Crime, Police Corruption and Development

Evidence from Victimization Data

Jens Chr. Andvig and Gbewopo Attila

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Department of International Economics

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Visiting adress: C.J. Hambros plass 2d
Address: Postboks 8159 Dep.
NO-0033 Oslo
Internet: www.nupi.no
E-mail: pub@nupi.no
Fax: [+ 47] 22 36 21 82
Tel: [+ 47] 22 99 40 00

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Department of International Economics
Norwegian Institute of International Affairs (NUPI)

Abstract
Recently economists have begun to study various aspects of public sector institutions (with their behavioral neighborhoods) and their effects on the long run economic development. Degrees of corruption, rule of law and protection of property rights have all apparently significant economic impact. These results are all based on the construction of indicators for these difficult-to-observe explanatory variable complexes. In most cases the indicators applied have been developed for most countries and have on the one hand 'nice' statistical properties when embedded in regression equations, but on the other hand are conceptually fuzzy with unclear relationships to basic observations. In this paper we go through many of the same relationships, but based on international efforts to collect questionnaire information about citizens' experience with crime and police corruption. This information is more conceptually distinct and likely to be more closely related to relevant experience, but proves on the other hand less amenable to econometric analysis. Despite the latter weakness we have found it worthwhile to pursue it in order to complement the indicator- based approaches.

Key words: Crime, police, corruption, development
JEL codes: H1, K42, O1.

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* Jens Chr. Andvig, Research Professor, Department of International Economics, Norwegian Institute of International Affairs (NUPI), C:J: Hambros Plass, Pb 8159, 0033 Oslo, Norway, jca@nupi.no, Tel (47)22994035. Gbewopo Attila, Guest Researcher, Department of International Economics, Norwegian Institute of International Affairs (NUPI), gbewopo.attila@gmail.com. Tel (+33)667327313. The authors are grateful to the Research Council of Norway for the financial support. They acknowledge the useful comments and suggestion from the participants at the "Violence, police corruption and poverty" workshop at NUPI, 8th December, 2009. They also thank J. N. Van Kesteren for the integrated ICVS data.

Introduction

Recently economists have begun to investigate a number of institutional conditions for growth. One question raised is how the degree of security of persons and property may impact economic development and human welfare. Based on different indexes, the importance of the degree of security is confirmed for growth and for investment in human and physical capital (Barro, 1991; Lloyd-Ellis and Marceau, 2003; Hall and Jones, 1999). Other studies had showed that corruption has a negative impact on growth (Mauro, 1995; Mo, 2001).

The purpose of this paper is to explore whether some specific sets of *criminal* actions that have impact on the security of property and persons and the behaviorally related police corruption may have significant impact on the long run economic development. Many of the econometric problems that arise when studying these effects are related to the rather obvious fact that these questions may be equally important in reverse: How are the incidence of crime and corruption related to the characteristics of economic development itself – its degree of economic inequality, its incidence of poverty; its speed? (Bourguignon, 2001; 1999).

Whatever the causal direction in the crime-development relationship that is sought, it may appear reasonable to start out with official crime statistics as the empirical basis. This has proved to be extraordinary misleading, however, when crime is related to development. The simple reason is that as police organizations become more efficient and trusted, the fraction of crimes *recorded* by the police tends to increase so strongly that it overshadows the movement in actual crime rates. Even the sign of the regression coefficients tend to be wrong (Soares, 2004). This has led to serious misunderstandings of the likely relationships between economic development and crime.

In another strand of research where crime-corruption nexuses have been related to economic growth rates or levels of income and poverty, the empirical starting point for assessing the quantitative significance of the nexus has been a set of indicators for corruption, ‘rule of law’ or ‘degree of property rights protection’. Large research efforts have been made in the construction of such indicators. They often produce interesting and statistically significant results either as explanatory or explained variables in connection with economic growth rates or income levels. Unlike the case of official crime statistics it is not obvious that the indicator statistics will lead to wrong conclusions.

The problem with them is rather different. It is as a rule unclear whether the indicators really reflect the phenomena they claim to stand for. Even in the best cases they remain conceptually fuzzy and it then remains somewhat unclear what they may explain. The conceptual content of any regression equation they become embedded in thus has to become fuzzy itself. When heavily based on the perceptions of a subset of actors, the indicator may in the worst cases stray far away from any likely reality (Razafindrakoto, 2006). Nevertheless, while in general rather fuzzy, their use may be very valuable in research. The alternative may become complete research silence about the involved processes and relationships.

Here we explore the alternative of looking at these relationships and processes by using so-called crime victimization survey data (International Crime Victimization Surveys, ICVS) that have been collected for a number of countries, mostly by the efforts of a UN-sponsored group of researchers (Van Dijk, 2008). In addition to regular crime experiences the respondents in some of these surveys are also asked about their experience with corruption in general and police corruption in particular. Unlike the indicator based analyses the meaning of the various observational values ascribed to crime and corruption events are not conceptually fuzzy. On the contrary, one of the strongest assets in the ICVS approach is the relatively clear and comparable definitions of the original crime and corruption events used in the different country surveys that constitute our empirical basis. Alas, our approach has its own weaknesses (which we discussed in section 2) that may lead scientific purists into silence.

Despite these weaknesses are these data neither as misleading in conjunction with economic development as the official crime statistics (Scorzafave and Soares, 2009; Glaeser, 1999) nor so fuzzy and difficult to interpret as the perception indicator approaches. But, they lead into a number of statistical difficulties. These may be one of the reasons that ICVS statistics have rarely been used, specifically to assess the macro-economic consequences of crime or police. In the literature we have so far only found one paper that is closely related to ours (Chatterjee and Ray, 2009)[1] While we are unable to solve all the problems related to the ICVS statistical weaknesses we find it worthwhile

[1] They use the same ICVS data, look at the interactions between crime victimization and bribery victimization, and how this may impact growth at the macro level. They find an association between crime and bribery, but fail to ascertain robustly their effects of growth. Our study departs from the Chatterjee and Ray's one in several aspects, however. Our main concern is on the long run development and we seek to highlight the mechanisms *behind* the impact of crime, inter alia by paying attention to human capital accumulation. In addition, we suspect there must be problems with their descriptive statistics. The crime rates they calculate (see their table A1) are extraordinarily high. For example, they estimate Finland to have had a crime rate of 100% in 1991!

to persevere since the alternatives of either speculate, neglect or study the issues through indicators are not satisfactory either.

It is obvious that the level of development also influence crime and police behavior, and plausibly more strongly so than the effects in our direction. Nevertheless criminal behavior appears to have some components that may not be explained by levels of development, economic inequality and other heavy-and-easy-to understand economic forces, components that must be considered exogenous by our present state of knowledge. Microeconomic research by Glaeser (1999) comparing crime levels in different US cities, finding them unexplained by income and inequality, suggests that forms of social interactions may explain some. The wide variation in crime levels across continents (Andvig and Shrivastava, 2009) suggests that there may also be important cultural components in crime behavior that in some respects are exogenous to economic development. Hence we consider it to be of interest to study the impact of crime and police corruption on development and try to isolate these effects from the ones that go in the other direction. Since these are likely to be quite strong, we have to put considerable efforts to control for those. In order to be able to do we have had to apply instrumental variables and bootstrapping techniques.

Regarding substance the present paper deals specifically with four complementary issues: (i) How does the crime affect the level of development? (ii) How does the police corruption affect the level of development? (iii) Are there indirect mechanisms through which the incidence of crime is transmitted to the economic performance where we also have sufficient empirical information? Here, we focus on factors such as education and health. (iv) We explore whether violent crime and property crime may have different impact on development.

The paper is organized as follows. We first outline a set of mechanisms where crime (and /or police corruption) may in a plausible ways affect economic development and derive empirical hypotheses about effects of crime and police corruption on the level of development (section 1). We carry out econometric analyses of these effects in section 2 where we seek to take care of the econometric issues that arise from reverse causality. Section 3 explores whether violent crime and property crime have different effects. Section 4 provides additional tests.

1. Crime, police corruption, and development: the theoretical issues

1.1. Crime and economic development

Crime rates vary considerably across countries and generate economic and social costs to the society, but are these costs heavy enough to have traceable effects on the countries long run development?[2] To answer that question we need to consider a number of factors that earlier research has shown to be significant determinants. Hence, the focus of this paper is the marginal impact of crime on long run development.

Let us then first look at some of the mechanisms that may explain it. Some are mainly related to the supply and use of *labor.* If a larger share of the population in country A than in country B is routinely engaged in criminal activities, the share of the population engaged in production will be smaller. In particular, youths are normally overrepresented in criminal activities. Crime may easily become an alternative to education. Hence, crime is likely to have a negative effect on *education* and the education level in A would tend to be lower than in B,[3] Here we have a number of spillover effects: good brains go to gangs instead of school, bullying at school destroy learning, quality schools may not develop in high violence areas. Barrera and Ibanez (2004) identify a certain number of channels through which violence affects education.[4]

Other represent pure *waste* of labor power: a larger share of the labor power in A is likely to be spent on preventing crime through guards, security companies, the monitoring of employees and so on. Working hours may be confined to day light time in the high crime areas. Violent crime in particular may have this effect. All these effects are working on the supply of (productive) labor power (Nunn, 2007;

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2 Klaus (1994) estimated that USA lost around 0.3% of their GDP in 1992 due to crime. Gaviria (2002) finds substantial negative effects of corruption and crime on sales growth where crime has a more pronounced effect on economic outcomes than corruption. Crime constitutes also an important obstacle to business in Africa countries: according the investment climate survey 2005, 37% of surveyed firms in Nigeria identify crime as a major or severe constraint on their business. This proportion increases to 50% in Zambia and 70% in Kenya.

3 Here again we are likely to have a reverse effect: If a larger share in **B** is students, they are less likely to engage in criminal activities.

4 Londoño (1998) estimated that in Colombia, the loss incurred in education in the 90s is equivalent to 4% of GDP. Idiosyncratic evidence based on a survey of ex child soldiers in Uganda (Blattman and Annan, 2009), showed (surprisingly) that while the extreme horrors they had been through have had only minor effects on their post-war income, the delays in their schooling have had strong negative effects.

Mehlum et al, 2005; Lloyd-Ellis and Marceau, 2003, Hall and Jones, 1999).

Other work mainly through the supply and use of *capital*: If crime rates are higher a larger share of capital in A has to be spent on *preventing* crime: The fences will be higher with reinforced neighborhood effects: It will be risky to have the lowest. Expenses to burglary alarms, monitoring devices, lighting and so on tend to be higher reducing the share of capital that will be allocated to production.[5] In the case when production may be located either in A or B, investors will tend to allocate capital in B reducing the amount of capital allocated in A.[6]

Important negative effects of crime on production work also through increased *transaction costs*: For example, when fraud are prevalent many profitable business deals will never be made, increased efforts and time will be spent on monitoring quality of goods and services to be bought. If serious violent crime is prevalent physical transport costs will also increase as cars become robbed or extra drivers will be hired to prevent it. At sea pirating will also increase the transport costs.

Despite all the capital and transaction costs of crime we will in the following estimations concentrate our attention on human capital accumulation, i.e. education and health[7] since any realistic estimation of the capital related mechanisms would need to build up specifications of the economic openness characteristics of A and B that we seek to avoid at this stage. Moreover, since we are looking at the development in the long run the 'stock' effect of violence on education tends to cumulate over time: when violence decreases education at period t, less educated labor power is available to teach students in period $t+1$ (Barrera and Ibanez, 2004).

