The Effects of Private Prison Labor Program Participation on Inmate Recidivism

by

Jeffrey D. Hopper

A dissertation submitted to the Graduate School at
Middle Tennessee State University in partial
fulfillment of the requirements for the degree:

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College of Business
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Finally, please note that any and all errors and/or omissions are the sole responsibility of the author.

Abstract

The United States is experiencing a persistent increase in its prison population and, consequently, a steady increase in public spending on incarceration. One possible change to mitigate these trends is a return to historically cost effective inmate labor programs. Thus, the primary focus of this dissertation is on potential cost savings and inmate recidivism reduction from the Prison Industry Enhancement Certification Program (PIE), a program that allows private companies to employ inmates while incarcerated.

Existing economics of crime models and human capital theories form the foundation for the hypothesis that training and education efforts result in a reduction of inmate recidivism. The theories suggest that increasing the returns to legal activities should raise the opportunity costs of illegal activities and thus the agent will favor legitimate, rather than criminal, activities. There is, however, the theoretical possibility that a prison training program may lower the cost of crime and therefore increase first offense rates.

The historical basis for the use of inmate labor in the United States is explored as is the body of literature tied to inmate rehabilitation efforts and recidivism. The conclusion is that more thorough and effective analytical techniques would improve these assessments.

The PIE program's effectiveness in reducing recidivism is explored using prisoner data from the Tennessee and Indiana Departments of Corrections. Contingency tables examine inmate characteristics and identify PIE participation as a potential explanitor of recidivism. Logit regression procedures, including an instrumental variable procedure to address endogeneity, are used to analyze the predictive value of the dependent variables

and quantify the reduction in the odds of inmate recidivism attributable to PIE program participation. The results indicate that PIE participation contributes to a statistically significant reduction in the odds of inmate recidivism.

Given the conclusion of PIE effectiveness, a potential framework for policy analysis is presented. A net return to participation model highlights the private benefits (including increased savings, future wages, education levels and employment probability) and social benefits (including increased tax revenues, victims' restitution, family support, and decreased incarceration costs) of the program. The monetary benefits are approximated to illustrate potential differences between participants and non-participants.

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I. MOTIVATION AND PURPOSE

The United States is faced with a consistently increasing number of prisoners in federal, state and local institutions. The average annual growth rate of the prison population in the 1990's was 6.2%. The prison population exceeded 2.24 million in 2006. This means that about one in every 109 men and one in every 1,563 women were sentenced prisoners under the jurisdiction of state or federal authorities (U.S. Department of Justice, 2007). As many as 60% of these inmates are incarcerated for offenses that are arguably financially motivated and may be considered economic crimes. Currently, with only 5% of the world's total population, the U.S. holds 25% of the world's prison population. The number of persons, sentenced and non-sentenced, being held in federal prisons, state prisons, and all local jails was 737 per 100,000 U.S. residents (U.S. Department of Justice, 2007). The United States has the highest per capita incarceration rate of any country in the world and seven to ten times that of most other democracies.[1]

The most obvious economic problem is that increasing prison populations have required rapidly increasing expenditures. According to the U.S. Department of Justice's Bureau of Justice Statistics, state budget expenditures on incarceration have increased 145% in 2001 constant dollars, from $15.6 billion in 1982 to $38.2 billion in 2001 (U.S. Department of Justice, 2004). This is approximately $134 per U.S. resident, up from $65 per resident in 1986. The Department of Justice further estimates that the average annual incarceration cost per state inmate in 2001 was $22,650, or $62.05 per day. Among

[1] Comparatively, the rate for England is 142 per 100,000, for France 91 and for Japan 58. These trends in the U.S. appear to be persistent and therefore are expected to continue, barring policy intervention that successfully slows or reverses this outlook.

facilities operated by the Federal Bureau of Prisons, the annual incarceration cost was $22,632 per inmate, or $62.01 per day. Crime is a major economic problem in the United States and a significant drain on public and private resources.

The more complicated economic problem is that of social cost. Steven Levitt (1999) estimates the social costs of crime committed by ex-prisoners when freed are approximately $30,000 a year. These societal costs are significant and possibly avoidable. Levitt (1999) states, "if working a prison job has even a relatively small impact on recidivism, the social benefits could be enormous." Levitt continues, "for instance, if working a prison job resulted in 10% of prisoners dropping out of crime upon their release, then the annual social benefit from reduced crime would be $6.1billion."

Annually there are an estimated 600,000 individuals, or approximately 1,600 a day, being released from state and federal prisons (U.S. Department of Justice, 2007). Given that as high as two-thirds of released prisoners being expected to be rearrested within three years of their release, recidivism rates are a significant concern as this perpetuates the aforementioned problems. There are many potential economic and societal benefits of reduced recidivism. These include reduced incarceration levels and budget expenditures on imprisonment, increased tax revenues from employed ex-cons, reduced crime level and number of crime victims, and safer civic atmosphere. Considering all of this information, any reasonable possibility to reduce recidivism merits investigation.

The economic goal of reduced recidivism is an incarceration cost reduction. Therefore, purely a reduction in recidivism is not sufficient. For example, simply paying

someone not to commit a crime or incarcerating the individual for life would result in reduced recidivism but would also result in increased costs.

Thus, quantifying the effects of a private prison work program that reduces the cost of inmate incarceration and potentially reduces inmate recidivism rates becomes the focus of this paper. Specifically the paper centers on the effects of the Prison Industry Enhancement (PIE) program, which allows private industries to employ prisoners. An assessment of the theoretical economic foundations of why the PIE program is expected to reduce recidivism, an empirical examination of the PIE program's effect on the odds of recidivism for various cohorts, and an evaluation of the net benefits of reduced recidivism and reduced incarceration costs are the primary contributions of this study.

II. ECONOMIC FOUNDATIONS OF LABOR PROGRAM PARTICIPATION

The inmates working in the PIE program are employees of private companies that are certified to operate within the prison compound. Their work environment is designed to facilitate the development of the skills and discipline necessary for real world work situations. The legislation that initiated the program claimed that this design should result in a reduction in recidivism. The theoretical foundations of this claim are explored in this section.

II.A: The Economics of Crime

Theory of the economics of crime is fairly well established with a general level of agreement on the factors affecting the criminal decision process. Economic theories of crime are best suited for non-violent, economically-rational criminals, particularly those who commit crimes of opportunity or property crimes. As is the consensus in the economics of crime research, theories of the mentally ill and violent criminals are left to the psychiatrists and sociologists. This will be re-emphasized in the empirical section of this paper where economic crimes are isolated from other crimes. While the focus in this paper is on factors influencing recommitment decisions, and therefore recidivism rates, it is first necessary to explore the full crime commitment decision theory.

Paolo Buonanno (2003) illuminates that, during the last three decades, the economics of crime has become a new field for economics investigation. He attributes this to the fact that "in 1968 Gary Becker presented a paper that radically changed the way of thinking about criminal behavior." Thus, following Becker's seminal paper, *Crime and Punishment: an Economic Approach,* the perceptions of criminal behavior

have shifted. Criminal choice is no longer exclusively viewed as a function of mental illness or preference for criminal activity. The theory of criminal behavior is now most commonly evaluated on the basis of a maximization problem where agents weigh the costs and benefits of legal and illegal activities taking into consideration the probability of arrest, severity of punishment and the returns to their activities. More succinctly, today the criminal decision is viewed as an economic choice by rational agents.

Six interconnected factors affecting criminal activity form common themes in most of the works and models that have followed Becker. These factors are: tastes or preferences; probability of apprehension; severity of punishment; level of initial wealth and/or demographic characteristics; expected returns to the legal labor market; and expected returns to crime. Variations on the probabilities and proxies of these items abound. However, they remain as the central arguments.

The taste or preference for crime ideas are viewed as noneconomic concepts that violate the assumption that the agents are making rational decisions. Mental illness, risk seeking behavior, and a propensity towards violence are certainly acknowledged as factors being involved in some criminal decisions but remain outside the realm of economic analysis. For this reason many models, and studies, filter or exclude the 'habitual' criminal as his or her decision has already been made and is beyond influence.

Becker's original work introduced new ideas with a focus on the second and third aforementioned central components of today's economic crime models, the influences of the probability of apprehension and the severity of punishment. *Crime and Punishment* targeted optimal public policies to combat illegal behavior. He argued that some persons

become 'criminals' not because their basic motivation differs from that of other persons, but because their benefits and costs differ. The costs and benefits in Becker's model are most influenced by the probability of apprehension and the severity of punishment.

Briefly examining the model, Becker defines a supply of offenses (O) as relating to offenses committed by a person to: their probability of conviction (p), the punishment if convicted (f), and a blended variable (u), the income available to him in legal and other illegal activities.

$$O_j = O_j(p_j , f_j , u_j)$$

If the agent's choice is made under uncertainty, then the utility expected from committing a crime is defined as:

$$EU_j = p_j U_j(Y_j - f_j) + (1 - p_j)U_j(Y_j)$$

where Y_j is benefit, monetary and mental, from committing a crime. Furthermore, expected utility is also determined by the probability of success $(1 - p_j)$ and by the monetary value of the punishment (f_j). The supply of crime is decreasing in p and f. Becker states that the main contribution of his work "is to demonstrate that optimal policies to combat illegal behavior are part of an optimal allocation of resources", hence "optimal decisions are interpreted to mean decisions that minimize the social loss in income from offenses." Becker defines the social loss function from offenses as:

$$L = D(O) + C(p, O) + bf\,pO$$

where D is damage from crime, C cost of apprehension and conviction, and bf pO is the total social loss from punishments. The variable b is use to transform f into f prime. The size of b varies with the type of punishment: it is close to 0 for fines, greater than one and especially large for imprisonment and close to unity for parole. Social policy variables are represented by p (probability of arrest) and f (punishment). Minimizing with respect to p and f Becker obtains important implications on agents' propensity toward risk. Crime reduction can occur through reducing the benefits of crime or raising the probability of being caught or the costs of being caught.

The conclusions focus primarily on society's influence over the criminal decision. The probability of being apprehended and the severity of the punishment can be manipulated to affect the criminal's decision with optimal levels of enforcement and optimal levels of punishment reducing crime. Becker does note, "a rise in the income available in legal activities or an increase in law-abidingness due, say, to 'education' would reduce the incentive to enter illegal activities and thus reduce the number of offenses."

