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Understanding the Determinants of Crime

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In this paper, we use an overlapping generations model in which individuals are allowed to engage in both legitimate market activities and criminal behavior in order to assess the role of certain factors on the property crime rate. In particular, we investigate whether the following could be capable of generating large differences in crime rates that are observed across countries: differences in the unemployment rate, the fraction of low-human-capital individuals in an economy, the probability of apprehension, the duration of jail sentences, and income inequality. We find that small differences in the probability of apprehension and in income inequality can generate quantitatively significant differences in the crime rates across similar environments.

Keywords: property crime, overlapping generations model, cross-country crime rates
JEL Codes: J24, K42

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Introduction

The roots of economic models of crime can be traced back to the seminal works of Becker (1968) and Stigler (1970).[4] Becker (1968) starts with a question: What is the optimal level of enforcement in a society? The answer is shown to depend on the cost of convicting offenders and the responses of offenders to changes in enforcement. The response of offenders to changes in enforcement underscores the importance of economic modeling. The novelty of this approach is in its focus on economic reasons for criminal behavior as opposed to relying on personality traits that are special to criminals. Focusing on individual responses to the incentives in an economy can provide important insights into the effectiveness of different law enforcement policies as well as identifying the role of changes in the economic well being of individuals that can affect their choices in terms of legitimate versus illegitimate activities.

In his survey, Ehrlich (1996) focuses on two aspects of economic models of crime. First is the application of economic incentives in trying to understand all crimes -ranging from theft to murder- as opposed to social or environmental factors that are beyond an individual's choice. Second, is optimal crime prevention: the optimal mix of negative versus positive incentives that can be used to deter individuals from criminal activities. He indicates that the relative desirability of different methods of crime control depend not only on the relative efficiency of certain factors but also on the welfare objective being used.

Although most models of crime offer explanations for a particular country or region, economic models of crime can be used to understand if differences in factors related to economic conditions or the effectiveness of law enforcement across countries could be responsible for the large variations in their crime rates. According to United Nations Interregional Crime and Justice Research Institute, people victimized by property crime (as a % of the total population) varied between 14.8% in New Zealand to 12.7% in Italy, 12.2% in U.K., 10.0% in U.S., and 3.4% in Japan.[5] According to the same data source, out of 100 countries, Spain has the highest per capita robberies (12.36 per 1000 people) followed by U.K. ranking 8th highest, U.S. 11th, Russia 19th, Italy 25th and Turkey 60th. Figure 1 displays the victimization rates across several countries in 1999 for burglary.

[4] See also Ehrlich (1973), and Polinsky and Shavell (1984). Ehrlich (1996) provides a survey of recent contributions. In addition, special issue of the International Economic Review (2004) provides many recent papers using economic modeling for examining criminal behavior.

[5] Property crime includes car theft, theft from car, burglary with entry and attempted burglary. It is important to note that these crime statistics are often better indicators of prevalence of law enforcement and willingness to report crime, than actual prevalence. For most countries the reported crime rates are for 1999. http://www.nationmaster.com/graph-T/cri_pro_cri_vic/EUR

