012) and Le Billon (2013) are two recent reviews of this literature.

[5] This idea is at the heart of the classic theories of conflict as a result of greed. See, e.g. Hirshleifer (1991) and Grossman (1991).

of government interdictions and crackdowns that create scarcity and make the business even more attractive.[6]

But the rapacity effect is not concomitant to illegal markets. Economic shocks on legal commodities may also funnel appropriation incentives. One key example is given by the observation that the income generated by large government investments in transport infrastructure may have the unintended consequence of increasing crime. Such investments have been shown to improve the material conditions and economic opportunities of neighboring communities insofar as new roads expand market access and reduce the cost of accessing better jobs, health services and education (Berg et al., 2015). Thus, at least theoretically, this should increase the opportunity cost of vulnerable populations to engage in criminal activities. However, by improving living conditions and increasing people's income, large infrastructure projects may also exacerbate the predatory incentives of criminals and illegal organized groups seeking to reap part of the economic surplus, and may also increase the demand for illegal goods. This has been shown for El Salvador by Baires et al. (2020). The authors study the effects of the construction of a highway in the north of the country and find short term increases in the economic activity of newly connected regions. However, prosperity attracted gangs, who engaged in crime and extortion, and recruited local minors thus increasing school dropout in the affected areas.[7]

The above example illustrates an important point, namely that the extent to which the opportunity cost is more salient than the rapacity effect or vice versa is not necessarily associated with the realization of different types of shocks (as in Dube and Vargas, 2013). Rather, the temporal dynamics of the effect of a single shock may imply that, while in the short run the opportunity cost effect dominates, in the long run the newly available rents attract sufficient criminals and the rapacity effect offsets the former. In El Salvador, the new highway generated short-term beneficial economic opportunities but ultimately attracted enough criminals so that the net effect of the highway on crime was positive. A similar pattern was apparent in US counties that introduced large casinos. Grinols and Mustard (2006) compare crime rates in US counties before and after the introduction of the first large operating casinos. As these establishments created many low-skilled jobs in the short run, employment rose and a large fraction of society obtained additional income. Thus, crime rates went down. However, the casinos ultimately attracted criminal structures such as loan-sharking gangs or money laundering organizations and the rapacity effect ultimately dominated, making property crime rise over time.

Clearly, the extent to which economic shocks are able to create criminal incentives through a rapacity effect depends on key contextual factors such as the degree of inequality or the overall level of law enforcement and property rights protection. On the one hand, for a given level of law enforcement (θ in our model) in more unequal societies, the more disadvantaged have more to gain from engaging in property crime. Conversely, positive economic shocks are more likely to induce decreasing crime rates if they benefit individuals at the bottom of the income distribution.

[6] Incidentally, this is one key reason (but by and large not the only one) why drug prohibition policies are largely ineffective and often backfire (see e.g. Baum, 1996 and Gray, 2013).

[7] Moreno et al. (2020), in turn, show that Colombia's large investment in rural road infrastructure projects also increased local economic activity alongside with the intensity of the internal conflict.

On the other hand, the very existence of a rapacity effect largely depends on society's underlying law enforcement (θ) and more generally on its degree of state capacity (Besley and Persson, 2009; Acemoglu and Robinson, 2012). In weakly institutionalized environments in which the state lacks the basic function of its monopoly of violence, more income also means a more attractive booty. In the next section we discuss in more detail how these and other contextual factors shape the relationship between economic shocks and crime.

V. The role of contextual factors

Independently of whether economic shocks take place in legal or illegal markets and on whether the incentives created by them are more likely to manifest in a higher opportunity cost or a higher rapacity effect, there are several predetermined contextual conditions that can shape the way in which such shocks affect criminal behaviors. In this section we discuss some of these conditions. First, we examine the role of both poverty and income inequality, which are two of the most studied potential drivers of crime. Second, we discuss jointly how instances of accelerated economic growth can create social disorganization and demographic changes which in turn may condition the relationship between economic shocks and crime. And third, we turn our attention to the potential mitigating effect of institutional factors such as state capacity and the underlying level of property rights protection.

When thinking about the effect of economic shocks on crime, poverty and inequality are hard to study in isolation. In part, this is because the poor are generally more vulnerable to negative economic shocks (for instance due to the lack of protection or insurance mechanisms), so in the context of high poverty rates negative shocks tend to increase both poverty and inequality, as well as reduce the opportunity cost of becoming a criminal.[8] This is exactly what Foley (2011) finds (looking at a positive economic shock): exploiting the staggered timing of welfare payments to poor households across US jurisdictions, the author shows that property crime drops just after the payments are made. The implication of this theoretical discussion --as well as of the related empirical evidence--is that poverty amplifies the effect of economic shocks on crime, but this occurs if and only if there is inequality and such shocks affect the most vulnerable individuals. Indeed, Bourguignon et al. (2003) argue that only economic shocks to a specific part of the income distribution affect the property crime rate.