Not only does violence affect education, it also affects the health of workers and the life cycle of the whole population.[8] Crime can also hamper the long run development by affecting children: childhood and

5 Again reverse causality effects may be present: less lighting make crime more easy to perform.

6 In a number of surveys where business leaders have been asked about what they consider their most serious problem, regular crime has come surprisingly high on their list (World Bank, 2005). Note that some of the relevant crime will not be recorded in the crime victimization data since crime directed against enterprises have only been recorde for a few countries. Some of that will be registered in the household questionnaires. Moreover it is reasonable to assume that the correlation between household and enterprise experienced crime rates are positive and pretty strong.

7 This importance of human capital accumulation is supported by the international communities and aid donors during the last decades. This is strongly emphasized in the ambitious UN Millennium Development Goals, aiming at curbing poverty by 50% by the end of 2015. Governments in developing countries are increasingly urged to raise education quantitatively and qualitatively, to reduce child mortality rates and such.

8 Soares (2005) found that on average 1 year of life expectancy lost to violence is associated with a yearly social cost of 3.8% of GDP.

adolescence are the critical stages of the accumulation of human capital assets (Heinemann and Verner, 2006). In addition to the impact on the traditional economic welfare measures we focus here, crime has strong effects on more diffuse, but equally important aspects of human welfare, feelings of insecurity, even fear.

Here we will only look at and test the following hypotheses: Crime affects negatively the long run development *(hypothesis 1).* Crime indirectly affects development through human capital accumulation *(hypothesis 2).*

1.2. Crime victimization, police corruption and development

Ideally the role of police in the society is to reduce the incidence of crime (Andvig and Fjeldstad (2008), providing security to the populations, protecting them from private expropriation; robbery, etc. Presumably police corruption is likely to increase crime rates in different ways: 1) it will increase the scale economies of crime organizations, 2) increase the relative return of any single crime to a non-crime action.[9] Despite these plausible mechanisms it has proved difficult to establish firm empirical evidence. In a study based on the same basic data as this paper Azfar and Gurgur (2008) show that while there are indeed close connection between police corruption and different forms of crime,[10] that police corruption appears to increase crime, effects of police corruption on crime rates are not firmly established. Hence, the approach here to look at the effects of police corruption and crime on development in isolation makes sense. What kind of mechanisms might then lead from police corruption to development that doesn't work through the crime rate? Apart from the consequences due to the interactions with criminal activities, police corruption may have its own separate effects on development, and then through its links to corruption in general. To some degree corruption in the police simply follows the overall level in the administration, but it also has a specific effect. After all corruption is a crime to be policed by the police. A corrupt police will increase the corruption in general and thereby have a separate effect on development. Andvig and Fjeldstad (2008) documented mechanisms through which police corruption may affect de-

9 As argued in Andvig and Fjeldstad (2008) the police may earn corrupt income through either extortion of innocents or through bribes from the guilty. The relative return of crime increases.

10 In their paper they show that the citizens' (households') crime reporting is also interlinked with their crime and corruption experiences in interesting ways. Despite this and because we have focus on potential macroeconomic effects of crime, we have refrained from bringing the rate of crime reporting into our analysis.

velopment[11]: direct illegal taxation of foreign trade, of the informal urban economy, and of transport in rural areas.[12]

The following hypotheses will be tested: police corruption contributes to increase the adverse effects of crime on development *(hypothesis 3);* police corruption *per se* will adversely affect the economic development (*hypothesis 4*).

11 For an microeconometric analysis of how police corruption affect the poor people, see Hunt and Laszlo (2007) and Hunt (2008).

12 To name but few, Nissen (2005) reported police extortion cases in rural Cambodia. Also, several witnesses on police extortion in urban India were published in the Hindu (10 may 2003).

2. Empirical analysis

2.1. Data presentation

The empirical analyses of the paper are based on the International Crime Victimization Surveys[13] that contains information about both police corruption and various forms of crime. Great efforts have been made to define the crime types in the same way across countries and years. The surveys like ICVS are likely to be more valid than the police-reported data in a cross country context (Azfar and Gurgur, 2008a) since the police reported data are more strongly influenced by the reporting process of police organizations. That may vary strongly across countries. The official crime data reported by police are affected by two problems in developing countries: the under-reporting bias of police and the unwillingness of victims to reports crime to the police (Soares, 2004; Scorzafave and Soares, 2009).[14] Victimization surveys have been judged as "the primary workhorse for measuring crime" (Glaeser, 1999) even for developed countries.[15] Further, with respect to corruption, our choice is reinforced by the argument of authors (see Roubaud and Razafindrakoto, 2006, Abramo, 2007) who claim that street reports of corruption or local populations facing more often bribery are likely to be less biased than the perception of international experts.

The present study takes advantage of the data for crime and police corruption from the latest integrated International Crime Victim surveys (ICVS) data compiled by van Kesteren (2007). Even though serious efforts had been made to ensure comparability across countries, these efforts are too costly to be made yearly and for each country. Hence, the data are available only for five waves: 1989, 1992, 1996, 2000/2002 and 2004/2005. In total 74 countries are covered (see ap-

13 For a detailed description of crime victimization data, see van Dijk(2008), Chatterjee and Ray (2009). Fajnzylber et al (2002) also describes the main sources of crime data.

14 The correlation between the official police reported crime rates and the crime experience rates appears to be only weak (Gibson and Kim, 2006).

15 Obviously, there are some weaknesses of the ICVS data. Andvig and Shrivastava (2009) drew attention on the most important. 1) Unlike the developed countries, the samples drawn from the developing countries are taken from the largest city(ies) only. Since crime rates on average are higher in cities, this may lead to an overestimation of crime rates in poorer countries. 2) The surveys performed in the collection of country surveys that we rely on, have been made at widely varying points of time. 3) Citizens report of crime in the surveys may systematically deviate from the actual experiences when the respondents try to manipulate the outcomes for one reason or another. 4) Although a lot of care has been made to formulate the questions in exactly the same manner, crime and corruption are exceptionally sensitive subjects that make the survey responses exceptionally exposed to systematic, but unknown environmental influences that may give very different rate outcomes from two seemingly identical surveys performed in the same country and close in time.

pendix 1 for the full list of countries).[16] Of the 74 countries, the first wave covers only 13 (developed) countries, the second wave 28 countries, the third wave 44 countries, the fourth wave 46 countries and the fifth wave 34 countries. Hence, not all countries are covered in each wave: about 65% of the sample had been covered by only 1 or 2 waves. The composition of the sample in the different geographic regions is presented in appendix A2. It is clear that ICVS cover more the developed countries (West Europe, USA and Canada, Australia) than the developing countries (Africa, Latin America and Asia).

Measurement of crime rates[17]
The construction of the crime rate index is based on the questions asking surveyed populations if they have been victims of [crime type] during the last two years. For each ICVS wave and a given country, the aggregate crime rate is measured as the simple average proportion of surveyed populations who were victims of any types of crime. The following types of crime are considered in this study: theft of cars and motorcycles, theft from cars, car vandalism, theft of personal properties, burglary, robbery and assault. Attempts of these types of crime are also included in our calculations.[18]

Measurement of police corruption
Corruption is difficult to measure because its activities are developed secretly. At macroeconomic level, only perception indexes are available. The present work exploits the data from the International Crime Victim surveys to measure police corruption. Here, respondents report their experience in paying bribe in public administrations:

> "In some countries, there is a problem of corruption among government or public officials. During the [year the survey was conducted], has any government official, for instance, a police officer or inspector in your country asked you, or expected you to pay bribe for his or her services?"

As for crime rates, the police corruption is measured as averages in each country. In other words, for each ICVS wave, the police corruption measures the proportion of individuals in a given country who paid bribe to the police over the last twelve months previous to the surveys.

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16 In fact the ICVS data cover four other countries: England and Wales, Northern Ireland, Scotland and Yugoslavia. For the purpose of this study, they are excluded because we are unable to merge other macroeconomic aggregates to them.

17 For the definition and source of all variables used in the paper see appendix 3.

18 Homicides and sex crimes are not considered in the following despite their importance. For obvious reason a direct victim of a homicide is unable to report the incident. Although household members may, the relationship between the crime incidences and the sample of respondents will have to differ for this crime. Sex crimes are more likely not be reported even in this form of questionnaire and its degree of reporting to vary strongly across countries so the ICVS data will be more difficult to interpret for these kinds of crime. As discussed later, the advantage of using an overall crime index in some situations is to reduce the erratic component in the answers to any single questions in a questionnaire and to smooth over cultural differences in the degree of reporting each single form of crime.

Crime rates and police corruption are calculated on a scale from 0 to 100.

2.2. Descriptive statistics

Figure 1 show the average crime victimization rates and police corruption for different groups of countries. We note that crime rate and police corruption averages vary widely from one wave to another for the same group of countries. While a part of these variations could be explained by actual changes in crime or police corruption levels or shift in the crime protection technology, it might be also due to characteristics of the questionnaire instrument itself: variation in the composition of the ICVS, variable responses of respondents or different ways to introduce the questionnaire from one wave to another. On the other hand, we have no reason to believe that actual crime patterns for a country may stay stable for more than a decade as we by implication have to assume to keep the sample of countries sufficiently large. In fact, in the period 1995-2005 one can observe a significant change (a decline) in crime rates in Europe (and in the United States, Van Dijk, 2008). The decline in the USA has led to much theorizing, but the simultaneous decline in Europe has thrown doubts on most of it. As far as police corruption is concerned, presumably, the reported instances of police corruption in developed countries are so low that the erratic component of the responses may be very large.

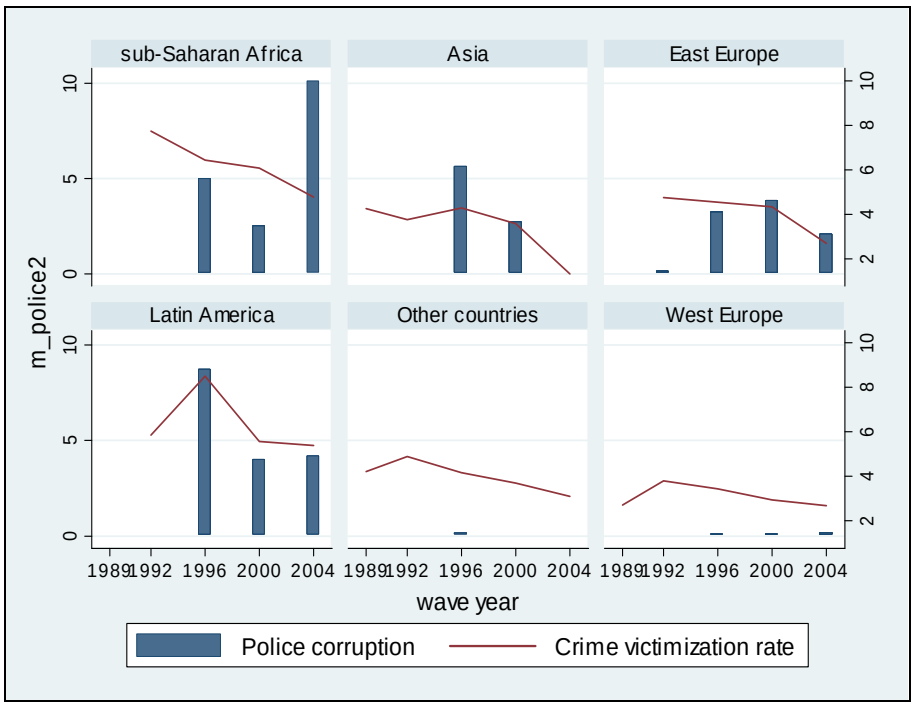

Figure 1- Crime and police in different continents and waves

To deal these weaknesses and the erratic nature of the data, our analyses are based on averages,[19] over the period 1989-2005. That is, for each country, we calculate the averages taking advantage of all data made available when merging the five ICVS waves during the whole period 1989-2005. Figure 2 below show positive correlations[20] between the different types of crime (see appendix A4 for their descriptive statistics).

