Expropriation and Trade: Evidence on the Links using Cross-Country Crime Data

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Abstract

Popular media and anecdotal evidence suggests that aspects of globalization, particularly trade liberalization, are associated with increasing social tension such as higher crime rates. Moreover recent theoretical models have suggested that trade liberalization might reduce crime, but the effect differs for labor abundant and capital abundant countries. Though there is substantial evidence that crime rates differ across countries the proposition that trade liberalization in itself has an impact on crime has not been tested in the literature. We test this theory and find that a higher degree of trade liberalization, as measured by both higher openness and lower import duty rates, tend to increase burglaries and thefts in labor abundant countries. In contrast, in capital abundant countries, trade liberalization has either a small negative effect or no effect on crime rates.

Keywords: Expropriation, International Trade, Globalization, Crime.

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1 Introduction

The argument against trade liberalization on non-economic grounds dates back at least to the ancient Greeks where Plato, Aristotle and Xenophon all expressed reservations about possible social costs from trade with foreigners (Irwin 1996). Arguably their suspicions were warranted since, as Findlay and O'Rourke (2007) make clear, in the 2-3 millennia that have followed, though trade has been associated with economic growth, it has also been accompanied by famine, war, enslavement and genocide.

In the contemporary context, the globalization debate indicates that there is still substantial skepticism over whether the purely economic gains from trade, might actually dominate other considerations.[1] Recent theoretical models have aimed to capture some of these negative social impacts through explicitly allowing for incomplete markets. These include Anderson and Marcouiller (2005), Anderson and Bandiera (2006), Ghosh and Robertson (2010) and Dal Bo and Dal Bo (2010). In particular Ghosh and Robertson (2010) show that the Stolper-Samuelson effects of trade liberalization on factor prices means that the impact of trade on expropriation, or predatory behavior, may be positive or negative depending on whether a country is labor or capital abundant. In these models expropriation is unproductive so that increased predation can reduce welfare. Moreover expropriation imposes other significant non economic costs (Dodson 2002, Demombynes and Ozler 2005).

Since most expropriation is illegal, the economics of crime literature, following Becker (1968) and Ehrlich (1973), is also relevant. One strand of this literature seeks to identify the factors affecting crime rates, and how they differ across the level of development (Soares 2004), the rate of growth (Pyle and Deadman 1994, Cook 2010), unemployment rates (Bushway, Cook and Phillips 2010) and urbanization (Glaeser and Sacerdote 1999, Fajnzylber, Lederman, Loayza, Reuter, Roman and Gaviria 2000). In many ways these studies look indirectly at the impact of globalization which might be thought to affect inequality, unemployment and incomes. But so far the hypothesis that trade liberalization might impact on crime rates has received scant attention in the empirical literature.

Before turning to empirics (section 3), first we develop a simple model of crime and trade (section 2) following Ghosh and Robertson (2010). We consider a Heckscher-Ohlin framework with two goods—an exportable and an importable—and two factors—labor and capital. An important difference with the standard Hecksher-Ohlin set up however is that property rights are not perfect. While rights to consumption of one's own in-

[1] For examples of the globalization debate among economists see, Rodrik (1997), Deardorff (2000) and Wolf (2004).

come is provided by law, enforcement of law is imperfect and costly. Legal services are competitively produced using labor and capital. As a consequence of imperfect enforcement of law, not all resources are engaged in productive activities. Individuals face an effective choice between employing labor and capital in producing goods or services and expropriating income from other agents.

How does trade liberalization impact crime in this extended Hecksher-Ohlin framework? Consider a labor-abundant, developing country which exports labor-intensive goods. From Stolper-Samuelson theorem we know that trade liberalization will lead to an increase in wage and an increase in returns to capital. If crime is relatively labor intensive—as is often assumed to be the case—the opportunity cost of crime increases which reduces the incentive to engage in crime. This crime-reducing effect of trade liberalization has been highlighted in the recent literature (see, for example, ...) and this effect is present in our framework as well. However, the role of the legal sector has typically been overlooked. If legal services are relatively labor intensive as well, the price of legal services increase which makes protection (against crime) costly. The demand for legal services decline which in turn increases the incentive to engage in criminal activities. Increase in opportunity cost of crime together with increase in price of legal services suggest that crime can be higher or lower with trade liberalization, at least for the plausible case where legal service and expropriation are both relatively labor intensive compared to the productive activities. Thus whether trade liberalization reduces expropriation or not is effectively an empirical question.

This paper explores the impact of trade liberalization on two measures of expropriation - thefts and burglaries. We employ an unbalanced panel data covering up to 72 countries over the period 1980 and 2008 (1986-2008 in the case of burglaries). The sample covers countries from all continents and includes a large variation of capital per worker ratios.

The rest of the paper is organized as follows. The model is presented in Section 2, and is followed by a discussion of the data and empirical strategy for dealing with data reporting issues in Section 3. The results are presented in the Section 4, followed by some concluding remarks and policy implications in Section 5.

2 A Model of Crime and Trade

Consider a small open economy with a unit measure of identical individuals. Each individual has $\bar{L}$ units of labor and $\bar{K}$ units of capital, the returns (per unit) to which are

denoted by w and r respectively. There are two tradable goods, an exportable and an importable denoted by x and m respectively. Let p_x and p_m respectively denote the world price of the exportable and importable. Choosing units appropriately for the two goods we set $p_m = p_x = 1$. We assume that the import-competing sector is tariff protected and let p ($>$ 1) denote the tariff-inclusive price of the importable good faced by domestic consumers.

Both x and m are produced under constant returns to scale and perfect competition using labor and capital. Perfect competition in both these sectors imply that unit cost equals price:

$$c_x(w, r) = 1, \tag{1}$$
$$c_m(w, r) = p, \tag{2}$$

where $c_x(w, r)$ and $c_m(w, r)$ denote the unit cost functions for x and m respectively.

Unlike standard Heckscher-Ohlin framework, law enforcement is not perfect. As a consequence of imperfect enforcement, some resources are not engaged in productive activities. Each individual endowed with $\bar{L}$ units of labor and $\bar{K}$ units of capital face an effective choice between employing labor and capital in producing goods or services and expropriating income from other agents.

Suppose individual i uses L_e^i units of labor and K_e^i units of capital in expropriation. Accordingly, $L^i \equiv \bar{L} - L_e^i$ units of labor and $K^i \equiv \bar{K} - K_e^i$ units of capital are engaged in productive activities. Then, in the absence of expropriation, income from productive activities for i is

$$\omega^i \equiv wL^i + rK^i.$$

A fraction $\gamma \in (0, 1)$ of this income is subject to potential expropriation and hence the actual income from productive activities may be less than ω^i. Nevertheless ω^i may also be realized if the act of expropriation is verified by a court.

Legal services: We assume that each individual i buys $z^i (\geq 0)$ units of legal services. Naturally, the higher the level of z^i, the higher the probability that the claim of expropriation by individual i is successfully verified in the court. Let $\alpha(z^i)$ denote that probability which satisfies the following plausible conditions: (i) $\alpha(0) = 0$, (ii)$\alpha(z^i) < 1$ for all finite z^i, and (iii) $\alpha'(z^i) > 0$, $\alpha''(z^i) < 0$. Let $z \equiv \int_0^1 z^i di$ denote the overall level of legal services in the economy. Like x and m, z is competitively produced under constant

returns to scale. The relevant pricing equation is

$$p_z = c_z(w, r), \tag{3}$$

where $c_z(w,r)$ and p_z respectively denote the unit cost function and the price of z.[2] Unlike x and m, z is non-traded.

Expropriation: We assume that, in their attempt to expropriate income, each individual can target only one individual and similarly she can be targeted only by one individual. The probability of successfully expropriating another individual's market income depends on the resources committed to expropriation. The production function for expropriation is $e(L_e^i, K_e^i) \equiv e^i$, where the following assumptions hold: (i) $e(0,0) = 0$, (ii) e^i is homogenous of degree one, (iii) $\frac{\partial e(.,.)}{\partial F_e^i} > 0$, $\frac{\partial^2 e(.,.)}{\partial {F_e^i}^2} < 0$; $\quad F \in \{L, K\}$.

The unit cost function associated with this expropriation technology, which captures the minimum income that an agent i has to forego to produce $e^i = 1$, is given by

$$c_e^i(w, r) = \min \left\{ wL_e^i + rK_e^i \mid e^i = 1 \right\}. \tag{4}$$

The level of e^i determines the probability of i's success in expropriation. More specifically, an agent i succeeds in expropriation with probability $\phi(e^i)$ where $\phi(.)$ satisfies the following properties: (i) $\phi(0) = 0$, (ii) $\phi'(e^i) > 0, \phi''(e^i) < 0$, and (iii) $\phi(e^i(L,K)) < 1$. The first two properties are standard. The third one says that there is strictly positive probability of failure of expropriation even if all resources are devoted to expropriation.

Income: An individual i's income comes from two sources: productive activities and expropriation. Consider first the income from expropriation. If i succeeds in targeting k and is not detected/convicted by legal authorities then she earns $\gamma\omega^k = \gamma(wL^k + rK^k)$ where $\gamma \in (0,1)$. The probabilities of (a) i's success in targeting k and (b) failure of detection/verification by courts are given by $\phi(e^i)$ and $1-\alpha(z^k)$ respectively. Since these two events are independent the probability that i successfully expropriates $\gamma\omega^k$ from k is $\phi(e^i)(1-\alpha(z^k))$. In all other cases i's income from expropriation is zero.