The fourth, fifth and sixth factors mentioned above (initial wealth/demographic characteristics; expected return to the legal labor market; and expected returns to crime) are further explored in current theoretical models. These factors are usually viewed as interconnected and as having an effect on one another. For example, decades ago low income or low wealth individuals were theorized to face a lower opportunity cost of crime. Belton Fleisher was another early researcher of the role of income on the criminal decision, and he stated that "the principal theoretical reason for believing that low income

increases the tendency to commit crime is that it raises the relative cost of engaging in legitimate activity" and that "the probable cost of getting caught is relatively low, since they (low-income individuals) view their legitimate lifetime earning prospects dismally they may expect to lose relatively little earning potential by acquiring criminal records." Fleisher continues, "furthermore, if legitimate earnings are low, the opportunity cost of time actually spent in delinquent activity, or in jail, is also low" (Fleisher, 1966). However, the level of legal income expected by an individual is not the only relevant income factor he cited; the income level of potential victims also matters. Higher levels of income of the potential victims result in higher incentives for the criminal to commit crimes, especially crimes against property. Thus, according to Fleisher, average income has two conceptual influences on delinquency that operate in opposite directions, although they are not necessarily equal in strength.

Researchers continued utility maximization models along this line of reasoning including returns to crime and returns to legal activities with age, education, and income and employment for several decades. The models generally illustrated that as factors such as age, income, and education increased, the returns to crime decreased, or the returns were sufficiently offset by increases in the returns to legal work (Chiu, 1998; Grogger, 1998; Uggen 2000). Models also show unemployment levels have a positive relationship to crime (Ehrlich, 1973; Freeman, 1996; Gould, 2002; Meyers, 1983). Lochner (1999) concluded that the factors that influence the criminal decision process suggest that studying crime within a human capital framework may be useful.

The works discussed support the idea that increased levels of education and training should raise the returns to legal activities. This assumption is derived from thoroughly documented human capital theory. Since much of the literature on the economics of crime incorporates ideas of human capital theory with the probability of arrest and punishment ideas, the related details of human capital theory should be clarified.

II.B: Human Capital Theory

Today's probability of arrest or incarceration may not be a strong enough deterrent factor for many criminals, as evident by the high incarceration and recidivism rates in the country. However, arguments to the merits, costs, or feasibility of increasing the likelihood of arrest or severity of punishment are best theorized by the criminal justice researchers. The focus in this paper remains on economic arguments.

The economic aspects of the crime literature illustrate that the criminal decision process can be viewed as a maximization decision. The typical low-skilled, young, unemployed agent faces a decision as to how to spend his time. If he theoretically faces low opportunity cost to crime, there are few competing opportunities for his time and the returns to crime are better than other alternatives. Raising the opportunity costs associated with crime could be achieved through raising the returns to the alternatives. If human capital theory is correct, an investment in education or job training would accomplish this. Theory suggests that for some agents the opportunity cost of incarceration is not large enough to represent a significant penalty. Some people may face economic hardships outside of prison that deter positive civic behavior. The

relatively low economic cost of 'room and board' in a prison facility may be attractive to some people. Thus the argument herein is that, for these individuals, the costs of incarceration must be offset by lower costs to freedom.

Again, the means to increase the returns to non-prison environments may be increasing the inmate's human capital. If, through human capital acquisition, the post incarceration experience results in greater economic reward, the criminal decision may be different and the recidivism rates for inmates who participate in programs that increase human capital should decline. The benefits of legal activity could now be larger than the benefits of illegal activity or incarceration. If one option becomes more rewarding, then a shift to that option may be observed. Under this theory, crime is assumed to be an income-generating mechanism where crime is used to replace income generated from legal means. This theory does not entirely ignore violent crime in that legal employment should raise the opportunity cost of incarceration thru the loss of earnings and human capital from employment and this should affect the choice process.

Research in the human capital decision process has consistently illustrated that an increase in training and education will increase an individual's lifetime earnings relative to individuals with less education, training or experience (Bjorklund, 2002). The costs in foregone time and wages during the acquisition period are illustrated to be more than offset by the future benefits of higher human capital levels. Researchers attribute this to the result of skills or knowledge gained. Along with this, most researchers acknowledge a possible screening effect of human capital acquisition that manifests in a firm's hiring process where the previous job or education signals the ability to operate in the

employment environment (Stiglitz, 1975). Regardless of the source, a consistent positive rate of return to education has been found in the literature since the first application of wage regression models by Jacob Mincer in 1958. In a meta-analysis of 43 studies of the relationship between earnings and education, Leslie and Brinkman (1988) estimate the mean rate of return to completing an undergraduate education at approximately 12.4%. Psacharopoulos (2004) estimated that in the late 1990's the returns were approximately 10%. These estimates are typical of most studies, which range from 8% to 16%, and represent the returns to higher education in the form of higher earnings.

While the individual is the direct beneficiary through higher wages, there is research that illustrates positive societal externalities from increased levels of education. These externalities include a more productive work force, a more civic minded society, and a reduction in crime (Hammer, 1996; Usher, 1997). Studies acknowledging the wider array of education's benefits claim that traditional estimates examined considerably underestimate the true returns and that the actual rate is quite possibly twice the standard estimate (Dee 2004; Wolfe, 2001).

The conclusions drawn in the literature documenting the positive effects of human capital acquisition can be extended to the criminal decision process. Lochner (1999) suggests that the human capital approach recognizes that education and training increase human capital levels and market wage rates, which raise the costs of planning and engaging in crime. Human capital investments also increase the costs associated with incarceration, since they increase the value of any foregone time. He cautions, however,

that crimes that reward skill, such as white-collar crimes, may result in increased returns to human capital acquisition and not experience the typical relationships.

The prison environment presents some interesting challenges in that the choice process being examined is not entirely free and of the prisoner's control. Therefore, not all prisoners are expected to benefit from participation. The usual human capital question of whether the agent has enough working lifetime remaining to recoup the investment in human capital now becomes the question of: when the inmate is released will there be time to use the increased skills?

The decision for the prisoner is also different from the typical agent in that he does not have to give up the same time or wages to acquire new skills. His alternative is time in his cell without earnings. This low opportunity cost of participation should increase the participation rates. An underlying assumption here is that economic agents will make decisions that will lead to the maximization of their utility. Do prisoners act rationally and have the same views of work and leisure as non prisoners? As the answer to this question may not be clear, one of the levels of analysis to follow includes an attempt to capture only 'economically motivated' criminals or at least those criminals who have committed economic crimes and therefore may be more likely to follow the traditional utility maximization assumptions.

The PIE program provides and ideal medium to extend human capital theory into prison settings, providing a theoretical link for reduced recidivism through education and training. This human capital theory link that translates participation in education and training activities into individual and societal benefits has been well examined in non-

prison environments and may be shown to extend past the typical training and education environments into the prison environment. This potential increase in human capital then addresses a key element of the economics of crime models where criminals are theorized to exhibit utility maximizing behavior evaluating the returns to legal and criminal opportunities.

Theory suggests a mechanism where prison work programs can be an effective tool in reducing inmate recidivism. These work programs, depending on the design, also have the potential benefit of reducing the costs associated with inmate incarceration. The proceeds from the inmate's labor can be used to reduce, or possibly eliminate, the incarceration expenditure. This is not a new concept as prisons were historically financially self-reliant.

III. HISTORICAL AND CURRENT PERSPECTIVES ON INMATE LABOR

This section details the history of the use of inmate labor in the United States. Also, the existing body of literature regarding inmate recidivism and the effect of labor programs on recidivism is reviewed. This framework is essential to understand the development of the PIE labor program and its potential.

III.A: The History of Inmate Labor in the United States

The use of American prison labor is claimed to originate in 1790 when the Walnut Street Jail in Philadelphia first contracted its prisoners to private business for profitable production (Barnes, 1943). This policy was quickly copied and, historically, prison labor was used to finance the costs of incarceration in the American penal system. In 1797 the Newgate prison opened in New York City and paid nearly all of its expenses during the first five years from production within the prison. The prison was self-sufficient, requiring no money from taxpayers, and aiding in the rehabilitation of the inmates. By 1825, this model was common and the New York Legislature stipulated that the duty of prison agents was to ensure that all expenses were to be supported wholly, or as nearly as possible, by the labor of prisoners (Morris, 1995).

During this period many craftsmen and businessmen opposed public and private enterprises that used prisoners because of the seemingly unfair competition the prison products created. The artisans were concerned with competition from ex-prisoners who had learned the trade while incarcerated. They purposely made it difficult for ex-convicts to obtain jobs (Lewis, 1965). These businessmen exerted great pressure on legislatures to pass restrictive laws on prison labor and prison industry, arguing that prisoners were

taking the means of income from local communities (Walker, 1988). However, taxpayers argued such laws would create a need to tax farmers, merchants, and professionals to fund the operation of the state prisons (Lewis, 1965). Despite the cries of an impending unnecessary and unfavorable tax burden, the New York Legislature in 1835 passed legislation limiting prison enterprises to areas that did not compete with domestic labor. The 1842 New York Legislature further limited employment of convicts to trades the prisoner had previously learned and practiced prior to conviction. This evolving public attitude toward the infringement of prison labor on local markets and the question of how to protect free labor from low cost prison labor was a precursor to the current debate.

As unions gained political strength in the latter half of the nineteenth century, opposition to prison labor grew. In 1887, the United States Congress did outlaw the leasing of federal convicts to farmers and entrepreneurs; however, it did not pass legislation that restricted interstate trade in goods from prison production at that time (Morris, 1995). Consequently, states that depended heavily on the revenue from prisoner leasing refused to house federal prisoners. As a result of this legislation Congress was forced to establish the federal prison system in 1891. Despite these actions, 85% of prisoners still worked in 1900.

The first significant federal legislation limiting state use of prisoners came in 1929 with the Hawes-Cooper Act. It mandated that prison-made goods transported from one state to another be subject to the laws of the destination state and effectively allowed states to ban the sale of prisoner-made goods within the state (Pencavel, 1986). At the

federal level, the Federal Prison Industries Incorporated (UNICOR)[2] was created in 1934. UNICOR, which employs federal prison labor to produce goods for sale only to federal agencies, was designed for rehabilitation, not profit. Eight of the ten legislative mandates are public policy oriented. The mandates were to: employ the greatest number of prisoners reasonably possible; concentrate on labor intensive manufacturing; diversify industries so that no private industry faces undue competition; diversify products so sales are widely dispersed; minimize competition with private industry and free labor; limit market share for any specific product; sell products to federal and other government institutions; provide opportunity for prisoners to learn skills useful in the free market; sell products at no more than the current market prices; and operate in a self-sustaining economic manner (Schwalb, 1994).

