An Analysis of the Crime as Work Model:
Evidence from the 1958 Philadelphia Birth Cohort Study

Jenny Williams
University of Adelaide
Adelaide, South Australia
jenny.williams@adelaide.edu.au

Robin C. Sickles
Rice University
Houston, Texas
rsickles@rice.edu

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Abstract:

This paper builds on the neoclassical model of crime introduced by Gronau (1977) and revisited and broadened by Grogger (1998) by disaggregating the types of capital characterizing an individual to include social and criminal capital in addition to traditional human capital. The combination of juvenile and adult arrest data, labor market and background variables make the sample we analyze, the 1958 Philadelphia Birth Cohort Study, especially well- suited to examine the relative importance of these aspects of individual capital. We find that human capital measures such as number of years of schooling have a significant impact on criminal choice in adulthood. We find that social capital measures such as peer influences during youth are also key predictors of criminality.

1. INRODUCTION

The standard economic model of crime described by Becker (1968) and developed by Ehrlich (1973) views crime as work in the sense that both activities take time and produce income. In this model, participation in the risky occupation of crime occurs if the expected net return exceeds the return in the alternative legitimate occupation. The appeal of this model - to economists and policy makers alike - lies in its treatment of criminals as rational agents who weigh up the costs and benefits of committing crime. If criminals do behave in this manner, then the government can deter crime through policies that increase the costs of crime, such as raising the certainty or severity of punishment.

The impact of the crime as work model on the development of deterrence based policy has been immense. However, due to its treatment of crime as work, the model's implications for preventative policy have been narrowly focused on aggregate labor market policies which increase the opportunity cost of time in crime, such as raising minimum wages or increasing employment levels (Freeman, 1983, 1991, 1996). While improving labor market opportunities is likely to be an important mechanism for preventing crime, there exist a plethora of government funded policy initiatives which are not based on employment. In a recent survey of these policies in the U.S., youth programs based on mentoring were found to be more promising in terms of preventing crime than programs based on general education and job placemen, (Sherman et al. 1997). The question is then, how do we develop our model of criminal choice to explore these effects?

One way to proceed is to note that rationality need not imply narrow materialism. In particular, one would expect social norms and stigma to influence participation in crime[1]. In this paper, we explore the role of these social influences on the decision to participate in

[1] Social influences are likely to impact a much wider set of economic decisions than participation in crime, and a growing body of research has emphasized this point. For example, Becker (1996) uses a model of social interactions to analyze intra-family relations, the influence of social norms and interactions on a range of decisions are considered by Akerlof (1997) and their role in modeling crime specifically in Akerlof and Yellen (1994). The affect of investments received in childhood on educational attainment and labor market outcomes in adulthood is studied by Keane and Wolpin (1997) and Rosenzweig and Wolpin (1994).

crime. To do so we build on the typical model of crime, disaggregating the types of capital that an individual may possess to include social capital and criminal human capital in addition to traditional human capital[2]. Our empirical framework is based on the Gronau (1977) type model of crime used by Grogger (1998) and is estimated using individual level data on young men. As with Grogger, our analysis focuses on property crime, for which the crime as work model has the greatest predictive power.

Social capital was introduced by Coleman (1988) as a means of integrating the framework of the rational agent with the social context in which decisions such as criminal choice are made. We use his concept of social capital to account for the role of social influences on the decision to participate in crime. Within the Gronau framework, we assume that the individual's social capital stock provides a flow of utility generating services associated with a good reputation, and that social punishment for deviant behavior can be represented as a reduction of his social capital stock. This extension of the traditional economic model of crime distinguishes work from crime through the differential effect of crime on utility. In particular, by engaging in crime individuals risk loosing social capital through the imposition of a social sanction, such as stigmatism.

The empirical work is carried out using data from the 1958 Philadelphia Birth Cohort Study. These data were collected for the purpose of examining delinquent and criminal activities of a birth cohort. The 1958 Philadelphia Birth Cohort Study contains both juvenile and adult arrest histories, in addition to complete work histories and earnings for a stratified random sample from the cohort. From this information, we construct a panel of data for our empirical analysis. The Study also provides some non-standard variables that allow us to look at peer and family background influences, such as whether close friends from high-school were picked up by the police, gang membership in youth, whether the respondents parents were arrested, and whether the respondent grew up with a father present in his childhood home. The combination of juvenile and adult arrest data, labor market and background variables make the 1958 Philadelphia Birth Cohort Study especially suited to studying the role of both human and social capital in criminal choice.

[2] While recent research has emphasized the importance of social interactions in forming tastes and determining the level of crime, (Sah, 1991; Akerlof and Yellen 1994; Glaeser, Sarcerdote and Scheinkman 1996), empirical implications have been addressed using aggregate level data.

To anticipate our results, we find robust evidence of the significance of variables used to measure both human and social capital in the decision to participate in crime. In particular, peer influences during youth, the number of years of schooling an individual attains, and his marital status, have a significant impact on criminal choice in adulthood.

The rest of this paper is organised as follows. In Section 2 we revisit the Gronau model used to derive our empirical models. Section 3 describes the 1958 Philadelphia Birth Cohort data and the empirical counterparts to the key theoretical variables. Section 4 provides the results of our analysis, and Section 5 concludes.

2. MODELING PARTICIPATION IN CRIME

As a starting point to modeling participation in crime, we present a standard microeconomic model of crime, in which crime is essentially treated as a second job. The empirical specification for this model is also presented. In Section 2.2, we discuss how this standard model can be adapted to allow for the possibility of utility costs associated with committing crime, such as stigmatism associated with being arrested.

2.1 The Crime as Work Model

Grogger (1998) proposes an adaptation of the Gronau model as the basis for an empirical model of crime. In this model, the representative individual allocates time to market work *(L)*, crime *(C)* and leisure *(ℓ)* to maximize utility, which depends on consumption *(X)* and leisure. The consumer is assumed to face a parametric market wage, *w*, and returns to crime function, *r(C, p)*. Returns to crime are assumed to exhibit diminishing returns, so that each successive crime produces less remuneration. Although Grogger does not take explicit account of uncertainty, we do so by including the probability of arrest (*p*) in the returns to crime function. We assume that the probability of arrest is determined by expenditures on detecting crime by the government. Since an individual cannot affect police expenditures on detecting crime through his own actions, the probability of arrest is exogenously determined in this model.

The consumer's problem can then be written as:

$$\max_{x,\ell} U(X, \ell)$$

subject to:

$$X = wL + r(C, p) + I$$
$$\ell = T - L - C$$

where T is the amount of time available and I is non-labor income. This model assumes the representative individual experiences no greater disutility from an hour spent in crime compared to an hour spent at work. This assumption along with the focus on income generating crime means that in this model, crime is essentially treated as work.

The optimal time allocated to income generating activities occurs where the marginal rate of substitution (MRS) between consumption and leisure is equal to the market wage. The marginal rate of substitution between consumption and leisure is given by:

$$MRS(X, \ell) = \frac{U_2\left(wL + I + r(C, p), T - L - C\right)}{U_1\left(wL + I + r(C, p), T - L - C\right)}$$
$$= m\left(L,\ I + r(C, p),\ T - C\right)$$

The reservation wage of the consumer is his marginal rate of substitution of leisure for consumption evaluated at the point where all of his time is allocated to leisure: $w^* \equiv m(0, I, T)$. In order for the individual to work, it must be that the case that the market wage exceeds his reservation wage, $w > w^*$.

Similarly, the necessary condition for the individual to participate in crime is that the expected return to the first hour in crime exceeds his reservation wage, $r_1(0, p) > w^*$. A consumer who chooses to work and commit crime will spend time in crime until the marginal expected return from crime equals the market wage, $r_1(C, p) = w$. Given the time allocated to leisure, the distribution of time between crime and work depends on productivity in crime, *r(C, p),* and in the labor market, *w,* and not on preferences.