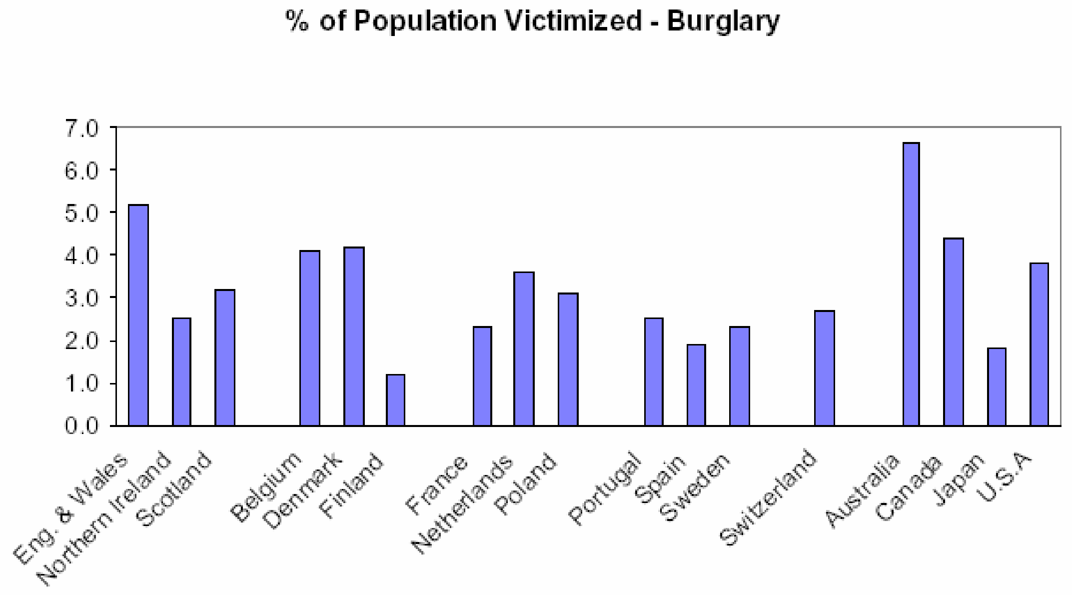

Figure 1: Burglary data

Countries also differ substantially in many dimensions that may matter for issues related to crime. For example, the number of police, the probability of apprehension, the probability of being sentenced, the duration of the jail sentence, as well as economic conditions such as the unemployment rate, age distribution of the population etc. vary significantly across countries. Figure 2 displays data on the number of police officers and the duration of sentencing for robberies in a selection of countries obtained from Barclay and Tavares (2003). In the first panel, the number of police officers per 100,000 persons averaged over 1999 and 2001 are presented. According to this data, the number of police officers per 100,000 persons varies between 623 for Cyprus and 605 for Northern Ireland to 156 in Finland. Perhaps partly due to these differences, the fraction of crimes cleared by an arrest also varies substantially across countries. The second panel of the graph presents data on the percent of sentences greater than 24 months and less than 60 months. Again we observe large differences across countries. For example, while 50% of sentences in England and Wales require sentencing that is more than 2 years, the same is true only for 6 percent of sentences in France.

Admittedly there are major difficulties in relying on cross country data for a careful study. However, these data convincingly demonstrate that large differences do exist across countries in the design and conduct of law enforcement.

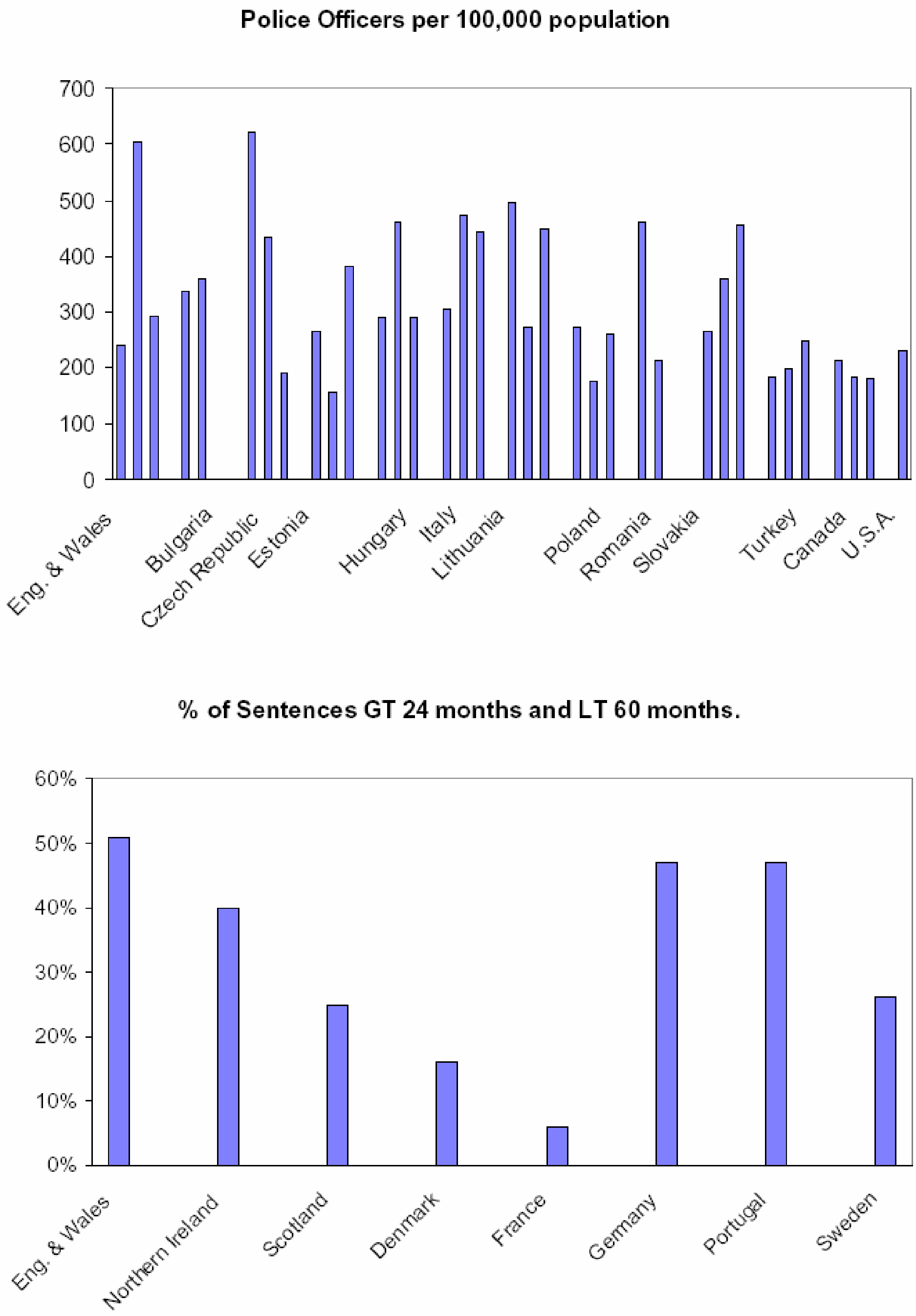

Figure 2: Data for Selected Countries

While it is very desirable to understand the differences in crime rates across countries, there are many obstacles to cross-national studies in this field. In particular, traditional data sources such as police statistics or national victimization surveys are quite difficult to use for examining crime rates across countries.[6] In this paper,