Now consider i's income from productive activities. Given that a fraction $\gamma\omega^i$ can be successfully expropriated by j with probability $\phi(e^j)(1-\alpha(z^i))$, i's income from productive activities is $(1-\gamma)\omega^i$ with probability $\phi(e^j)(1-\alpha(z^i))$ and, ω^i with probability $1-\phi(e^j)(1-\alpha(z^i))$. Taking these different types of incomes and probabilities into account,

[2]Existence of market for z is not necessary for our results. Analogous to contest/conflict literature we can think of z^i as i's investment in protection of property/endowment which uses both labor and capital.

and deducting the legal expenditures, $p_z z^i$, individual i's expected income available for consumption of tradables is

$$\bar{y}_d^i \equiv \omega^i(1-\gamma\phi(e^j)(1-\alpha(z^i))) + \gamma\omega^k\phi(e^i)(1-\alpha(z^k)) - p_z z^i. \tag{5}$$

Consumers' optimization problem: The representative consumer i maximizes $U(x_c^i, m_c^i)$, a homothetic utility function in x and m, subject to the budget constraint $x_c^i + pm_c^i = y_d^i$, where x_c^i, m_c^i, and y_d^i respectively denote the consumption of x, consumption of m and the income available to i for consumption of x and m. Corresponding to this utility maximization problem let $V(p, y_d^i) \equiv V^i$ denote the indirect utility function. Since $U(.)$ is homothetic,

$$V^i = v(p)\ y_d^i, \tag{6}$$

where $v(p)$ is decreasing in p. Exploiting V^i's linearity in income, the expected indirect utility can be written as

$$\bar{V}_i \equiv v(p)\bar{y}_d^i, \tag{7}$$

where $\bar{y}_d^i$ is given by (5).

Consider the optimization problem faced by an individual i who targets individual k and is targeted by individual $j(\neq k)$. Each individual i chooses (e^i, z^i) to maximize $v(p)\bar{y}_d^i$. The first-order conditions corresponding to e^i and z^i respectively are:

$$\gamma\omega^k\phi'(e^i)(1-\alpha(z^k)) = c_e^i(w,r)(1-\gamma\phi(e^j)(1-\alpha(z^i))), \tag{8}$$

$$\gamma\omega^i\phi(e^j)\alpha'(z^i) = p_z. \tag{9}$$

First, assume z^i as given and consider an infinitesimally small increase in e^i. The left-hand side of (8) captures the marginal benefit: the incremental expected income from expropriation. The right-hand side is the expected foregone income (from productive activities). The second equation, i.e.(9), equates the marginal benefit and marginal cost of an additional unit of z^i. The right-hand side of (9) is cost of buying an additional unit of z^i while the left-hand side is the increased expected income due to better enforcement.

2.1 Equilibrium

We focus on symmetric equilibrium with $e^i = e, z^i = z$ and $\omega^i = \omega$ for all $i \in [0, 1]$. Then equations (8) and (9) reduce to the following:

$$\frac{\phi'(e)(1-\alpha(z))}{1-\gamma\phi(e)(1-\alpha(z))} = \frac{c_e}{\gamma\omega}, \tag{10}$$

$$\phi(e)\alpha'(z) = \frac{p_z}{\gamma\omega}. \tag{11}$$

Figure 1 below shows these two equations.

Insert Figure 1 about here

The downward sloping curve EE depicts (10) which captures the optimal level of expropriation for a given level of z. As the level of z increases, (i) expected income from expropriation declines, and (ii) more income from productive activities is retained. Both (i) and (ii) lower incentives to engage in expropriation and consequently e declines. The upward sloping curve ZZ depicts (11) which captures the relationship between the demand for legal services and expropriation. There are two forces at work. First is the obvious one: the higher the level of expropriation the higher is the demand for legal services. This effect suggest a positive relationship between e and z. Second, higher e implies lower $\omega = w\bar{L} + r\bar{K} - c_e(.)e$. Thus there is less income to protect which reduces the marginal benefit from legal services. The second effect suggests that e and z might be negatively related. We assume that the first effect dominates and draw ZZ as an upward sloping line in (e, z) space.[3] The intersection of EE and ZZ gives equilibrium values (e^*, z^*).

2.2 Trade liberalization

Consider trade liberalization in a developing economy which exports a labor intensive good x. We model trade liberalization as a reduction in p. From Stolper-Samuelson theorem we know that as p declines, w increases and r declines. The change in factor prices affects

(a) opportunity cost of expropriation (c^e),
(b) price of legal services (p_z) and,
(c) income from productive activities (ω)

[3]Even if ZZ is downward sloping our arguments go through as long as ZZ is steeper than EE.

which in turn shifts EE and ZZ and impacts the equilibrium level of expropriation e^*.

Consider EE first. From (10) it follows that whether EE shifts left or right depends on how $\frac{c_e}{\gamma\omega}$ changes with trade liberalization. If successful in expropriation, an individual grabs $\gamma\omega$ while the opportunity cost of engaging in expropriation in terms of foregone income (ignoring the probability of retaining it) is c_e. We have that

$$\frac{c_e}{\gamma\omega} = \frac{wa_{Le} + ra_{Ke}}{\gamma(wL + rK)}$$

where (i) L and K are labor and capital employed in productive activities (x, m, and z) and (ii) $a_{fe}(\equiv \frac{\partial c_e}{\partial f})$ denote the amount of factor f required to produce one unit of e for a given (w, r). We find that $\frac{c_e}{\gamma\omega}$ increases, and accordingly incentive for expropriation decline with trade liberalization, if and only if expropriation is labor intensive compared to the productive activities. The following observation summarizes our finding.

Observation 1: *For a given z, expropriation declines (increases) with trade liberalization if and only if the capital-labor ratio in expropriation is lower (higher) than that of productive activities as a whole. That is, EE shifts left (right) if and only if $\frac{a_{Ke}}{a_{Le}} < (>)\frac{K}{L}$.*

Now consider ZZ. From (11) it follows that whether ZZ shifts up or down depends on how $\frac{p_z}{\gamma\omega}$ changes with trade liberalization. If successful in court, an individual retains $\gamma\omega$ of her income while the cost of court/legal services expropriation in terms is p_z. We have that

$$\frac{p_z}{\gamma\omega} = \frac{c_z(w, r)}{\gamma(wL + rK)} = \frac{wa_{Lz} + ra_{Kz}}{\gamma(wL + rK)}$$

where (i) $p_z = c_z(w, r)$ (due to (3)) and (ii) $a_{fz}(\equiv \frac{\partial c_z}{\partial f})$ denote the amount of factor f required to produce one unit of z for a given (w, r). We find $\frac{p_z}{\gamma\omega}$ increases and accordingly the demand for z declines if and only if z is labor intensive compared to the productive activities.

Observation 2: *For a given e, demand for legal services decreases (increases) with trade liberalization if and only if the capital-labor ratio of z is lower (higher) than that of productive activities as a whole. That is, ZZ shifts down (up) if and only if $\frac{a_{Kz}}{a_{Lz}} < (>)\frac{K}{L}$.*

Observations 1 and 2 suggest that expropriation unambiguously decreases(increases) with the trade liberalization if $\frac{a_{Kz}}{a_{Lz}} > \frac{K}{L} > \frac{a_{Ke}}{a_{Le}}$. However, it is natural to think both expropriation and legal services are labor intensive compared to productive activities. In that case, from observations 1 and 2 it follows that EE shifts left and ZZ shifts down with trade liberalization.

Insert Figure 2 about here

Figure 2 shows that, depending on the magnitude of shifts of the two curves, EE and ZZ, expropriation might decrease or increase with trade liberalization. Similar ambiguity exists for the effects of trade liberalization on expropriation in a developed country, or more specifically a country that exports capital-intensive good. From Stolper-Samuelson theorem we know that trade liberalization will lead to a reduction in w and an increase in r. This lowers the opportunity cost of crime. Thus for a given z, expropriation increases. EE shifts right. However, if z is relatively labor intensive as well, then the price of legal services decline. Demand for legal services increase and ZZ shifts up. Observe that once again the overall effect is ambiguous. Whether expropriation increases or decreases depends on the magnitude of shifts of EE and ZZ.

Thus our theoretical analysis identifies the channels through which trade liberalization affects expropriation. The overall effect on expropriation is ambiguous for the plausible case where legal service and expropriation are both relatively labor intensive compared to the productive activities. Thus whether trade liberalization reduces expropriation or not is effectively an empirical question.

3 Data

Illegal expropriation covers many activities from smuggling, coercion and through to violence homicide and civil wars. To take the theory to the data we consider one well defined element of expropriation for which comparable data is available across countries, specifically thefts and burglaries. Our primary data source is the official crime data from the United Nations Survey of Crime Trends and Operation of Criminal Justice (UNCS). This data-set offers a time span of nearly four decades (1970-2008) and covers 156 countries.