This model has a recursive structure, with the individual first choosing how much time to spend in crime, and then how much time to spend working in the market.[3] For individuals who commit no crime, the optimal time in the labor market is chosen by equating the marginal

[3] This is required for coherency of the empirical model. For examples of simultaneous models of work and crime at the individual level, see Sickles, Schmidt and Witte (1979) , Schmidt and Witte (1984), and Good, Pirog-Good

rate of substitution to the market wage, $m(L, I, T) = w$. Participating in crime has the effect of both increasing non-labor income from *I* to *I+r(C, p),* and reducing available time from *T* to *T-C*. Individuals who participate in crime choose time in the labor market such that $m(L,\ I + r(C, p),\ T - C) = w$.

2.2 Empirical Specification of the Crime as Work Model

We next outline how the theoretical model discussed above can be implemented for empirical analysis. First, let the marginal returns to time in crime be parametrized by

$$r_1(C, p) = X_1\beta_1 + \alpha_1 C + \alpha_2 p + u_1 \qquad (2.2.1)$$

where X_1 contains measures of criminal human capital, $(\alpha_1, \alpha_2, \beta_1)$ are parameters to be estimated, and u_1 is the stochastic error term. We defer discussion of the variables we use to measure the various forms of capital stock until section 3.

Since hours in crime are unobserved, this equation cannot be estimated. However, by exploiting the participation rule for crime, $r_1(0, p) > w$, the parameters on the determinants of criminal returns, (β_1), and the probability of being caught, (α_2), can be estimated. Let A be an indicator of participation in crime. The probability of an individual participating in crime is given by:

$$\begin{aligned} P(A = 1) &= P(r_1(0, p) - w > 0) \\ &= P(X_1\beta_1 + \alpha_2 p - w + u_1 > 0) \end{aligned} \qquad (2.2.2)$$

The standard probit model follows by assuming u_1 is a standard normal random variable. Since we make use of panel data to estimate this model, we allow for individual specific unobserved heterogeneity. We assume that

$$u_{1it} = \mu_i + v_{it},\ E[\mu_i + v_{it}] = 0,\ Var[u_{1it}] = Var[\mu_i + v_{it}] = \sigma_\mu^2 + 1, Cov[u_{1it}, u_{1is}] = \sigma_\mu^2$$

and μ_i and v_{it} are normally distributed iid random variables. The μ_i 's reflect any individual specific unobservable effects that are persistent over time, while the ε_{it} represent the purely random component of the error term. This is the univariate random effects probit model

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and Sickles (1986).

whose maximum likelihood estimator can be obtained by the quadrature methods introduced by Butler and Moffit (1982) and generalized to the multivariate case by Sickles and Taubman (1986, 1997).

If everyone in the sample worked and wages were uncorrelated with the unobservables governing the probability of participation in crime, estimation of the crime particiaption equation would be straightforward. However, it is likely that the unobservables determining wages and criminal participation are correlated. Also, a sizeable group in our sample do not work and so the possibility of wages reflecting selection into employment exists. We address these issues by replacing actual wages with predicted wages from a selectivity corrected wages model (Heckman, 1979). Derivation of the selectivity corrected wages equation is given in Appendix 1.

The empirical counterpart to the basic theoretical model of crime consists of the structural random effects probit model

$$P(A_{it}=1)=P\left(X_{1it}\beta_1+\gamma p_t-\hat{w}_{it}+\mu_i+v_{it}>0\right) \qquad (2.2.3)$$

and the selection corrected wage equation

$$w=X_2\beta_2+\sigma_2\rho\lambda\left(Z\hat{\delta}\right)+e \qquad (2.2.4)$$

where X_2 contains exogenous variables relating to market human capital, ρ is the covariance between the error terms in the selection into market work and wages equations, $\hat{\delta}$ are the parameter estimates from the selection equation, and $\lambda(.)$ is the inverse Mill's ratio.

2.3 Incorporating Social Capital

The structural probit for participation in crime derived above assumes that, given time allocated to leisure, it is only the remuneration in crime relative to the legitimate market that determines participation in crime. This is a particularly strong assumption since it rules out any disutility associated with breaking the law, such as stigmatism. In this section we discuss how the basic model can be generalized to allow for the effect of social sanctions in criminal choice.

The extent to which an individual may experience disutility from social sanctions imposed for criminal acts is likely to depend upon his attachment to the community which

imposes these sanctions. At one extreme consider a young male from a disadvantaged minority living in a large urban ghetto. In ethnographic studies describing the life of such individuals, Anderson (1999) documents a code of conduct he calls the code of the 'street'. According to Anderson, the code of the street imposes social order and a social status system for that part of society where the influence of the police and the norms and values of the wider 'decent' community ends. For individuals fully vested in the code of the street, the threat of legal and social sanctions associated with engaging in crime impose very low costs. Indeed, such sanctions may in fact increase their standing in street terms. For hard core street individuals, neither the legal system nor the norms and values of the wider community has much influence on their behavior. At the other extreme, we could imagine that an individual living in the suburbs, with a good reputation, a job and family for example, would be heavily vested in what Anderson calls 'decent' society. Such a person would risk great disutility from social sanctions in the event of arrest, and is therefore unlikely to engage in crime.[4]

Even in the inner city ghettos studied by Anderson, hardcore street orientated individuals are in a minority. While many of these less alienated individuals may have assumed a street demeanour as a way of expressing their ethnicity, they embrace the value system of the wider decent community. According to Anderson, these people are trying to be part of the main stream culture, but depending on the situation may slip back and forth between decent and street behaviour. This suggests that there is a continuum of behaviour that exists between the two poles of the code of the street and the code of the wider decent community.

For our purposes, we define the norms of the wider decent community as the benchmark and measure the degree to which an individual is vested in this system of norms and behaviour by his social capital stock (S). We assume that social capital provides a utility generating flow of services associated with a good reputation and social acceptance within the wider community. In this model, utility is given by $U(X,\ell,S)$. We assume that in the event of arrest, the agent incurs a social sanction, such as stigmatism, which can be represented as a reduction in his social capital stock.

[4] This is one explanation of why highly respected members of the community are chosen to head up charitable organizations. We thank John Seigfreid for pointing this out.

The effect of including social capital in the model of crime is that the cost of engaging in crime now includes both forgone labor market earnings and the utility cost associated with social sanctions. We assume that the social sanction an individual faces for deviant behaviour is proportionate to his social capital stock. *Ceteris Paribus*, this has the effect of increasing the expected cost of engaging in crime for individuals heavily vested in the code of behavior of legitimate society, making criminal acts less likely. Conversely, individuals with a smaller stock of social capital face smaller expected costs of engaging in crime in terms of social sanctions, and are therefore more likely to engage in crime.

As with the basic Gronau type model discussed in the previous section, the optimal time allocated to income generating activities, work and crime, occurs where the marginal rate of substitution between consumption and leisure is equal to the market wage. In this case, the marginal rate of substitution between consumption and leisure is given by:[5]

$$\begin{aligned} MRS(X,\ell,S) &= \frac{U_2(wL+I+r(C,p),T-L-C,S)}{U_1(wL+I+r(C,p),T-L-C,S)} \\ &= m(L,I+r(C,p),T-C,S) \end{aligned} \tag{2.3.1}$$

Unlike the basic model, crime has a direct welfare affect, operating through the individuals stock of social capital, in addition an indirect effect working through income used to purchase the consumption good, *X*. Consequently, the necessary condition for the individual to participate in crime is that the expected return to the first hour in crime exceeds his reservation wage plus utility costs associated with the social sanction, $r_1(0,p) > w^* + g(S)$, where $g(\ )$ is an increasing function that transforms social capital into the utility cost of engaging in crime. A consumer who chooses to work and commit crime will spend time in crime until the marginal expected return from crime equals the market wage plus the utility costs of crime, $r_1(C,p) = w + g(S)$.