In 1935, Congress further restricted prison labor with the Ashurst-Sumners Act making shipping prisoner-made goods to a state where state law prohibited the receipt, possession, sale or use of such goods a federal offense. This effectively ended the industrial prison era by banning interstate commerce in prison made goods. The Walsh-Healy Act of 1936 banned convict labor on federal procurement contracts in the manufacturing, production, or furnishing of any materials, supplies, articles or equipment used in government contracts where the amount of the contract exceeds $10,000. In 1940, Congress added further restrictions with the Sumners-Ashurst Act that declared it a federal crime to knowingly transport convict-made goods in interstate commerce for private uses, regardless of the laws in the states (Orlando, 1967). These actions, along

[2] UNICOR is the trade name for Federal Prison Industries, Inc.

with a shift in the focus of corrections from rehabilitation through work to rehabilitation through counseling and education, led to further reductions in prison industries.

By the early and middle 1970's, the effectiveness of rehabilitation counseling was concluded to be limited. Researchers and prison administrators were beginning to abandon hopes of finding successful rehabilitation methods, and the still prevailing warehousing mentality emerged. A U.S. Department of Justice funded study by a National Academy of Sciences' Panel (Sechrest, et al, 1979) was conducted to review what was known about effective criminal rehabilitation methods. The Panel concluded "the entire body of research appears to justify only the conclusion that we do not know of any program or method of rehabilitation that could be guaranteed to reduce the criminal activity of released offenders." Further conclusions stated, "although a general reviewer of the literature might discern glimmers of hope, those hopes are so few, so scattered, and so inconsistent that they do not serve as a basis for any recommendation other than continued research."

While some abandoned the rehabilitation effort, others searched for new ideas and programs to reduce criminal behavior. With increasing prison populations and prison violence resulting in increasing costs of incarceration, a renewed interest in employing prisoners emerged. Prisoners could obtain marketable skills for their post-prison experience and incarceration costs could be mitigated through a return to historically effective prison labor programs. Ultimately, Congress relaxed its stance on prison labor in 1979 with the Percy Amendment to the Justice Improvement Act which created the Prison Industry Enhancement Certification program (PIE) in seven states. PIE was

expanded by Congress in 1984 and 1990 to cover all 50 states. During the past twenty years, more than thirty states have enacted laws permitting the use of convict labor by private enterprises and initiated participation in the PIE program.

III.B: Prison Labor and the PIE Program

The PIE program involves private entrepreneurs and the federal and state governments working cooperatively in prison-based joint ventures. The program provides private industries access to the growing prison population and the government access to private industry's revenues. The program faced initial criticism with questions about the overall effects of this program on the nation's GDP, society as a whole, and the low-skilled portion of the U.S. labor force's wages. Since the demographic profile of prisoners in terms of age, gender, education, and race of the typical prisoner is similar to the typical low-skilled portion of the U.S. labor force, some were concerned that these programs may cannibalize some of those low-skilled jobs. Others argued that these jobs would otherwise have been moved offshore. Consequently, several conditions must be met in the participating firm's application process—the sale of inmate-made products in the open market, certification that equivalent wages to private employment in a similar labor market with comparable benefits are provided, certification that there is no private sector worker displacement, a condition of voluntary participation in accordance with EEOC hiring guidelines, consultation with organized labor and local private industry, and compliance with environmental policy (U.S. Department of Justice, 2004).

The program exists to encourage states and units of local government to establish employment opportunities for inmates that approximate private-sector work opportunities. And, the program is designed to place inmates in a realistic work environment, pay them the prevailing local wage for similar work, and enable them to acquire marketable skills to increase their potential for successful rehabilitation and meaningful employment upon release (U.S. Department of Justice, 2004). There are two primary objectives of this program: (1) inmate production that contributes to society, offsets incarceration costs, compensates crime victims and supports inmate families, and (2) success in the community once the inmate is released. The success of the program in meeting these objectives is assessed empirically later in this paper through an exploration of the net returns to the program and the participants' recidivism rates.

It should be reiterated that even without a reduction in recidivism, the program effectively reduces the cost of incarcerating inmates by charging them for their room and board. Thus the state receives the major benefit of reduced incarceration costs for PIE participants. Also, if the program reduces recidivism, the state benefits from a reduction in future expenditures on enforcement, prosecution and incarceration. The states could see a welfare savings as well since the participants are paying child support (when required) and victims' compensation. The participants are also being taxed on their wages which is a further benefit to the state. Overall, the PIE program appears to be a positive addition the states' penal systems.

To accomplish these goals, PIE relocates manufacturing operations into prisons. Some operations receive tax breaks or location subsidies, which, along with a stable work force, encourage the move into the prison. Prisoners are employed on a voluntary basis and paid market wages, which are often equivalent to the legal minimum wage. The theory is that these jobs are unfilled in the private sector.

While the deductions vary by state, the prisoners are generally expected to pay for their room and board, victims' compensation, child support, and other expenses. This is a unique and very important characteristic of the PIE program. The inmates' wages are used to offset the cost of their incarceration and to make restitution. After deductions, the net earnings accrue to the prisoner. While the legislation only mandates that 20% of the prisoner's earnings go to the prisoner, research indicates that 43-47% of wages are paid to the inmate (Petersik, 2003). The Prison Industry Enhancement Certification Program's accounting lists nearly $403 million in gross wages paid to inmates from the program's inception in 1979 through the 4th quarter of 2006. In the average program 30–33% of inmate wages go to state households and business taxpayers through an offset of room and board costs, 11% go to Social Security and Medicare systems[3], 8% to victims of crime, 4% to federal taxpayers, 3% to unemployment and workers compensation, and 2% to inmates' children (Petersik, 2003).

[3] The 11% Social Security and Medicare estimate is less than the expected 15.3% (7.65% employee plus 7.65%) because the PIE inmates are considered working for state-owned entities and thus not obliged to pay Social Security taxes, though many do.

Some insight into the post-prison success, or lowered recidivism rates, may come from observations from the pre-incarceration and incarceration periods. At time of their incarceration, an estimated one-third of U.S. inmates are unemployed due to low skill and education levels and low wage prospects. (Maguire, 1996) PIE jobs provide prisoners with wages higher than traditional prison work (e.g. cafeteria, laundry, library jobs). The PIE training often results in obtaining higher wage jobs after the prisoner's release. These employment and wage observations lend themselves to human capital theory questions for criminals, as well as the current economics of crime theories.

III.C: Current Recidivism Literature

In 1999 the National Symposium on the Economics of Inmate Labor Force Participation was held at The George Washington University. This symposium's main topics and findings are reviewed and examined in Will's (1999) "The Devil Is in the Details: National Symposium on the Economics of Inmate Labor Force Participation." Most of the conference papers presented recognized the shortcomings of the existing work examining the economic impact of prison labor and industries. Jeffrey Kling and Alan Krueger (1999) discuss the effects of inmate labor on national output, the potential wage effects on the low-skilled work force, and the societal benefits that manifest through reduced recidivism. Kling and Krueger specifically address the lack of recidivism studies and conclude that further studies of the effect of inmate labor on recidivism should be a high priority for researchers. Steven Levitt (1999) also participated in the symposium and likewise concluded, "it is surprising that so little research has been devoted to this important [recidivism and prison labor] question."

The topic has seen an increased level of research since this symposium, although many of the issues raised remain unexplored. The research that does exist falls broadly into three categories: summary information, post-release assistance, and pre-release programs. The first is a general approach that simply evaluates recidivism rates across categories as seen in many state, federal, and criminal justice publications. With no action taken to change these rates, they are expected to remain relatively constant. The second category explores the effects of attempts to reduce recidivism rates through post-incarceration intervention such as half-way houses or employment assistance. The third category also explores attempts to reduce recidivism. The focus in this category is intervention during the incarceration period, primarily through education or training programs. Finally, there is sparse literature focusing on the PIE program.

In the first category, the focus of much of the literature on recidivism concentrates on the demographic, time, and release condition characteristics and their associated recidivism rates. Many of the studies (Florida Department of Corrections, 2003; Gendreau, 1996; Langan, 2002; U.S. Department of Justice, 2004) show the most predictive characteristics of inmate recidivism to be age, education, race, prior arrests and drug and/or alcohol involvement. In 1997 the Tennessee Bureau of Investigation's Statistical Analysis Center examined recidivism rates in the state by age, gender, race, type of crime and type of release. The report presented a summary of recommitment rates given inmate characteristics but did not control for the effects of other variables through multivariate regression and consequently lacks a conclusion of causality or even correlation. This is a consistent problem throughout the state and federal studies.

In general, recidivism reports from the Tennessee Department of corrections focus on recidivism by release conditions. The three-year failure rates for all felons averaged 42- 45% with parole and probation recommitment rates as high as 56% and expired sentence recommitment rates as high as 27%. Adding re-arrest rates puts estimates as high as 67.4% (Tennessee Department of Corrections, 2001, 2005). Most other state-level reports have similar rates for one, two, and three years across the same categories, and these time and demographic categories are the reporting standards (U.S. Department of Justice, 2005).

A report comparing two studies by the U.S. Department of Justice comes closest to providing "national" recidivism rates for the United States. One tracked 108,580 state prisoners released from prison in 11 states in 1983. The other tracked 272,111 prisoners released from prison in 15 states in 1994, and comparisons of the studies were made to illustrate trends in recidivism (U.S. Department of Justice, 2002). This U.S. Department of Justice report cites the most important numbers as the three-year rates. The study shows that 67.5% of prisoners released in 1994 were re-arrested within three years, an increase over the 62.5% found for those released in 1983. The re-arrest rate for property offenders, drug offenders, and public-order offenders increased significantly from 1983 to 1994. During that time, the re-arrest rate increased from 68.1% to 73.8% for property offenders, from 50.4% to 66.7% for drug offenders, and from 54.6% to 62.2% for public-order offenders. The re-arrest rate for violent offenders remained relatively stable (59.6% in 1983 compared to 61.7% in 1994).