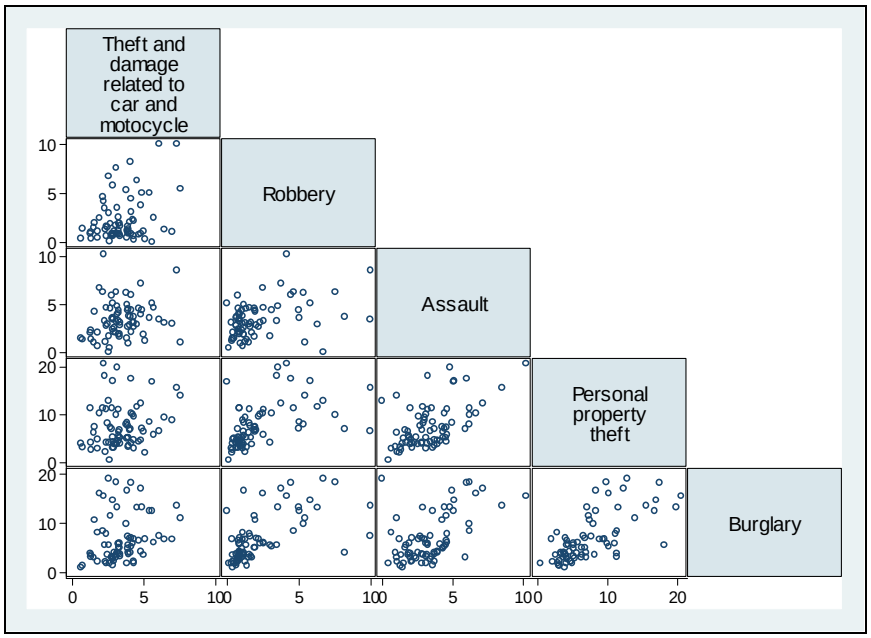

Figure 2- Crime types correlations

Table 1 displays the average proportion of populations who were victims of crime rate, police corruption in different groups of countries for the period 1989-2005. Standard deviations are in the parentheses. The number of developed countries surveyed has been higher than developing ones. On average crime incidence rate is higher in African and Latin America countries. Crime rates are lowest in Western Europe, with an average representing less than 50% of the crime rates observed in Africa or Latin America. Asian countries and East European countries have similar average crime rates, which is significantly different from the average of Africa or Latin America.[21]

19 Using the averages for the whole period reduces the volatility associated with the composition of the sample for each country. In addition, it makes it possible to correct for the artificially-high-and-low variations in the victimization rates. Even so, we expect measurement errors in the data.

20 In each cell, the scatter plots show the correlation trend between the variable labeled in the top along the diagonal and the variable on the right-side along the diagonal.

21 The relative low score of poor Asian countries and the high score of Latin American countries suggest that any relationship between crime and development may be influenced by some set of cultural or income distribution mechanisms. We control for these factors in our regressions.

Obviously, average statistics hide disparities among countries. Among the ten countries with the highest crime rates in the world, five come from Africa. The highest crime rate (11.6) is observed in Colombia, followed by Zimbabwe (9.5). In Western Europe countries and Asian countries, crime rates are low: Hong Kong (1.4), Azerbaijan (1.5) and Japan (1.7) have the lowest crime rates in the world.

Statistics displayed in table 1 show that the highest proportion of population who pay bribe to the police is observed in Latin America. This is surprising since the average for African countries, generally considered as the most corrupt in the world, is lower (2.84) even though the variability is higher than Latina America. However, Nigeria has the highest police corruption. Among the ten countries with the highest police corruption rate, three are from Africa (Nigeria, Mozambique and Uganda), three from Latin America (Bolivia, Mexico and Colombia), three from East Europe (Russia, Croatia and Kirgizstan), and one from Asia (Cambodia). Police corruption is very low if not completely absent in Western Europe countries and other developed countries.

The relationship between crime rate and police corruption is described in Figure 1. The two variables are positively correlated.[22]

Table 1: Average crime and police corruption rates in different groups of countries

	Crime rate	Police Corruption
Africa (N=12) (a)	7.29 (1.67)	2.84 (4.44)
Asia (N=11) (b)	4.22 (2.65)	1.90 (2.16)
East Europe (N=20) (c)	4.75 (1.12)	2.90 (1.88)
Latin America (N=9)	7.14 (2.35)	4.70 (3.64)
Western Europe (N=18)	3.32 (0.78)	0.12 (0.19)
Other (N=4)	4.29 (0.25)	0.03 (0.03)
All countries (N=74)	5.00 (2.17)	2.13 (2.88)

The p-value of the two-tail t-test of the mean difference between Africa and Latin America is 0.875. (b) The p-value of the two-tail test of the mean difference between Africa and Asia is 0.0045. (c) The p-value of the two-tail t-test of the mean difference between East Europe and Asia is 0.5347.

22 The correlation coefficient is 0.39 and significant at 1% level.

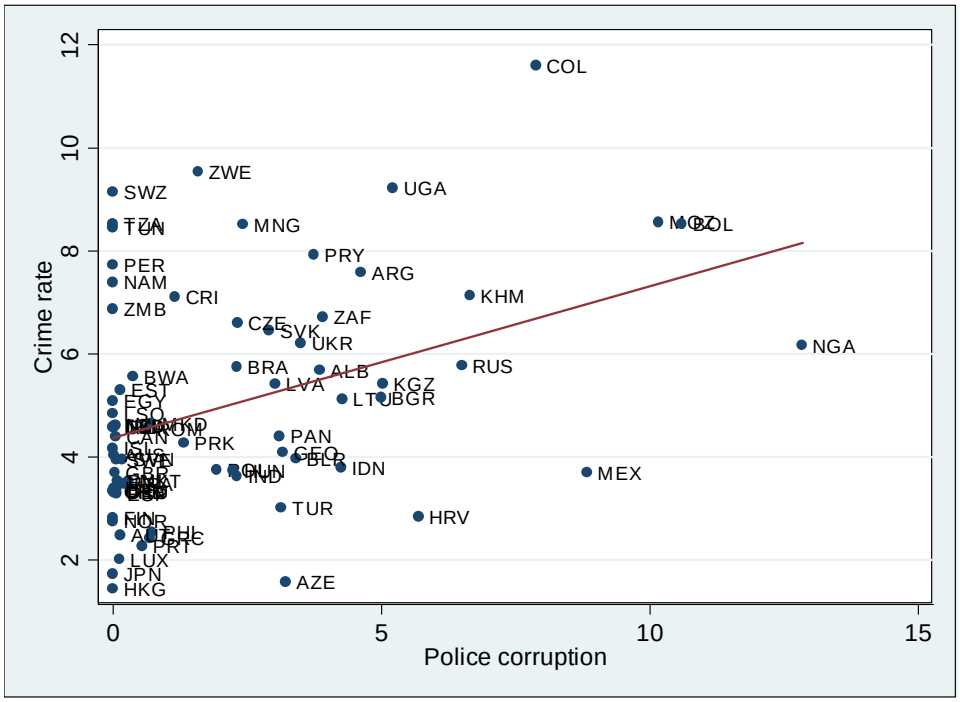

Figure 3- Crime and police corruption correlation

2.3. Main econometric results

2.3.1. OLS estimates

So far, we hypothesized that both crime and police corruption are likely to have negative effects on the level of development. The purpose of the econometric analysis is to explore whether this may be confirmed from the data and to estimate the eventual strengths of the impact of crime and police corruption on the level of development.

As shown in the previous section, for each country the ICVS waves cover different time periods, which are not adjacent. Furthermore, there is a wide variation in the composition of countries samples covered by each ICVS wave as well as individual countries samples. All these problems make it difficult to conduct panel data analysis. The econometric analyses rely therefore on cross-country average over the whole period 1990-2004. By reducing the measurement errors in the ICVS data, the averaging allows us to generate more accurate estimates of our coefficients of interest.[23]

The dependent variable is the log of real GDP per capita, which come from Penn World tables 6.2 computed by Heston et al (2006). [24] The

[23] One inconvenient of this approach is to affect the strength of the relationship between crime, police corruption and the level of development if the inter-temporal variation is not merely noise.

[24] Alternative measures of GDP are used to check the robustness of our results in section 4.

level of GDP captures the differences in the long-run process of economic development. We seek to explain differences across countries which are not just transitory (see Easterly et al, 1993; Hall and Hones, 1999). The equation estimated is as follows:

$$Logy_i = \beta_0 + \beta_1 crime_i + \beta_2 pol_i + \sum \beta_k x_{ik} + \varepsilon_i \quad (1)$$

X_{ik} is a set of control variables (discussed below) that are related to the 'deep' determinants of economic performance (geography), human capital accumulation factors (education and health), the quality of institutions, the social factors and the economic characteristics (informal sector). The impact of these variables on the level of development is well established in the literature. Their omission could lead to bias in the coefficient of police corruption and crime variables since they are plausibly correlated with crime and corruption.

Our econometric procedure consists of four steps: (i) Estimate the impacts of crime and police corruption on the level of development, holding other factors constant. (ii) Assess the indirect effects of crime, focusing on police corruption, education and life expectancy. (iii) Next, two dimensions of crime are considered: the violent crime and the property crime. (iv) Tests of robustness are finally conducted.

The scatter plots in figure 4 show a negative correlation between both average crime rate and police corruption and GDP per capita[25]. That is, countries with low crime rate (or low police corruption) like Western Europe countries have high level of GDP per capita while countries with high crime rates (or high police corruption) in Africa or Latin America have low GDP per capita.

[25] The correlation coefficient between crime and GDP is -0.54. The correlation coefficient between police corruption and GDP per capita is -0.49. Both coefficients are significant at 1% level.