The empirical counterpart to this theoretical model of crime consists of the structural random effects probit model

$$P(A_{it}=1) = P(X_{1it}\beta_1 + X_{3it}\beta_3 + \gamma p_t - \hat{w}_{it} + \mu_i + v_{it} > 0) \tag{2.3.2}$$

and the selection corrected wage equation

$$w = X_2\beta_2 + X_3\beta_3 + \sigma_2\rho\lambda(Z\hat{\delta}) + e \tag{2.2.3}$$

where X_3 contains measures of social capital stock. We have not considered possible complementarities between the various forms of capital in this model. However, it is likely that the accumulation of human and social capital stocks are correlated. There is some evidence of this in the empirical literature. Coleman (1988) shows that educational attainment as measured by high school graduation is affected by social capital from within the family and the community. Similarly, Glaeser, Laibson and Sacerdote (2000) find that there is a strong positive correlation between social capital and human capital. Modeling educational choice explicitly is beyond the scope of this analysis. The approach taken here is to condition our analysis on individuals having completed their education, and treat education as a predetermined variable. **Jenny: do we have any support for the conjecture that…** This approach assumes that unobservables determining current period choices are not correlated with unobservables that determine educational attainment.

3. DATA

Our analysis is based on data collected as part of the 1958 Philadelphia Birth Cohort Study. These data represent a stratified random sample from the universe of individuals who were born in 1958 and lived in Philadelphia from their tenth to eighteenth birthdays. We begin this section with a description of the 1958 Philadelphia Birth Cohort Study data. This is followed by a discussion of the measurement of variables entering the empirical models.

3.1. The 1958 Philadelphia Birth Cohort Study.

The purpose of the 1958 Philadelphia Birth Cohort Study was to collect data on a birth cohort with a special focus on their delinquent and criminal activities. The cohort is composed of subjects who were born in 1958 and who resided in the city of Philadelphia at least from their tenth until their 18th birthday. In addition to collecting the complete (official) criminal histories of members of this cohort, the Study entailed a retrospective follow-up survey for a sample from the cohort. The investigators employed a sampling scheme that

[5] In order to maintain the recursive structure of the model, we assume that preferences are separable in leisure.

stratified the population five ways: by gender, race, socio-economic status, juvenile offense history (0, 1, 2-4, 5 or more offenses), and juvenile "status" offenses, which are offense categories only applicable to individuals less than 18 years of age. From the resulting strata, a sample was randomly selected to be interviewed, with equal draws from all strata.

The follow-up survey took place during 1988. Between thirty and forty percent of the members of each strata were interviewed so that the relative response rate were roughly equal.[6] Figlio (1994) reports that comparisons among strata indicate no apparent biases due to non-response. Areas of inquiry covered by the survey include personal history of delinquency and criminal acts; gang membership; work and education histories; composition of current and childhood households; marital history; parental contact with the law; and personal and social demographic characteristics.

The complete (official) criminal history of the birth cohort was collected between 1979 and 1984 and covers the criminal careers of members, as recorded by the police, and juvenile and adult courts. The information for juveniles was obtained from the Philadelphia police, Juvenile Aid Division (JAD). Information about adult arrests was obtained from the Philadelphia Police Department, the Common and Municipal Courts, and the FBI, ensuring offenses both within and outside the boundaries of Philadelphia are included.

We consider the male population captured in the follow-up survey, and only those for whom we can construct all key variables required for our analysis. Our data set contains observations on 426 men over the ages of 19-24 corresponding to the period 1977 to 1982. We exclude observations on individuals who were still enrolled in school. This limits the sample to men who had left school and whose primary alternatives to leisure are market work and crime. This restriction results in an unbalanced panel. The average number of periods that an individual is observed in our sample is 5.5, and the total number of observations is 2,322. A definition of variables used in the empirical analysis and descriptive statistics can be found in Appendix 2.

3.2 Participation in Property Crime and Criminal Human Capital

[6] Of the 1,992 individuals randomly selected for the survey, 576 men and 201 women were interviewed. Most respondents lived within the Philadelphia SMSA or within a 100 mile radius of the urban area. However, to insure that out-migration of cohort members from Philadelphia would not have any significant effect, sample

We use the official data on arrests as our measure of participation in crime.[7] Since arrest information includes when the arrest occurred we are able to construct panel data for this variable. We define property crime to include arrests for robbery, burglary, theft, forgery, counterfeiting, fraud, and stolen property (buy, sell, receive).[8] Table 1 shows the number of arrests of each type of crime for sample members over the period 1977-1982.

We proxy criminal human capital with variables that reflect past criminal experience and exposure to information that would raise criminal productivity. Because our sample period covers the ages 19-24, criminal experience would largely occur before the age of eighteen. Therefore, we use the individual's number of juvenile arrests to measure his past criminal experience. We also include two variables that are intended to capture exposure to information that would raise criminal productivity. The first variable is an indicator for whether the respondent reported that his father was arrested during his childhood, and the second is the respondent's number of siblings. This last variable is included because in their extensive review of the literature, Visher and Roth (1986) find that large families contribute a disproportionate number of criminals, and so the probability of having a sibling who engages in crime is increasing in the number of siblings one has.

Table 2 contains population-weighted averages of these measures of criminal human capital for our sample and for the subsamples of criminals and non-criminals. Criminals are defined as individuals who have at least one adult arrest during the sample period, 1977-1982. Table 2 shows that on average, a male from the birth cohort experiences 0.63 arrests as a juvenile. However, the criminal sub-population have (on average) about 2 juvenile arrests

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members were traced and if possible contacted, throughout the United States (Figlio, 1994)

[7] Our data contain both self-reported information on criminal activity and official arrest records. The self-reported information was collected as part of the retrospective follow up survey in 1988 and asks respondents to report the number of times they undertook a set of criminal activities during broad age categories, (up to 11 years of age, 12-18, 19-24, over 24 years of age). Our decision to use the official arrest data is based on the fact that these data give precise dates for arrest. A large literature discusses the relative merits **What are they??**of self-report versus official records (such as arrest) as a measure of criminal participation. A good discussion is given in Wolfgang Thornberry and Figlio (1987).

[8] It is noteworthy that we have not included selling drugs in income generating crime. This is because, although the Philadelphia crime code classifications allow narcotic drug laws violations to distinguish between selling, manufacturing, and possession, all arrest records report a crime code classification 1899, narcotic drugs laws. Therefore, we are unable to make the distinction between arrests for selling or possession. The self report data suggests that that most of these arrests are for possession, therefore we do not arrests for drug related crime in our analysis.

compared to the non-criminal population who have 0.43 juvenile arrests on average.[9] The statistics in Table 2 indicate that criminals are more than twice as likely to report that their father was arrested during their childhood than the non-criminal population, and that criminals tend to come from larger families than non-criminals. We also note that non-whites are over-represented in the criminal population.

The final variable in the crime participation equation in the basic Gronau model is the probability of arrest that is assumed to be determined by expenditures on detecting crime by the government. We measure this variable using real expenditure on police protection and prisons for Philadelphia divided by the population of Philadelphia. The data was obtained from the official budget archives of the City of Philadelphia.