Despite the relative consistency of this data, it is nevertheless recognized that official crime data, like the UNCS, tends to suffer from under-reporting. Official data are likely to be particularly biased if there is a lack of trust in the authorities (Fajnzylber et al. 2000) and if there is inherent corruption within the judicial system (Bourguignon 1999).[4]

[4]A second problem is that some countries have modified their classification of crime over time (Mosher, Miethe and Hart 2011, Zvekic and Alvazzi del Frate 1995). Following Fajnzylber et al. (2000), the data was scanned for such inconsistencies and observations that were clearly out of line, without a plausible explanation, have been dropped. Given the arbitrary nature of this correction, all the models discussed in this paper have been estimated using the corrected version of the data (results presented in this

Underreporting will introduce bias only if the extent of underreporting differs non-randomly across countries or across time. In particular, crime reporting is argued to depend on the level of development of a country, among other things. To deal with this issue, Soares (2004) advocates correcting the data for difference in reporting rate across countries by supplementing the estimation with victimization data, which is based on household surveys, and hence more consistent across countries.[5] Specifically, following Soares (2004), suppose the true crime rate is explained by the model,

$$Y^* = X\theta + \varepsilon \tag{12}$$

where $Y*$ is the logarithm of the true crime rate, X is a vector of country characteristics and ϵ is a random error. Suppose further that the reported crime rate is

$$Y = Y^* + \nu \tag{13}$$

where ν is a reporting error. If the reporting rate depends on the country characteristics ($COV(\nu|X) \neq 0$), then omitting to control for the reporting rate in the model explaining crime rates will result in estimating $Y = X\theta + \mu$ with $\mu = \nu + \varepsilon$. We can however exploit the availability of the victimization data to obtain an estimator for $\widehat{\nu}$ and hence construct the series $Y - \widehat{\nu}$. If the relation between the explanatory variables, X, and the reporting rate is constant over time and countries, and if we assume that ν and X are jointly normally distributed, we have $E(\nu \mid X) = X\gamma$, where γ is a constant. We can then estimate the 'true' crime rate, Y^*, for all the observations for which we have the police reported crime rate and the explanatory variables, X. The true crime rate is equal to the log of the crime rate reported to the police minus the reporting error $\widehat{\nu}$.[6]

Due to the presence of the corrected crime rate, the standard errors estimated by the OLS procedure are biased. This however, affects only the variable used in the reporting rate model (Soares 2004).

Thus we consider a reporting rate regression to obtain estimates of the extent of under

paper) and using the original version of the data (results available on request). Both versions lead to similar conclusions. A related problem is the inclusion of burglaries and automobile thefts in the UNCS definition of thefts for some years but their separate recording in others. To ensure consistency our variable $thefts$ is inclusive of automobile thefts, burglaries and other thefts.

[5] A simpler way of correcting for non-random differences in reporting rate across countries is to include country fixed effects as done by Fajnzylber et al. (2000). However, this technique will work only if the reporting rate is constant across time within each country. This is unlikely to hold in long panels.

[6] A similar methodology has been used before by Glaeser and Sacerdote (1999) in a paper explaining the higher crime rates found in cities in the USA.

reporting of crime relative to victimization data. Specifically we use the International Crime Victims Survey (ICVS). This data covers 46 countries over the period 1989 and 2005.[7] With respect to $thefts$ and $burglaries$ the UNCS and ICVS data overlap 107 times over the period 1985-2008. Once the necessary explanatory variables are included, we are left with a maximum overlap of 65 observations.[8] The reporting rate for thefts varies between 0.18% in the Philippines and 36.89% in Austria and is of 7.68% on average. Similarly, the reporting rate for burglaries varies between 0.01% in South Korea and 249% in Finland and is, on average, of 15.31% (Table 1).

3.1 Reporting Rate Results

The reporting rate, *rrate*, is defined as the log of the ratio of the crime rate reported to the police, relative to the crime rate as measured in the victimization survey. The results of regressing this ratio on explanatory variables, using OLS and adjusting the standard errors for clustering at the country level, are given in Table 2. The first two models are the model used by Soares (2004) which, given the lack of significance of most of his explanatory variables (Columns 1 and 4) consider the reporting rate to be a function of the log of GDP per capita only (Columns 2 and 5). Other potential determinants are the quality of institutions, as suggested by Kaufmann, Kraay and Zoido (1999) and, ethnic fractionalization, a variable often associated with crime and conflict, for example, see Fafchamps and Moser (2003). We also include dummy variables for the major geographical areas, namely, Asia (*asia*), Latin America (*latin*) and Sub-saharan Africa (*SSA*). The following model is therefore estimated

$$\begin{aligned} rrate_i = \alpha_0 + \alpha_1 gdp_i \ &+ \alpha_2 democ_i + \alpha_3 ethnic_i \\ &+ \alpha_4 asia_i + \alpha_5 latin_i + \alpha_6 SSA_i + \nu_i \end{aligned} \tag{14}$$

where *GDP* is the log of per capita gross domestic product taken from the Penn World Tables, *democ* is a dummy variable taking the value of one if the country has been a democracy for the whole period for which the data is available and zero otherwise and ethnic is a measure of ethnic fractionalization taken from Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg (2003). This specification also suggests that GDP per

[7] To compare the ICVS data to the UNCS data, we define thefts as inclusive of car thefts, thefts from car, thefts of motorcycle, bicycle thefts and thefts of personal property while burglaries includes burglaries and thefts from garage/shed/lockups.

[8] The countries included in the sample are listed in Appendix A.

capita has a positive impact on the reporting rate. But it also shows that so does a stable democracy while ethnic diversity reduces the reporting rate (but only in the case of thefts). Finally, the reporting rate is significantly lower in Asia (marginally insignificant for burglaries) and in Latin America but statistically significantly higher in Sub-saharan Africa (only in the model explaining thefts).

[Tables 1 and Table 2 about here]

4 Crime and Trade Liberalization

Our theoretical model suggests that a change in trade policy regimes will have an impact on crime, but that the sign of this effect is ambiguous. In particular it depends on whether a country is labor or capital abundant. Moreover, a country that has the same endowment rate as the word average is predicted to experience no impact from changes in trade regimes on crime. Hence the sign of the effects of trade on crime is an important empirical question that has not been widely addressed in the literature. In order to test the hypothesis that changes in trade regimes can affect crime rates, the following model is estimated:

$$\ln(crime_{it}) = \beta_0 + \beta_1\, k_i + \beta_2\, trade_{it} + \beta_3\ (k_i\ \ trade_{it}) + \cdots + \varepsilon_{it} \tag{15}$$

where *crime* is measured either as thefts per 100,000 inhabitants or as burglaries per 100,000 inhabitants, adjusted for reporting rate; k is the log of the ratio of capital per worker in 1970 to the average world capital per worker for the same year; and trade is a measure of trade openness. As high theft and burglary rates may impede capital accumulation, leading the variable capital per labor to be endogenous, we use the capital per labor ratio prevalent in 1970, 10 years before our first observation.[9] With respect to *trade* we use both the widely used "openness" measure - the ratio of trade over GDP (*open*) - and the log of the ratio of duties over imports (*duties*).[10] The control variables include all the variables in the reporting rate regression as well as the growth rate of GDP per capita (*gdpg*), the population size and the population size squared (*pop* and

[9] As a robustness check we have used the contemporaneous value of the capital per labor ratio. The main conclusions remain the same (results available on request).

[10] The ratio of trade over GDP is from the World Bank (2009) while the log of the ratio of duties over imports is from the WDI and the Historical Government Finance Statistics (International Monetary Fund 2005)

pop2) and, finally, the ratio of unemployed over the total workforce (*unemp*).[11]

Thus the impact of trade depends on the relative capital – labor ratio of the country in question. Note in particular that if a country's capital per worker is equal to the world average then $k_i = 0$. Hence β_2 gives the impact of trade on the country with average capital abundance, which may well be zero according to the theory. For countries with above or below the world average the impact of trade on the crime rate is $\partial crime/\partial trade = \beta_2 + \beta_3 k$, which clearly varies according to k.

4.1 Base Model Estimation

Our base model pool time and country observations using a clustered sandwich estimator, to adjust for time series correlation in the error terms within each country. The results from this base model are presented in Table 3 (column 1).[12] [13]

The results show that the coefficient of *open* is insignificantly different from zero. This is consistent with the theory, as in order to reverse sign, the true coefficient has to be zero for some level of capital abundance. The results suggest that *open* has no impact on thefts for countries with average capital abundance. Examples of such countries are Costa Rica, Morocco and Tunisia.

Further the results show that the impact of trade depends on the relative capital abundance, as indicated by the negative and statistically significant interaction term *open* k. Thus *open* is associated with an increase in the theft rate in labor abundant countries, and a decrease in the theft rate in capital abundant countries. Joint significance tests for $\beta_2 + \beta_3 k$ are also presented for $k = -4$, $k = -2$ and $k = 2$, which represent low level, moderately low level and high level of capital abundance among all countries for which we have data on capital per labor ratio. Those results show that the total impact of openness is highly significant and negative for capital abundant countries, marginally insignificant at moderately low level of capital abundance and labor abundance, and highly significant and positive for high level of labor abundance. Therefore, countries like Australia, Singapore and the United States see their theft rate decrease following a trade liberalization policy, while the opposite is true for countries like Uganda and Bangladesh.

[11] The data sources are provided in Appendix B.

[12] While only the main variables of interest are presented in the core of this paper, the results for the control variables are available in Appendix C.