Re-conviction rates may more accurately portray the recidivism issue than do re-arrests, as those who were re-arrested were not necessarily re-convicted and therefore do not have the associated costs of long-term incarceration. Re-conviction implies that the individual has been returned to a facility for either a new crime or a violation of the terms of the initial release. The findings illustrate that, overall, re-conviction rates did not change significantly from 1983 to 1994. Among prisoners released in 1983, 46.8% were reconvicted within three years compared to 46.9% among those released in 1994. From 1983 to 1994, re-conviction rates remained stable for released: violent offenders (41.9% and 39.9%, respectively), property offenders (53.0% and 53.4%), and public-order offenders (41.5% and 42.0%). Among drug offenders, the rate of re-conviction increased significantly, going from 35.3% in 1983 to 47.0% in 1994. While these studies and reports give a broad view of recidivism rates, they fail to provide significant insight as to the causes of recidivism.

The literature in the second category, post-release assistance, indicates fairly consistent results on employment outcomes for offenders. Holzer, Raphael and Stoll (2003) found that ex-offenders face significant barriers in the labor market, such as lack of skills, limited work experience, substance abuse issues, and other health-related problems. They point out that since most skills are not directly observable at the time of hiring, employers look for certain credentials to signal employability and avoid those with certain stigmas. These claims are supported in may other studies (Marks, 1986; Uggen, 2000; Westen, 2002). Additionally, many states limit employment for ex-offenders in certain areas: professional fields, public employment and in health care

fields. Compounding these issues is the fact that ex-offenders receive little transition assistance from the incarcerating agency.

Until the early 1990's, the majority of ex-offender employment programs were run buy local nonprofit organizations (Buck, 2000). Subsequently, there was a resurgence of government interest in ex-offender programs. There were two federal programs created in the middle 1990's. As a result of the Violent Crime Control and Law Enforcement Act of 1994, the Office of Correctional Job Training and Placement (OCJTP) was created to coordinate efforts of federal agencies and others to improve outcomes for offenders. In 1996, the Federal Bureau of Prisons launched the Inmate Placement Program Branch, which has focused on holding mock job fairs in prisons, posting job openings in prisons, establishing employment resource centers in prisons to help prepare resumes and job applications, providing job-search and job-retention skills, developing portfolios of documents relevant for employment, and serving as a clearing house for information and technical assistance for other inmate employment programs.

Many state initiatives followed with the stated goal of reducing recidivism, in an attempt to curtail the costs of incarceration (Buck, 2000). However, there is a lack of consensus in the primary goal of ex-offender employment assistance programs. Some programs have the stated goal of reducing recidivism and use employment as the primary vehicle for decreasing criminal activity. These programs typically have additional components to help address a larger variety of issues such as substance abuse and character development, rather than focusing solely on employment. Other programs focus only on finding employment. They operate on the premise that finding

employment probably contributes to reduced recidivism and that that there are other influences, such as substance abuse and personal issues, which could lead to a return to crime, but they do not believe that employment programs should be held accountable for these issues (Bushway, 2003).

Regardless of the goal of the employment assistance programs, the consensus in the literature is that they are necessary and effective. They help the ex-offender overcome barriers to employment and provide an alternative to criminal activity for income. The research also shows that post-prison employment does, in many instances, effectively reduce recidivism (Wilson, 2001).

The third category, pre-release programs, is also ultimately directed at increasing post-incarceration employment opportunities and involves research that is dedicated specifically to an examination of the effects of vocational and educational prison programs during incarceration. Martinez and Eisenberg (2000) found in a Texas Department of Corrections (DOC) study that the unemployment rate for people who had been incarcerated was nearly 30% versus the state average of 4.8%. However, many studies conclude that offenders who participate in prison industries, work release programs, or education programs have lower unemployment rates than their counterparts (Bushway 2003; Harer, 1995; Saylor, 1997; Wilson, 1999).

Often these increases in employment translate into reduced recidivism rates. A study evaluating returns to educational programs in Maryland, Minnesota, and Ohio (Steurer et al, 2001) finds a 29% reduction in the likelihood of re-incarceration if the inmate attended school while behind bars. Given budget expenditures on incarceration in

Maryland and the savings from reduced expenditures, the study illustrated that education programs returned two dollars for every dollar spent. Some research suggests that prison-work programs are not effective. Maguire et al. (1988) find the effect of working in prison (in a non-PIE program) is small and not significant. In Wilson's (2001) meta-analysis of prison based education, vocational, and work programs there was a finding of "strong support for the claim that participants in corrections-based programs recidivate at a lower rate than non-participants." However, this study also concluded that the current level of research was not sufficient to determine which programs were most effective.

Lastly, there is scarce independent research focused on PIE programs and their labor opportunities, but a few state and academic-sponsored studies have been conducted. Within this area an Ohio Department of Rehabilitation and Correction (1995) report estimates an 18% reduction in recidivism rates for participants in the Ohio Penal Industries (OPI) programs along with higher employment rates. However, this study included all OPI workers. Some were in PIE programs and others were not. Therefore, while it can be inferred that the PIE participants experienced a reduction in recidivism, the exact level cannot be examined.

Drake (2003) finds that within the Washington state correctional system, inmates who participate in these private sector business opportunities recidivated at a 17% lower rate than their counterparts. The study was only conducted for PIE participants from 1992-1996. The United States Department of Justice's National Institute of Justice (NIJ) division 2006 publication implements a five state PIE program comparison found that inmates who participated in the program were found to be significantly more successful

in post-release employment with 55% of PIE participants employed within the first quarter of release versus only 40% of non-participants. Also, the participants were more likely to sustain employment than non-participants over one-year and three-year periods. Again, previous studies have linked employment with reduced recidivism and the NIJ study confirms the link for PIE participants.

III.D: Conclusions from the Literature

Only a few of the 36 state PIE programs have been empirically evaluated. Also, the results from the existing studies vary in size and significance which makes any consensus conclusions difficult to derive. Further, there have been no national evaluations for this federally legislated program and program funding continues without regard to the results. Examining more states leads the literature closer to a national conclusion on PIE effectiveness. This paper will contribute to closing this gap by empirically examining the effectiveness of the PIE programs in Indiana and in Tennessee. These two states have similar sizes and characteristics in their prison populations. Both have PIE programs added in the early 1990's. The similarities in the data sets offer a method to confirm one state's results relative to another with rigorous empiricism which is missing from other studies.

The step forward in this paper is the use of a series of multiple regression models. The lack of multiple regression analysis in the state and federal publications leaves questions about the true effects of the variables and prevents any assessment of causality. Multiple regression analysis is well suited for this type of study and will hold the effects of the other influences constant while exploring PIE participation.

Another major addition to the existing literature is the focus on endogeneity. Measurement error, simultaneity, and omitted variable bias are not effectively addressed in previous works. The potential for omitted variable bias is a major concern when using observational data to determine treatment effects. The field of economics is on the forefront of developing methods to control for these outside factors. The instrumental variable technique employed in this study will provide a more accurate picture of the effects of the PIE program.

IV. EMPIRICAL EFFECTS OF PIE PARTICIPATION ON INMATE RECIDIVISM

This section empirically explores the hypothesized effects of inmate participation in the PIE program. An examination of the data used in this study details the background of the data set and the characteristics of the inmates. Contingency tables offer an initial look at the potential effects of the explanatory variables. Multivariate regression techniques and methods for controlling for biases are introduced to improve the rigor of the analysis. The results of the empirical work are examined to determine the effectiveness of the PIE program in reducing inmate recidivism.

IV.A: Hypothesized Effect

The purpose of this section is to explore recidivism empirically by isolating the effects of participation in the PIE labor program. While the program is known to reduce the costs associated with incarceration through inmate room and board charges, the specific effect of the program on the participating inmate's recidivism is also important to know for future policy decisions. If this cost saving program is effective in reducing recidivism, expanding the program could have widespread benefits. If the program is not found to be effective, then resources might be best directed elsewhere, although there would still be the benefit of the reduced cost of inmate incarceration through wage deductions.

From the implications of the human capital theory and the economics of crime theory discussed in Section II, the primary hypothesis is that participation in the PIE program reduces participants' recidivism rates relative to that of their non-participant counterparts. This is explored in the following section.

IV.B: Data and Variables

The data used in this study were obtained from the Indiana and Tennessee Departments of Corrections (DOC). The Indiana Department of Corrections maintains information about prisoners through their Offender Information System (OIS) database. The data from Indiana's DOC was merged with data from the Prison Enterprises Network (PEN Products), the Indiana DOC's labor division that operates the state's PIE program. These sets were merged using the DOC's unique prisoner identification numbers. The identification numbers provide an anonymous common reference for data management. The Tennessee Offender Management Information System (TOMIS) is the comprehensive data system in which the Tennessee DOC manages information about persons who have been or currently are under the Department's jurisdiction. These data are merged with data from the Tennessee Rehabilitative Initiative in Correction (TRICOR) which operates the certified Tennessee PIE program.

The Indiana data set provides information about inmates released from 1997 through 2004. The information on the prisoners consists of demographic characteristics and incarceration history including age, gender, race, educational background, marital status, offense type, sentence, infraction data, facility where incarcerated, subsequent incarcerations, and information on PIE program participation. These data serve as the basis for the analysis in the following sections. The Tennessee data are similar to the Indiana data in content and time frame. Both sets are discussed in more detail in subsequent sections.

Some measurement error in a recidivism study is expected due to ex-inmate mobility. That is the potential for the inmate to be released from Indiana or Tennessee and commit a crime in another state. There is a question as to how this would affect the recidivism estimate since only returns to the jurisdiction of the state that released the inmate are calculated. The concern is that the recidivism estimate may underestimate the true figure. However, the expectation is that the bias would manifest equally across all demographic groups and characteristics. A report by the U.S. Department of Justice (2002) examining national recidivism rates from 1994 concludes that 3.7% of released inmates who were re-arrested (not necessarily re-committed, which is a smaller portion) were re-arrested in another state. Whether they returned to the original state's system would depend on the conditions of the inmate's release and the nature of the crime in the new state.