3.3 Measuring Social Capital

The degree to which an individual subscribes to the code of behaviour of the wider community is likely to depend upon social influences from childhood as well as current social interactions. Both the ethnographic evidence of Anderson (1990, 1999), and quantitative evidence of Coleman (1988), Sampson and Laub (1990, 1992), and Case and Katz (1991) find that family, peer, and neighbourhood influences are important in the development of social norms and behaviors in youth. Following Coleman (1988), we attempt to account for parental influence using the presence of a father in the respondent's childhood home, and whether the respondent's mother worked during his childhood. In general, we would expect a boy from a two-parent family to be more likely to be vested in the code of legitimate society. The expected effect of having a working mother is less clear. Mothers generally work to provide access to better opportunities for their children. In addition to providing extra resources for their children, working mothers provide a positive role model. Anderson found the later effect to be particularly important in creating bonds to the legitimate society for single parent families he studied. However, mothers who work are also less able to spend time instilling the values and norms of society in their children, which may reduce their children's bonds to legitimate society. The population weighted sample statistics contained in Table 2 show that

[9] About 24% of the sample were arrested as juveniles. If we consider the population by criminal and non-criminal status, we find that about 42% of criminals were arrested as juveniles, compared to 21% for non-criminals.

respondents categorized as criminals are more likely than non-criminals to have grown up without their father living with them, with 78% of criminals and 84% of non-criminals reporting their father was present in their childhood home. Criminals are also less likely to have reported that their mother worked while they were growing up, with 50% reporting that their mother worked compared to 65% for non-criminals.

Case and Katz (1991) find substantial neighbourhood effects on youth behavior even after controlling for the influences from within the family. While the Philadelphia Birth Cohort Study does not ask questions about an individual's childhood neighbourhood per-se, the investigators use the respondent's childhood address and census tract information to create a dummy variable that indicates socioeconomic status of the childhood neighbourhood is high. In addition, the retrospective survey includes several variables that relate to peer influences in youth. We use gang membership before the age of eighteen, and the proportion of the respondent's three best friends from high school who were picked up by the police to capture these influences. Table 2 shows that individuals with adult arrests during the sample period are much less likely to have come from a high socioeconomic status neighbourhood than their non-criminal counterparts, with 31% of criminals growing up in a high socioeconomic status neighbourhood compared to 59% of non-criminals. Also, criminals are almost twice as likely as non-criminals to have been in a gang before the age of eighteen, and have a greater proportion of high school friends stopped by the police.

In terms of building social capital in adulthood, Akerlof (1998) in the economics literature and Laub and Sampson (1993) and Sampson and Laub (1990) in the sociology literature identify employment and marriage as key institutions for investing in decent society. Anderson (1990) reports that followers of the code of the street have a rather superficial sense of family and community. Therefore, we expect bonds to family such as marriage and children to be associated with greater social capital in legitimate society. Our data contain information on whether the individual is in a common law or traditional marriage, when these relationships began and ended, and the number of children the individual has. Table 2 indicates that criminals are less likely to be married and report having fewer children than non-criminals. Interestingly, criminals are more likely to be in a common law marriage than non-criminals.

3.4 Labor Market Participation and Market Wages

The follow-up survey contains detailed information on employment histories for the individuals interviewed. In particular, for each job (whose tenure was at least six moths), the month and year the individual began and finished the job was recorded, along with wage income when the individual began and ended employment, whether the job was part time or full time, the pay period (hourly, weekly, monthly, or yearly), and the average hours worked per week. Annual wages are constructed by linear interpolation between the beginning and ending wage for each job.[10]

We include in our wage equation standard measures of human capital and an indicator for whether the respondent is white. In terms of human capital, education is measured by the number of years of schooling the individual has acquired and an indicator for having graduated from high school. We also include experience to capture human capital acquired on the job. Experience is measured in years and calculated on the basis of reported information on employment. Table 2 shows that our sample represents a population that has 12.33 years of education on average. It is interesting to note that on average the criminal population fails to complete high school, attaining 11.8 years of education, compared to 12.41 years completed by the non-criminal population. Criminals also have fewer years of work experience on average than non-criminals with averages of 2.38 and 3.04 years experience accumulated by 1982 respectively.

Human capital theory provides a number of qualitative predictions about the relationship between education, employment, wages, and crime that we now consider. Table 3 reports the (population weighted) average hourly wage (in current dollars for people working) by educational attainment (not graduated from high school, high school graduate, college graduate) and criminal status (not arrested during sample period, arrested during sample period). These data support the basic predictions of human capital theory; earnings are increasing in human capital stock as measured by educational attainment, and the opportunity cost of crime in terms of forgone wages is smaller for criminals than non-criminals. For the period under consideration, the average hourly wage for criminals is 12% lower than the

[10] If the reported pay period was not hourly, then wages were calculated by dividing income by hours worked for

average hourly wage for non-criminals.[11] The wage differential between criminals and non-criminals is likely to be even larger than this however, since Table 3 compares reported wages for those individuals who work, and it is likely that there is selection into employment. In the presence of selection into working, we would expect that the wages of those who work would be greater than the expected wages for those not working. If more criminals than non-criminals do not work, we expect the true wage differential to be greater than 12%. We investigate this by considering employment rates of our sample.

Table 4 shows that those who have accumulated a larger human capital stock are more likely to be employed (having completed their education), as predicted by the human capital model. With respect to the comparison between criminals and non-criminals, we find that criminals are less attached to the labor market. This suggests that there may be selection into employment and that the wage differential between criminals and non-criminals is likely to be greater than that reported in Table 3. Overall, the data are found to be consistent with the human capital theory of earnings, and the model of crime as work.

3.5 The Relative Roles of Criminal Capital, Human Capital and Social Capital In Arrest Profiles for the 1958 Philadelphia Birth Cohort Study

To determine whether our various measures of capital continue to be related to adult criminality once other background variables are controlled for, we estimate reduced form probit models for the probability of arrest. While these regressions do not tell us whether theses variables cause adult criminality, patterns in the results may provide information helpful for the further exploration of potentially causal models.

Table 5 presents the marginal effects of estimated of probit models relating the probability of adult arrest to measures of criminal, human and social capital. The dependent variable is a binary variable, equal to 1 if individual *i* is arrested in year *t*, and zero otherwise. Column 1 and 2 relate the probability of arrest to our measures of criminal capital only. In addition to an indicator for whether the respondent is white, the first model includes the criminal capital variables that can be considered truly exogenous (father arrested during the

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the pay period.

[11] Alternatively, if we define criminals for each year as those who were arrested in that year, we find that criminals earn about 15% less per hour on average than non-criminals.

respondents childhood and number of siblings), while the second model adds the number of times the respondent was arrested as a juvenile. The results for Model 1 indicate that the probability of arrest as an adult is greater for individuals whose father was arrested while they were growing up, and for those from larger families. However, only the latter effect is statistically significant. Being white is associated with a statistically significant $(\alpha = 0.10)$ negative effect on the probability of arrest. We find that the marginal effects of these variables are robust to the inclusion of the number of arrests as a juvenile. However, neither father's arrest, number of siblings, nor race has a significant impact on the probability of arrest after controlling for the number of juvenile arrests. One possible explanation for this finding is that these factors impact adult arrest indirectly by increasing the probability of juvenile arrest, and have no independent effect on the probability of adult arrest. The number of arrests the respondent had as a juvenile has a positive and significant effect on the probability of adult arrest and its inclusion improves the explanatory power of the model considerably, increasing the psuedo R^2 from 2.7% to 8.7%.

Model 3 examines the influence of the childhood family characteristics related to social capital accumulated during childhood, (having a father, a working mother), on the probability of adult arrest. The estimate marginal effects suggest that while both of these variables decrease the probability of arrest, only the presence of a father in the childhood home is found to have a statistically significant effect. Model 4 adds socioeconomic status of the respondent's childhood neighbourhood, gang membership before the age of eighteen and the proportion of the individual's three best friends from high-school who were picked up by the police as measures of peer influence. The later two variables are found to have a statistically positive impact on the probability of adult arrest, suggesting that peer influences from youth continue to influence criminal choice in adulthood. The inclusion of these three variables increases the psuedo R^2 from 2.3% in model 3 to 6.0% in model 4.