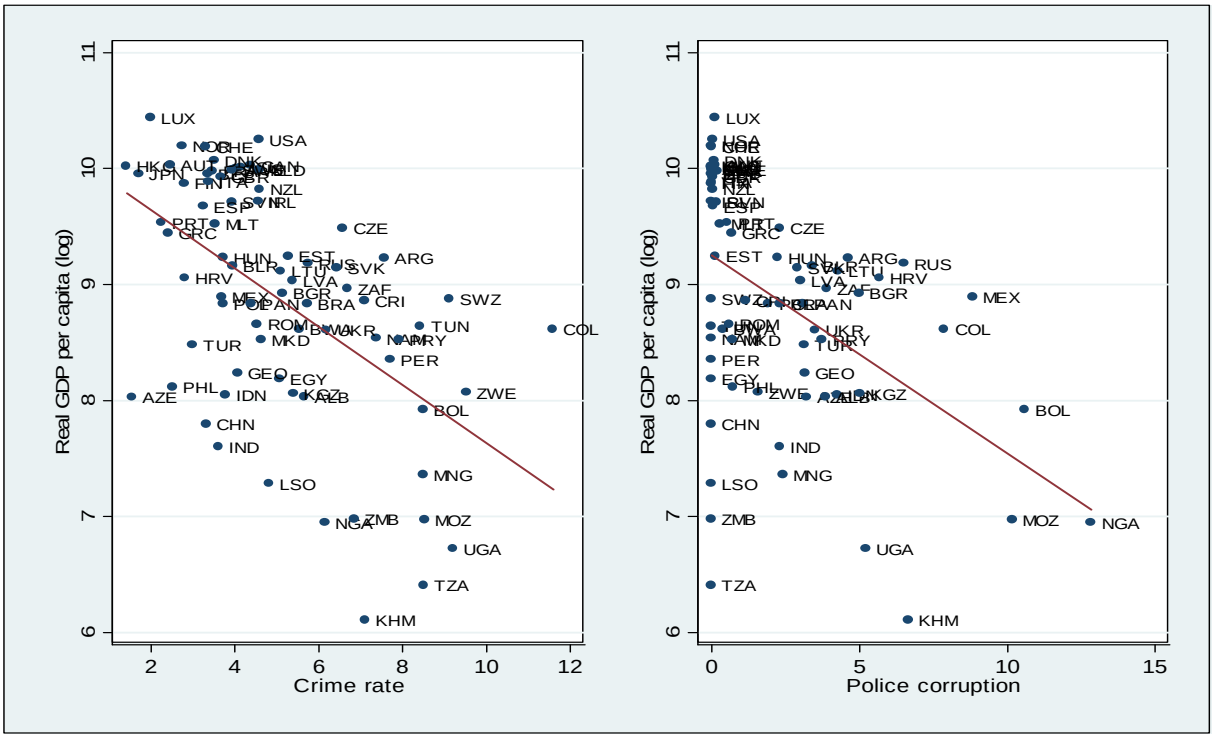

Figure 4. Correlation between crime and police corruption and GDP per capita

The ordinary least squares (OLS) estimates go beyond the simple correlation, taking into account the other determinants of economic performance. Several specifications are tested so as to take into account the correlation among some right-side variables. We include the following sets of control variables. (1) *Geographic variables*: Many studies have argued for a direct effect of geographic factors on economic performance (Hall and Jones, 1999; Gallup et al, 1999; Acemoglu et al, 2001; Rodrik et al, 2004). Climate, endowment of natural resources, disease burden can exert strong influence on the agricultural productivity and the quality of human capital. We use three variables to control for geography: the absolute value of latitude, dummies for the landlocked countries, and dummies for tropical countries. All three variables can be considered as exogenous (see Rodrik et al, 2004). (2) As far as *human capital accumulation* is concerned, we use the total years of education in the population (over 25 year) and the life expectancy at birth[26]. (3) Furthermore, police corruption and crime are mostly hidden activities although they pop up to some degree in the victimization surveys. They take place mainly in the shadow economy preponderant in developing countries and developed countries as well. We control therefore for the *informal economy*. Finally, we include

[26] It doesn't matter whether we use life expectancy or infant mortality rate. Using the infant mortality rate under five instead of life expectancy makes no significant difference in our coefficients estimates. The results are displayed in appendix 7.

also r*egional dummies* for Africa, Latin America, East Europe-Asia since there are reasons to suspect that crime levels are influenced by spontaneous processes that vary across continents. West Europe and other continents are the omitted group

OLS results are reported in table 2. In order to highlight the main channels through which crime affects the economic performance, we report in the first column the coefficient estimate when crime rate is the only independent variable. This coefficient is negative and significant. The magnitude of crime's coefficient decreases once we introduce the police corruption in the model in column (2). The R^2 in column (2) suggests that 38% of the variation of income per capita is associated with the variation of the crime rate index and police corruption. This result emphasizes on the one hand the interaction between police corruption and crime (cf. Azfar and Turgur, 2008a; Kugler et al, 2005, Gaviria, 2002) and on the other hand the indirect effect of crime through police corruption. The coefficient of crime simultaneously with the police corruption's coefficient continues to decrease when we introduce the geographic variables, the regional dummies, and both cease to be significant when we control for human capital variables (column 5)[27]. In the next columns (6-7), we control respectively for the Gini coefficient and the informal sector. The informal sector has a negative impact on economic performance. The Gini coefficient is not significant. The main conclusion we can draw from the results in columns (6) through (7), is that even though the coefficient of crime is considerably reduced, it still remains significant while the coefficient of police corruption becomes non-significant.

[27] This result reflects the interactions between corruption and education and health outcomes. At macro level, Gupta et al (2001) found a negative effect of corruption on the provision of education and health care. For country studies, Reinikka and Svenssion (2001) reported large leakages funds allocated to education and health in Uganda and Tanzania cases. Azfar and Turgur (2008b) found negative effects of corruption on health outcomes (immunization rates, vaccinations of newborns, etc.) in Philippines.

Table 2: Crime, police corruption and level of development: OLS regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Average crime rate	-0.252***	-0.193***	-0.102*	-0.121**	0.0208	-0.149**	-0.136***
	(-4.760)	(-3.413)	(-1.749)	(-2.038)	(0.627)	(-2.045)	(-2.727)
Police corruption		-0.115***	-0.0871**	-0.0677**	-0.0318	-0.110***	-0.0491
		(-3.225)	(-2.491)	(-2.623)	(-1.215)	(-2.885)	(-1.302)
Latitude			0.0338***	0.0297***	0.0139**		
			(3.410)	(3.571)	(2.515)		
Dummy for tropical region			0.295	0.0555	0.0355		
			(0.779)	(0.154)	(0.141)		
Dummy for landlocked countries			-0.264	-0.240	0.164		
			(-0.982)	(-1.359)	(0.984)		
Dummy Africa				-0.544			
				(-1.372)			
Dummy Latin America				0.382			
				(1.156)			
East Europe and Asia				-0.908***			
				(-4.787)			
Education					0.0594*		
					(1.908)		
Life expectancy					0.0430***		
					(2.873)		
Urbanization rate					0.0121**		
					(2.658)		
Gini Index						-0.0157	
						(-1.405)	
Informal economy							-0.030***
							(-4.053)
Constant	10.14***	10.10***	8.357***	8.985***	4.372***	10.46***	10.56***
	(37.51)	(38.47)	(14.38)	(20.74)	(4.294)	(30.62)	(39.98)
Observations	72	72	65	65	49	68	68
R-squared	0.291	0.382	0.554	0.757	0.877	0.383	0.508

Notes: All regressions are OLS. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of the average real GDP per capita over 1980-2004. Crime rate (and police corruption) are calculated as average proportion of populations who were victims of types of crimes such theft, robbery, assault or burglary (and police corruption). The original data come from the integrated ICVS including all waves for each country over the period 1989-2005. See appendix A3 for more detailed variables definition and sources.

2.3.2. Instrumental variables approach

In the OLS estimates, we assume that there is no correlation between police corruption, crime rates and the error terms. The results obtained could be not interpreted satisfactorily as causal because of potential endogeneity problem. Llyod-Ellis and Marceau (2003) argue that there is an endogenous dynamic relationship between insecurity and development. It has been shown by previous economic analysis of crime that the level of development affects it (Bourguignon, 1999;

2001), but a number of studies of reverse causality has been heavily influenced by measurement errors (Soares, 2004). Increased GDP decreases crime but increases the rate of reported crime. Hence the observed effect will underestimate the negative effect on actual crime. Omitted variables and measurement errors can also cause OLS to be biased and inconsistent. To address the endogeneity problem, we apply a two-stage estimation procedure. Here we use the Generalized Method of Moments (GMM) which is more efficient than the standard instrumental variables in the presence of heteroskedasticity and non normal and non independent errors (Baum et al, 2003).

The identification strategy relies on instruments, some of which have already been demonstrated to be "valid" for corruption and crime.[28] Our instruments for police corruption include the British legal origin (*british*),[29] the proportion of Catholics (*catho*), Protestants (*prot*) and Muslims (*musl*) in 1980 (La porta et al, 1999). We will expect the legal origin to have a stronger imprint on the police and judiciary system than most other public institutions. One legacy of former colonies is the institution of military and the structure of the police. Contemporaneous police organizations in African or Asia countries are in most of the cases based either on a British model or a French model. Regarding religion, we may expect countries with large proportion of muslims and catholics to increase corruption in general (see also Treisman, 2000; Paldam, 2002)

Our instruments for crime rates are based on three sets of factors. First, we use crime victimization rate in the five previous years (*lagcrime*) as instruments.[30][31] The second instrument concerns the abortion law status (*abort*). Legal abortion rights have been found to be negatively correlated with crime in USA (see Donohue and Levitt, 2001).[32] The third instrument we try is related to culture: the trust (*trust*) and cultural difference. The higher the degree to which people can trust in others in the society, the lower is the probability that they

28 We do not pretend to build sound theories explaining the relationship between these instruments and the endogenous variables. The instruments mainly intend to identify an exogenous source of variation of our independent variables of interest. Cf. Rodrik et al (2004) *"An instrument does not a theory make".*

29 We include only British legal origin because our sample doesn't cover many countries with French or other legal origins.

30 This variable is also taken from the ICVS. It is calculated based on the question asking if respondents were victims of crime over the lat 5 years.

31 If a respondent report of recent crime experience is influenced by her past experience the lagged crime variable is only a weak instrument since it is also likely to affect the contemporary income per capita. The over-identification restrictions tests on the other additional instruments, more exogenous, allow us to rely on the instrumental variable results.

32 Based on anecdotal empirical facts, Donohue and Levitt (2001, pp.386-389) have provided a number of theoretical mechanisms through which the abortion legalization can affect the crime rate. We find them hardly convincing. Crime data from Europe showed a simultaneous decline there without any significant changes in abortion rights. Nevertheless legalized abortion may catch a number of cultural factors that may influence lawmaking and other mechanisms that have impact on crime.

are victim of crime (see Azfar and Turgur, 2008).[33] Cultural dimension is also captured through the Hofstede's Power Distance index (*pdi*), which measures the extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally. Large cultural difference can be source of conflict.

In the first stage regressions, *crime* and *police* are regressed on these instruments and all the exogenous variables.

$$crime_i = \delta_0 + \delta_1 lagcrime_i + \delta_2 trust + \delta_3 abortion_i + \delta_4 pdi + \sum \delta_k z_{ik} + \mu_i \quad (2)$$

$$pol_i = \omega_0 + \omega_1 british_i + \omega_2 catho_i + \omega_3 prot + \omega_4 musl_i + \sum \omega_k z_{ik} + \upsilon_i \quad (3)$$

Results from the GMM regressions are reported in table 3.[34] Apart from the Hansen test in column (1), the validity of our instruments can be "reasonably" accepted. The partial R2s shows a strong correlation between the instruments and the endogenous variables.[35] Column (1) shows the coefficient estimate of the impact of crime when the other variables are excluded from the model. The significance of this coefficient disappears once we include additional variables. Adding police corruption in column (2) or the geography variables in column (3) [36] or human capital accumulation column (5) reduce considerably the magnitude and the significance of the crime's coefficient. We conclude from these results that crime does not have any *significant* direct impact on the economic performance.

Due to the fact that crime coefficient's significance seems to disappear when police corruption is introduced in most of specifications, one may question whether crime and police corruption are not capturing the same phenomenon. Even though crime and police corruption can both be considered as forms of social disorder, our results suggest that

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33 Again reverse effects, that is, from crime to trust are, of course, potentially significant.

34 It is noteworthy that the coefficients of crime (column 1) and police corruption (column 2) are higher than those obtained from the OLS estimates. The coefficient of the crime variable is positive and not significant from column (2) and then. Such results suggest that the OLS estimates suffer from attenuation bias (due to the measurement errors) or that potential sources of positive bias due to simultaneity or omitted variables strongly dominate those creating negative bias.

35 The F-tests in all regression allow us not to accept the hypothesis that the set of excluded instruments significantly correlated with each endogenous variable. See also appendix 6 the scatter plots displaying the correlations between crime, police corruption and their instruments. The Durbin-Wu-Hausman tests confirm the endogeneity of crime and police corruption in five out of the seven specifications.