IV.B.1: Indiana

The data provided by the Indiana DOC includes observations on 60,078 state inmates released from 1997 through 2004. The 2000 U.S. Department of Justice estimate cited earlier in this paper estimates approximately 1,600 prisoners a day being released in the United States. The Indiana total is in line with what would be expected during this time frame[4]. The data regarding PIE labor program participation information from PEN Products were merged into this set. Each inmate is assigned a unique identification number by the DOC. This number eliminates personally-identifiable information about

[4] 60,078 over eight years is approximately 20 inmates released per day. The U.S. estimate of 1,600 per day divided by 50 states is approximately 32 inmates per day.

the inmate that is unnecessary for this study. This identification number is used for all incarceration events, past, present, and future. Some recorded release events were to other prison facilities. These between-facilities release observations, as well as observations that are missing important demographic, classification, or work information, are excluded, reducing the sample. The remaining 48,429 observations are available depending on which cohort or specification of the model is being examined. Summary information on the prisoners released from Indiana's prisons during the aforementioned period is presented in IV.B Table 1. The full non-PIE sample excludes the PIE participants. The employed sample contains all inmates who earned a wage from any employment (e.g. laundry, cafeteria or custodial jobs) while incarcerated, and the PIE columns are the PIE participants only.

IV.B. Table 1. Summary Statistics: Indiana Inmates Released Between 1997-2004.

	Full Sample		Full Non-PIE		Employed: Non-PIE		PIE	
Variable	**Mean**	**(SD)**	**Mean**	**(SD)**	**Mean**	**(SD)**	**Mean**	**(SD)**
Age	31.880	(9.012)	31.857	(8.960)	32.625	(8.817)	32.987	(8.023)
Education Level	10.776	(2.219)	10.769	(2.215)	10.757	(2.222)	11.013	(2.340)
Male	0.903	(0.295)	0.902	(0.296)	0.887	(0.307)	0.926	(0.262)
Married	0.180	(0.384)	0.179	(0.384)	0.192	(0.398)	0.201	(0.402)
White	0.592	(0.391)	0.593	(0.392)	0.564	(0.390)	0.536	(0.399)
Recidivism	0.444	(0.352)	0.445	(0.352)	0.438	(0.344)	0.391	(0.325)
Prior Prison	0.611	(0.407)	0.612	(0.409)	0.618	(0.420)	0.592	(0.414)
Program Participation	0.023	(0.163)	0.000	n/a	0.000	n/a	1.000	n/a
Time Served	5.077	(5.997)	4.993	(5.934)	5.588	(6.236)	7.210	(6.874)
Maximum Sentence	9.554	(10.508)	9.485	(10.268)	10.115	(10.916)	12.880	(11.541)
Economic Crime	0.572	(0.469)	0.569	(0.468)	0.599	(0.473)	0.610	(0.477)
Security Level	2.095	(0.765)	2.092	(0.766)	2.067	(0.758)	2.230	(0.615)
# of Observations	48,429	n/a	47,312	n/a	11,622	n/a	1,117	n/a

The age variable is the prisoner's age at the time of release. The average age for the full sample released Indiana inmate is 31.88. This estimate is similar to the 1998 report from the U.S. Department of Justice, *Correctional Populations in the United States*, which outlines demographic information on national and state-specific populations in the time frame of this data set and reports that the average prisoner is in the age range of 30 to 34 years old.

The educational attainment statistics for all U.S. inmates (federal, state, and local) show that only 22.6% of inmates have a high school diploma and that 12.7% have some level of postsecondary education (U.S. Department of Justice, 2003). The summary statistics from the Indiana data set show the average inmate has less than a high school education with an average education level of 10.77 years.

Gender is captured using a dummy variable. Male inmate observations are set equal to one and female to zero. The table shows 90.3% of the released Indiana inmates are male. This is consistent with national reports. In 1998, the U.S. Department of Justice reports the national rate to be 92.5% and the Indiana-specific rate to be 92.7% male (U.S. Department of Justice, 1998). The marital status of the inmate is equal to one when married and zero if single, divorced, or widowed. The married inmate proportion is 18.0%, which is similar to the U.S. Department of Justice report that roughly 20% of inmates are married.

A race variable is set equal to one if white and zero if non-white. Examining the race variable, 59.2% of the inmates are white. The aforementioned report from the U.S. Department of Justice found 51.1% of the U.S. inmate population is white and 57.4% of

Indiana's inmate population is white. At this point it is noted, but not explored in terms of economic or social implications, that the U.S. Census Bureau estimates that approximately 20 to 30% (depending on the treatment of the Hispanic population) of the total U.S. population is reported as non-white. The overrepresentation of minority populations in prisons is a well documented issue and the variable will be controlled for in the analysis to follow.

An initial broad look at recidivism finds that 44.4% of the prisoners released during this period were re-committed. At this summary level, the time until re-commitment is not examined. Thus, early observations had up to seven years to be re-committed and the later observations may have had only a few months. As such, this is not the best measure of recidivism. The release and re-commitment dates will be used later to examine recidivism in one-, two-, and three-year periods. A Department of Justice estimate shows that of the 272,111 persons released from prisons in 15 states in 1994, an estimated 67.5% were re-arrested for a felony or serious misdemeanor within three years and 46.9% were reconvicted (U.S. Department of Justice, 2002). The Indiana data set is only capturing re-conviction and the 44.4% estimate is consistent with the U.S. Department of Justice study.

Prior convictions are noted in many recidivism studies as a strong predictor of recidivism. The prior prison statistic above illustrates that 61.1% of the inmates in the Indiana prison system had prior convictions. The U.S. Department of Justice (2002) estimates that nearly two-thirds of inmates have prior convictions.

The program participation variable includes inmates who have at least six months of employment in a PIE job. As the effects of participation are theorized to be attributable to the training effects in human capital theory, the inmates must have a time period for the training to occur. If an inmate had been employed for one day and was terminated, then no training effects would be expected and therefore this individual would not be considered a participant. Intensity measures for specific amounts of time in the program are calculated later in the empirical section and include inmates who have participated for less than six months. The program participation variable shows a 2.3% PIE participation rate. This number correctly illustrates that slightly over 1,200 of the released inmates had been employed in a PIE program while incarcerated.

Also included in the above table are summary statistics on the average sentence served by the prisoner and maximum length of sentence the released prisoner faced. These will be used in the empirical calculations to control for differences between inmates with relatively shorter or longer sentences. The average time served for an inmate was 5.07 years. The Department of Justice (2004) estimates the average sentence served is approximately 4.75 years.

The type of crime committed is included. One of the arguments presented in the economics of crime theory is that criminals who were economically motivated might see the most significant reduction in recidivism from participation in a training, education, or subsidy program. Also, there may be unobserved or unmeasured differences in the motivation or characteristics of economically motivated criminals versus violent criminals. Thus it is important to capture economic versus non-economic crime to

control for these potential differences. One potential area of concern here is classification. In the Indiana data set, zero equals "non-economic" crime and one is for "economic" crime. The number reported indicates that 57.2% of the criminals potentially had an economic motivation. Admittedly, it is impossible to know the underlying motivation of the criminal. Necessarily, this classification does involve some judgment as to what type of crime is economically motivated crime, and the potential for financial reward is the used as the key factor.

In categorizing crimes, the Department of Justice (2005) makes five distinctions and estimates the portion of criminals incarcerated on these charges (in parentheses):

1. Violent Offenses (51.8%) including murder (12.1%), manslaughter (1.4%), rape (4.9%), other sexual assault (7%), robbery (14.1%), assault (9.9%) and other violent crimes (2.5%).
2. Property Offenses (20.9%) including burglary (11%), larceny (3.9%), motor vehicle theft (1.6%), fraud (2.4%) and other property crimes (1.9%).
3. Drug Offenses (20.0%) these are not subdivided in this report.
4. Public-Order Offenses (6.9%) including drunken driving, court offenses, morals and decency charges, liquor law violations and other public-order offenses.
5. Other/Unspecified (0.5%) including juvenile and unspecified felonies.

The intention here is to make a distinction between economic and non-economic crimes to try to control for differences in criminal motivation or intent in the regression analysis. For the purpose of this study, all violent crime as defined above, except robbery, is categorized as non-economic. Thus, an estimate for potential economic crime would include: the 20.9% property offenses the 14.1% robbery (while robbery is considered violent, it is potentially economically motivated) plus approximately half of

the drug crimes (see below) plus the 0.5% Other/Unspecified. Or, potentially 45.5% of the crimes in the national average are economic crimes.

The economically motivated drug crimes that are included in this study from the Indiana data are convictions for manufacturing, dealing, or intending to distribute, which are arguably financially motivated. Broadly speaking, drug crimes persist and continue to escalate as a problem in the correctional system. With an increase of 37%, drug offenders represented the largest source of jail population growth between 1996 and 2002 with more than two-thirds of the growth in inmates held in local jails for drug law violations due to an increase in persons charged with drug trafficking (U.S. Dept. of Justice, 2004).

IV.B.2: Tennessee

The data provided by the Tennessee DOC are similar to that provided by the Indiana DOC. The Indiana data set is slightly larger than the Tennessee set, 60,078 versus 53,129 respectively. However, the Indiana prison population is approximately 8.25% larger than that in Tennessee according to the Department of Justice (1998). This is not unexpected given the United States Census state population estimate for this time period shows Indiana's population roughly 5.1% larger than Tennessee's.

The Tennessee DOC data set provides observations of prisoners released from state facilities, excluding local jails, between 1996 and 2006. The exclusion of local jails is an important note, and it is reiterated here that this study is only of inmates in prisons and the recidivism events for local jails are outside the scope of this research since the PIE program only operates in prisons.

The PIE inmate participants' data comes from TRICOR employment records. These data are merged with the Tennessee DOC data by the unique DOC assigned identification number so that personally identifiable information is not present. This number is consistent across all Tennessee inmate records and reports for all past, present and future dealings with the DOC. Summary statistics for the full sample as well as subsets follow in Table IV.B.2.

IV.B. Table 2. Summary Statistics: Tennessee Inmates Released Between 1996-2006.