The influence of variables related to social capital accumulated in adulthood, being in a traditional marriage, being in a common law marriage, and the number of children at the time of survey, are included in Model 5. While being married is negatively related to the probability of arrest, this effect is not significant. Nor is the estimated marginal effect of the number of children the respondent has at the time of survey. Interestingly, we find that men in

a common law marriage are significantly more likely to be arrested than their single or married counterparts. One possible interpretation of this result is that individuals who are in a common law marriage are less attached to the norms of legitimate society compared to single men and men in a conventional marriage, and they are therefore more likely to engage in crime and be arrested.

Model 6 considers the relationship between the human capital variables (years of education, high school graduation, and labor market experience) and arrest. **Jenny: Remind me again why have HS graduation and years of schooling entered separately??** The results indicate a negative relationship between the probability of adult arrest and high-school graduation and years of school. High-school graduation does not have a statistically significant effect on the probability of arrest controlling for years of school completed. **Jenny: Why should I expect this to be otherwise??** The negative and statistically significant relationship between years of schooling and arrest may be attributed to the wage increasing impact of higher levels of education, and hence reflective of the negative relationship between wages and crime. However, wages are also increasing in experience, and so we would expect to find a significantly negative relationship between experience and the probability of arrests. However, labor market experience is not found to have a statistically significant impact the probability of arrest. This finding is not sensitive to the inclusion of nonlinear experience effects. This suggests that education may have a direct impact on participation in crime and the probability of adult arrest.

Model 7 includes the full set of measures for criminal, human and social capital. The results for this model show the robustness of the preceding models. The point estimates on the human capital, criminal capital and social capital measures generally have the expected signs, consistent with the earlier models. In terms of statistical significance, we find that the probability of adult arrest is significantly increasing in the number of juvenile arrests, which is our proxy for criminal capital. We also find that peer influences which are likely to negatively impact the social capital inherited from the family (gang membership and proportion of best 3 friends from high school arrested by the police) increase the probability of adult arrest. In terms of proxies for social capital accumulated in adulthood, we find that those in common law marriages are more likely to be arrested than single men, or men in traditional marriages.

We also find that although not individually significant, years of schooling completed and high school graduation are jointly significant in explaining the probability of adult arrest. Our failure to find a similar negative relationship between experience and arrest suggests that education may have a direct effect on participating in crime, rather than solely an indirect effect working through wages. This issue is pursued in the following analysis in which we control for expected wages. In the next section we also allow for possible unobserved heterogeneity using the random effects probit model.

4. RESULTS FROM THE BASIC CRIME AS WORK MODEL AND THE EXTENDED SOCIAL CAPITAL MODEL

In the basic model of crime as work derived in section 2.2, an individual engages in crime if the expected return exceeds the return in the legitimate labor market. The empirical counterpart to this model consists of a structural probit for participation in crime, in which the probability that an individual participates in crime depends on his expected labor market wage. A selection corrected wage equation is used to form the expected wage. This basic model is then extended in section 2.3 to include social capital as a determinant of criminal choice. Correspondingly, our empirical investigation of these models will begin in section 4.1 with the results for the basic human capital model. This model focuses on criminal and human capital as the determinants of criminal choice. In section 4.2, we will present our results for the empirical specification that includes variables which proxy for social capital. The structural probits in each of these sections allow for individual specific unobserved heterogeneity using the random effects probit model. Results for the section corrected wage equation and random effects probit for arrest are presented in each of the following sections.

4.1 The Crime As Work Model

The model for selectivity corrected wages consists of a reduced form probit for selection into the labor market and a wages equation. Since past criminal activity potentially depends on unobservables that also affect current labor market decisions, we estimated two forms of the model. The first model included only those criminal capital variables which can

be considered truly exogenous (father arrested during the respondents childhood and number of siblings) in the participation equation. The second model added the number of juvenile arrests. We found that our results were robust to the inclusion of the number of juvenile arrests, suggesting that this variable can be considered predetermined. Therefore only the results for the model including the number of juvenile arrests are reported in the text. Table 6 contains the results from estimating the selectivity corrected wage equation and three versions of the human capital based structural probit model for arrest.

Exclusion restrictions on the wage equation are required to identify the selection into market work equation. We exclude the criminal capital variables and the number of respondent's children from the wages equation. *A priori*, there is no reason to expect the number of children to affect the wage that an individual can attract conditional on working. We also expect that criminal capital is not productive in the legitimate sector, and Grogger (1998) provides some empirical support for this hypothesis. We test whether the criminal capital variables (father arrested, number of siblings, and number of juvenile arrests) jointly effect wages using the Wald test. We find that the measures of criminal capital are jointly insignificant in the wage equation at conventional levels of significance $\left(\chi_3^2 = 1.82\right)$. **What is the probability??**

The results in Table 6 show support for the human capital model of employment and earnings. In the wage equation, the coefficients on the education and experience variables are signed as expected, and are generally statistically significant. In particular, we find that wages are increasing in the number of years of schooling, and that high school graduates attract higher wages than those who did not graduate, although the later effect is not significant. We find diminishing returns to experience and, as is typically the case, we find that there is a wage premium associated with being white. The human capital variables are also signed as expected in the participation equation for market work, with the probability of working increasing in the number of years of schooling and experience. These effects are statistically significant at conventional levels. We also find that the probability that an individual works is increasing with the number of children he has, and men in a traditional or common law marriage are significantly more likely to work than single men. However, only men in a traditional marriage earn more than single men. We find that two of the three variables used

to measure criminal capital, number of juvenile arrests and father arrested, have a statistically significantly negative effect on the probability that an individual works.

There is no statistically significant evidence of self-selection into employment in these data. The point estimate of the correlation between the error terms in the employment and wages equations is negative and insignificant at both the 5 and 10% level $\left(\chi_1^2 = 0.93\right)$.

The predicted wage is used in the place of the actual wage in the structural probit for the probability of arrest. **Jenny: Again, what is the justification for this??** The second part of Table 6 contains the results from estimating three models for the probability of arrest. Arrest 1 contains the variables proxying for criminal capital, expenditures on law enforcement, the fitted wage and a time trend. The second model adds the human capital variables to Arrest 1's specification, while the third model adds marital status and the number of children the respondent has to Arrest 1's specification. Correspondingly, Arrest 1 is identified by the excluding human capital and family structure variables, Arrest 2 is identified by excluding the family status variables and Arrest 3 is identified by excluding human capital variables.

According to the theoretical model, we expect that (per capita) expenditures on law enforcement and legitimate wages to each have a negative impact on participation in crime and hence probability of arrest. Our results find weak evidence of this. Our point estimates on real expenditures on law enforcement and prisons per capita and the fitted wage in Arrest 1 are correctly signed but statistically insignificant. We find that each of the variables proxying for criminal capital are signed as expected, with the probability of arrest being greater for respondents whose father was arrested during their childhood, who come from larger families, and who had a greater number of juvenile arrests. However, as with our earlier analysis, only the number of juvenile arrests is statistically significant.

The second model for the probability of arrest, Arrest 2, considers whether human capital has a direct impact on participation in crime, in addition to its indirect effect through market wages. Results for this model are in Table 6. The estimated effect of the human capital variables, years of schooling and high school graduate, are negative but individually insignificant. **Jenny: Are they significant as a group??-see fn # 14** The point estimates on the experience variables are not signed as expected and also insignificant. We

find no evidence that race effects the probability of arrest, with the co-efficient on the indicator for being white negative but statistically insignificant. This confirms our earlier findings that, controlling for the number of juvenile arrests, race has no independent effect on the probability of adult arrest. The chi squared statistic for the joint null hypothesis that race, years of education, high school graduation, experience and the square of experience are not significant in explaining the variation in the probability of arrest is 9.39. At the 10% level of significance, we reject this hypothesis. However, we accept the null at the 5% level of significance. **What is the probability??**

There is clearly a high degree of collinearity between predicted wages and these human capital measures. **Why??** Our earlier findings suggested that years of schooling may have an independent effect on the probability of arrest. To test this hypothesis, we reformulate the null to test that race, high school graduation and experience and its square have an insignificant effect on the probability of arrest. We accept this null comfortably at the conventional levels of significance $\left(\chi_4^2 = 4.73\right)$. [12] **What is the probability??**

We take this as evidence that years of schooling completed is significant in explaining the variation in the probability of adult arrest.