[13] As a robustness check, the same model is estimated with the standard errors corrected for autocorrelation of order one. The results are similar. The only notable difference is the lost of statistical significance for the trade variable, as measured by *duties*, in the model explaining burglaries.

Next we consider using the rate of duties relative to imports (*duties*) as an alternative measure of trade restrictiveness. We believe this variable to be a more reliable measure of trade policy as the ratio of trade over GDP is often believed to be endogenous. Stated differently, it is plausible that a high crime level deters exports and imports. Moreover, *duties* is a preferable index of trade restrictiveness as it is more directly linked to trade policy. The cost is a drop in the sample size from 240 to 155 observations.

The results for *duties* as an independent variable are shown in column 1 of Table 4. The results show that *duties* is negative and significant – meaning that more protection reduces crime for countries with average capital abundance. Likewise the interaction term is now positive and significant, showing that the extent to which removing trade restrictions increases crime diminishes for more capital abundant countries. The joint significance tests for the interaction term also show that the total impact of openness on crime, $\beta_2 + \beta_3 k$, is highly significant at low and moderately low capital labor ratios but, even though of the expected sign, insignificant at higher levels of capital abundance.

To investigate these interaction terms more closely, panel (i) of Figure 3 shows the estimated line $\partial crime/\partial openness = \beta_2 + \beta_3 k$ and $\partial crime/\partial duties = \beta_2 + \beta_3 k$ for the two models. The dotted lines show the 90% and 95% confidence intervals for all values of k. Clearly the line for *duties* and *open* have opposite signs since the former is a measure of trade policy restrictiveness and the latter is an indicator of trade policy openness.

It can be seen from the graphs that both models give very similar results. The estimated elasticity of trade on crime, $\beta_2 + \beta_3 k$, is quite similar in each case, ranging from absolute values of approximately 0.9 in the case of *open* and 0.6 in the case of *duties*, to 0.6 and 0.1 respectively. While the theft rate increases following an increase in trade openness in labor intensive countries, the impact loose its strength the higher the capital per labor ratio is and reverse sign for the most capital abundant countries (statistically significant only in the 1st model–panel i).

Both models, therefore, suggest larger coefficients for labor abundant countries, with smaller or possibly insignificant impacts for capital abundant countries. The signs of the coefficients are consistent across the two models, but there is some variation in their size and also the estimated critical capital labor ratio where the overall impact of trade on crime changes from negative to positive. Nevertheless all the results are consistent with our theory which says that the impact of trade on crime is likely to depend on the capital abundance of the country, and show that increased openness or reduced duty rates both tend to increase crime in labor abundant countries and reduce crime in capital abundant countries.

[Figure 3 about here]

Next the first Column of Tables 5 and 6 present the same models, but using the burglary rate, rather than the theft rate, as the dependant variable. Arguably the burglary rate, which is essentially theft associated with breaking into a premise, is a better measure of crime because it is more tightly defined across time and countries. Nevertheless using burglary data further restricts the sample size.

Encouragingly, however, the results are very similar to the results for thefts. Again we conclude that reducing barriers to trade increases crime in labor abundant countries but reduces crime in capital abundant countries

The interaction term results for burglaries are summarized in panels (iii) and (iv) of Figure 3. It can be seen that the pattern of the interaction term for burglaries across both models is quite similar to the pattern we obtained for the thefts data. The main impact of using burglary data, rather than theft data, is that the elasticity of trade reform with respect to burglaries is around 2-3 times larger than the elasticity is for thefts. Apart from this, the results for burglaries are very similar to those for thefts, and similar conclusions are drawn from either model.

While the previous discussion has focused on statistical significance, it is important to note that the impact of trade liberalization on crime rate is not only statistically significant but also economically significant.

For example, the United States, a capital abundant country had had a policy of trade liberalization over the period 1980 and 2009. Our model predicts that the increase in openness of 46.23% over this three decades resulted in a reduction in the theft rate of 19.54% and a reduction in the burglary rate of 38.04%, everything else constant. In the case of Bangladesh there was a policy of trade liberalization over the same period and openness increased by 118.15%. Our model suggest this would have increased the rate of thefts by 75.21% and the burglary rate by 240.43%. Likewise consider the very large reform programme in India, which led to an increase in openness of 158.57% over the period 1990-2009. the model predicts that this would have lead to an increase in thefts of 67.43%.[14] As those three example illustrates, the economic significance of trade liberalization on crime rate is, therefore, far from negligible.

[14]In the USA openness increased from $open_{1980-84} = 2.94$ to $open_{2005-09} = 3.32$ and $k = 1.30$; for Bangladesh we have $open_{1980-84} = 3.01$; $open_{2005-09} = 3.79$; $k = -2.86$ and for India; $open_{1980-84} = 2.91$; $open_{2005-09} = 3.86$; $k = -2.03$.

4.2 Alternative estimators

Inequality

A possibly important determinants of crime for which we have not controlled for so far is inequality. Inequality is believed to have an impact on crime through two main mechanisms. First, the net gains from crime should be higher in an unequal society as the revenue from employment for the poor should be relatively low compare to the potential spoil. Secondly, poor in an unequal society may resent the rich, leading them to seek compensation through crime (Fajnzylber, Lederman and Loayza (2002)).

Following Fajnzylber et al. (2002), we control for inequality by including either the Gini coefficient or the ratio of the income earned by the 20% richest on the income earned by the 20% poorest, henceforth *ratio*. While including the contemporaneous measure of inequality makes the most theoretical sense, this is not feasible empirically given the patchy availability of inequality measures over time and over countries. In particular, the data is rarely available for developed countries in the year 2000s, leading to a biased sample when the contemporaneous values are used. We therefore use the average Gini coefficient and the average *ratio* over all years for which the data have been collected.

As shown in Tables 4 to 7 (columns X and X), these two measures of inequality never reaches statistical significance. The only exception being for the model explaining burglaries with the Gini coefficient as measure of inequality and the log of trade over GDP as measured of trade openness. More importantly, however, is the fact that the inclusion of an inequality measure does not change our main conclusions that is an increase in trade openness leads to an increase in crime in labor abundant countries and a decrease in crime in capital abundant countries.

Instrumental Variable

As previously mentioned, the use of openness as an explanatory variable can be criticized on the ground that it is likely to be endogenous. We addressed this issue above by using the ratio of duties to imports as a trade policy measure. An alternative approach is to instrument for openness using data on the lagged trade openness and on natural openness, that is the predicted openness, based solely on the geographic and historical characteristics of a country.[15] To stay on the safe side, we also instrument for duties

[15]Following Wei (2000) and Elbadawi and Hegre (2008), we estimate a model explaining the ratio of trade over GDP using, as explanatory variables: a measure of remoteness, the log of the population size, if the country is landlocked, the ratio of the coastline on the total area of the country, if the country is an island, if English is an official language, if French is an official language and if Spanish is an official language. Using this model, we predict the natural openness of the country, that is, the expected ratio

using the lag of duties.

For both new specifications, we conclude that the first stage fit is high (Tables 3 and 4, column 2) and that there is always at least one instrument that reach statistical significance in the first stage model (results available on request).[16] This also holds for burglaries (Tables 5 and 6, column 2). In the case of openness, as the model is overidentified, we perform a test of overidentifying restriction. We conclude in both the theft and the burglary models that our instruments are valid (Tables 3 and 5, column 2). With Shea's partial adjusted R-squared over 0.3 for all models, we are also confident that our instruments are not weak (Results available on request).[17] Nonetheless, we find no strong evidence for the need to instrument. The Hausman tests show that *open* and $open * k$ are not endogenous in the theft and the burglary models. However, the evidence is weaker for duties in the model explaining theft rate as the Hausman test is only marginally insignificant. In any case, the GMM estimator's results are similar to the OLS results found previously, reinforcing our confidence in our base model estimates.

Fixed Effects and Autocorrelation

While the use of a pool model can be justified by our small sample size, arguably relying on cross section data is likely to be problematic if there are significant differences in the determinants of crime across countries which are not controlled for in the model. It is also plausible that the data suffers from autocorrelation. We therefore estimate a model including fixed effects and controlling for autocorrelation of order one. From our perspective, however, the fixed effects estimator poses one major limitation, that is, the degree of freedom becomes even lower than in the pooled model. Moreover, given the limited depth of the data, we are limited at correcting for autocorrelation of order one while there might be potentially autocorrelation of higher level.

Tables 3 to 6 (column 3) present results for the Fixed Effects estimator, adjusting for autocorrelation of order one, using openness and duties as alternative explanatory variables. Encouragingly and despite the preceding concerns, the Fixed Effects estimator gives relatively similar results to the pooled estimator in the model explaining thefts, where the degrees of freedom are highest. With respect to the burglaries models, the interaction

of trade over GDP based solely on the geographic and the historical characteristics of the country. In contrast to the observed ratio of trade over GDP, natural openness is not expected to be influenced by the actual crime rate.

[16]Instrumental variable estimators are biased in finite sample. As noted by Cameron and Trivedi (2007), the IV estimator may approach the OLS estimator and therefore have a similar bias when the first stage fit is high and the number of instruments is very large relatively to the sample size. Therefore, as a robustness check we have estimated the IV model with only the lag of the endogenous variables. We again conclude that there is no need to instrument (results available on request).