36 The coefficient of the landlocked dummy in column (4), counterintuitive, must be interpreted with caution. Only four countries (Hungary, Switzerland, Austria and Luxembourg) are included in this specific regression. The positive coefficient reflects simply the higher economic performance of these countries compared to the others, after controlling for the regional characteristics. Estimating the specified model in column 4 excluding these countries and without the landlocked dummy does not alter our results (results available upon request).

they are two different phenomena. Indeed, crime and police corruption seem to have different impact on the level of development. While the coefficients of police corruption are still significant in columns (2) and (3), (6) and (7) crime does not have any additional power in explaining the level of development, and even so when we exclude police corruption from our regressions. Combined with the OLS estimates, we can fairly conclude that police corruption exert a *direct significant* adverse influence on the level of development. But how plausible are our estimates? The estimates in column (3) suggest that a 1% increase in police corruption, evaluated at the world average (2.13) cause the income per capita to decrease by 0.58%. Let us compare two countries, Nigeria which has the highest police corruption in our sample (12.8) to the Czech Republic with a level of police corruption (2.3) that is close to the world average. If Nigeria reduces its police corruption to the Czech's level, its real income per capita should increase by 2.9 percentage point. This effect is however less than the actual income gap between the two countries (2.54 log difference). That it is, the magnitude of police corruption impact is considerable. This result is consistent with previous studies such Mauro (1995)[37] and Mo (2001).[38] However, our estimates are not directly comparable to theirs. One reason is that our measure of police corruption is the proportion of population victims to bribery by the police instead of a perception index. In addition, their dependent variable is the average growth rate, which is capturing only the short-term income differences between countries. We are rather interested in the long-run development.

[37] Mauro found that a one-standard-deviation improvement in bureaucratic efficiency (their measure of corruption) is associated with a 1.3 (0.8) percentage point increase in the annual growth rate of GDP per capita (table 7, p.702, columns 5 and 6).

[38] Mo (2001) found that their OLS estimations that 1% increase in the corruption level reduces the growth rate by 0.72% (table 2, p.72, column 1). Their IV estimations suggest that a 1% increase in the corruption level reduces the growth rate by 0.69% (table 8, p.77 column 1).

Table 3: Crime, police corruption and level of development: IV regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM
Average crime rate	-0.295***	0.188	0.135	-0.0199	0.00921	0.175	0.0979
	(-3.385)	(1.631)	(1.289)	(-0.281)	(0.285)	(1.533)	(1.279)
Police corruption (POLCOR)		-0.387***	-0.274***	-0.0202	0.0531	-0.335***	-0.240**
		(-4.155)	(-3.305)	(-0.352)	(1.135)	(-3.558)	(-2.650)
Latitude			0.0320***	0.0241***	0.0150***		
			(3.155)	(3.339)	(2.905)		
Dummy for tropical region			0.0604	-0.271	-0.0233		
			(0.120)	(-0.796)	(-0.114)		
Dummy for landlocked countries			0.429*	0.283***	0.0767		
			(1.942)	(2.773)	(0.386)		
Dummy Africa				-1.120**			
				(-2.399)			
Dummy Latin America				-0.0708			
				(-0.161)			
East Europe and Asia				-1.051***			
				(-6.585)			
Life expectancy					0.0772***		
					(3.508)		
Education					0.0832**		
					(2.118)		
Urbanization rate					0.00491		
					(1.057)		
Gini Index						-0.00255	
						(-0.185)	
Informal economy							-0.036***
							(-3.785)
Constant	10.67***	9.268***	7.829***	8.853***	2.111	9.337***	10.16***
	(29.07)	(22.11)	(12.69)	(24.19)	(1.533)	(16.66)	(26.28)
Observations	44	43	41	41	34	42	41
R-squared	0.127	-0.479	0.193	0.794	0.824	-0.311	0.253
Hansen J statistic	15.57	7.263	6.694	4.365	7.263	9.584	10.04
(p-value)	ns	0.297	0.350	0.627	0.297	0.143	0.123
Partial R2 crime; police	0.,93	0.93; 0.36	0.92; 0.33	0.92; 0.24	0.996; 0.39	0.92; 0.30	0.92; 0.24
Shea partial R2 crime; police corruption	0.92	0.55; 0.21	0.79; 0.29	0.88; 0.23	0.80; 0.33	0.77; 0.25	0.74; 0.19

Notes: All regressions are two step instrumental variables, implemented in Stata using ivreg2 with robust, gmm and small options. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of the average real GDP per capita over 1980-2004. Crime and police corruption are the two endogenous variables Crime rate (and police corruption) are calculated as average proportion of populations who were victims of types of crimes such theft, robbery, assault or burglary (and bribery in police). The original data come from the integrated ICVS including all waves for each country over the period 1989-2005. The list of instruments for crime includes the lagged crime, the abortion law status, the level of trust in the society, the cultural dimension captured by by the Hofstede's power distance index. The list of instruments of police corruption includes the British legal origin, the proportion of Catholics, protestants and Muslims in 1980. For more detailed variables definition and sources see appendix A3

2.4. Indirect effects of average crime rate and its interactions with police corruption

In the previous section, we have found that crime does not *directly* affect economic development. Why not? Here we explore the possibility that the influence works indirectly. Doing that, crime's impact on other variables makes these mask its impact on economic development. To answer our question we need to identify the main indirect channels through which crime and police corruption influence economic performance.

The channels investigated here are level of education (*educ*), life expectancy (*life*), urbanization rate (*urb*) and police corruption (*police*). The indirect effects working through these intermediate variables are estimated using the specification in column (5) of table 3. The method consists of two steps. First, we estimate the impact of crime on each of the candidate intervening variable (x_i).

$$x_i = \kappa_0 + \kappa_i crime_i + \pi_i \tag{4}$$

In estimating the impact of crime on the candidate variable, we treat crime as endogenous. Results from the GMM estimations are displayed in table 4. The Hansen tests not do reject the validity of our instruments, which are the previous ones used in the GDP per capita specifications.

Table 4: Effects of crime on police corruption and development factors

	(1)	(2)	(3)	(4)
	Police corruption	Education	Life expectancy	Urbanization rate
Average crime rate	1.017**	-0.306**	-4.679***	-4.251
	(2.677)	(-2.032)	(-3.378)	(-1.469)
Constant	-2.863*	7.756***	92.46***	85.28***
	(-1.887)	(10.24)	(17.01)	(6.850)
Observations	45	40	45	45
R-squared	0.143	0.057	-0.261	-0.127
Hansen J statistic	4.302	3.984	1.824	2.460
p-value of Hansen J statistic	0.116	0.136	0.402	0.292
Robust t-statistics in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Crime has adverse effects on education and life expectancy. Increasing crime rate of 1 point reduces the total years of education by 0.31 and life expectancy by 4.7 years. Crime does not significantly affect the urbanization rate. Unlike Azfar and Turgur (2008a), we find that crime rates increase police corruption: an increase of crime rate of 1 point increases police corruption by 1.02. Since education and life expectancy increase GDP per capita (see table 3 above), one may con-

clude from these results that indirect effects of crime through these two channels are necessarily negative. Inserting equation (4) in (1), it follows straightforward that the indirect effect of crime is equal to:

$$idcrime = \sum \kappa_i \beta_{iIV} \tag{5}$$

B_{iIV} are the direct impact (coefficient from column (5)) of each channel on GDP per capita. To test the significance of indirect effects, we need to compute the standard error of $\kappa_i \beta_i$. As discussed by Preacher and Hayes (2008), there are several methods for testing indirect effects. Most of these methods are based on the product-of-coefficients approach (Sobel, 1982; 1986 quoted by Preacher and Hayes), where the standard error is computed using the normal distribution. However, it is possible that both the specific and the total indirect effect are not normally distributed (Preacher and Hayes, 2008). In addition, when the test involve multiple mechanisms, it is possible that specific indirect effects $\kappa_i \beta_i$ are significant even if the total indirect effect is non significant. Indeed, the product-of-coefficients approach from the baseline sample cannot appropriately handle this problem. In order to cope with these problems, we use a bootstrap approach. To bootstrap the sampling distribution of the specific and total indirect effects, we take a sample of size n observations with replacement from the original sample. Each observation can be selected as part of a bootstrap sample not at all, once, twice, or even multiple times. Using this new resample of size *n* (initially 74 in our study), we estimate κ_i and β_i and then calculate $\kappa_i \beta_i$ and $\sum \kappa_i \beta_i$. This process is repeated *k* times, yielding *k* estimates of the total and specific indirect effects.

The estimates reported in table 5 are based on more than 7200 replicates. The significance of the coefficients is determined from the percentile confidence intervals (PCIs) and bias-corrected bootstrap intervals (BCIs). Several results deserve attention. The total indirect impact of crime is negative and significant. Combined with the non-significant direct effect of crime, we conclude that crime affect the level of development mainly through indirect mechanisms. Thus, if crime rate increase by 1% point, the log of real GDP per capita is expected to decrease by 0.65. The indirect effect through education is non significant. That is, crime does not exert any influence through education. Of the total indirect effects, 42% is exerted through life expectancy, 13.48% through urbanization rate and 44.42%.though police corruption.

Table 5: Indirect effects of crime

	Observed Coefficients and standard errors
Indirect effect of education	0.006 [0.024]
Indirect effect life expectancy	-0.273** [0.135]
Indirect effect urbanization	-0.088** [0.044]
Indirect effect police corruption	-0.295*** [0.093]
Total indirect effect	-0.660*** [0.161]
Total direct effect of crime	0.082 [0.069]
Total direct effect of police corruption	-0.290*** [0.117]

10000 bootstrap replicates. Due to the convergence conditions, coefficient estimates and standard error estimates include only 7294 complete replicates. Bootstrap standard Errors are in the brackets. *** p<0.01, ** p<0.05, * p<0.1

In addition to estimating the indirect effect, the bootstrap method allows us to test the robustness of the direct effect of crime and police corruption. Results displayed in table 5 also suggest that crime does not have direct impact on the level of development. While this result is not strongly favorable to the hypothesis 1, the indirect effects through human capital accumulation and police corruption do lend support to hypotheses 2 and 3 respectively. On the other hand police corruption has significant adverse direct impact on the level of development[39] (hypothesis 4).

39 It is plausible that police corruption like crime exerts indirect effects through general development factors. When we examine the extent to which eventual effects are transmitted to the economic performance, we found that the negative impact of police corruption is not *significantly* transmitted through development factors such education, life expectancy, or urbanization. Nevertheless, we found that the indirect impact of police corruption may *significantly* be transmitted through the size of the informal economy. Results are available upon request.

3. Violent crime versus property crimes

3.1. Direct impact of violence crime and property crime on development

In the previous analysis we have used an overall crime index to measure the level of criminal activities.[40] Nevertheless, the relative prevalence of different types of crime may vary systematically within and across countries and they may have different impacts on economic performance. In this section we distinguish two types of crime: violent crime which is the average proportion of surveyed population who have been victims of robbery or assault and property crime which is the average of the victimization rates for burglary, car-, motorcycles- and personal property theft.

Results from the GMM regressions in table 6[41] suggest that although violent crime and property crime interact with police corruption they have different effect on economic development. Unlike overall crime, violent crime has no direct effect on economic performance. On the other hand property crime has a surprising, positive and significant direct impact on the economic activities. But, does such an effect persist when we take into account the indirect effects?.

[40] We don't investigate whether aggregation bias affects our results. For discussions on aggregation bias in the economic model of crime see for example Cherry and List (2002) and Garett (2003).

[41] The OLS regressions are reported in appendix 8.