In the next model for the probability of arrest, Arrest 3, we explore the role of marital status and number of children on the probability of arrest. This model builds on the preceding 2 models by controlling for years of education in addition to criminal capital, the predicted wage and expenditures on criminal justice by the government. In this model, as with the previous two specifications, expenditures by the government have a negative but statistically insignificant effect on the probability that an individual is arrested. Although the predicted

[12] The null hypothesis that high-school graduation, experience, experience squared and white are jointly insignificant is also accepted. Although there is not much difference in the models if we include either measure of educational attainment, the log likelihood improves slightly if we retain years of schooling rather than high-school graduation (-442.50 for the model that includes schooling and –440.64 for the model that includes high-school graduate), and for this reason we prefer the model that includes years of schooling. We also tested the null that years of schooling, high-school graduation, experience, and experience squared are jointly insignificant, but cannot accept this hypothesis at the 5 or 10% level of significance. **What is the probability??**

wage is insignificant (and incorrectly signed), years of schooling has a statistically significant negative impact on the probability of arrest. In terms of our family status variables, which may be considered related to social capital accumulated during adulthood, we find that being married has a negative but insignificant impact on the probability of arrest, being in a common law marriage has a statistically positive impact on the probability of arrest, and the number of children the respondent has at the time of survey has no significant impact on the probability of arrest, confirming the results from the previous section.

The negative and statistically significant coefficient on year is typical of studies such as this. It reflects a declining arrest rate as the cohort ages. We also find that individual specific heterogeneity is statistically significant in all three models, and accounts for around one third of the unexplained variation in the data.

4.2 Incorporating Social Capital

We next include measures of social capital accumulated before the age of eighteen in our model of criminal choice. We also add other measures in the random effects probit model for the probability of arrest in addition to those proxying social capital. These include the presence of a father in the respondent's childhood home, having a mother who worked, the socio-economic status of the respondent's childhood neighbourhood, the proportion of his best three friends from high school who had contact with the police, and gang membership before the age of eighteen. They are included in the reduced form model for the probability that an individual works and in the selection corrected wage equation. These variables would be expected to affect wages if the reputation associated with the individual's level of social capital stock was useful in obtaining higher paying jobs in the legitimate sector. Li (1988) finds empirical evidence in the U. S. for the use of informal social resources to achieve occupational mobility. DeGraaf and Flap (1988) provide corroborating evidence for the Netherlands.

Table 7 contains the reduced form probit and selection corrected wage equation estimates for this model. As with the previous section, the wage equation is identified by excluding the respondent's number of children at time of survey and the criminal capital

variables. The Wald test confirms that the criminal capital variables are jointly insignificant in explaining the variation in wages $\left(\chi_3^2 = 3.08\right)$. **What is the probability??**

Overall, the results for the reduced form probit for the probability that an individual works and the selection corrected wage equation are consistent with the results presented in Table 6. The point estimate on the years of schooling in the wage equation is somewhat smaller than the estimate from the short form of the model, but the difference is not significant. The results from Table 7 also indicate that the family background variables, father present in the respondent's childhood home and mother worked, are neither individually nor jointly significant in explaining variation in the probability of working or wages **(Jenny: NEED TEST STAT HERE).** In terms of the variables measuring peer influences and neighbourhood effects, we find that individuals who grew up in high socio-economic status neighbourhoods are more likely to be working, and earn higher expected wages than those who grew up in low socio-economic status neighbourhoods. Gang membership before the age of eighteen has a negative and significant effect on expected wages in adulthood, while the proportion of the respondent's best three friends from high school who were picked up by the police has a positive and significant effect on expected wages. Neither of these variables have a significant effect on the probability of working.

Table 7 also includes the results for five random effects models for the probability of arrest. The first three models (Arrest 1, Arrest 2, Arrest 3) have the same specification as the models in Table 6, and only differ by the model used to form the predicted wage. The results for these three models are consistent with those found in Table 6, and are included to demonstrate the robustness of our results with respect to the model used to generate the fitted wage.

The fourth random effects model contained in Table 7, Arrest 4, adds the family background variables, father present in the respondent's childhood home and mother worked, to those variables included in Arrest 3. The point estimates for these variables imply that respondents who had a father living with them while they were growing up are less likely to be arrested as an adult, and respondents whose mothers worked are more likely to be arrested as an adult. However, these variables are neither individually nor jointly significant at either the 5 or 10% level of significance. **What is the probability??**

The final model in Table 7 adds the peer and neighbourhood variables to the previous model. We find a positive correlation between the probability of arrest and both gang membership (before the age of eighteen) and the proportion of the respondent's best three friends from high-school who were picked up by the police. However, only gang membership has a statistically significant effect on the probability of arrest. Also, while the point estimate on the socio-economic status of the respondent's childhood neighbourhood indicates that individuals from a high socio-economic neighbourhood are less likely to be arrested as adults, this effect is not statistically significant.

We also note that earlier results based on our hypotheses concerning the negative relationship between market wages and crime, and the deterrent effect of expenditure on law enforcement, are robust to the alternative specifications found in Table 8. Real expenditures on police protection and corrections per offense are found to have a consistently negative but insignificant effect on adult criminality. Point estimates for the wage variable are neither correctly signed nor significant. The negative effect of aging on the probability of engaging in crime is also found to be robust to the range of specifications explored in Table 7. The proportion of the unexplained variation attributed to individual specific heterogeneity declines only slightly when the full set of proxies for social capital are included.

6. CONCLUSION

The crime as work model assumes that agents face no greater disutility from engaging in crime than from engaging in market work. We generalize this model by disaggregating the stock of capital that an individual possesses to include social capital in addition to market human capital and criminal human capital. Social capital is assumed to generate a flow of utility generating services associated with a good reputation, and social sanctions for arrest are treated as a proportionate reduction in the individuals stock of social capital. In this way, we allow for a potential disutility associated with engaging in crime.

We identify several variables in our data that could be considered to contribute to or detract from an individual's stock of social capital. The social capital stock an agent inherits from childhood depends on peer, family and neighborhood influences from childhood, while

current social capital accumulation depends on his attachment to social institutions of marriage and employment. We empirically evaluate the significance of these measures, along with human and criminal capital variables, in the decision to participate in crime.

In terms of the basic crime as work model, our results are mixed. We fail to find evidence of a negative and significant relationship between market wages and participation in crime. We find weak support for the deterrence hypothesis, with expenditures on police protection and corrections per offense having a negative, although insignificant impact on participation in crime. **Jenny: I'm assuming we are now talking about the disaggregate model in what follows**. With respect to our social capital extensions on the basic crime as work model, the variables used to measure social capital are generally correctly signed. We find that the presence of a father in the respondent's childhood home decreases the probability of participating in crime in adulthood, as does living a in a high socioeconomic status neighborhood in youth. However, these variables are neither individually nor jointly significant. Peer influences from youth are found have an enduring influence on criminality in adulthood. We find that sample members who were gang members in youth, and whose high school friends were picked up by the police, are more likely to participate in crime in adulthood, although only the former effect is statistically significant. In terms of social capital accumulated in adulthood, we find that family structure is an important factor in criminal choice. Married men with children are less likely to engage in crime, while men in common law marriages are more likely to engage in crime. Interestingly, only the positive influence of a common law mariage on crime is found to be significant.