[17]We do not perform the Stock and Yogo tests as we cannot assume that our standard errors are iid.

and trade terms are found to be statistically insignificant, which is not surprising given the limited sample size. In any case, we conclude that there is no autocorrelation in the burglary models.[18]

Arellano and Bond

A common concern in the crime literature is that past crime rates may affect the current crime rates. Specifically, high crime is argued to weaken social capital (Case and Katz 1991), lower the psychological cost of committing crimes (Rasmusen 1996) and deter job creation in the legal sector (Glaeser, Sacerdote and Scheinkman 1996), leading to higher crime rate in the future. Moreover, a surge in crime rate may overwhelm the police force, decreasing the risk of apprehension and, therefore, enticing would-be criminal to enter the crime market (Sah 1991).

In order to control for the past crime rate, we use an Arellano and Bond estimator (Arellano and Bond 1991).[19] The results are given in column 4 of Tables 3 and 4 (*thefts*) and column 4 of Tables 5 and 6 (*burglaries*). Given the unbalanced structure of our panel, the use of past values of crime rate as explanatory variable leads to a sharp drop in the sample size even though we include only one lag. Nonetheless, despite the extremely limited degrees of freedom, we conclude that more openness and less duties increases thefts and burglaries rate in labor abundant countries but has positive or no significant impact in capital abundant countries. Interestingly, once other factors are controlled for, past theft and burglary rates are not found to be statistically significant.

Democracy

Another concern is the high correlation between the capital labor ratio and our measure of institutions, with a correlation coefficient of 0.7164. It is plausible that institutions mitigate the impact of trade on crime by, for example, offering social protection to the losers or by allowing discontents to be hear in the public sphere. As a robustness check, we include the multiplicative variable *trade * democ* in the original pooled models (Tables

[18]It is possible that the smaller sample size in the burglary model impedes the autocorrelation test to reach statistical significance.

[19]The Arellano and Bond estimator is similar to the first difference estimator in the sense that the variation in the dependent variable is explained by the variation in the explanatory variables. Among those explanatory variables is the past crime rate. By definition, the variation in lag_crime is correlated with ϵ. Arellano and Bond's solution to this problem is to use the past *level* values of the dependant variable as instruments.

3 to 6, column 5). That is, we estimate:

$$\begin{aligned}\ln(crime_{it}) \;=& \beta_0 + \beta_1\, k_i + \beta_2\, trade_{it} + \beta_3\;\; (k_i\;\; trade_{it}) + \\ & \beta_4\, democ_{it} + \beta_5\;\; (democ_{it}\;\; trade_{it}) + \cdots + \varepsilon_{it}\end{aligned} \tag{16}$$

The new variables *trade*democ* never reaches statistical significance. Moreover, we conclude that the total impact of trade openness on crime is similar in democratic countries ($\beta_2 + \beta_3\, k + \beta_5$) than in autocratic countries ($\beta_2 + \beta_3\, k$). The inclusion of this extra variable, however, leads to important loss in statistical significance while not adding much to the model.

Real Openness

Finally, an alternative measure of trade openness has been proposed by Alcal and Ciccone (2004). Rather than using the nominal ratio of imports and export on GDP, they use the ratio of imports and exports in exchange rate US$ on PPP GDP (US$). As a robustness check, we re-estimated all models using this alternative measure. The conclusions remains the same for burglaries but loose statistical significance for thefts (Table 3 and 4, column 6).

5 Conclusion

This study has been motivated by historical observation that, in an imperfect world with costly law enforcement and imperfect property rights, trade liberalization often may involves social costs, even if the net economic gains are positive. This would be the main claim of globalization sceptics such as Rodrik (1997). As we show in our model, this claim does not contradict the gains from trade theorem but can be seen as an outcome of a extended standard trade model, where expropriation activities are costly to monitor and prevent. Our model showed that in a standard trade model, the effects of trade liberalization are likely to be ambiguous and will differ across countries depending on their capital abundance.

We have tested the theory using an unbalanced cross country panel data on thefts and burglaries. We also used two measures of trade regime, the standard openness measure and a measure of duties relative to imports as a trade restrictiveness measure. Across a range of specifications, we obtain ample evidence that trade liberalization does increase crime rates in labor abundant countries, and has small reduction in crime, or no effect, in capital abundant countries. This may seem at odds with intuition if we think of crime

as a labor intensive activity. In this case the Stolper-Samuelson theorem suggests that rising wages in labor abundant counties would raise the opportunity cost of crime and hence crime should fall.

As our theory shows, however, this argument ignores the costs of law enforcement activities such as policing and the judiciary. If these activities are also labor intensive then the impact of trade liberalization on crime is theoretically ambiguous. The theory does show, however, that the direction of the impact of trade liberalization on crime will depend also on the countries relative capital abundance. We find a great deal of evidence in support of that proposition. To this extent our paper supports the recent literature on trade and institutions. One interpretation of our results is that trade liberalization tends to drive up wages and hence the cost of law enforcement institutions in labor abundant countries, and that this may be in part responsible for higher crime rates. Likewise for capital abundant countries, the falling cost of labor tends to have the opposite effect, making crime prevention institutions less costly. Finally we note, however, that the results also show that for many countries where the capital abundance ratio is around the world average trade liberalization has no impact on crime.

Appendix A: Countries Included in the Sample

Reporting rate models: The countries for which the data overlap and for which we have all useful variables are: Argentina (only thefts), Australia, Austria, Belgium (only burglaries), Canada, China, Colombia, Costa Rica, Denmark, Egypt (only burglaries), Finland, France, Greece (only burglaries), Iceland, India, Indonesia, Ireland, Italy (only thefts), Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Panama (only thefts), Philippines (only thefts), Portugal, Romania, South Africa, South Korea, Spain, Sweden, Switzerland (only burglaries), Turkey, Uganda, United Kingdom, United States, Zambia and Zimbabwe.

Crime rate models: Algeria, Argentina (only thefts), Australia, Austria, Bangladesh, Barbados, Belgium, Bolivia, Botswana, Canada, Chile, China, Colombia, Costa Rica, Cyprus, Denmark, Ecuador, Egypt, El Salvador, Ethiopia (only burglaries), Fiji, Finland, France, Greece, Iceland, India, Indonesia, Iran (only thefts), Ireland, Israel, Italy, Jamaica, Japan, Jordan, Korea South, Lesotho (only burglaries), Luxembourg, Malawi (only thefts), Malaysia, Mauritius, Mexico, Morocco, Nepal (only thefts), Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Panama (only thefts), Papua New Guinea, Paraguay, Peru, Philippines (only thefts), Portugal, Romania, Seychelles, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Syria, Thailand, Trinidad (only thefts), Tunisia, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela (only thefts), Zambia and Zimbabwe.

Appendix B: Definition of Variables

[Table A.1 about here]

Appendix C:

[Table A.2 about here]

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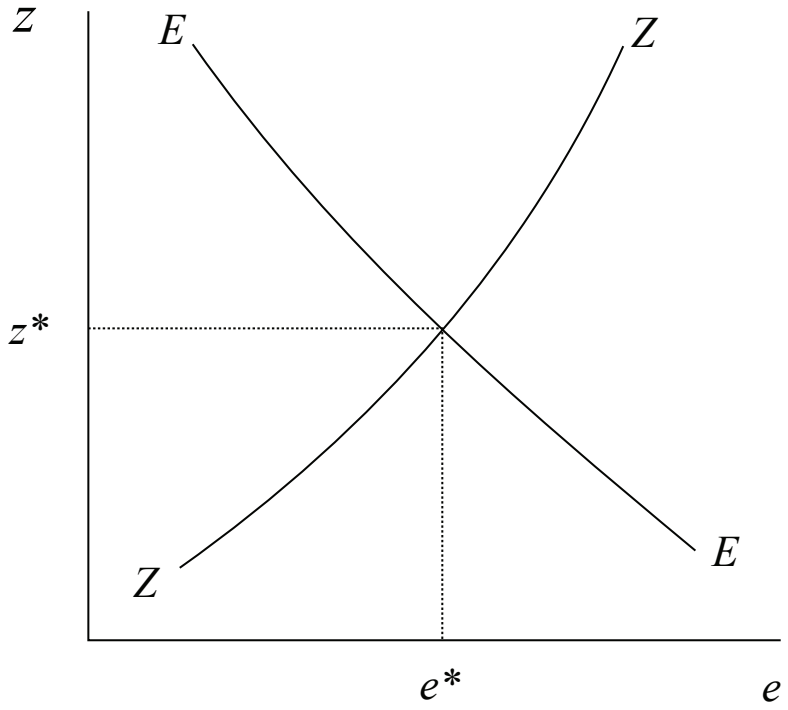
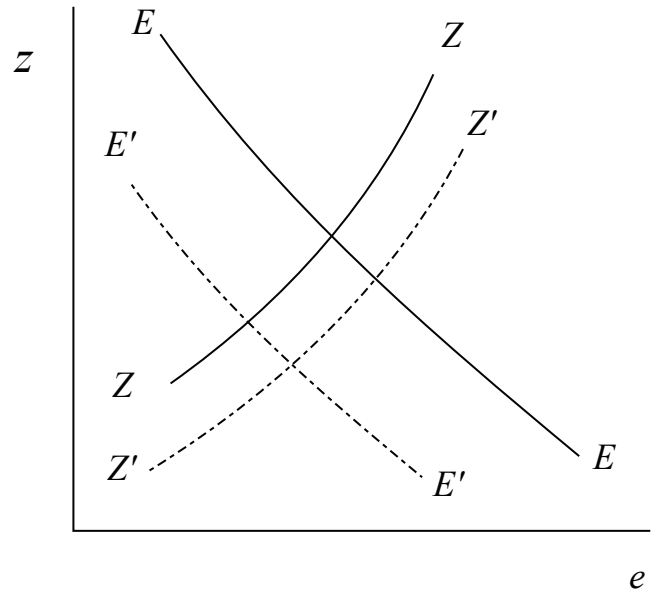
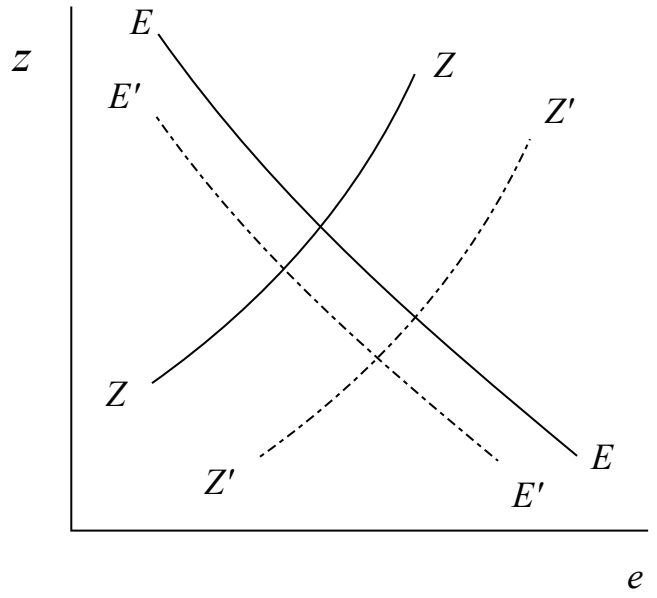