Table 6: Violent crime and property crime effects on GDP per capita

	(2)	(3)	(4)	(6)	(7)	(8)
	GMM	GMM	GMM	GMM	GMM	GMM
Police corruption (POLCOR)	-0.511***	-0.501**	-0.249	-0.378***	-0.310***	-0.255
	(-4.125)	(-2.514)	(-0.987)	(-3.951)	(-3.199)	(-1.585)
Violent Crime	0.162	0.136	0.0425			
	(1.360)	(0.917)	(0.562)			
Property Crime				0.303***	0.271***	0.167*
				(2.713)	(3.208)	(1.779)
Latitude		0.0240*	0.00890		0.0343***	0.0126*
		(1.706)	(1.254)		(3.009)	(2.044)
Dummy for tropical region		0.904	0.528		0.462	0.522
		(0.894)	(0.826)		(0.687)	(0.991)
Dummy for landlocked countries		0.405*	0.378		0.536***	0.423*
		(1.910)	(1.377)		(2.778)	(2.006)
Education			-0.00739			-0.000850
			(-0.0979)			(-0.0160)
Life expectancy			0.0558			0.0630*
			(1.206)			(1.957)
Urbanization rate			0.0199			0.0127
			(1.418)			(1.506)
Constant	9.316***	8.227***	3.581	9.287***	7.630***	3.180
	(17.36)	(8.810)	(1.216)	(39.69)	(13.34)	(1.554)
Observations	43	41	34	43	41	34
R-squared	-1.140	-0.917	0.519	-0.193	0.284	0.590
Hansen J statistic	2.183	1.144	6.071	4.428	4.120	5.044
p-value of Hansen J statistic	0.823	0.950	0.299	0.490	0.532	0.411

Notes: All regressions are two step instrumental variables, implemented in Stata using ivreg2 with robust, gmm and small options. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of the average real GDP per capita over 1980-2004. Violent crime, property crime and police corruption are the endogenous variables. Violent crime is the average proportion of surveyed population victims of robbery and assault and the property crime which is the average of the average proportion of population victims of burglary, auto and motorcycles theft and personal property theft. Police corruption is calculated as average proportion of populations who were victims of bribery in police. The original data come from the integrated ICVS including all waves for each country over the period 1989-2005. The list of instruments for both crime types includes the lagged crime, the abortion law status, the level of trust in the society, the cultural dimension captured by the Hofstede's power distance index. The list of instruments of police corruption includes the British legal origin, the proportion of Catholics, protestants and Muslims in 1980. For more detailed variables definition and sources see appendix A3

3.2. Indirect impact of violent and property crime

Table 7 shows that the total indirect impact of property crime is negative. The method applied is the same as for the average crime analysis. This indirect impact outweighs greatly the positive direct effect. In fact, adding the negative impact (-0. 252) to the impact estimated in table 6 with the same covariates (0.303), the total effect of violent crime is negative (-0.085). The main channel of this negative impact of the property crime is police corruption. Table 7 emphasizes a negative and significant effect of violent crime on the long run development. For 1 point increase of violent crime, the real GDP per capita decreases by 0.8. In addition to police corruption, this negative impact

of violent crime is transmitted through a lowering of urbanization rate and a reduction of life expectancy.

Table 7- Indirect effect of crime types

	Violent crime	Property crime
Indirect effect of education	0.010 [0.085]	0.000 [0.028]
Indirect effect urbanization	-0.226** [0.093]	-0.008 [0.022]
Indirect effect life expectancy	-0.27* [0.152]	-0.093 [0.084]
Indirect effect police corruption	-0.263*** [0.062]	-0.152** [0.075]
Total indirect effect	-0.757*** [0.248]	-0.252 ** [0.111]
10000 bootstrap replicates. Due to the convergence conditions, coefficient estimates and standard error estimates include only 7294 complete replicates. Bootstrap standard Errors are in the brackets. *** p<0.01, ** p<0.05, * p<0.1		

4. Additional tests

4.1. Alternative measures of level of development

Several robustness tests are conducted. First we use three different variables of GDP, all purchasing power parity (PPP) adjusted: real GDP per capita in 2007, GDP per worker over 1990-2004 and GDP per capita in 1995, We use GDP per capita in 2007, which is the latest year available in the Penn World Table 6.3, in order to reduce the bias of simultaneity between crime, police corruption and the income per capita. The GDP per worker captures the productivity of the economy and the GDP per capita in 1995 is used as in several empirical studies such Acemoglu et al (2001), Rodrik et al, (2004).[42]

The GMM estimates reported in table 8 below confirm the direct negative impact of police corruption. The coefficient of crime rates display similar results as in the above analyses, though sometimes the coefficient become positive but then not significant Hence, in general we can fairly state that crime has no impact on any of the alternative measures of GDP.

Table 9 highlights the negative indirect impact of the overall crime regardless of the measure of GDP used. Indirect effects are still transmitted by the means of police corruption, urbanization, and life expectancy and at some extent education.

[42] It could also make sense to examine whether there is no systematic difference of the impact of crime and police corruption between developed countries and developing countries. Due to the nature of the ICVS data, a large proportion of our sample concerns the developed countries, where, unlike developing countries, surveys are conducted at national level. Respondents in developed countries, where the economic performance is higher, are less likely to be confronted to crime or police corruption. On the contrary, in the developing countries, with poor economic performance, it is likely that respondents are more facing criminal activities and police corruption. Moreover, as documented by Abramo (2007), there is a difference in terms of experience of corruption between rich countries (with GDP per capita above US$10,000) and poor countries (with GDP per capita below US$10,000). Thus, one may question whether the previous results established are not driven by such above considerations. In order to cope with this problem, we attempted to do the same regressions as previously done for developing countries and developed countries. From the baseline sample, we have 48 developing countries and 26 developed countries. However, the missing data for most explanatory variables combined with the erratic nature of the ICVS data make it impossible draw a firm conclusion from it (appendix 10).

Table 8: Test of robustness with alternative measure of GDP per capita

	Dependent variable: GDP per capita in 2007				Dependent variable: GDP per worker (log)				Dependent variable: GDP per capita in 1995			
Average crime rate	0.162	0.128	0.0252	0.0711	0.158	0.175	0.211	0.188	0.221	0.0612	0.199	0.190
	(1.404)	(1.254)	(0.783)	(0.961)	(1.329)	(1.564)	(1.602)	(1.473)	(1.431)	(0.656)	(1.323)	(1.326)
Police corruption (POLCOR)	-0.398***	-0.316***	-0.0195	-0.270***	-0.363***	-0.452	-0.449**	-0.435***	-0.510***	-0.255	-0.451**	-0.483***
	(-4.523)	(-4.006)	(-0.362)	(-2.994)	(-3.812)	(-1.565)	(-2.648)	(-3.754)	(-3.994)	(-1.120)	(-2.321)	(-3.752)
Latitude		0.0293***	0.0143**			0.00732				0.0108		
		(3.097)	(2.672)			(0.864)				(1.370)		
Dummy for tropical region		0.296	0.0274			0.777				0.688		
		(0.593)	(0.108)			(0.878)				(1.080)		
Dummy for landlocked countries		0.374	0.0470			0.628*				0.418		
		(1.491)	(0.338)			(1.925)				(1.579)		
Life expectancy			0.0894***			0.0392				0.0739		
			(4.991)			(0.759)				(1.610)		
Education			0.0444			-0.0846				-0.0309		
			(1.340)			(-1.061)				(-0.444)		
Urbanization rate			0.000456			0.0264				0.0193		
			(0.136)			(1.671)				(1.589)		
Informal economy in 1999				-0.0287**			-0.00607				-0.0129	
				(-2.578)			(-0.278)				(-0.551)	
Gini Index					0.000184			0.0116				0.00845
					(0.0120)			(0.602)				(0.389)
Constant	9.871***	8.535***	2.296*	10.63***	9.837***	5.412*	10.01***	9.604***	9.183***	2.310	9.451***	8.985***
	(23.23)	(15.04)	(1.907)	(27.19)	(17.03)	(1.738)	(13.37)	(13.86)	(16.45)	(0.797)	(11.49)	(11.39)
Observations	43	41	34	41	42	34	41	42	44	35	42	43
R-squared	-0.523	0.058	0.855	0.177	-0.397	-0.167	-0.849	-0.724	-0.783	0.480	-0.458	-0.627
Hansen J statistic	5.145	7.360	7.289	10.32	7.501	2.018	3.195	3.529	2.578	5.629	3.271	3.641
p-value of Hansen J statistic	0.525	0.289	0.295	0.112	0.277	0.847	0.670	0.619	0.765	0.344	0.658	0.602

Notes: All regressions are two step instrumental variables, implemented in Stata using ivreg2 with robust, gmm and small options. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Crime and police corruption are the two endogenous variables Crime rate (and police corruption) are calculated as average proportion of populations who were victims of types of crimes such theft, robbery, assault or burglary (and bribery in police) The original data come from the integrated ICVS including all waves for each country over the period 1989-2005. The list of instruments for both crime types includes the lagged crime, the abortion law status, the level of trust in the society, the cultural dimension captured by the Hofstede's power distance index. The list of instruments of police corruption includes the British legal origin, the proportion of Catholics, protestants and Muslims in 1980. For more detailed variables definition and sources see appendix A3

Table 9: Indirect effects of crime rate with alternative measures of GDP

	GDP per capita 2007	GDP per woker	GDP per capita 1995
Indirect effect of education	0.001 [0.021]	0.026* [0.016]	0.009 [0.020]
Indirect effect urbanization	-0.015 [0.022]	-0.112*** [0.039]	-0.082* [0.044]
Indirect effect life expectancy	0.338** [0.145]	-0.183* [0.104]	-0.346*** [0.114]
Indirect effect police corruption	-0.251*** [0.089]	-0.460*** [0.087]	-0.259*** [0.093]
Total indirect effect	-0.604** [0.153]	-0.729*** [0.129]	-0.678*** [0.137]
Nb. replications	7317	3177	3187
Bootstrap standard Errors are in the brackets. *** p<0.01, ** p<0.05, * p<0.1			

4.2- Alternative measure of police corruption

The second set of robustness tests rely on an alternative measure of police corruption. Here the indicator of police corruption is computed from Transparency International 2006 global corruption barometer surveys. It measures the proportion of individuals who answer yes to the following question: "*In the past 12 months, have you or anyone living in your household paid a bribe in any form to each of the following institution/organisation?-Police".* As one can see, this question differs from the ICVS one in that it concerns the household experience instead of individual experience. Hence, this indicator is likely to be higher than the ICVS police corruption, which measures only individual experience (see appendix 10). Moreover, measurement errors are likely to be higher here since surveyed individuals must conjecture the corruption experience of other relatives. This index has finally inconveniently covered only 34 countries.[43]

Results based on Transparency International police corruption (table 10) are consistent with those previously obtained: once again the negative effect of police corruption is highlighted and crime is not robustly significant.

[43] We tried to increase the number of observations by merging all Transparency International data available for 2006, 2007 and 2008. This allows us to gain 16 more observations for police corruption. However, when we introduce this variable into our regressions, we add only 5 more observations and our results do not change fundamentally.