	Full Sample		Full Non-PIE		Employed: Non-PIE		PIE	
Variable	**Mean**	**(SD)**	**Mean**	**(SD)**	**Mean**	**(SD)**	**Mean**	**(SD)**
Age	32.608	(8.752)	32.521	(8.681)	32.913	(8.992)	34.627	(6.924)
Education Level	11.013	(2.230)	11.009	(2.247)	11.107	(2.011)	11.580	(1.987)
Male	0.921	(0.213)	0.919	(0.228)	0.912	(0.294)	0.963	(0.251)
Married	0.202	(0.343)	0.199	(0.362)	0.211	(0.395)	0.225	(0.391)
White	0.546	(0.428)	0.549	(0.441)	0.533	(0.416)	0.517	(0.428)
Recidivism	0.422	(0.411)	0.425	(0.408)	0.414	(0.397)	0.388	(0.353)
Prior Prison	0.601	(0.452)	0.591	(0.429)	0.608	(0.468)	0.587	(0.442)
Program Participation	0.024	(0.154)	0.000	n/a	0.000	n/a	1.000	n/a
Time Served	5.170	(5.258)	5.167	(5.233)	5.772	(5.882)	6.946	(7.077)
Maximum Sentence	10.041	(11.017)	10.033	(11.011)	10.941	(11.437)	11.724	(12.166)
Economic Crime	0.539	(0.429)	0.536	(0.433)	0.566	(0.446)	0.593	(0.459)
Security Level	2.225	(0.814)	2.224	(0.828)	2.425	(0.810)	3.658	(0.483)
# of Observations	35,712	n/a	34,854	n/a	9,595	n/a	858	n/a

The Tennessee data are formatted and defined in the same manner as the Indiana data. There are 35,712 observations available for analysis, depending on which cohort or specification of the model is being examined. The full non-PIE sample excludes the PIE participants, the employed sample contains all inmates who earned a wage from any employment while incarcerated, and the PIE columns are the PIE participants only.

The age variable in the full sample is, as before, the prisoner's age at the time of release. The average age is 32.60 years. This estimate is consistent with the aforementioned 1998 report from the U.S. Department of Justice, *Correctional Populations in the United States*, which reports that the average prisoner is in the age range of 30 to 34 years old.

Further, the mean education level in Tennessee is 11.01 years. This is consistent with both the national averages and with Indiana's prison population discussed in the previous section. The table shows 92.1% of the released criminals were male. The inmates' marital status is also examined. The table indicates that 20.2% of the inmates were married. The gender and marital statistics are both consistent with national and Indiana estimates.

A race variable is set equal to one if they are white and zero if non-white. Examining this variable, 54.6% of the Tennessee inmates were white. The aforementioned report from the U.S. Department of Justice found 51.1% of the U.S. inmate population is white and estimated that 53.8% of Tennessee's inmates are white.

Recidivism is again defined as a return to incarceration in a state facility due to a new conviction, revocation of parole, or court ordered return. Tennessee's overall recidivism rate shows that 42.2% of the prisoners released during this period were re-committed. This rate is consistent with the Department of Justice estimate illustrating that of the 272,111 persons released from prisons in 15 states in 1994, an estimated 67.5% were re-arrested for a felony or serious misdemeanor within 3 years and 46.9% were reconvicted (U.S. Department of Justice, 2002).

The program participation variable shows a 2.4% PIE participation rate. This number is similar to the Indiana rate. Indiana has more total participants. However, Indiana also has a larger PIE program and a larger prison population and has more released inmates per year than does Tennessee. Also included in the table are summary statistics on the average sentence served by the prisoner and maximum length of sentence the released prisoner faced. The average time served for an inmate was 5.17 years. The Department of Justice (2004) estimates the average sentence served is approximately 4.75 years.

As detailed in the preceding section, the type of crime variable is an indication of the motivation behind the original crime. Crimes that are potentially financially motivated are assumed to be economic crimes. In the Tennessee data set, zero equals "non-economic" crime and one is for "economic" crime. Thus, the number reported indicates that 53.9% of the criminals in Tennessee potentially had an economic motivation. As before, the primary criterion for an economically motivated crime is the potential for financial gain.

While the summary statistics for the full sample in Indiana and Tennessee are consistent with national averages, the mean characteristics of the PIE participants are observed to be different than those of the non-participants. This observation will be revisited in the following empirical section when endogeneity is addressed.

IV.C: Empirical Examination

The methodology for recidivism studies is, as in many cases, of some debate. As discussed in the literature review section, several techniques have been employed in an attempt to examine this issue. Steven Levitt (1999), at the National Symposium on the Economics of Inmate Labor Force Participation in Washington, D.C., proposes that:

> "The ideal way to attempt to answer this [recidivism] question in the future is through randomized experiments in which prisoners are divided into two pools: one that is eligible to participate in prison industry and another which is not. By comparing future recidivism across these two groups, an estimate of the independent contribution of prison labor in determining future criminal involvement could be obtained."

Unquestionably, most scientists would agree with this. The traditional 'controlled experiment' design eliminates selection bias and is proven and accepted. However, since randomized experiments are not feasible given the constraints of the current prison system, and are not anticipated given the concerns with human experimentation, other methods must be employed. Thus, a quasi-experimental design is employed in this study. The traditional control group is created after the fact based on the characteristics of the test group. The test, or experimental, group comes from a natural experiment, in this case the incidence of PIE participation, and the observational data is used to examine the effectiveness of the program.

As a first look at inmate recidivism, the next section examines the non-controlled effects of the inmate characteristics using contingency tables as is seen in many state and federal reports. While this methodology is not ideal, the results give an initial indication

of the factors affecting recidivism. These tables compare recidivism rates across various demographic and participation groups to examine the significance of the recidivism differences in these groups. This is followed by a more controlled look at the effects of the variables where logit regressions and an instrumental variable (IV) approach are employed on matched groups to isolate specific effects of independent variables.

IV.C.1: Contingency Tables

Garson (1998) notes, "traditional approaches to categorical data rely on chi-square and other measures of significance to establish if a relationship exists in a table. For simple two-variable tables, the traditional approach may still be preferred." Contingency tables are used to analyze the significance of the differences between two (or more) categorical, exclusive and exhaustive, variables. In this case, the differences in recidivism rates for variables such as gender, race, education, and marital status, participation, and crime type are observed to be different. For example, a contingency table will illustrate the occurrence of recidivism for males versus females. The significance of the differences is tested to see whether the difference is due to chance or some influence that may later be isolated.

The objective is to test whether the column the subject is in (recidivism or not) is contingent or dependent on the row (e.g. male or female) categories. The null hypothesis is that there is no relationship between the row and column frequencies. If the columns are not contingent on the rows, then the row and column frequencies are independent. So, in the gender example, if recidivism and gender are independent, the conclusion drawn is that gender is not expected to influence recidivism rates. In examining the chi-

square test of the null hypothesis a low p-value would indicate a low likelihood of independence or a greater likelihood of the variable having a statistically significant influence on recidivism.[5]

IV.C.1.a: Indiana Results

The following table presents the one-, two-, and three-year recidivism results for inmates released from Indiana state prisons between the years 1997-2003, 1997-2002, and 1997-2001 respectively. The comparisons are made across the various categorical demographic inmate characteristics. The differences in the recidivism rates are then tested to determine if the differences found are statistically significant.

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[5] A chi square test is used to test independence. The chi square test examines the difference between the expected values (E) and the observed (O) values in the table. The observed values are known and the expected values are calculated as: $E_{ij} = \frac{T_i \times T_j}{N}$ where E_{ij} is the expected frequency for the cell in the i^{th} row and the j^{th} column, T_i is the total number of subjects in the i^{th} row, T_j is the total number of subjects in the j^{th} column, and N is the total number of subjects in the whole table. Once the expected values are calculated they can be used to calculate the chi square value where: $\chi^2 = \sum \frac{(E - O)^2}{E}$ After obtaining the degrees of freedom (df), which are equal to (R-1)(C-1) where R is the number of rows and C is the number of columns, a chi square table can be used to determine that for df = 1, a chi square of X has a given probability value (p-val). The p-val illustrates the likelihood of the variable examined being independent of the recidivism event.

IV.C.1. Table 1: Indiana Cumulative Recidivism Rates

Variable		1 Year rate%	(#)	2 Year rate%	(#)	3 Year rate%	(#)	3 Year Chi^2 (p-val)
Age	**18 - 34**	27.2	(8,746)	41.5	(13,344)	53.8	(17,298)	98.7 (<.001)
	35 +	16.4	(3,664)	31.1	(6,949)	40.1	(8,960)	
Race	**White**	19.1	(6,141)	30.2	(9,710)	41.7	(13,408)	141.1 (<.001)
	Non-White	24.1	(5,385)	41.9	(9,362)	52.0	(11,619)	
Gender	**Male**	24.3	(11,918)	37.8	(18,540)	46.6	(22,856)	110.9 (<.001)
	Female	16.4	(894)	28.3	(1,542)	37.1	(2,022)	
Time Served	**< 1year**	21.5	(2,929)	36.2	(4,932)	44.1	(6,008)	29.7 (<.001)
	1 - 5	22.9	(6,240)	37.5	(10,218)	47.2	(12,861)	
	5 +	18.7	(2,548)	28.8	(3,924)	36.9	(5,027)	
Marital Status	**Married**	21.0	(2,174)	34.4	(3,562)	43.8	(4,535)	2.81 (0.093)
	Not Married	21.7	(9,579)	35.1	(15,494)	45.4	(20,041)	
Education	**< 12**	25.2	(9,613)	41.8	(15,946)	51.4	(19,608)	84.9 (<.001)
	12 +	16.1	(2,632)	25.2	(4,120)	30.5	(4,986)	
Prior Recidivism	**Yes**	38.4	(16,741)	49.2	(21,450)	57.2	(24,938)	138.3 (<.001)
	No	19.4	(2,114)	28.7	(3,128)	36.9	(4,022)	
Type Of Crime	**Economic**	25.5	(7,244)	44.9	(12,756)	54.9	(15,596)	60.7 (<.001)
	Non-Econ	15.1	(3,371)	30.3	(6,763)	37.2	(8,303)	
PIE Participation	**Yes**	17.7	(193)	27.9	(304)	36.8	(401)	31.1 (<.001)
	No	21.4	(11,429)	35.0	(18,692)	44.7	(23,873)	
Overall		21.3	(11,608)	34.9	(19,019)	44.5	(24,197)	N/A

Note: The recidivism rate is calculated as number re-commitments divided by number of observations in the category.

Table 1 illustrates the three-year recidivism rate for PIE participants to be 36.8% and the non-participant group had a return rate of 44.7%. Overall, without controlling for other variables, participation in a PIE program appears to produce a decrease in recidivism. The chi-square value allows a rejection of the null hypothesis. Thus, the difference in the recidivism rates is said to be influenced by the inmate's participation in the PIE program. This difference represents a 7.9% reduction in recidivism.