Figure 1: Equilibrium Determination of Expropriation and Law Enforcement



(i) Expropriation Falls



(ii) Expropriation Increases

Figure 2: The impact of Trade Liberalization on Expropriation

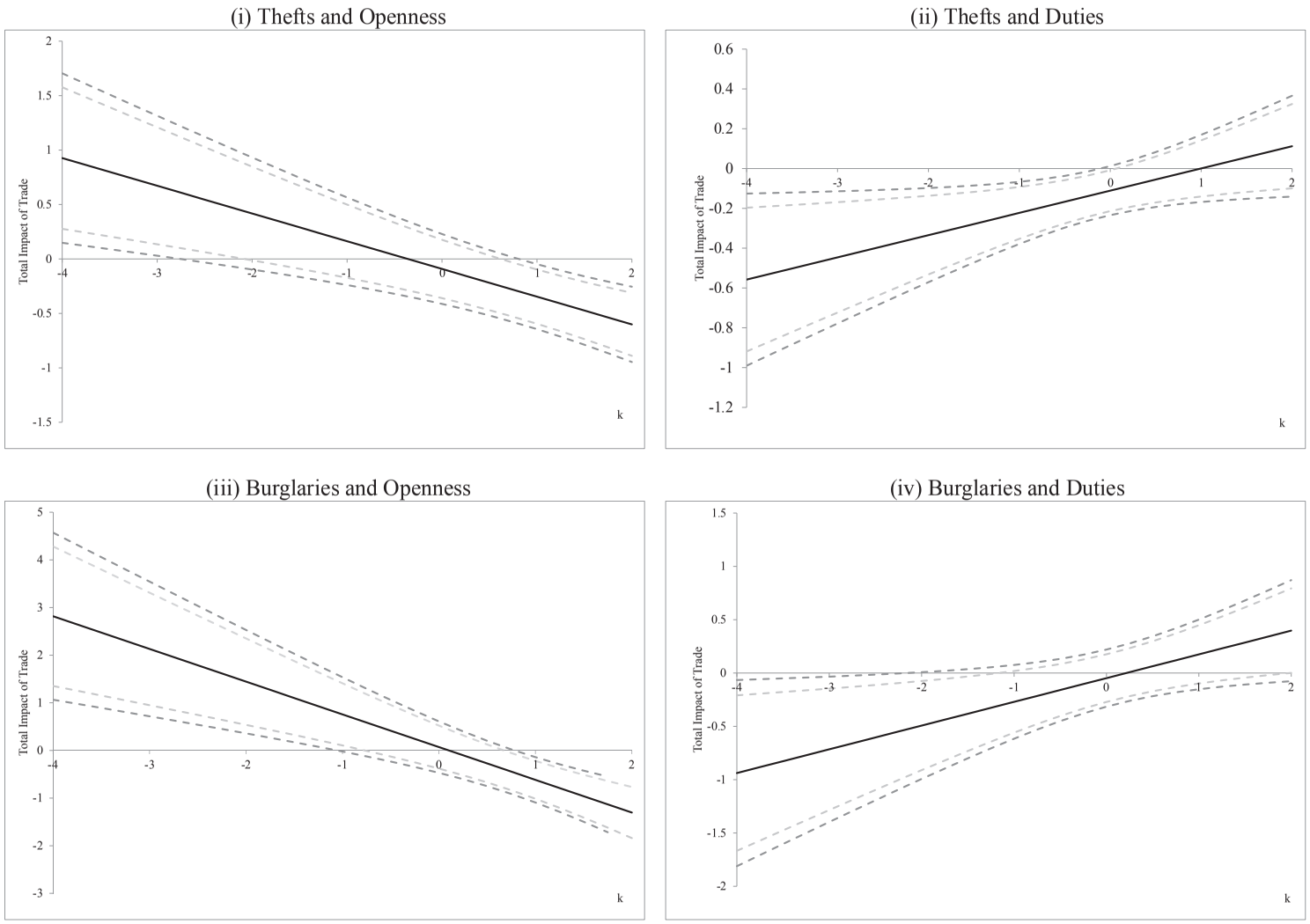


Figure 3: Results

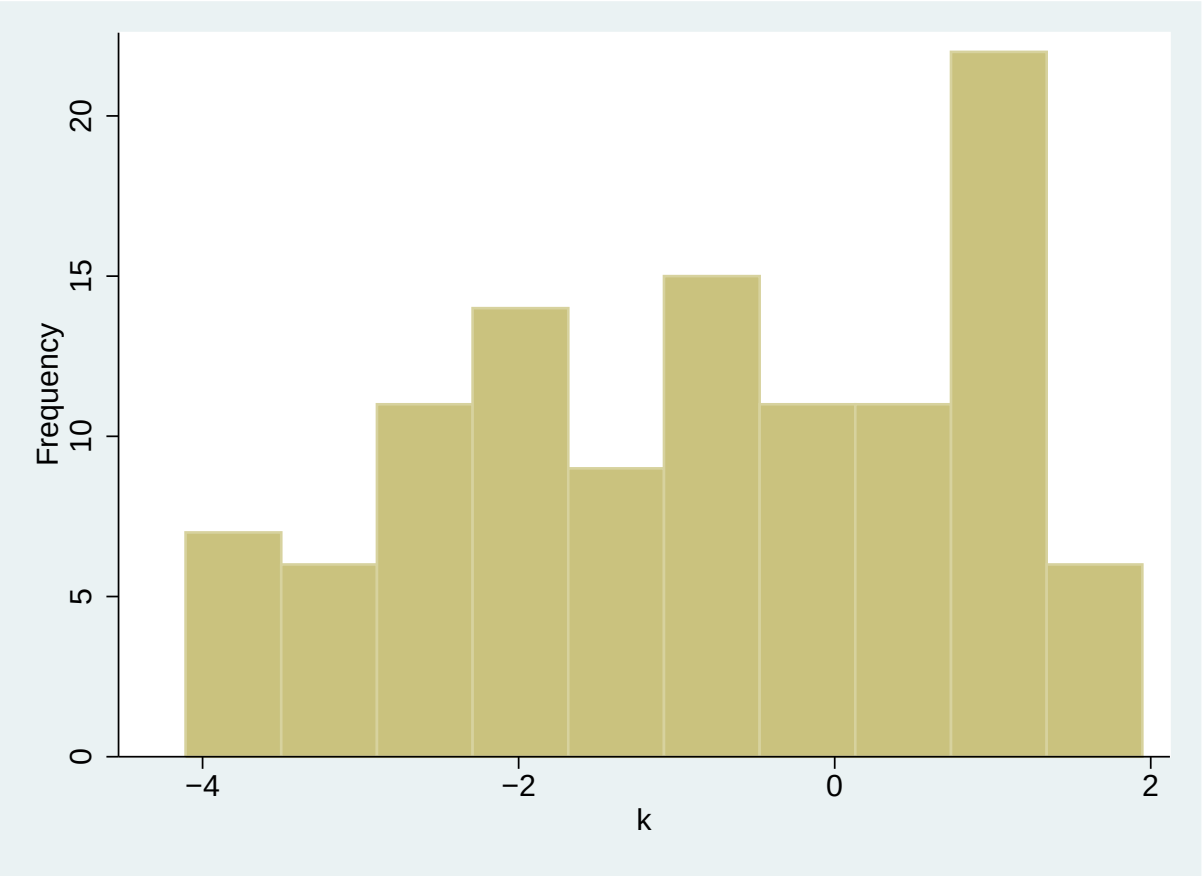


Figure 4: Results

Table 1: Reporting Rate

	Thefts			Burglaries		
	(1)	(2)	(3)	(4)	(5)	(6)
gdp	2.4173***	1.4579***	0.9448***	1.7665**	1.4787***	0.8314**
	(0.0001)	(0.0000)	(0.0000)	(0.0270)	(0.0000)	(0.0394)
educ	0.0099			0.0665		
	(0.7760)			(0.1756)		
urban	-0.0514*			-0.0379		
	(0.0795)			(0.2029)		
ratio	-0.0135			-0.0929		
	(0.7652)			(0.1396)		
christian	-0.1191			0.9992*		
	(0.7978)			(0.0885)		
police	0.2084			0.4064		
	(0.3668)			(0.3244)		
democ			0.7358***			1.0456*
			(0.0073)			(0.0610)
ethnic			-0.7282**			-0.4088
			(0.0437)			(0.5083)
asia			-1.3393***			-1.7817
			(0.0026)			(0.1127)
latin			-1.2507***			-1.3551***
			(0.0001)			(0.0094)
SSA			0.8664**			0.0577
			(0.0234)			(0.9400)
Constant	-23.0298***	-16.7319***	-11.8390***	-23.0012***	-16.3431***	-10.3727***
	(0.0002)	(0.0000)	(0.0000)	(0.0010)	(0.0000)	(0.0093)
Observations	23	65	65	21	63	63
$R-squared$	0.8002	0.7164	0.8972	0.7232	0.5587	0.6904
$AdjustedR-squared$	0.725	0.712	0.887	0.605	0.551	0.657

Table 2: Descriptive Statistics

	Mean	Std. Dev.	Min	Max
rrate (thefts)	-2.57	1.55	-6.34	-1.00
rrate (burglaries)	-1.88	1.78	-7.06	0.98
thefts (original)	6.63	1.69	0.12	9.02
thefts (corrected)	9.98	0.90	5.35	12.53
burglaries (original)	5.20	2.03	-2.72	7.77
burglaries (corrected)	7.84	1.41	1.94	10.03
gdp	9.33	0.94	6.90	11.22
democ	0.45	0.50	0.00	1.00
ethnic	0.32	0.23	0.00	0.93
asia	0.14	0.35	0.00	1.00
latin	0.23	0.42	0.00	1.00
SSA	0.07	0.25	0.00	1.00
gdpg	2.24	2.74	-14.92	13.05
pop	54.42	158.12	0.07	1229.63
unemp	8.03	5.17	1.23	34.60
k	0.19	1.19	-3.66	1.94
open	4.16	0.55	2.62	6.10
duties	-3.95	1.42	-9.87	-0.81

Table 3: Dependant Variable is Thefts, Trade is Measured by Open

	(1) Pool	(2) Gini	(3) Ratio	(4) IV	(5) FE AR(1)	(6) A-B	(7) Democ	(8) Real Open
k	1.4930***	1.5415***	1.3735***	1.4068***			0.9940**	1.0124***
	(0.0000)	(0.0001)	(0.0001)	(0.0007)			(0.0460)	(0.0028)
open	-0.0916	-0.0479	-0.1059	-0.1327	-0.2070	0.3105	0.0418	
	(0.5711)	(0.7740)	(0.4998)	(0.4655)	(0.5245)	(0.4293)	(0.8188)	
real open								0.0834
								(0.6028)
*open * k*	-0.2546***	-0.2802***	-0.2411***	-0.2656***	-0.3299**	-0.2681	-0.1328	
	(0.0011)	(0.0009)	(0.0026)	(0.0090)	(0.0327)	(0.3802)	(0.2310)	
*real open * k*								-0.1596*
								(0.0728)
gini		-0.0197						
		(0.1894)						
ratio			-0.0043					
			(0.8844)					
*open * democ*							-0.4535	
							(0.1582)	
lag thefts						-0.1969		
						(0.6684)		