[6] There are large differences across countries in the way crime data are defined and collected. There are also major differences in reporting practices across countries. In addition, nationally designed surveys show important differences in research design, the questionnaires, and the kind of crimes respondents are asked about. One data source, International Crime Victims Survey presents data for a large group of countries where the same

we use the model economy in İmrohoroğlu, Merlo and Rupert (2004) that allows us to quantitatively assess the role of some of the factors discussed above in affecting the property crime rate. We follow the tradition of using economic modeling to examine issues related to property crimes which are typically motivated by the prospect of direct pecuniary gain. Economic considerations are therefore most likely to guide individual decisions of engaging in this type of criminal activities. To achieve our goal we specify a dynamic overlapping generations (OLG) model with heterogeneous agents. We examine individuals who start their economically meaningful lives at the age of 15 and live until the retirement age of 65.[7] The agents in our model differ ex ante with respect to their income earning abilities. We consider four categories of skill type; less than high school, high school degree but no higher degree, college degree, and more than a college degree. In each period of their (finite) life agents receive a stochastic employment opportunity. After knowing their employment status, they decide how much to save and whether to engage in criminal activities in that period. Criminal activities amount to stealing from other agents in the economy. If agents choose to commit a crime, they may be apprehended and punished. If they are apprehended, they spend a period (specified by the duration of an average jail sentence) in prison and are not able to claim any legitimate earnings from the market. We calibrate this model economy to the crime rate in the U.S. in 1980. Later we conduct counterfactual experiments to investigate the differences in the crime rate that would take place due to differences in factors such as: apprehension probability, expected prison time, income inequality, and skill distribution of the population. We carry out these experiments by increasing each one of these factors by 10% instead of trying to calibrate them to a particular country. We compare steady state crime rates that result from change in each one of these factors.

While we calibrate the model economy to match the crime rate in the U.S. in 1980 only, our results indicate that this framework is capable of reproducing certain dimensions of the socio-demographic composition of the criminal population in the U.S. fairly well. For example, our model predicts that approximately 5% of the employed and 16% of the unemployed population engages in criminal activities. In addition, the model-predicted fraction of criminals without a high school diploma is equal to 46.1%. These implications of the model are consistent with the data. Given these properties of the model, we focus our attention on examining the sensitivity of the property crime rate to several economic factors and law enforcement tools. We find that two factors generate quantitatively significant increases in the crime rate relative to the rest of the factors. Those are the apprehension probability and income inequality. Thus we conclude that small differences in apprehension probabilities or income inequality would be capable of generating large differences in property crime rates across countries. These results complement an extensive amount of research pointing to the importance of income inequality and deterrence effects of the justice system in understanding criminal behavior.[8]

In section 2 we describe the model economy and discuss its calibration. Section 3 presents the results and section 4 concludes.

The Model

The model economy which is populated by overlapping generations of heterogeneous agents is taken from İmrohoroğlu, Merlo and Rupert (2004).

Preferences

The economy is populated by a large number of individuals who are ex ante heterogeneous with respect to their income earning abilities. Each individual maximizes the expected, discounted lifetime utility

$$E\sum_{j=1}^{J}\beta^{j-1}U\left(c_j^i\right) , \tag{1}$$

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methods and questionnaires are used to generate crime statistics. However, the scope of data in this source is not very large.

[7] Since the majority of property crimes are committed by young individuals, we abstract from the behavior of agents above 65 year old and issues related to social security

[8] For the impact of income inequality, see for example, Dahlberg and Gustavsson (2005), Nilsson (2004), Fajnzylber, Lederman and Loayza (2002), and Freeman (1996). There is also a well-developed literature on deterrence and incapacitation effects of the criminal justice system. See, for example, Ehrlich (1973, 1981), Blumstein, Nagin, and Cohen (1978), Cameron (1988), DiIulio and Piehl (1991), Grogger (1991), Levitt (1998), and Marvell and Moody (1996).

where β is the subjective discount factor, and c_j^i is consumption of a type-i individual of age j. The share of age-j individuals in the population is given by the fraction μ_j, $j = 1, ..., J$, $\sum_{j=1}^{J} \mu_j = 1$, where J is the maximum possible lifetime. The share of type-i individuals in the population is given by the fraction γ_i, $\sum_{i=1}^{I} \gamma_i = 1$, where I is the number of skill types.

Opportunities

In each period of their life, individuals face a stochastic employment opportunity. Let $s \in S = \{e, u\}$ denote the employment opportunities state. If $s = u$, the agent is unemployed. If $s = e$, the agent is given the opportunity to work and will supply labor inelastically. In addition, regardless of their employment status, agents can choose to engage in criminal activities. For a type-i individual of age j, we let $\ell_j^i \in \{0,1\}$ denote the individual's choice to engage in criminal activities or not. In particular, $\ell_j^i = 1$ indicates an individual who commits a crime and $\ell_j^i = 0$ indicates an individual who chooses not to do so.