Table 10: Test of robustness with Transparency International measure of Police corruption

	Dependent variable: Real GDP per capita (log)				Dependent variable: GDP per worker (log)			
Police Corruption TI	-0.056*** (-5.843)	-0.077 (-1.568)	-0.0165 (-1.685)	-0.059*** (-6.525)	-0.0535*** (-6.113)	-0.059 (-1.331)	-0.0141 (-1.221)	-0.065*** (-7.126)
Average crime rate	-0.0465 (-0.925)	-0.361 (-1.357)	-0.0332 (-1.549)	-0.0724 (-0.950)	-0.0179 (-0.382)	-0.293 (-1.212)	-0.0166 (-0.744)	-0.0884 (-1.106)
Latitude		-0.0127 (-0.765)				-0.0147 (-0.944)		
Dummy tropical region		1.894 (1.064)				1.289 (0.804)		
Landlocked countries		0.104 (0.522)				0.147 (0.979)		
Life expectancy		-0.0633 (-1.005)				-0.0427 (-0.753)		
Education		0.0612 (1.224)				0.0317 (0.692)		
Urbanization rate		0.0506 (1.738)				0.0440 (1.665)		
Informal economy			-0.0348*** (-3.062)				-0.0333** (-2.728)	
Gini Index				0.00899 (0.553)				0.0282* (1.730)
Constant	10.21*** (53.08)	12.62** (2.682)	10.60*** (58.83)	10.05*** (28.80)	10.78*** (60.22)	12.29** (2.906)	11.22*** (63.23)	10.24*** (29.47)
Observations	26	20	25	26	26	20	25	26
R-squared	0.465	0.623	0.817	0.446	0.346	0.540	0.773	0.179
Hansen J statistic	4.675	5.445	7.523	4.589	5.446	4.467	7.587	4.142
p-value of Hansen J statistic	0.457	0.364	0.185	0.468	0.364	0.484	0.180	0.529

In table 11 below, we estimate the indirect effects of crime using the Transparency International police corruption index and the three measures of GDP. The negative indirect effect of crime is confirmed. Transmission channels are only police corruption and urbanization, however.

Table 11: Indirect effects using Transparency International Police corruption

	RealGDPPC	RealGDPWOK	GDPPC1995
Indirect effect of education	-0.019 [0.042]	-0.010 [0.033]	-0.018 [0.033]
Indirect effect urbanization	-0.215* [0.132]	-0.187* [0.104]	-0.157** [0.063]
Indirect effect life expectancy	0.296 [0.217]	0.200 [0.152]	0.174 [0.119]
Indirect effect police corruption	-0.579*** [0.086]	-0.448*** [0.091]	-0.437*** [0.083]
Total indirect effect	-0.516** [0.225]	-0.445** [0.183]	-0.439*** [0.144]
Nb. replications	3163	3171	3101
Bootstrap standard Errors are in the brackets. *** p<0.01, ** p<0.05, * p<0.1			

4.3. Evidence from pooled data

In the previous sections, we argue that cross-country averages are more appropriate to handle the weaknesses of the ICVS data. Nevertheless, one may question whether some unobservable factors are not affecting our main results. The ideal would be to deal with such issues using panel data technique, but for reasons mentioned above, the results from this method are likely not to be precise. To approximate the ideal we conduct now analyses on e pooled data of the five ICVS (1989, 1992, 1996, 2000 and 2004). Hence, for each ICVS wave we consider all countries for which we have observations. Time dummies are included in all the regression in order to control for the unobserved common factors that affect the economic performance of countries as well as their crime levels and police corruption. We also correct for the heteroskedasticity, possible autocorrelation and spatial correlation between countries.

The results reported in table 12 are consistent with those obtained: the negative impact of crime and police corruption on economic development and the interactions between on the one hand crime and police corruption and one other hand between crime and human capital accumulation.

Table 12- regression with pooled data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Pooled OLS	Pooled OLS	Pooled OLS	Pooled OLS	Pooled OLS	Pooled OLS	Pooled OLS
Average crime rate	-0.184*** (-7.725)	-0.115*** (-8.391)	-0.0566*** (-2.850)	-0.0627*** (-2.795)	-0.0240*** (-3.608)	-0.0607*** (-6.244)	-0.0902*** (-3.149)
Police corruption (POLCOR)		-0.114*** (-16.02)	-0.0879*** (-6.837)	-0.0417*** (-4.274)	-0.0537*** (-4.611)	-0.110*** (-18.54)	-0.0525*** (-9.487)
Absolute value of latitude			0.0181*** (3.401)	0.0114*** (4.717)	-0.000930 (-0.334)		
Dummy for tropical region			-0.260** (-2.269)	-0.491*** (-5.181)	-0.357*** (-3.478)		
Dummy for landlocked countries			-0.238*** (-2.870)	-0.0607 (-0.948)	0.0167 (0.373)		
Dummy Africa				-0.935*** (-10.54)			
Dummy Latin america				-0.0637 (-0.427)			
East Europe and Asia (EEA)				-0.976*** (-7.925)			
Education					0.0530*** (6.584)		
Life expectancy					0.0244*** (2.768)		
Urbanization rate					0.0236*** (16.19)		
Gini Index						-0.0194*** (-7.255)	
Informal economy							-0.0331*** (-30.64)
Constant	10.44*** (159.8)	10.38*** (259.9)	9.416*** (29.71)	9.962*** (66.47)	6.030*** (8.024)	10.89*** (98.35)	10.94*** (118.9)
Time dummies	YES	YES	YES	YES	YES	YES	YES
Observations	153	153	153	153	153	153	153
R-squared	0.286	0.385	0.511	0.712	0.784	0.418	0.562

Note: Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of the average real GDP per capita. The pooled data cover five years (1989, 1992, 1996, 2000 and 2004). Most variables (crime, police corruption, life expectancy, urbanization) are taken according to these years. For education, we take the 1980-85 average for 1989, 1985-1990 for 1992, 1990-95 for 1996, 1995-2000 for 2000 and 200o for 2004. The Gini coefficient refer to 2004 and the informal economy to the years 1990s. The other variables are dummies as defined in appendix 3. Time dummies included, with 2004 as the period of reference. Standard errors are robust to heteroskedasticity, possible autocorrelation and correlation between countries.

Conclusion

The objective of this paper is to analyze the consequences of crime and police corruption on the level of development using crime victimization statistics that so far has only rarely been used for the purpose. While the existing literature on economic crime focus on the consequences of development on crime rate, we attempt in this study to assess the reverse effect, that is, the effect of crime on development. Although corruption in the police is higher in the public administration in developing countries; no attempt has been made to empirically estimate its effects on the process of development. Not only police activities in the society are necessary to secure private properties, but they also contribute to the enforcement of the law and hence to development. We expected from theoretical considerations that extensive corruption in the police would have an overall negative impact on the development process. That expectation was confirmed. Moreover we traced empirically some of the various mechanisms through which we expected the crime effects to work. An important one was through its relationship with police. Although the empirical observations used made it impossible to use data that could reflect the relationship between police corruption and organized crime, we found that the institutional cluster consisting of crime and police behavior appears to have a strongly significant effect on economic development. Here we have sought to document the interactions between the police and regular criminal activities with identifiable victims (except murder) and their joint effects on development. Regarding econometric methodology we used instrumental variables approach to assess the direct impacts of both crime and police corruption. We use non parametric bootstrapping approach to estimate the indirect effects of crime. Since we expected that the effects of crime on long-run productivity should be rather roundabout, we have made considerable effort in studying these indirect effects and their channels.

The main results of our investigations are as follows. First, unlike police corruption, crime seems to have no robust direct and significant impact on the level of development. Secondly, we show that the main effects of crime, although negative, are rather indirect. Hence, crime affects the level of GDP per capita through police corruption and human capital accumulation (education and life expectancy) and urbanization. Finally, we found that the magnitude of the impact of crime on development differs according to crime types, such as violence crime and property crime. For both crime types, the indirect effect through police corruption is strong.

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Appendices

Appendix 1. List of countries

bm	country	bm	country
ALB	Albania	KHM	Cambodia
ARG	Argentina	LSO	Lesotho
AUS	Australia	LTU	Lithuania
AUT	Austria	LUX	Luxembourg
AZE	Azerbaijan	LVA	Latvia
BEL	Belgium	MEX	Mexico
BGR	Bulgaria	MKD	Macedonia
BLR	Belarus	MLT	Malta
BOL	Bolivia	MNG	Mongolia
BRA	Brazil	MOZ	Mozambique
BWA	Botswana	NAM	Namibia
CAN	Canada	NGA	Nigeria
CHE	Switzerland	NLD	Netherlands
CHN	China	NOR	Norway
COL	Colombia	NZL	New Zealand
CRI	Costa Rica	PAN	Panama
CZE	Czech Republic	PER	Peru
DEU	Germany	PHL	Philippines
DNK	Denmark	POL	Poland
EGY	Egypt	PRK	Republic of
ESP	Spain	PRT	Portugal
EST	Estonia	PRY	Paraguay
FIN	Finland	ROM	Rumania
FRA	France	RUS	Russia
GBR	United Kingd	SVK	Slovak Republic
GEO	Georgia	SVN	Slovenia
GRC	Greece	SWE	Sweden
HKG	Hong Kong	SWZ	Swaziland
HRV	Croatia	TUN	Tunisia
HUN	Hungary	TUR	Turkey
IDN	Indonesia	TZA	Tanzania
IND	India	UGA	Uganda
IRL	Ireland	UKR	Ukrain
ISL	Iceland	USA	USA
ITA	Italy	ZAF	South Africa
JPN	Japan	ZMB	Zambia
KGZ	Kyrgyzstan	ZWE	Zimbabwe
Total	74		

Appendix 2. Sample composition and the ICVS waves

continent	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Africa	0	4	5	8	1
Asia	1	5	4	6	2
East Europe	0	7	18	15	6
Latin America	0	3	6	4	3
West Europe	9	7	7	10	18
Other developed countries	3	3	2	3	4
Total	13	29	42	46	34

The figures in the cells refer to the number of countries covered by each ICVS wave in each group of country.

Appendix 3. Definitions of variables

	Definition	source
Real GDP per capita	Real GDP per capita (Chain): RGDPCH [17] Base year 2000. Average over the period 1980-2004 and 2007	Penb World Table 6.3. Heston, summers and Aten (2009)
GDP per worker	Real GDP chain per worker: RGDPWOK [19]	
Average crime rate	Proportion of individuals who are victims of the following type of crime over the last two years: car theft (question C01A100, modality 2), theft from car (question C02A100, modality 2), theft from motorcycle (question C04A100, modality 2), bicycle theft (question C05 A100, modality 2), burglary (question C06A100, modality 2), attempt at burglary (question C07A100, modality 2), Robbery (question C09A100, modality 2)., theft from personal property (question C10A100, modality 2), Assault (question C12A100, modality 2),.	Calculations based on the Integrated International Crime Victimization Surveys data 1980-2005 Kesteren (2007)
Lagged crime rate	Proportion of individuals who are victims of the above defined type of crime over the last five years (modality 1 of C01A000, C02A000, C04A000, C05A000, C06A000, C07A000, C09A000 C10A000, C12A000)	
Police corruption	Proportion of individuals victims of police corruption*." Based on the question "…During the [year the survey was conducted], has any government official, for instance, a police officer or inspector in your country asked you, or expected you to pay bribe for his or her services?"*	
Trust	Level of trust within the society to other people	World Values Survey
Dummy for tropical region	Equal to 1 if a country is tropical region, 0 otherwise	
Dummy for landlocked countries	Equal to 1 if a country is landlocked, 0 otherwise	
Dummy Africa	Equal to 1 if a country is in Sub-Saharan Africa, 0 otherwise	
Dummy Latin America	Equal to 1 if a country is in Latin America, 0 otherwise	
East Europe and Asia	Equal to 1 if a country is in East Europe or Asia, 0 otherwise	
GDP per capita in 1995	GDP per capita, PPP (current international $), year 1995.	World Development Indicators (2008)
Life expectancy	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	
Urbanization rate	Urban population (% of total) Urban population is the midyear population of areas defined as urban in each country and reported to the United Nations.	
Education	Schooling years in the total population. Average over the period 1980-1985	Barro and Lee (2000)
Gini Index	GINI coefficient	UNDP, Human Development Report (2004)
Informal economy	Unofficial activity as a percent of GDP in the 1990s	Friedman, Johnson, Kaufmann, and Zoido-Lobatón (2000)
Abortion legal status	Whether abortion is permitted without any restriction or permitted on socio-economic grounds.	
British colonies	Equal to 1 if a country is former British colony	Treisman (2000).
Proportion of Catholics	Catholics as % of population 1980	La Porta et al.(1999)
Proportion of Protestants	Protestants as % of population 1980	
Proportions of Muslims	Muslims as % of population 1980	
Latitude	Absolute value of latitude	
Cultural distance	Measured by the power distance index: the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally.	From Geert Hofstede website http://www.geert-hofstede.com/