In general, the role of poverty in shaping the relationship between economic shocks and crime is more nuanced. To see why, imagine a community of potential criminals and crime targets in which all individuals have the same income and suppose that an economic shock takes place reducing everybody's income by the same amount, making all of them equally poorer. Such a shock would reduce the expected pecuniary gain from property crime, thus likely reducing crime. In contrast, a shock that hit the same type of society, but that represented a transfer of income from half of it to the other half, would unambiguously increase crime.

[8] In terms of our theoretical framework such a shock would decrease y and thus V, whilst C remains approximately constant.

The above discussion implies that inequality is probably much more important than poverty in shaping the relationship between economic shocks and criminal behavior. In fact, inequality is certainly the contextual factor that has received the most attention in the empirical literature. In addition, and consistent with the observation that negative economic shocks tend to affect the poor more than proportionally, by and large the literature suggests that inequality is criminogenic (see, for example, Fajnzybler et al. 2002, Bourguignon et al. 2003, Soares 2004, Choe 2008, Enamorado et al. 2016). This result generally holds for different metrics of inequality, using different units of observation (county, state or country level), controlling for past levels of crime, controlling for poverty, and applies to different types of crime (violent, property, and drug-related).[9]

It remains true, nevertheless, that the evidence mentioned in the previous paragraph is dominantly based on correlations, without clear sources of causal identification. The causal effect of inequality on crime is still elusive. The identification concerns in this context are related to the possibility of omitted variable bias---as when shocks increasing inequality also affect other determinants of crime---and to the specific measurement of inequality. Inequality metrics such as the Gini coefficient, which are mute about what part of the income distribution is affected, may lead to problems analogous to measurement error when used to assess the relationship between inequality and crime. Recently, Buonanno and Vargas (2019) overcame several of the identification challenges by using the municipal share of slaves before the abolition of slavery in the mid 19th century in Colombia as a source of plasuibly exogenous variation in current inequality levels. Consistent with the previous literature, the authors find that inequality does cause (both property and violent) crime.

While Becker (1968)'s model offers a theoretical explanation compatible with the empirical findings of the link between inequality and property crime, at first glance it cannot account in a satisfactory way for the relationship between inequality and violent crime. In fact, violent crime can be, to some extent, a by-product of property crime, and this could help explain the observed patterns. However, inequality also impacts certain crimes that seem to lack any connection with clear pecuniary motivation. For example, Sanz-Barbero et al. (2015) find that inequality is positively associated with the incidence of intimate partner violence, even after controlling for income. This illustrates the limitations of the Beckerian framework to account for the relationship between inequality and violent crime more generally.

The social disorganization theory offers an alternative that complements the basic rational choice framework in explaining the effect of inequality on violent crime. It is beyond the scope of this chapter to describe all the nuances and implications of this theory (for a comprehensive review, see Kubrin and Weitzer, 2003). But the core idea is that communities establish enduring relationships that function as an extra layer of social control beyond the control exerted by the

[9] The empirical literature, however, has also identified interesting heterogeneities related to the specific types of crime. For instance, different property crimes are affected in different ways by inequality. To give a simple example, an increase in inequality might make pick-pocketing more attractive, but auto thefts might become more costly (since more expensive cars might be better protected). In other words, using our theoretical model, the *g* in the expected utility from committing an offense *C*, is specific to each type of crime.

state. Social disorganization is associated with factors that weaken such relationships. Thus, a shock that increases inequality may also increase segregation and isolation, disrupting social networks, community cohesion, and ultimately social control. In turn, this may increase the level of violence observed in society.

Social disorganization can also explain another puzzle from the crime literature. The empirical evidence has documented various contexts where short-term accelerations in economic growth are accompanied by increases in crime. For instance, Freedman and Owens (2016) study the impact on crime of a governmental program of renovation and construction of military bases in San Antonio that benefited federally contracted construction workers. The authors find that neighborhoods in which more construction workers were hired saw an increase in both property and violent crimes. A higher degree of inequality seems to be associated with these results, but through different channels. The increased gain from stealing might be the main driver for the increase of larceny, auto theft and burglary--which could be, qualitatively, fully explained by Becker's model. By contrast, a stronger social disorganization can better describe the rise of assaults and rapes.