The labor income of an agent who is given an opportunity to work is denoted by $wh\varepsilon_j^i$ where w denotes the wage rate, h denotes the number of hours spent working, and ε_j^i denotes the efficiency index of a type-i agent of age j. Unemployed individuals receive unemployment insurance benefits equal to a fraction θ of the employed wage, $\theta wh\varepsilon_j^i$. The only role of government in this economy is to administer the unemployment insurance program by choosing the tax rate τ so that its budget is balanced.[9] Hence, the disposable income from legitimate activities of a type- i individual of age j is given by

$$y_j^i = \begin{cases} (1-\tau) wh\varepsilon_j^i, & \text{if } s = e \\ \theta wh\varepsilon_j^i, & \text{if } s = u. \end{cases} \tag{2}$$

We assume that the employment opportunities state follows a Markov process with transition probabilities matrices $\Pi_j = [\pi_j(l,k)]$, $l,k = e,u$, where $\pi_j(l,k) = \Pr(s_{j+1} = k \mid s_j = l)$, $j = 1, ..., J-1$. We allow for the unemployment rate to vary with age.[10]

In this economy, criminal activities amount to theft. Each individual faces an equal probability π_v of being the victim of a crime, where π_v is equal to the (endogenous) fraction of criminals in the population. If victimized, an individual loses a fraction α of his disposable income from legitimate activities. For computational simplicity, we assume that each criminal steals a fraction α of average disposable income from legitimate activities, $\bar{y}$, that is criminals do not have the ability to target their victims based on their income.[11] Criminals face a probability π_a of being apprehended. A criminal who is apprehended for a crime goes to jail.

Given these assumptions, the budget constraint facing an individual who chooses not to be a criminal can be written as

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[9] The government may also use tax revenue to finance a technology used to apprehend or deter criminals. In this paper we abstract from this using an exogenous probability of apprehension. For a model where expenditures on police are determined endogenously see İmrohoroğlu, Merlo, and Rupert (2000).

[10] This framework abstracts from possible interactions between current criminal activities and future employment opportunities. For an extension of this model that includes the 'stigma" effect of incarcerations, see İmrohoroğlu, Merlo and Rupert (2004).

[11] We also do not allow for private insurance. See Prohaska and Taylor (1973) for a model of insurance coverage against burglary.

$$a_{j+1}^{i}=\begin{cases}(1+r)a_j^i+y_j^i-c_j^i+T, & \text{with probability } 1\text{-}\pi_v\\ (1+r)a_j^i+(1-\alpha)y_j^i-c_j^i+T, & \text{with probability } \pi_v\end{cases} \tag{3}$$

where a_j^i is the end-of-period asset holdings of a type-i agent of age j, r is the rate of return on asset holdings, and T denotes a lump-sum transfer. Similarly, the budget constraint facing an individual who chooses to be a criminal can be written as

$$a_{j+1}^{i}=\begin{cases}(1+r)a_j^i+y_j^i+\alpha\overline{y}-c_j^i+T, & \text{with probability } (1\text{-}\pi_v)(1\text{-}\pi_a)\\ (1+r)a_j^i+(1-\alpha)y_j^i+\alpha\overline{y}-c_j^i+T, & \text{with probability } \pi_v(1\text{-}\pi_a)\\ (1+r)a_j^i \text{ and } c_j^i=\overline{c}, & \text{with probability } \pi_a\end{cases} \tag{4}$$

where $\overline{c}$ is the level of consumption of a convicted criminal. Note that we assume that apprehended criminals cannot access their assets to finance their consumption while they are in jail.

Agents in this economy are not allowed to borrow and have no access to private insurance markets. They are able to accumulate assets to help smooth consumption across time. This liquidity constraint can be stated as

$$a^i{}_j \geq 0,\ j=1,...,I. \tag{5}$$

An implication of this assumption, together with the lack of a bequest motive indicates that in period J all individuals will choose not to carry over any assets to the next period: $a^i{}_J=0,\ \ i=1,....,I.$

Technology

The production technology of the economy is given by a constant returns to scale Cobb Douglas function

$$Q=f(K,N)\equiv BK^{1-\eta}N^{\eta}, \tag{6}$$

where $B>0,\ \eta\in(0,1)$ is the labor share of output, and K and N are aggregate capital and labor inputs, respectively. The aggregate capital stock is assumed to depreciate at the rate δ.

The profit-maximizing behavior of the firm gives rise to first-order conditions which determine the net real return to capital

$$r=(1-\eta)B\left(\frac{K}{N}\right)^{-\eta}-\delta \tag{7}$$

and the real wage

$$w=\eta B\left(\frac{K}{N}\right)^{1-\eta}. \tag{8}$$

Stationary Equilibrium

The concept of equilibrium we use in this article follows Stokey and Lucas (1989) where we can represent the consumer's utility maximization problem as a finite-state, finite horizon discounted dynamic program for which an optimal stationary Markov plan always exists. Let $V_c^i(a,s)$ be the (maximized) value of the objective function of a type-i agent of age j with beginning-of-period asset holdings and employment status (a,s). $V_c^i(a,s)$ is defined as the solution to the dynamic program.