Appendix 4. Descriptive statistics of different types of crime

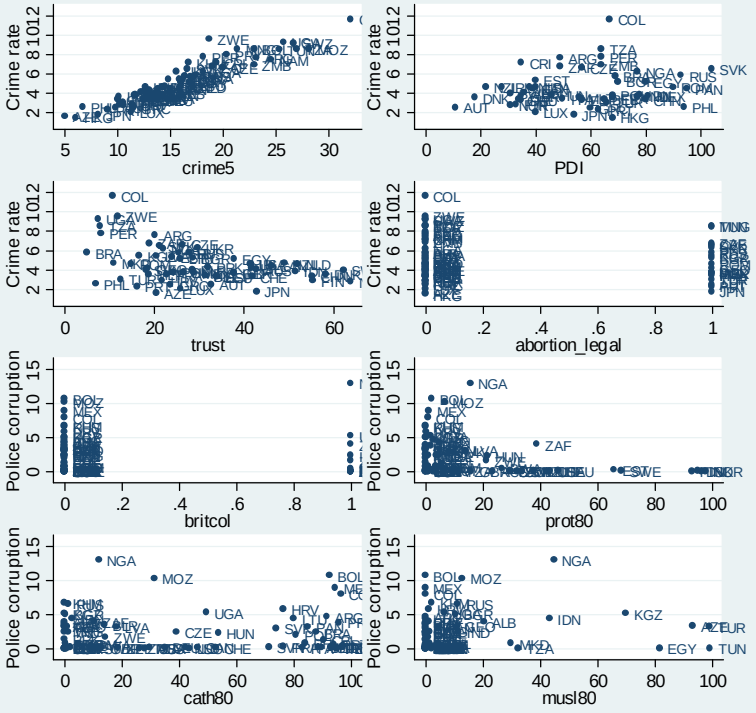
	Statistics	Theft	Robbery	Assault	Property	Burglary
Africa	Min	1.584	1.901	1.013	7.069	6.700
	Mean	3.596	4.075	5.467	11.251	13.007
	SD	1.691	1.707	2.345	4.242	3.946
	Max	7.551	7.553	10.239	20.577	18.328
Asia	Min	0.628	0.000	0.442	0.396	0.964
	Mean	2.878	0.970	2.339	7.455	6.130
	SD	1.684	0.990	1.734	6.173	5.532
	Max	5.589	3.545	5.090	19.869	16.640
East Europe	Min	1.798	0.300	0.644	2.818	1.900
	Mean	3.837	1.661	2.970	7.725	5.088
	SD	1.367	0.808	1.005	3.739	1.850
	Max	6.969	3.468	4.629	18.135	8.052
Latin America	Min	2.547	0.887	0.000	3.991	4.009
	Mean	4.392	6.219	3.454	9.671	10.746
	SD	1.649	3.023	2.390	4.797	4.989
	Max	7.308	10.020	8.532	17.017	19.097
West Europe	Min	1.320	0.375	0.939	2.169	1.436
	Mean	3.024	0.916	2.832	4.046	3.299
	SD	0.985	0.406	1.089	0.951	1.234
	Max	4.791	1.947	4.570	6.340	6.472
Other countries	Min	2.775	0.733	4.092	4.415	2.984
	Mean	3.457	0.994	4.719	5.401	4.759
	SD	0.558	0.267	0.818	1.092	1.234
	Max	3.941	1.345	5.916	6.963	5.705
All	Min	0.628	0.000	0.000	0.396	0.964
	Mean	3.505	2.287	3.401	7.473	6.762
	SD	1.445	2.268	1.879	4.521	4.790
	Max	7.551	10.020	10.239	20.577	19.097

Appendix 5. Crime and police corruption: top and bottom tens

	Crime rate	Police corruption
Ten highest	Colombia (11.59), Zimbabwe (9.53 Uganda (9.21) Swaziland (9.13) Mozambique (8.54) Tanzania (8.52) Bolivia (8.51) Mongolia (8.50) Tunisia (8.44) Paraguay (7.92)	Nigeria (12.85) Bolivia(10.61) Mozambique (10.17) Mexico (8.84) Colombia (7.89) Cambodia (6.66) Russia (6.51) Croatia (5.70) Uganda (5.22) Kyrgyztan (5.03)
Ten lowest	Hong Kong (1.43) Azerbaijan (1.56) Japan (1.73) Luxembourg (2.00) Portugal (2.26) Greece(2.42) Austria (2.48) Philippines (2.53) Norway (2.75) Finland (2.81)	Iceland (0) Peru (0) SWZ (0) Egypt (0) Lesotho (0) Swaziland (0) Namibia(0) Zambia(0) China (0) Finland (0) Norway (0)

Appendix 6. Correlation between crime, police corruption and their instruments

Figure A1: Correlation between crime, police corruption and instruments



Appendix 7. Using infant mortality rate instead of life expectancy

	(1)	(2)
	OLS	GMM
Average crime rate	0.0154	-0.0121
	(0.451)	(-0.373)
Police corruption (POLCOR)	-0.0170	0.0764
	(-0.662)	(1.648)
Absolute value of latitude	0.0146**	0.0103**
	(2.683)	(2.119)
Dummy for tropical region	0.0160	-0.260
	(0.0728)	(-1.348)
Dummy for landlocked countries	0.0655	0.266
	(0.405)	(1.232)
Infant mortality under 5	-0.00837***	-0.0149***
	(-4.233)	(-4.664)
Total years of education	0.0626**	0.0726**
	(2.134)	(2.352)
Urbanization rate	0.0111**	0.00610
	(2.439)	(1.256)
Constant	7.769***	8.462***
	(18.09)	(18.52)
Observations	48	37
R-squared	0.880	0.860
Hansen J statistic		8.013
p-value of Hansen J statistic		0.156

Notes: Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of the average real GDP per capita over 1980-2004. Crime and police corruption are the two endogenous variables Crime rate (and police corruption) are calculated as average proportion of populations who were victims of types of crimes such theft, robbery, assault or burglary (and bribery in police). The original data come from the integrated ICVS including all waves for each country over the period 1989-2005. The list of instruments for crime includes the lagged crime, the abortion law status, the level of trust in the society. The list of instruments of police corruption includes the British legal origin, the proportion of Catholics, protestants and Muslims in 1980. For more detailed variables definition and sources see appendix A2

Appendix 8. Violent crime, property crime and development: OLS regressions

	(2)	(3)	(4)	(6)	(7)	(8)
Police corruption (POLCOR)	-0.118***	-0.0875**	-0.0293	-0.140***	-0.108***	-0.0404
	(-3.387)	(-2.544)	(-1.142)	(-3.561)	(-2.827)	(-1.609)
Violence Crime	-0.176***	-0.108**	0.00862			
	(-3.855)	(-2.274)	(0.286)			
Property Crime				-0.113	6.64e-05	0.0550*
				(-1.648)	(0.000946)	(1.749)
Absoute value of latitude		0.0316***	0.0134**		0.0385***	0.0139**
		(3.195)	(2.364)		(3.854)	(2.576)
Dummy for tropical region		0.268	0.0244		0.279	0.0376
		(0.708)	(0.0953)		(0.729)	(0.153)
Dummy for landlocked countries		-0.246	0.172		-0.352	0.168
		(-0.918)	(1.037)		(-1.283)	(1.015)
Total years of education			0.0588*			0.0578*
			(1.907)			(1.912)
Life expectancy			0.0414***			0.0483***
			(2.742)			(3.509)
Urbanization rate			0.0126***			0.0105**
			(2.766)			(2.363)
Constant	10.21***	8.577***	4.525***	9.507***	7.743***	4.063***
	(39.00)	(14.45)	(4.299)	(48.47)	(14.59)	(4.589)
Observations	72	65	49	72	65	49
R-squared	0.414	0.573	0.876	0.265	0.522	0.882
Robust t-statistics in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Appendix 9. Analyses on subsamples

Table 9a: Regressions on developed countries

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	GMM	GMM	GMM
Average crime rate	-0.0548	-0.0378	-0.0157	-0.0257	-0.0522	-0.0116
	(-1.093)	(-0.799)	(-0.455)	(-0.533)	(-1.278)	(-0.231)
Police corruption (POLCOR)	-0.939***	-0.515**	-0.575***	-1.096***	-0.492	-0.884**
	(-6.950)	(-2.755)	(-3.885)	(-3.100)	(-1.020)	(-2.294)
Absolute value of latitude		0.00439			0.00606	
		(1.246)			(1.567)	
Dummy for tropical region		0.151				
		(1.710)				
Dummy for landlocked countries		0.106			0.0948	
		(1.752)			(1.411)	
Life expectancy		0.00489			-0.00665	
		(0.154)			(-0.193)	
Total years of education		0.0513**			0.0521	
		(2.391)			(1.702)	
Informal economy			-0.015***			-0.0126*
			(-2.898)			(-1.829)
Constant	10.21***	9.090***	10.28***	10.14***	9.949***	10.29***
	(53.62)	(3.603)	(82.44)	(51.36)	(3.488)	(53.97)
Observations	25	23	22	23	21	20
R-squared	0.437	0.726	0.619	0.406	0.713	0.560
Hansen J statistic				0.901	4.248	1.359
p-value of Hansen J statistic				0.637	0.120	0.507

Table 9b: Regressions on developing countries

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	GMM	GMM	GMM
Average crime rate	-0.0815	0.0836**	-0.0837	-0.0522	0.109**	-0.0546
	(-1.467)	(2.129)	(-1.532)	(-0.407)	(3.162)	(-0.594)
Police corruption	-0.0357	-0.0139	-0.0147	0.147	0.00723	0.136
	(-0.823)	(-0.465)	(-0.341)	(0.455)	(0.173)	(0.902)
Absolute value of latitude		0.0243			0.0388*	
		(1.640)			(1.974)	
Dummy for tropical region		0.333			0.606	
		(0.741)			(1.499)	
Dummy for landlocked countries		0.00235			-0.370	
		(0.00735)			(-0.567)	
Life expectancy		0.0482**			0.0227	
		(2.422)			(0.519)	
Total years of education		0.0664			0.0439	
		(0.888)			(0.581)	
Informal economy			-0.0151*			-0.0106
			(-1.722)			(-0.923)
Constant	8.922***	3.751**	9.429***	8.413***	4.888*	8.869***
	(27.68)	(2.665)	(20.31)	(11.95)	(2.115)	(17.67)
Observations	47	26	46	34	16	34
R-squared	0.072	0.659	0.142	-0.346	0.714	-0.191
Hansen J statistic				1.980	1.296	4.954
p-value of Hansen J statistic				0.372	0.523	0.0840

Appendix 10. ICVS police corruption and Transparency international police corruption