All of the variables in the table above, with the exception of marital status, test to be statistically significant. Thus, it can be said that these variables have an effect on recidivism and influence recidivism rates. Specifically, it is observed that older inmates are less likely to return to prison than are younger persons; whites are less likely to recidivate than non-whites; persons with longer sentences are less likely to recidivate than those with shorter sentences; persons with higher levels of education are less likely to recidivate than those with lower levels; prior convicts have higher recidivism rates; and economically motivated criminals are more likely to return to prison than those with other motivations.

These observations are consistent with theory and confirm that there are many factors that may influence recidivism. Therefore, since any combination of these factors may affect the likelihood of a return to prison, it is necessary to isolate the effects of these variables in a regression analysis so that the effects of PIE program participation can be properly examined under ceteris paribus assumptions.

IV.C.1.b: Tennessee Results

Table 2, presents the one-, two-, and three-year recidivism results for inmates released from Tennessee state jurisdiction between the years 1996-2005, 1996-2004, and 1996-2003 respectively.

IV.C.1. Table 2: Tennessee Cumulative Recidivism Rates

Variable		1 Year rate%	(#)	2 Year rate%	(#)	3 Year rate%	(#)	3 Year Chi^2 (p-val)
Age	**18 - 34**	28.8	(6,651)	42.7	(9,862)	55.2	(12,749)	79.3 (<.001)
	35 +	15.9	(3,005)	30.0	(5,669)	41.6	(7,861)	
Race	**White**	18.4	(4,189)	34.1	(7,763)	43.1	(9,812)	105.6 (<.001)
	Non-White	25.7	(4,786)	46.1	(8,586)	54.8	(10,207)	
Gender	**Male**	23.2	(9,158)	39.2	(15,435)	47.7	(18,829)	62.7 (<.001)
	Female	17.8	(449)	29.5	(743)	38.2	(963)	
Time Served	**< 1year**	23.4	(2,457)	35.9	(3,769)	45.8	(4,703)	16.8 (<.001)
	1 - 5	23.7	(4,976)	38.1	(8,000)	48.6	(9,995)	
	5 +	19.9	(2,089)	29.8	(3,129)	35.0	(3,674)	
Marital Status	**Married**	22.6	(2,088)	38.2	(3,529)	45.9	(4,241)	1.90 (0.168)
	Not Married	21.5	(6,952)	38.0	(12,287)	46.4	(15,004)	
Education	**< 12**	24.9	(7,308)	42.6	(12,503)	50.3	(14,762)	117.3 (<.001)
	12 +	17.1	(2,151)	26.8	(3,371)	31.9	(4,012)	
Prior Recidivism	**Yes**	37.5	(12,598)	48.1	(16,159)	59.4	(19,956)	140.5 (<.001)
	No	20.2	(1,697)	30.7	(2,587)	37.6	(3,158)	
Type Of Crime	**Economic**	23.8	(4,678)	46.2	(9,081)	57.9	(11,381)	86.6 (<.001)
	Non-Econ	16.4	(2,475)	32.5	(4,905)	39.1	(5,901)	
PIE Participation	**Yes**	18.4	(155)	31.6	(265)	38.1	(312)	22.4 (<.001)
	No	22.5	(9,260)	38.3	(15,762)	47.3	(19,054)	
Overall		22.1	(9,422)	37.8	(16,032)	47.7	(19,374)	N/A

Note: The recidivism rate is calculated as number re-commitments divided by number of observations in the category.

Similar conclusions are drawn for the Tennessee set as were in the Indiana set. While there are some minor differences in the rates, all the variables have similar effects, magnitudes, and significance. This consistency across state data will allow verification across states and help ensure robust conclusions in more detailed analysis.

The contingency tables in this section serve to confirm the results of many of the state and federal studies as they were conducted. And, of particular interest for this study, PIE is a potential explanitor of recidivism. However, using this methodology

presents a very limited picture of the factors effecting recidivism. No other influence is being held constant in this descriptive analysis. This is the primary criticism of examining the factors individually. For example, the alleged effects of age may actually be due to education. This limited method of analysis offers no insight into the true effects of the variables. Thus, the addition of multivariate regression where the effects of all other variables are held constant is a major improvement over this limited approach.

IV.C.2: Regression Methodology

The preceding tables show differences in recidivism from different individual characteristics. Thus, any observed recidivism difference may be due to these individual characteristics and not participation in a PIE program. Regression models allow for the control of individual-specific characteristics and provide more insight into the causal effects of the independent variable on, in this case, recidivism rates. The typical linear regression model, such as ordinary least squares (OLS), provides parameter estimates (beta) for corresponding independent predictor variables. The coefficient estimates provide an indication of the portion of the dependent variable for which the independent variable is responsible. However, in the case of categorical outcomes (such as recidivate or not), the linear regression model is inappropriate. Peng et al. (2002) detail that the categorical nature of the outcome makes it impossible to satisfy either the normality assumption for residuals or the continuous, unbounded assumption on the dependent variable. Thus, significance tests performed on linear regression coefficients for categorical outcomes would not be valid.

Logit models extend the principles of generalized linear models to better treat the case of dichotomous and categorical variables. They focus on association of categorical or grouped data, looking at all levels of possible interaction effects (Garson, 2006). This method is ideally suited for the type of data and participation decision explored in this study. The Logit techniques allow a mixture of categorical and continuous independent variables to predict the categorical dependent variable. It is important to note that the logit estimates examine the odds of an event and therefore the conclusions will illustrate the change in the odds given a category or, of interest here, the change in the odds of recidivism and not a specific percent change in the recidivism rate.

IV.C.2.a: The Logit Model

In the following models, the logit procedure is used to determine which variables are statistically significant predictors of recidivism and their anticipated effect. Thus, as indicated, it can be determined whether participation in a labor program has a statistically significant effect on reducing recidivism while controlling for the effects of other variables. If the effect is found to be significant the size and sign of the coefficient can be examined. The model is specified several times to examine the significance of these factors in different time (one-, two-, and three-year) periods for recidivism for Indiana, Tennessee and a pooled sample.

The first specification of the model (IV.C.2-1) examines one-year recidivism for all prisoners in the matched sample. The results will indicate the independent variables' effects on the likelihood of ex-prisoners returning to prison within one year. Recidivism is the dependent (Y) variable.

$$logit(\text{recidivism1}) = \ln\left(\frac{recidivism1}{1-recidivism1}\right) = \alpha + \beta_i \mathbf{X}_i \qquad \text{(IV.C.2-1)}$$

where

$$\text{recidivism1} = \Pr(Y_i = 1). \qquad \text{(IV.C.2-2)}$$

The natural logarithm of the odds ratio of the outcome is modeled as a linear function of the explanatory variables, **X**, also written as:

$$\text{recidivism1} = \Pr(Y_i = 1 \mid X) = \frac{e^{\alpha+\beta_i X_i}}{1+e^{\alpha+\beta_i X_i}}. \qquad \text{(IV.C.2-3)}$$

Both the Y-intercept (alpha) and the beta coefficients are estimated by maximum likelihood.

Initially an Indiana inmate's return to prison within one year (recidivism1) is set to be a dummy (0/1) dependent variable. The **X** vector contains the independent variables. These variables were discussed in the previous section and include: age, gender, education, race, marital status, offense type, prior recidivism, security level, length of sentence, participation, an age and participation interaction term, and facility dummy variables. The model is then used to examine Indiana prisoners' two-year and three-year rates using recidivism2 and recidivism3 to analyze those persons who returned to prison within two and three years respectively. The three time frames are then examined for Tennessee. Subsequently, the same time frames are examined for a pooled

sample that combines Indiana and Tennessee data. The specifications of each model are discussed later in this section.

IV.C.2.b: Endogeneity

With any regression analysis there is a concern about factors that may bias the results and lead to erroneous conclusions. The primary concern when using observational data to examine the effects of a treatment (as is the case in this study) is that there is endogeneity. As described by Lee (2005), "in observational data, treatment is self-selected by the subjects, which can result in selection problems: 'selection-on-observables' and 'selection-on-unobservables'." Thus, the first concern is to ensure the inmates included in the regression analysis have similar 'observable' characteristics. Or that the individuals in the treatment and comparison groups are closely matched. The second concern regarding endogeneity results from omitted or 'unobserved' individual characteristics. These unobserved characteristics of participants can bias the estimator and skew the results. Thus, the potential for endogeneity is of great concern and must be properly addressed as should other potential biases.

These potential biases can be acknowledged or ruled out. Simultaneity is not of concern since recidivism occurs in the future relative to the participation decision. Measurement errors commonly occur in observational data sets but considering the nature of the event, a human incarceration, a significant level of accuracy is recognized. Also, selection bias is not the issue in this study. The dependent variable is recidivism and all inmates have a chance to recidivate. If the analysis were only selecting those persons who were in the program, a Heckman correction to adjust for the probability of

participation might be necessary. However, the entire population of released inmates is being examined and therefore a correction is unnecessary.

The bias of concern is, as stated before, endogeneity. The observable, or overt, bias can be addressed by using a quasi-experimental design and matching the non-participating population characteristics to those of the participation population. One technique is to match based on a propensity score. However, this was not necessary in this case as a simple observational matching correction appears to be sufficient. This is possible in part because there are only a few variables that are non-binary. Matching on age eliminated the concerns with education and sentence differences.

Summary statistics are presented for the adjusted data set for the non-PIE control groups and the PIE participant treatment group for Indiana in IV.C.2 Table 1 and for Tennessee in IV.C.2 Table 2. The matching procedure adjusts the sample to match the treatment groups' facilities and characteristics and also to remove any outliers on the low and high side. Removing outliers is necessary for an accurate comparison. For example, the oldest released inmate from the Indiana set was 83. This study would not be concerned with this individual as his post-release use of human capital would not be representative.