The dynamic programming problem faced by an individual of a given skill-type i who may or may not have received an employment opportunity can be written as:

$$V^i(a,s) = \max\left\{V_{nc}^i(a,s), V_c^i(a,s)\right\} \tag{9}$$

subject to the budget constraints in equations (3) and (4), where

$$\begin{aligned} V_{nc}^i(a,s) = & (1-\pi_v)\max_{a'}\left\{U\left((1+r)a^i - a^{i\prime} + y^i + T\right) + \beta\sum_{s'}\pi(s,s')V^i(a',s')\right\} \\ & + \pi_v \max_{a'}\left\{U\left((1+r)a^i - a^{i\prime} + (1-\alpha)y^i + T\right) + \beta\sum_{s'}\pi(s,s')V^i(a',s')\right\}, \end{aligned}$$

is the value of not committing a crime in the current period, and

$$\begin{aligned} V_c^i(a,s) = & (1-\pi_v)(1\text{-}\pi_a)\max_{a'}\left\{U\left((1+r)a^i - a^{i\prime} + y^i + \alpha\overline{y} + T\right) + \beta\sum_{s'}\pi(s,s')V^i(a',s')\right\} \\ & + \pi_v(1\text{-}\pi_a)\max_{a'}\left\{U\left((1+r)a^i - a^{i\prime} + (1-\alpha)y^i + \alpha\overline{y} + T\right) + \beta\sum_{s'}\pi(s,s')V^i(a',s')\right\} \\ & + \pi_a\left\{U(\overline{c}) + \beta\sum_{s'}\pi(s,s')V^i(a',s')\right\} \end{aligned}$$

is the value of committing a crime in the current period, where $i = 1,\ldots,I$, and y^i is equal to $(1-\tau)wh\varepsilon^i$ for $s = e$ and $\theta wh\varepsilon^i$ for $s = u$.

Definition: A Stationary Equilibrium for a given set of policy arrangements $\{\tau,\theta\}$ and an apprehension probability π_a is a collection of value functions $V_j^i(a,s)$, individual policy rules c_j^i, ℓ_j^i, age and type dependent, time-invariant measures of agents $\lambda_j^i(a,s)$ for each age $j = 1,\ldots,J$ and each type $i = 1,\ldots,I$, an aggregate crime rate and victimization probability $\{\chi,\pi_v\}$, relative prices of labor and capital $\{w,r\}$, an average disposable income from legitimate activities $\overline{y}$, and a lump-sum transfer T such that:

i) Individual and aggregate behavior are consistent.

ii) The aggregate crime rate is $\chi = \sum_{i,j,a,s}\gamma_i\mu_j\lambda_j^i(a,s)\ell_j^i(a,s)$; and the victimization probability is $\pi_v = \chi$.

iii) Average disposable income from legitimate activities is given by $\overline{y} = \sum_{i,j,a,s}\gamma_i\mu_j\lambda_j^i(a,s)y_j^i(a,s)$.

iv) Relative prices $\{w,r\}$ solve the firm's profit maximization problem by satisfying equations (7) and (8);

v) Given relative prices $\{w, r\}$, government policy $\{\tau, \theta\}$, probabilities $\{\pi_a, \pi_v\}$, average income $\bar{y}$, and transfer T, the individual policy rules $c_j^i(a,s)$, $a_j^i(a,s)$ and $\ell_j^i(a,s)$ solve the individuals' dynamic program (9);

vi) The commodity market clears,

$$\sum_{i,j,a,s} \gamma_i \mu_j \lambda_j^i(a,s)\left[c_j^i(a,s) + a_j^i(a,s)\right] = f(K,N) + (1-\delta) \sum_{i,j,a,s} \gamma_i \mu_j \lambda_j^i(a,s) a_{j-1}^i, \tag{10}$$

where the initial wealth distribution of agents, a_0^i, $i = 1,...,I$ is taken as given;

vii) The collection of age and type dependent, time-invariant measures $\lambda_j^i(a,s)$ for $j = 1,...,J$ and $i = 1,...,I$ satisfies

$$\lambda_j^i(a',s') = \sum_{a\in\Omega_a} \sum_{s} \pi_j(s,s') \lambda_{j-1}^i(a,s)$$

where $\Omega_a \equiv \{a : a' = a_j^i(a,s)\}$, and the initial measures of agents at birth, λ_0^i, $i = 1,...,I$, are taken as given;

viii) The government budget constraint is satisfied:

$$\tau \sum_{i,j,a} \gamma_i \mu_j \lambda_j^i(a, s=e) wh\varepsilon_j^i = \sum_{i,j,a} \gamma_i \mu_j \lambda_j^i(a, s=u) \theta wh\varepsilon_j^i; \tag{11}$$

ix) The income of individuals who are convicted of a crime is confiscated and used to finance the consumption expenditures of convicted criminals c. Any income in excess of these expenditures is distributed in a lump-sum fashion among all individuals who are not in jail:

$$T = \frac{\pi_a \left[\sum_{i,j,a,s} \gamma_i \mu_j \ell_j^i(a,s) \lambda_j^i(a,s) \left(y_j^i(a,s) + \alpha \bar{y} \right) - \bar{c}\chi \right]}{1 - \pi_a \chi}. \tag{12}$$

Parameter Choice and Data

As mentioned above, the proposed exercise necessitates a benchmark calibration for the model economy. We choose 1980 in the U.S. as a benchmark and conduct exercises to examine the quantitative role of several factors on the crime rate.