2 + 3 k (k = -4)	0.9270**	1.0727***	0.8585**	0.9297*	1.1127	1.3828	0.5728	0.7220
	(0.0202)	(0.0086)	(0.0206)	(0.0817)	(0.1347)	(0.1439)	(0.1879)	(0.1144)
2 + 3 k (k = -2)	0.4177	0.5124*	0.3763	0.3985	0.4529	0.8467**	0.3073	0.4027
	(0.1101)	(0.0502)	(0.1099)	(0.2455)	(0.3493)	(0.0297)	(0.2176)	(0.1691)
2 + 3 k (k = 2)	-0.6009***	-0.6083***	-0.5882***	-0.6639***	-0.8668**	-0.2256	-0.2237	-0.2358
	(0.0009)	(0.0040)	(0.0057)	(0.0002)	(0.0346)	(0.8124)	(0.4854)	(0.1660)
2 + 3 k +5 (k = -4)							0.1193	
							(0.8580)	
2 + 3 k +5 (k = -2)							-0.1462	
							(0.7510)	
2 + 3 k +5 (k = 2)							-0.6772***	
							(0.0000)	
Observations	240	220	220	194	168	89	240	246
# of country	72	65	65	61	60	37	72	72
R2	0.4764	0.5087	0.4996	0.4927			0.4838	0.8977
overall R2					0.0002			
between R2					0.0002			
within R2					0.6740			
1st stage fit: Adj R2: open				0.9380				
1st stage fit: Adj R2: open * k				0.9987				
Hausman test: joint (open and open * k)				0.8900				
				(0.6408)				
OIR				1.3648				
				(0.5054)				
Wooldridge test of serial correlation					31.6850***			
					(0.0000)			

Table 4: Dependant Variable is Thefts, Trade is Measured by Duties

	(1) Pool	(2) Gini	(3) Ratio	(4) IV	(5) FE AR(1)	(6) A-B	(7) Democ
k	0.7977**	0.9047***	0.8717***	1.1101**			0.8219**
	(0.0106)	(0.0071)	(0.0076)	(0.0145)			(0.0131)
duties	-0.1112*	-0.0875	-0.0958	-0.3011**	-0.4481**	-0.4255*	-0.1036
	(0.0757)	(0.2017)	(0.1125)	(0.0238)	(0.0150)	(0.0740)	(0.1200)
*duties * k*	0.1117**	0.1428**	0.1379**	0.2191**	0.5147***	0.6851**	0.1202**
	(0.0392)	(0.0170)	(0.0161)	(0.0167)	(0.0060)	(0.0202)	(0.0462)
gini		-0.0228					
		(0.2060)					
ratio			-0.0254				
			(0.4915)				
*duties * democ*							-0.0551
							(0.7346)
lag thefts						-0.3476	
						(0.4457)	
2 + 3 k (k = -4)	-0.5581**	-0.6588**	-0.6475***	-1.1776***	-2.5071***	-3.1659**	-0.5843**
	(0.0122)	(0.0130)	(0.0094)	(0.0053)	(0.0055)	(0.0202)	(0.0138)
2 + 3 k (k = -2)	-0.3347***	-0.3731**	-0.3717***	-0.7393***	-1.4776***	-1.7957**	-0.3439***
	(0.0063)	(0.0142)	(0.0082)	(0.0037)	(0.0056)	(0.0214)	(0.0063)
2 + 3 k (k = 2)	0.1122	0.1982	0.1800	0.1372	0.5814**	0.9447**	0.1368
	(0.3800)	(0.1043)	(0.1256)	(0.4807)	(0.0222)	(0.0346)	(0.3574)
2 + 3 k +5 (k = -4)							-0.6394*
							(0.0530)
2 + 3 k +5 (k = -2)							-0.3990*
							(0.0800)
2 + 3 k +5 (k = 2)							0.0816
							(0.6010)
Observations	155	140	140	114	87	37	155
# of country	68	61	61	52	42	20	68
R-squared	0.4867	0.5446	0.5375	0.4756			0.4871
overall R2					0.0135		
between R2					0.0151		
within R2					0.826		
1st stage fit: Adj R2: duties				0.8107			
1st stage fit: Adj R2: duties * k				0.9812			
Hausman test: joint (duties and duties * k)				4.3000			
				(0.1165)			
Wooldridge test of serial correlation					10.6010***		
					(0.0042)		