James and Smith (2016) obtain similar conclusions when analyzing the boom of shale oil and gas in the US. A sudden technological innovation in the extraction of fossil fuel made the extraction of shale gas and tight oil a very profitable business almost overnight. The authors find that countries that benefited from the extraction boom experienced a differential increase in the rates of rape, aggravated assault, robbery, larceny and murder. In addition to the channels highlighted by Freedman and Owens (2016) regarding social disorganization, James and Smith (2016) also highlight the role of sudden demographic changes driven by the migration patterns into boom counties. Oil and gas drilling disproportionately attracts young men. In turn, this demographic group commits more crimes (of all types) than any other demographic group.[10] Soares and Souza (2021) document similar effects for homicides in oil producing areas of Brazil that benefited from the 2000s increase in oil prices, but identify a potentially different channel. They do not find changes in demographic composition in these areas--possibly because in this context extraction was mostly off-shore and very capital intensive--, but document increased local economic and population growth not accompanied by proportional expansions in the provision of public goods. The evidence on road constructions in El Salvador presented by Baires et al. (2020), discussed in the previous section, represents also another setting where local accelerated growth seemed to have been associated with increased crime.

The last contextual factor we discuss is the role of a strong state and institutional environment. Clearly, better law enforcement institutions and property rights protection are likely correlated with lower crime *levels* (via a higher θ parameter in the model presented in section II). But remember that we are primarily interested in the effects on *variations* in crime due to economic shocks. Although the concept of "better institutional environment" encompasses many distinct aspects of state capacity, the main prediction of our theoretical model is that good institutions mitigate crime

[10] Street (2020) investigates the same oil boom episode but focuses on the crimes committed by the individuals who lived in the booming counties before the shock (the non-migrants). She finds null effects, which supports the idea that the crime surge was driven by the incoming migrants.

changes whenever they can offer quick and efficient countercyclical policies. For instance, Cortés et al. (2016) show how the crash of a large network of Ponzi schemes in Colombia affected thousands of investors and increased property crime. But the authors also show that the Ponzi-driven crime surge was only present in places with weak judicial and law enforcement institutions and with less access to consumption smoothing opportunities. This implies that governments can reduce crime if they can provide safety nets and compensate losers from negative economic shocks, which is also in line with the evidence from welfare payments and crime discussed before.

Acemoglu et. al (2020) provide a related, but different, example, associated with organized crime: after Sicili was hit by a large drought at the end of the 19th century, mafia organizations became stronger in provinces with weaker state capacity. This is because affected areas sought help and relief from either the state or its closest substitute, depending on the varying levels of state presence. As a result, the drought strengthened criminal organizations in various parts of the island. This illustrates a more general (and policy relevant) point: if the state is not strong enough to retain the monopoly of violence (or does not have the capacity to provide additional public goods other than security), unexpected economic shocks that generate scarcity can consolidate organized criminal organizations.

VI. Discussion and areas of future research

In this chapter, we have discussed that the relationship between economic shocks and crime is complex and definitely not unidirectional. This is because economic shocks can be manifold and may affect the equilibrium level of crime through a variety of channels. Guided by a simple theoretical framework the chapter discusses these channels as well as the empirical evidence, distinguishing between shocks that take place in legal or illegal markets, that make either the opportunity cost or the rapacity effect more salient, and that are shaped by key contextual factors such as inequality and institutional strength.

Understanding the main drivers of crime and disentangling these channels is essential, among other reasons, for policy purposes. For example, consider two equally costly projects to reduce crime after an economic shock: a welfare program and an increase in the size of the police. The most effective policy depends on how the shock may induce increases in crime. Offering income relief may be more effective if the shock is poverty-augmenting. By contrast, reinforcing the police is likely to be the best policy to respond if the cause is social disorganization induced by accelerated urban growth.

While we have tried to rationalize the proposed channels as well as the empirical evidence using a Beckerian framework complemented with insights from the social disorganization theory, it is important to acknowledge that there are other influential ecological theories of crime that can account for some of the empirical findings. For example, Merton (1938)'s *strain theory* argues that inequality increases violent crime by exacerbating the frustration of unsuccessful individuals who witness the relative success of others. Whether the increases in violent crime that result from changes in inequality are a byproduct of the dynamics of property crime (à la Becker), or can be explained by social disorganization theory or else by strain theory, implies quite different policy

prescriptions. It is therefore extremely important to engage in more research about the mechanisms that link each type of economic shock to crime in general, and to violent crime in particular.

There are other dimensions that also need further research. While the literature has primarily focused on who commits crimes and the context under which criminal decisions are taken, less attention has been given, for example, to the identity of victims. Understanding how economic shocks may affect the vulnerability of different populations to crime is a largely understudied topic. Indeed, victimization surveys worldwide suggest that the likelihood of being a victim of a crime is strongly associated with the victim's income and also depends on the type of crime. However, while in the US low-income individuals are disproportionately more likely to be victims of both property and violent crime (see the US National Crime Victimization Survey), in Latin America and the Caribbean the rich are more vulnerable to property crime (Schargrodsky and Freira, 2001). How different types of economic shocks may exacerbate or mitigate these striking heterogeneities in victimization is a potentially interesting area for further research.

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