The utility function $U(.)$ is set to be logarithmic. A period in the model is one year. An overlapping generations structure is imposed where individuals are assumed to be born at the real-time age of 15 and live $J = 51$ years, to the real-time age of 65. The model economy's inhabitants are distinct with respect to their age and their human capital type. Specifically, we consider $I = 4$ skill levels corresponding to the following categories: less than high school, high school degree but no higher degree, college degree, and more than a college degree.

If an individual is employed, he spends a fraction $h = 0.45$ of his time working. In the event that an individual becomes unemployed he receives unemployment insurance with a replacement rate θ equal to 0.83.[12]

[12] Unemployment duration in the model is one year (one period) while in the U.S. the replacement ratio is 0.25 and duration is about 12 weeks, which means individuals would receive 83% of their income if they were to be unemployed 12 weeks and employed the rest of the year.

The parameter α that characterizes criminal earnings from property crimes as well as the costs of property crime to victims is set to be 0.15 (see İmrohoroğlu, Merlo and Rupert (2000)). While in prison the apprehended criminal receives a per-period consumption level denoted by $\overline{c}$. Given that there is little data on consumption and utility while in prison, $\overline{c}$ is treated as a free parameter and is used to calibrate the model to match the crime rate in the U.S in 1980. The calibrated value of $\overline{c}$ is equal to 0.052, which corresponds to about \$1,400 (in 1990 dollars).[13]

With respect to the production side of the economy, the following parameter values were chosen: B =1.295, $\eta = 0.64$, and $\delta = 0.08$. This parameterization is fairly standard and together with setting the discount factor β equal to 0.989 produces an economy where the capital output ratio is around 2.5. For a discussion of issues related to calibrating these parameters see, e.g., Cooley and Prescott (1995) or İmrohoroğlu, İmrohoroğlu and Joines (1999).

The share of age- j individuals in the population, μ_j , for 1980 is taken from the Bureau of the Census. The share of type- i individuals in the population, γ_i , is taken from the Current Population Survey (CPS), where γ_1 denotes the fraction of individuals with less than a high school degree, γ_2 the fraction of individuals with a high school degree but no higher degree, γ_3 the fraction of individuals with a college degree, and γ_4 the fraction of individuals with more than a college degree. For 1980, these are $\gamma_1 = 0.11$, γ_2=0.64, $\gamma_3 = 0.17$, $\gamma_4 = 0.08$. The age earnings profiles, ε_j^i, are constructed from the CPS for each year by regressing the log of real weekly earnings on age, age-squared, and dummy variables for different human capital types (the omitted category being those with less than a high school degree).

[13] Average consumption in this framework is about 0.8 while average output is normalized to be 1. So $\overline{c}$ corresponds to 6.5% of total consumption. To provide another term of comparison, note that the per inmate annual expenditure on food (obtained by dividing total annual expenditures on food by the average daily population in federal correctional facilities for 1990) amounts to about \$1,600 (U.S. Bureau of Prisons, Office of Research and Evaluation, unpublished data, 1990).

Table 1: Earnings Regressions[14]

Year	1980
Constant	2.84
	(0.026)
Age	0.125
	(0.002)
age^2	-0.0014
	(0.00001)
High School	0.371
	(0.008)
College	0.671
	(0.017)
Post graduate	0.808
	(0.015)

Age-specific unemployment rates are used to generate the transition probabilities of the employment opportunities state, Π_j, so that the fraction of the time the employment opportunity is offered equals the employment rate of that age group. For example, if the unemployment rate of 16-year old individuals in the data is 20.2%, the transition probabilities for this age group are chosen so that the probability of unemployment will equal 0.202, independent of the availability of the opportunity the previous period. Thus, the transition probabilities matrix for age-16 individuals would be given as

$$\Pi_{16}(s,s') = \begin{pmatrix} 0.748 & 0.252 \\ 0.994 & 0.006 \end{pmatrix}$$

Unemployment rate data indicates an unemployment rate of 6.9% for the 15-65 year age group and 17.1% for the 15-19 year age group for this time period. The apprehension technology of the police is summarized by the clearance rate, which is the fraction of crimes cleared (solved) by arrest. We take that rate to be 16.8% in 1980 and the expected prison time to be 12.6 months.

We now turn attention to the experiments that will conducted to isolate the importance of several factors.