Table 5: Dependant Variable is Burglaries, Trade is Measured by Open

	(1) Pool	(2) Gini	(3) Ratio	(4) IV	(5) FE AR(1)	(6) A-B	(7) Democ	(8) Real Open
k	3.3802***	2.8158***	3.3055***	2.8446***			4.1902***	2.1642***
	(0.0001)	(0.0024)	(0.0001)	(0.0017)			(0.0000)	(0.0002)
open	0.0702	-0.2636	-0.0644	-0.0509	-0.1513	0.8619	-0.2580	
	(0.7958)	(0.3737)	(0.8020)	(0.8644)	(0.8371)	(0.2155)	(0.5250)	
real open								-0.0101
								(0.9719)
*open * k*	-0.6870***	-0.5589***	-0.6637***	-0.5948***	0.1890	-0.9266*	-0.8791***	
	(0.0003)	(0.0058)	(0.0004)	(0.0028)	(0.6142)	(0.0899)	(0.0000)	
*real open * k*								-0.4869***
								(0.0015)
gini		0.0690*						
		(0.0533)						
ratio			0.0725					
			(0.1649)					
*open *democ*							0.8288	
							(0.2012)	
lag burglaries						-0.1806		
						(0.4092)		
2 + 3 k (k = -4)	2.8180***	1.9721*	2.5904***	2.3281**	-0.9073	4.5682*	3.2586***	1.9374**
	(0.0021)	(0.0522)	(0.0040)	(0.0210)	(0.6114)	(0.0943)	(0.0001)	(0.0145)
2 + 3 k (k = -2)	1.4441***	0.8542	1.2630**	1.1386*	-0.5293	2.7150	1.5003***	0.9636*
	(0.0099)	(0.1746)	(0.0206)	(0.0703)	(0.6429)	(0.1031)	(0.0042)	(0.0599)
2 + 3 k (k = 2)	-1.3037***	-1.3814***	-1.3917***	-1.2404***	0.2266	-0.9913	-2.0163***	-0.9839***
	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.8117)	(0.1937)	(0.0009)	(0.0011)
2 + 3 k +5 (k = -4)							4.0874***	
							(0.0000)	
2 + 3 k +5 (k = -2)							2.3291***	
							(0.0020)	
2 + 3 k +5 (k = 2)							-1.1875***	
							(0.0010)	
Observations	185	169	169	152	119	58	185	190
# of country	66	59	59	56	51	31	66	66
R2	0.3641	0.4091	0.4057	0.4503			0.3729	0.7382
overall R2					0.00389			
between R2					0.00474			
within R2					0.133			
1st stage fit: Adj R2: open				0.9351				
1st stage fit: Adj R2: open * k				0.9988				
Hausman test: joint (open and open * k)				1.7300				
				(0.4213)				
OIR				2.1418				
				(0.3427)				
Wooldridge test of serial correlation					0.7060			
					(0.4075)			

Table 6: Dependant Variable is Burglaries, Trade is Measured by Duties

	(1) Pool	(2) Gini	(3) Ratio	(4) IV	(5) FE AR(1)	(6) A-B	(7) Democ
k	1.1327***	1.2550***	1.3198***	1.5175***			1.0167***
	(0.0016)	(0.0004)	(0.0003)	(0.0070)			(0.0064)
duties	-0.0475	-0.0169	0.0132	-0.5517*	-0.2254	-0.4746**	-0.0806
	(0.7239)	(0.9066)	(0.9243)	(0.0583)	(0.3552)	(0.0254)	(0.5808)
*duties * k*	0.2226**	0.2534***	0.2686***	0.4054**	-0.2427	0.2867**	0.1908*
	(0.0328)	(0.0084)	(0.0099)	(0.0321)	(0.2300)	(0.0337)	(0.0972)
gini		0.0575					
		(0.1803)					
ratio			0.0538				
			(0.4744)				
*duties * democ*							0.2218
							(0.4083)
lag burglaries						0.1340	
						(0.2436)	
2 + 3 k (k = -4)	-0.9378**	-1.0305***	-1.0611**	-2.1733**	0.7453	-1.6213***	-0.8437*
	(0.0356)	(0.0085)	(0.0143)	(0.0227)	(0.3949)	(0.0072)	(0.0721)
2 + 3 k (k = -2)	-0.4927*	-0.5237**	-0.5240**	-1.3625**	0.2599	-1.0480***	-0.4621*
	(0.0536)	(0.0192)	(0.0326)	(0.0221)	(0.6030)	(0.0038)	(0.0758)
2 + 3 k (k = 2)	0.3977*	0.4899*	0.5504**	0.2591	-0.7107	0.0987	0.3010
	(0.0988)	(0.0557)	(0.0315)	(0.4163)	(0.1083)	(0.7601)	(0.2893)
2 + 3 k +5 (k = -4)							-0.6219
							(0.3030)
2 + 3 k +5 (k = -2)							-0.2403
							(0.5510)
2 + 3 k +5 (k = 2)							0.5228*
							(0.0550)
Observations	138	126	126	100	74	29	138
# of country	64	57	57	50	42	18	64
R2	0.2919	0.3393	0.3450	0.2935			0.2959
overall R2					0.0302		
between R2					0.0301		
within R2					0.797		
1st stage fit: Adj R2: duties				0.8187			
1st stage fit: Adj R2: duties * k				0.9789			
Hausman test: joint (duties and duties * k)				2.6800			
				(0.2625)			
Wooldridge test of serial correlation					0.0040		
					(0.9510)		

Table A.1: Definitions

Variable	Definition	Source
$rrate\_thefts$	Log of the ratio of the official theft rate on the victimization theft rate. The official recorded theft rate includes burglaries, automobile thefts and other thefts for all years. The victimization theft rate includes: car thefts, thefts from car, thefts of motorcycle, bicycle thefts, thefts of personal property, burglaries and thefts from garage/sheds/lockups.	CTS and ICVS
$rrate\_burglaries$	Log of the ratio of the official burglary rate on the victimization burglary rate. The official recorded burglary rate includes only burglaries. The victimization burglary rate includes: burglaries and thefts from garage/sheds/lockups.	CTS and ICVS
$thefts$	Log of official theft rate adjusted for reporting rate following the procedure discussed in section 3.	CTS and ICVS
$burglaries$	Log of official burglary rate adjusted for reporting rate following the procedure discussed in section 3.	CTS and ICVS
gdp	Log of real GDP per capita (2005 Constant Prices: Chain series, international $).	PWT
$educ$	Gross enrolment ratio is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.	WDI
$urban$	Urban population (% total population).	WDI
$ratio$	Ratio of the income share of the 20% richest on the income share of the 20% poorest.	WDI
$christian$	Dummy variable taking the value of one for countries in which Christians represent at least 60% of the population.	CIA Factbook
$police$	Log of total police personnel (per 100 inhabitants).	CTS
$democ$	Dummy variable taking the value of one if the country has kept a score of one or two in the political right index for each year in which this index has been calculated and zero, otherwise. One and two are the highest level of political right as measured by Freedom House.	Freedom House
$ethnic$	Index of ethnic fractionalisation. The index is calculated as: with: sij is the share of group i (i = 1:::N) in country j. A higher value indicates a more diverse country.	Alesina et al. (2003)
$asia$	Dummy variable taking the value of one for East and Southeast Asian countries and zero, otherwise.	CIA Factbook
$latin$	Dummy variable taking the value of one for Latin American and Caribbean countries and zero, otherwise.	WDI
SSA	Dummy variable taking the value of one for Sub-Saharan African and zero, otherwise.	WDI
$gdpg$	Growth rate of real GDP per capita (2005 constant prices: Chain Series, international $).	PWT
pop	Population (total, in million).	WDI
pop_sq	Population squared (total, in million).	WDI
$unemp$	Unemployment total (% of total labour force).	WDI
k	Log of capital per worker calculated using the perpetual inventory method.	PWT
$open$	Log of trade as % of GDP (trade includes exports and imports).	WDI
$openk$	The interaction between open and k.	WDI and PWT
$duties$	The log of the ratio of customs & other import duties on import of goods and services.	WDI and HGFS
$dutiesk$	The interaction between $duties$ and k.	WDI and HGFS
$opennat$	Estimated natural openness (Wei 2000, Elbadawi and Hegre 2008).	
$opennatk$	The interaction between $opennat$ and k.	

Table A.2: Full Regression Results

	(1)	(2)	(3)	(4)
	Thefts		Burglaries	
	Open	Duties	Open	Duties
gdp	-0.1894	-0.2776	-0.2240	-0.0655
	(0.2300)	(0.1820)	(0.4500)	(0.83500
democ	0.0339	0.3493	0.1091	0.2736
	(0.8770)	(0.1900)	(0.7650)	(0.4320)
ethnic	0.8089**	0.3685	1.2815**	0.7736
	(0.0130)	(0.3650)	(0.0210)	(0.1470)
asia	0.7023**	1.0299**	0.9465	1.0842**
	(0.0150)	(0.0110)	(0.1050)	(0.0190)
latin	0.8046***	0.9352***	0.3170	-0.1807
	(0.0010)	(0.0010)	(0.5790)	(0.6300)
SSA	0.7400**	1.3305***	0.9201	1.4347***
	(0.0280)	(0.0030)	(0.1440)	(0.0030)
ggdp	-0.0319*	-0.1054***	-0.0245	-0.0767
	(0.0680)	(0.0010)	(0.4850)	(0.2050)
pop	-0.0034**	-0.0025	-0.0057**	-0.0046*
	(0.0180)	(0.1220)	(0.0350)	(0.0880)
pop2	0.0000***	0.0000**	0.0000***	0.0000**
	(0.0010)	(0.0200)	(0.0010)	(0.0170)
unemp	0.0032	0.0166	0.0373*	0.0560**
	(0.7490)	(0.2040)	(0.0620)	(0.0220)
k	1.4930***	0.7977***	3.3802***	1.1327***
	(0.0000)	(0.0000)	(0.0000)	(0.0010)
open	-0.0916		0.0702	
	(0.4420)		(0.7600)	
duties		-0.1112*		-0.0475
		(0.0820)		(0.6860)
open k	-0.2546***		-0.6870***	
	(0.0000)		(0.0000)	
duties k		0.1117**		0.2226**
		(0.0250)		(0.0140)
cons	11.5772***	11.6105***	8.7095***	7.5598***
	(0.0000)	(0.0000)	(0.0020)	(0.0070)
Observations	240	155	185	138