It is noteworthy that, even after controlling for a wide range of personal characteristics, we find that individual specific heterogeneity still accounts about one third of the unexplained variation in the decision to participate in crime.

We conclude that the 1958 Birth Cohort Study provides evidence that, in addition to human capital, social capital plays a significant role in criminal choice. In particular, social influences and interactions in youth are found to have a lasting impact on the probability of deviant behavior in adulthood. Our finding are consistent with a number of other studies and adds to the body of literature that provides evidence of the life-cycle nature of criminality.

This body of evidence provides a basis for developing richer models of crime that include both human and social capital dimensions and suggests that the crime participation decision should be viewed in a dynamic rather than static framework. Further research in this direction is likely to lead to a better understanding of the mechanisms by which preventative policy impacts criminal choice.

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Jenny: Can't you find an appropriate place to cite the remaining uncited references?

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Table 1

Distribution of Property Crime Arrests by Charge for the Sample

Crime	Sample	
	number	percent
Robbery	68	39
Burglary	65	37
Theft	38	22
Forgery/counterfeiting	2	1
Fraud	1	1
Stolen property-buy/receive/possess	8	5
Total	**174**	**100**

Table 2

Population Weighted Averages for Measure of Capital by Criminal Status

	Full Sample	Non Criminals	Criminals
Criminal Human Capital			
Number of juvenile arrests	0.63	0.43	2.01
Father arrested during respondents childhood	0.07	0.06	0.15
Number of Siblings	3.20	3.05	4.22
Market Human Capital			
Years of Education[a]	12.33	12.41	11.80
Experience (in years) [a]	2.96	3.04	2.38
White	0.52	0.55	0.33
Social Capital			
Father present in childhood home	0.83	0.84	0.78
Mother worked during respondents childhood	0.63	0.65	0.50
Socioeconomic status of childhood neighborhood is high	0.55	0.59	0.31
Gang member during juvenile years	0.19	0.18	0.30
Proportion of best 3 friends from highschool picked up by the police	0.33	0.32	0.43
respondent is married[a]	0.26	0.28	0.13
respondent is in a common law marriage[a]	0.10	0.09	0.15
the number of children the respondent has at time of survey	0.99	1.00	0.94
N	426	329	97

[a] evaluated in 1982

Table 3

Population Weighted Average Hourly Wage by Level of Education and Criminal Status

Year	Education			Status	
	No High School Diploma	High School Graduate	College Graduate	Not Criminal	Criminal
77	4.35	4.23	-	4.26	4.19
78	4.51	4.87	-	4.84	4.38
79	5.12	5.34	-	5.36	4.79
80	5.20	5.69	5.67	5.64	5.28
81	5.79	6.10	6.54	6.23	5.27
82	6.01	6.26	6.65	6.44	5.30

Table 4

Population Weighted Average Employment Rate by Level of Education and Criminal Status

Year	Education			Criminal Status	
	No High School Diploma	High School Graduate	College Graduate	Not Criminal	Criminal
77	0.42	0.70	-	0.62	0.43
78	0.51	0.74	-	0.69	0.54
79	0.43	0.78	-	0.70	0.51
80	0.43	0.77	0.56	0.70	0.41
81	0.55	0.78	0.91	0.76	0.63
82	0.56	0.84	1.0	0.81	0.75

Table 5
Probit Estimation of Adult Arrest: Marginal Effects and t-statistics

	MODEL 1	MODEL 2	MODEDL3	MODEL 4	MODEL 5	MODEL 6	MODEL 7
race is white	-0.017	-0.010					-0.004
	(-1.840)	(-1.180)					(-0.490)
father arrested during respondents childhood	0.025	0.017					0.010
	(1.590)	(1.220)					(0.800)
number of siblings	0.004	0.003					0.002
	(1.980)	(1.430)					(1.240)
number of juvenile arrests		0.009					0.006
		(8.130)					(5.810)
father present in childhood home			-0.022	-0.016	-0.013		-0.009
			(-1.920)	(-1.480)	(-1.290)		(-0.930)
mother worked during respondents childhood			-0.016	-0.010	-0.012		0.003
			(-1.63 0)	(-1.110)	(-1.320)		(0.400)
socioeconomic status of childhood neighbourhood is high				-0.007	-0.004		-0.002
				(-0.820)	(-0.490)		(-0.260)
gang member before 18 years old				0.046	0.038		0.026
				(4.310)	(3.690)		(2.790)
number of best friends from high school stopped by the police				0.029	0.027		0.016
				(2.850)	(2.740)		(1.750)
married					-0.012		-0.008
					(-1.010)		(-0.620)
common law marriage					0.038		0.026
					(3.830)		(2.690)
number of children at time of survey					0.002		0.000
					(0.570)		(0.010)
years of school completed						-0.009	-0.001
						(-2.030)	(-0.130)
high-school graduate						-0.187	-0.0156
						(-1.310)	(-1.16)
experience						-0.001	0.003
						(-0.190)	(1.330)
yr	-0.011	-0.009	-0.011	-0.010	-0.010	-0.009	-0.010
	(-4.090)	(-3.630)	(-4.040)	(-3.950)	-3.960	(-3.080)	(-3.730)
Psuedo R2	0.027	0.087	0.023	0.060	0.077	0.040	0.122

Table 6
Results for the Basic Human Capital Model of Work and Crime[a]

	LOG WAGE	WORK	ARREST 1	ARREST 2	ARREST 3
Real expenditure per capita			-1.327	-1.461	-1.483
			(1.311)	(1.332)	(1.325)
Fitted log wage			-0.384	0.673	1.160
			(0.801)	(2.227)	(1.170)
Years of schooling	0.025*	0.214*		-0.068	-0.129*
	(0.010)	(0.037)		(0.089)	(0.060)
High school graduate	0.032	-0.017		-0.227	
	(0.027)	(0.106)		(0.223)	
Years of experience	0.056*	1.135*		0.092	
	(0.023)	(0.056)		(0.158)	
Years of experience squared	-0.006*	-0.116*		-0.009	
	(0.003)	(0.010)		(0.020)	
White	0.041*	0.404*		-0.226	
	(0.020)	(0.070)		(0.178)	
Married	0.077*	0.248*			-0.250
	(0.022)	(0.107)			(0.226)
Commom law married	0.030	0.277*			0.372*
	(0.025)	(0.099)			(0.144)
Number of children at time of survey		0.061*			0.007
		(0.024)			(0.049)
Father arrested during respondents childhood		-0.215*	0.234	0.232	0.231
		(0.101)	(0.195)	(0.199)	(0.196)
Number of siblings		-0.016	0.044	0.044	0.041
		(0.016)	(0.029)	(0.030)	(0.030)
Number of juvenile arrests		-0.049*	0.115*	0.108*	0.102*
		(0.012)	(0.019)	(0.020)	(0.019)
Year	-0.057*	-0.127*	-0.161*	-0.136	-0.092
	(0.007)	(0.022)	(0.052)	(0.131)	(0.068)
constant	1.404*	6.933*	10.714*	12.659*	11.121*
	(0.480)	(1.706)	(4.345)	(5.425)	(4.468)
ρ [b]	-0.116		0.313*	0.324*	0.309*
	(0.123)		(0.063)	(0.065)	(0.065)
σ_u [c]	0.319*		0.675*	0.692*	0.669*
	(0.006)		(0.099)	(0.103)	(0.101)
Log Likelihood	-1307.473		-450.197	-445.036	-442.50

a standard errors in parentheses; * significant at the 5% level; ** significant at the 10% level

b: In the selection correction model, rho is the estimated correlation between the disturbance terms in the selection and wage equations. In the random effects probit model, rho is the proportion of the total variance contributed by the individual specific heterogeneity $\left(\rho = \sigma_\mu^2 \Big/ 1+\sigma_\mu^2 \right)$

c:in the selection correction model, sigma u is the estimated standard deviation of the disturbance term in the wage equation. In the random effects probit model is the standard deviation of the individual heterogeneity.