Results

In table 2 we present several properties of the benchmark economy calibrated to deliver a crime rate of 5.6% to match the crime rate in the U.S. in 1980. In particular, we investigate the implications of our model with respect to the composition of the criminal population. First, note that our model predicts that about 79% of the people engaging in criminal activities are employed and only the remaining 21% are unemployed. This implies that approximately 5% (16%) of the employed (unemployed) population engages in criminal activities. This (perhaps surprising) implication of the model is consistent with the data. According to the Bureau of Justice Statistics, in 1979, 71% of all state prisoners were employed prior to their conviction.[15] Studies by Grogger (1998) and Witte and Tauchen (1994) that use other data sets provide further evidence in support of this finding. Next, we turn our attention to the composition of the criminal population by age and educational attainment. Our model predicts that about 76% of the people who commit property crimes are 18 years of age or younger. According to the Federal Bureau of Investigation, in 1980, 47.7% of all people arrested for property offenses were 18 years of age or younger. While the figure in the data is much lower than the one generated by the model, juvenile property offenders are often released without being formally arrested and charged of a crime. Furthermore, the model-predicted fraction of criminals without a high school diploma is equal to 46.1%. In 1979, 52.7% of the

[14] Dependent Variable is log of real weekly earnings with standard errors in parentheses.
[15] This statistic is taken from the Profile of State Prison Inmates (NCJ-58257), August 1979. Unfortunately, this information is not available for criminals convicted for property offenses only.

correctional population in state prisons did not have a high school diploma.[16] Hence, the model seems to be capable of reproducing certain dimensions of the socio-demographic composition of the criminal population fairly well. In addition, the model matches the capital output ratio and the share of consumption in output for 1980.

Table 2: Benchmark

Crime rate	5.6
Fraction of criminals who are employed	78.8
Fraction of criminals who are unemployed	21.2
Fraction of criminals 18 years of age or younger	76.1
Fraction of criminals with less than a high school degree	46.1

In table 3 we present results of three experiments to assess the quantitative impact of several factors. In each case, we increase a particular parameter by 10% and examine the resulting change in the crime rate and several other statistics. For example, in column 3 we report the results of an experiment where the apprehension probability is increased by 10% from 16.80% to 18.50%; in column 4 we examine the case where income inequality as measured by the standard deviation of earnings is increased by 10%.[17] In the last column we examine what happens to the crime rate if the economy has a higher fraction of low human capital individuals by increasing the fraction of low human capital types in the economy by 10% and decreasing the fraction of the population with a post-graduate degree by 10%.

[16] This statistic is also taken from the Profile of State Prison Inmates (NCJ-58257), August 1979.

[17] There are several different ways to increase income inequality in this model. Instead of carrying out an arbitrary experiment, we have used the income data from 1985 in the U.S. which indicates a 10% increase in the standard deviation of earnings. This is also a period where the wage gap between individuals with high school degrees and those with higher degrees have widened significantly.

Table 3: Results

	Bench	π_a	Ineq.	γ_1
Crime rate	5.6	3.17	8.62	5.25
% of criminals who are employed	78.8	77.5	79.4	76.9
% of criminals who are unemployed	21.2	22.5	20.6	23.1
% of criminals 18 years of age or younger	76.1	70.2	78.5	72.6
% of criminals with less than a HS degree	46.1	68.7	35.8	53.2

Several interesting points emerge from the results in table 3. For example, if we compare the results in the benchmark economy with those in the economy where only the apprehension probability, π_a, is increased by 10%, we observe a 44% decline in the overall crime rate. A 10% increase in income inequality causes a 54% increase in the crime rate.

On the other hand, a 10% increase in the fraction of individuals without a high school degree, γ_1, causes a small decline in the crime rate, from 5.6% to 5.25%. While young low human capital type individuals constitute the largest group engaging in criminal activities in this environment, their overall weight in the population is not too large. In addition, in order to keep the population constant this experiment was conducted by reducing the share of the high human capital types in the economy by 10%. These changes result in a 5% lower overall income, which causes a reduction in the average gains obtained from property theft, and a 1% lower standard deviation of income.[18] Overall, the resulting crime rate in this experiment is lower. These results indicate that an increase in the fraction of low human capital types in a society, perhaps through migration, may not necessarily cause an increase in the crime rate. What may be more important are the implied income inequality and the apprehension probability in understanding large differences in property crime rates across countries.

There are significant differences in the schooling characteristics of criminals in these experiments. In this model, for most of the parameter choices, only the individuals without a high school degree and with just a high school degree engage in property crime. However, the fraction of these groups responsible for property crime seems highly sensitive to some of the conditions in the economy. For example, the increase in the apprehension probability by 10% seems to deter mostly the individuals with a high school degree from engaging in criminal activities, resulting in the fraction of criminals with less than a high school degree to increase to 68.7% from its benchmark value of 46.1%. On the other hand, the experiment where income inequality is increased by 10% results in a higher fraction of crimes committed by those with a high school degree. The main reason for this result is the particular way income inequality is increased in this period, the wage gap between individuals with a high school degree and those with higher degrees has widened substantially. Consequently, we observe a significant increase in the percent of criminals with a high school degree in this experiment.

Among the variables examined above, apprehension probability may be the one factor that is easiest to change by policy makers, perhaps by devoting more resources to enforcement. In this case it would be interesting to compare changes in the property crime rate that would occur due to the increase in the apprehension probability versus an increase in the duration of jail time. In the benchmark calibration duration of incarceration was set to 12 months which was the average duration in the U.S. in 1980. As the second panel of Figure 2 shows, incarceration duration varies significantly across countries. To check the sensitivity of the property crime rate to the length of a jail sentence we increase the duration by 10% to 13.2 months.

Table 4: Results

	Bench.	Apprehension	Duration	U-rate
Crime rate	5.6	3.17	4.73	5.94

Comparing the results in columns three and four to the benchmark in column 2, demonstrate that while a 10% increase in the apprehension probability reduces the crime rate by 43.4%, a 10% increase in the duration of incarceration decreases the crime rate only by 15.5%.

[18] There is also a decrease in the opportunity cost of incarceration since $\overline{c}$ is kept constant. However, this decrease is quantitatively very small.

In the last column, we report the crime rate in the case where both the overall unemployment rate and the unemployment rate of 15-19 year olds are increased by 10%. Notice that this change causes only a 6% increase in the crime rate. It is important to realize that in the benchmark economy 79% of the people engaging in criminal activities are employed and only the remaining 21% are unemployed. This implies that approximately 5% of the employed and 16% of the unemployed population engages in criminal activities. Given this result it is not surprising that a 10% increase in the unemployment rate results in a 6% increase in the property crime rate. While this is not an insignificant change in the crime rate, its magnitude is much smaller than the changes caused by apprehension probability and income inequality.[19]

Figure 3 summarizes the crime rates that resulted from our five experiments.

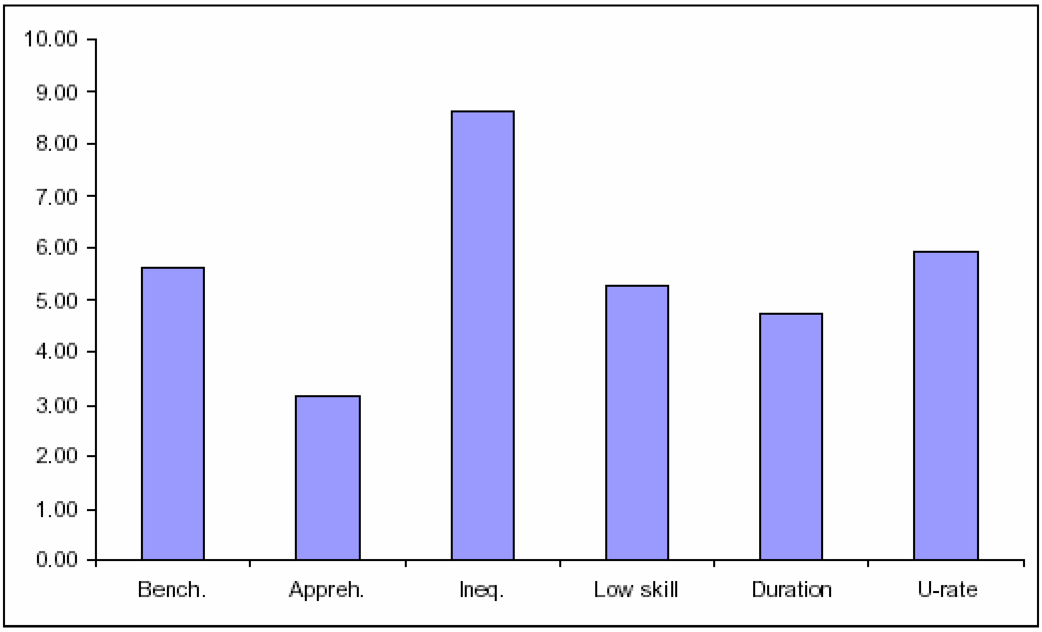

Figure 3: Property Crime Rates

We can also observe from this figure the prominent role played by the apprehension probability and income inequality. It is important to point out that the purpose of these counterfactual experiments in not to provide insights into how these changes, such as an increase in the apprehension probability or a decrease in the income inequality, could be accomplished. Rather, their aim is to provide insight into the quantitative importance of different factors in a fully specified general equilibrium model.

Conclusions

In this paper, a fully specified overlapping generations framework is used to examine the sensitivity of the property crime rate to several economic factors and law enforcement tools that vary significantly across countries. In particular, we examine individuals who start their economically meaningful lives at the age of 15 and live until the retirement age of 65. In each period, agents of four different skill levels receive a stochastic age specific employment opportunity. After knowing their employment status, they decide how much to save and whether to engage in criminal activities in that period. Criminal activities amount to stealing from other agents in the economy. If agents choose to commit a crime, they may be apprehended and punished. If they are apprehended, they spend a period in prison and are not able to claim any legitimate earnings from the market. This framework allows us to quantitatively examine the effect of several factors on the crime rate such as the unemployment rate, fraction of low human capital individuals in an economy, apprehension probability, duration of a jail sentence and income inequality. Among the variables we introduce, we identify the apprehension probability and differences in income inequality as having a major impact on the crime rate.

[19] Since labor supply is inelastic, this framework is not well suited to run an experiment with changes in the generosity of unemployment insurance payments See Hansen and İmrohoroğlu (1992) for issues related to changes in unemployment insurance.

Given the large differences in crime rates across countries, it would be desirable to collect precise data on income inequality and apprehension probability and investigate this issue further. This is left for future research.

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