Table 7
Including Social Capital measures in the Model of Crime and Work[a]

	LOG WAGE	WORK	ARREST 1	ARREST 2	ARREST 3	ARREST 4	ARREST 5
real expenditure per capita			-1.331	-1.464	-1.443	-1.435	-1.491
			(1.312)	(1.332)	(1.321)	(1.319)	(1.325)
fitted log wage			-0.3170	-0.355	0.162	0.187	1.244
			(0.559)	(0.810)	(0.662)	(0.661)	(1.082)
years of schooling	0.017**	0.208*		-0.042	-0.097	-0.095**	-0.108*
	(0.010)	(0.038)		(0.075)	(0.051)	(0.051)	(0.055)
high school graduate	0.040	0.002		-0.201			
	(0.027)	(0.108)		(0.212)			
years of experience	0.059*	1.128*		0.155			
	(0.021)	(0.056)		(0.106)			
years of experience squared	-0.006*	-0.114*		-0.015			
	(0.003)	(0.010)		(0.016)			
white	0.039*	0.397*		-0.173			
	(0.019)	(0.073)		(0.144)			
married	0.080*	0.237*			-0.142**	-0.125	-0.243
	(0.021)	(0.108)			(0.202)	(0.203)	(0.223)
commom law married	0.042**	0.276*			0.400*	0.395*	0.315*
	(0.025)	(0.099)			(0.142)	(0.142)	(0.146)
number of children at time of survey		0.055*			0.005	0.002	-0.006
		(0.025)			(0.049)	(0.049)	(0.050)
father present in childhood home	-0.012	-0.193				-0.159	-0.141
	(0.021)	(0.102)				(0.152)	(0.152)
mother worked during respondents childhood	0.004	-0.008				0.037	0.044
	(0.017)	(0.017)				(0.138)	(0.138)
socioeconomic status of childhood neighborhood is high	0.140*	-0.056*					-0.224
	(0.017)	(0.013)					(0.206)
gang member before 18 years old	-0.044*	0.085					0.384*
	(0.020)	(0.085)					(0.151)
number of best friends from high school stopped by the police	0.046*	0.016					0.151

	(0.019)	(0.073)					(0.159)
Father arrested during respondents childhood		0.259**	0.234	0.230	0.220	0.208	0.160
		(0.070)	(0.195)	(0.199)	(0.194)	(0.194)	(0.194)
Number of siblings		0.120	0.041	0.043	0.039	0.046	0.046
		(0.081)	(0.030)	(0.030)	(0.031)	(0.031)	(0.031)
Number of juvenile arrests		0.088*	0.115*	0.108*	0.099*	0.100*	0.091*
		(0.082)	(0.019)	(0.020)	(0.019)	(0.019)	(0.020)
Year	-0.059*	-0.126*	-0.158*	-0.193*	-0.138*	-0.138*	-0.089*
	(0.007)	(0.022)	(0.047)	(0.066)	(0.052)	(0.052)	(0.065)
constant	1.527*	6.614*	10.678*	13.972*	11.608*	11.705*	10.931*
	(0.466)	(1.715)	(4.339)	(4.811)	(4.434)	(4.433)	(4.459)
ρ [b]	-0.070		0.314*	0.323*	0.303*	0.300*	0.288*
	(0.113)		(0.063)	(0.0650	(0.064)	(0.064)	(0.065)
σ_u [c]	0.310*		0.676*	0.691*	0.660*	0.654*	0.636*
	(0.006)		(0.099)	(0.102)	(0.100)	(0.100)	(0.101)
Log likelihood	-1254.30		-450.15	-444.98	-442.97	-442.41	-436.97

a standard errors in parentheses; * significant at the 5% level; ** significant at the 10% level

b: In the selection correction model, rho is the estimated correlation between the disturbance terms in the selection and wage equations. In the random effects probit model, rho is the proportion of the total variance contributed by the individual specific heterogeneity $\left(\rho = \sigma_{\mu}^{2} \Big/ 1+\sigma_{\mu}^{2}\right)$

c:in the selection correction model, sigma u is the estimated standard deviation of the disturbance term in the wage equation. In the random effects probit model is the standard deviation of the individual heterogeneity.

APPENDIX 1

Following Grogger (1998), we develop the selectivity corrected wages equation from the structural model. According to the model above, individuals work ($L>0$) if the market wage is greater than the reservation wage. Recall that the reservation wage is defined to be the marginal rate of substitution of leisure for consumption evaluated at the point where all time is allocated to leisure. Let the market wage be given by:

$$w = X_2\beta_2 + u_2$$

where X_2 contains exogenous variables relating to market human capital and $u_2 \sim N(0, \sigma_2^2)$. The MRS is given by:

$$m(L,\ I + r(C,p),\ T - C) = X_3\gamma_{31} + \gamma_{32}L + \gamma_{33}[I + r(C,p)] + \gamma_{34}(T - C) + u_3$$

where X_3 contains exogenous variables relating to labor supply and $u_3 \sim N(0, \sigma_3^2)$.

Then the probability that an individual works is given by

$$\begin{aligned} P(L>0) &= P(w > w^*) \\ &= P(X_2\beta_2 + u_2 > X_3\gamma_{31} + \gamma_{33}I + \gamma_{34}T + u_3) \\ &= P\left(\frac{u_2 - u_3}{\omega} > -\frac{X_2\beta_2 + X_3\gamma_{31} + \gamma_{33}I + \gamma_{34}T}{\omega}\right) \\ &= P(\eta > Z\delta) \end{aligned}$$

where $\eta = \frac{u_2 - u_3}{\omega}$ and $\omega^2 = \text{var}(u_2 - u_3)$. This model can be estimated by probit since η is distributed as a standard normal.

The expected wage is given by:

$$\begin{aligned} E[w | X_2, w > w^*] &= X_2\beta_2 + E[u_2 | \eta > Z\delta] \\ &= X_2\beta_2 + \sigma_2\rho\lambda(Z\delta) \end{aligned}$$

where σ_2^2 is the variance of u_2, and ρ is the correlation between u_2 and η. The parameters in the wage equation an be consistently estimated using the sub-sample who work using the following equation:

$$w = X_2\beta_2 + \sigma_2\rho\lambda(Z\hat{\delta}) + e$$

where *e* is a zero meaned error term and $\hat{\delta}$ are the parameter estimates from the probit for participation in market work. We are then able to form consistent estimates of the parameters from the structural probit model by replacing actual wages with conditional predicted wages from the selection corrected wage equation.

Appendix 2: Population Weighted Sample Statistics

Variable	mean	standard deviation	min	max
Labor Market				
wage	3.90	2.93	0	10.50
employed	0.70	.46	0	1
Years of education	11.83	1.90	3	16
Experience (in years)	1.81	1.93	0	8.33
White	0.50	0.50	0	1
Criminal Participation				
arrest for property offense	0.027	0.163	0	1
real expenditure on police and corrections / population	1.04	0.05	0.98	1.14
Number of juvenile arrests	0.72	2.01	0	17.98
Father arrested during respondents childhood	0.08	0.265	0	1
Number of Siblings	3.17	2.20	0	10
Social Capital				
Father present in childhood home	0.83	0.38	0	1
Mother worked during respondents childhood	0.64	0.48	0	1
Socioeconomic status of childhood neighborhood is high	0.51	0.50	0	1
Gang member during juvenile years	0.20	.40	0	1
Proportion of best 3 friends from highschool stopped up by the police	0.34	0.43	0	1
respondent is married	0.17	0.38	0	1
respondent is in a common law marriage	0.09	0.30	0	1
the number of children the respondent has	1.04	1.18	0	10
N=2,322				