IV.C.2. Table 1: Matched Inmate Groups: Indiana

	Non-PIE		Employed: Non-PIE		PIE	
Variable	Mean	(SD)	Mean	(SD)	Mean	(SD)
Age	32.667	(8.412)	32.810	(8.718)	32.987	(8.023)
Education Level	10.915	(2.295)	10.724	(2.101)	11.013	(2.340)
Male	0.931	(0.291)	0.891	(0.302)	0.926	(0.262)
Married	0.192	(0.389)	0.194	(0.399)	0.201	(0.402)
White	0.561	(0.391)	0.552	(0.384)	0.536	(0.399)
Recidivism	0.412	(0.342)	0.434	(0.347)	0.391	(0.325)
Prior Prison	0.628	(0.407)	0.619	(0.420)	0.608	(0.414)
Time Served	6.878	(6.434)	6.930	(6.218)	7.210	(6.874)
Maximum Sentence	12.153	(11.158)	12.115	(10.996)	12.880	(11.541)
Economic Crime	0.574	(0.466)	0.549	(0.473)	0.610	(0.477)
Security Level	2.261	(0.760)	2.257	(0.715)	2.230	(0.615)
# of Observations	30,369		8,198		1,117	

IV.C.2. Table 2: Matched Inmate Groups: Tennessee

	Non-PIE		Employed: Non-PIE		PIE	
Variable	Mean	(SD)	Mean	(SD)	Mean	(SD)
Age	34.315	(7.282)	34.441	(7.339)	34.627	(6.924)
Education Level	11.417	(2.199)	11.297	(2.014)	11.580	(1.987)
Male	0.955	(0.201)	0.959	(0.213)	0.963	(0.242)
Married	0.214	(0.367)	0.213	(0.388)	0.225	(0.391)
White	0.531	(0.443)	0.539	(0.411)	0.517	(0.428)
Recidivism	0.414	(0.384)	0.421	(0.392)	0.388	(0.353)
Prior Prison	0.607	(0.421)	0.613	(0.408)	0.587	(0.442)
Time Served	6.638	(6.803)	6.738	(6.888)	6.946	(7.077)
Maximum Sentence	11.493	(11.814)	11.648	(11.739)	11.724	(12.166)
Economic Crime	0.562	(0.438)	0.569	(0.441)	0.593	(0.459)
Security Level	3.724	(0.528)	3.702	(0.503)	3.658	(0.483)
# of Observations	25,142		6,537		858	

The first match of the data was by security level of the facility. Only inmates who could have been assigned to a location with a PIE facility are examined. There are no PIE programs operating in category one (minimum security) or category five (maximum security) prisons in either state. The three Indiana and four Tennessee maximum security facilities hold more long and life sentence inmates and were small portions of the

released inmate samples in both states. The exclusion of the eight Indiana prisons in the aforementioned categories reduces the inmate sample from 48,429 to 32,430. In Tennessee the exclusion of seven minimum and maximum security prisons reduces the inmate sample from 35,712 to 26,908.

After sorting the data by age, the top 0.24% or 78 observations of the Indiana data set were eliminated. This removed inmates over the age of 65. In the Tennessee set 0.33% or 89 observations were removed, which limited the set to inmates 65 years old or younger. Subsequently, as the Indiana and Tennessee PIE treatment groups were observed to be roughly one to two years older respectively at release than the full sample, the youngest 2.66% of the Indiana and 3.13% of the Tennessee non-PIE inmates were eliminated. Also, there were originally differences in sentence lengths and education levels. PIE participants were observed to have higher levels of both. However, the age correction removed inmates who were younger at release and those inmates had shorter sentences. To be incarcerated and released when one is 18 years old necessitates a short sentence. Also, the correlation between age and education levels resulted in an appropriate adjustment for that category as well. Thus, it was not necessary to perform further matching on these categories. The t-tests on the age, sentence, and education mean values were unable to reject the null hypothesis that the differences in the mean values of the control and treatment groups are equal to zero.

A subset of the control group for non-PIE working inmates was also evaluated. This group will be used to examine the independent variables' effects on recidivism for

only the employed inmates. This reduced sample is drawn from the matched sample described above and the mean values are included in Table 2 above.

The second endogeneity issue, omitted variable bias, occurs when the variable of interest's coefficient picks up the effects of another, unmeasured or omitted, variable. This occurs due to a correlation between the two variables. Thus, instead of being captured in the error term, the unmeasured or omitted variable biases the other variables' true effects. The most direct solution would be to include the omitted variable into the regression. However, since the omitted and therefore unmeasured characteristic may be something such as motivation, need to work, or ability it is impossible to include.

The bias is not because the inmate's ability was left out of the regression. The bias occurs when the variable affecting recidivism is correlated with both the participation event and recidivism. Arguably, those with higher ability are more likely to work. Thus, the coefficient showing the effects of participation may actually be showing the effects of ability. To correct this problem a proxy for participation can be used. The predicted values of the instrument are captured in the first stage of the two stage process. Those values are then used to adjust the variable of concern in the second stage. To be a useful instrument and therefore remove the endogeneity, the proxy must not itself belong in the explanatory equation and must be correlated with participation (so that those effects remain) but not correlated with the unmeasured characteristic affecting recidivism (so that those effects are in the error term).

While using an instrumental variable (IV) approach potentially solves the endogeneity problem, finding a suitable instrument can be difficult. In this case two

potential instruments have been identified. The first is the facility location of the PIE program. The second is a time characteristic that may be correlated with participation such as the month of incarceration or month of employment.

The first potential instrument is the availability of a PIE facility. The suitability is examined by determining whether the variable is correlated with participation but uncorrelated with recidivism independently of participation. This instrument is definitely correlated with participation. There must be a facility in the prison in order for the prisoner to participate. On the surface, the second criterion seems to hold as the location should not be related recidivism independently of PIE participation. However, if those inmates with higher abilities are being systematically sent to prisons with PIE programs, then there would be a correlation between these items. Conversely, if the inmate's facility assignment is random, then there should be no correlation and the second criterion will be satisfied.

According to the Indiana and Tennessee DOC's (2008, 2006), the primary consideration for facility assignment is the inmate's security designation. After that, assignment decisions are based on capacity. As most facilities are operating at, or near, maximum capacity, inmates are assigned or transferred to facilities based on available beds. Thus, as inmates are released from a facility new inmates are assigned to their bed. To confirm this random assignment assumption the mean characteristics of all inmates in PIE facility locations are tested against all inmates in non-PIE facilities of the same security designation.

IV.C.2. Table 3. Facility Comparison Inmate Statistisc: Indiana

	PIE Facilities		Non-PIE Facilities			
Variable	**Mean**	**(SD)**	**Mean**	**(SD)**	**t-test**	**p-val**
Age	31.450	(9.144)	31.621	(9.222)	-1.403	0.161
Education Level	10.698	(2.344)	10.725	(2.671)	-0.821	0.417
Male	0.924	(0.291)	0.919	(0.299)	1.277	0.202
Married	0.178	(0.341)	0.181	(0.393)	-0.616	0.538
White	0.586	(0.354)	0.579	(0.384)	1.430	0.153
Recidivism	0.462	(0.358)	0.457	(0.347)	1.068	0.286
Prior Prison	0.624	(0.408)	0.618	(0.426)	1.085	0.278
Time Served	5.459	(5.997)	5.810	(5.934)	-1.667	0.096
Maximum Sentence	9.599	(10.561)	9.745	(10.357)	-1.339	0.181
Economic Crime	0.561	(0.428)	0.548	(0.440)	1.657	0.098
Security Level	2.845	(0.524)	2.932	(0.601)	1.532	0.126
# of Observations	10,944		11,792			

In examining the p-values in Table 3 above, the conclusion is that any differences in the mean values between facilities would likely be due to chance because the null hypothesis, that the difference in the mean values is equal to zero, can not be rejected. The conclusion is that the inmates are not being assigned to a facility based on ability and therefore ability and the facility location should not be correlated.

The same conclusion is draw form Table 4 below. The p-values indicate that any differences in the mean values between facilities are due to chance as the null hypothesis can not be rejected. Again the conclusion is that the inmates are not being assigned to a facility based on ability. Therefore ability and the facility location should not be correlated.

IV.C.2. Table 4. Facility Comparison Inmate Statistisc: Tennessee

	PIE Facilities		Non-PIE Facilities			
Variable	**Mean**	**(SD)**	**Mean**	**(SD)**	**t-test**	**p-val**
Age	31.912	(8.693)	32.011	(8.599)	-0.678	0.498
Education Level	10.989	(2.201)	10.945	(2.254)	1.176	0.240
Male	0.960	(0.291)	0.942	(0.299)	1.258	0.184
Married	0.194	(0.351)	0.197	(0.364)	-0.501	0.617
White	0.532	(0.436)	0.529	(0.442)	0.406	0.685
Recidivism	0.416	(0.409)	0.421	(0.417)	-0.720	0.471
Prior Prison	0.603	(0.455)	0.594	(0.436)	1.191	0.234
Time Served	5.744	(5.645)	5.649	(5.488)	1.008	0.313
Maximum Sentence	10.671	(11.943)	10.525	(11.311)	0.739	0.460
Economic Crime	0.551	(0.421)	0.560	(0.429)	-1.260	0.208
Security Level	3.560	(0.451)	3.548	(0.428)	1.595	0.111
# of Observations	5,457		9,920			

There may be some concern that the private companies that are operating in these facilities are only entering the best prisons. Certainly the business decision of where to locate an operation involves an assessment of the potential labor pool. However, as seen above, the inmates do not have significantly different characteristics. Therefore, while the company's decision may be influenced by proximity, space, available laborers and other characteristics, the demographic characteristics of the pool of inmates should not have an effect on the decision. It is concluded that facility location should serve as a suitable instrument.

A second instrument would be helpful to confirm or improve the results. A time measure would be a good instrument as there may be a correlation between the time of an event such as incarceration or PIE employment dates and participation. Examining the two IV criteria again, there needs to be correlation with participation but not with recidivism independently of participation. The non-correlation of time of incarceration

and recidivism independently of participation seems plausible as the month of incarceration and future recidivism should be unrelated.

The problem discovered with this instrument comes in the lack of correlation with participation. There are relatively consistent variations in the number of incarcerations by month which could be useful. However, the monthly employment in PIE programs is very stable with little variation. The correlation coefficient, rho (ρ), between average monthly incarceration events and average PIE employment is calculated as -0.0614 for the Indiana data set, thus there is not a strong enough correlation between the dates and participation for this to be a suitable instrument. For Tennessee the results are similar, and the lack of variation in the PIE employment numbers again prevents the time measure from being a suitable instrument. Rho is calculated as 0.0729 for the relationship between incarceration and employment and a value this small is, again, considered insubstantial. Appendix A contains the time and event plots for this information for Indiana and Tennessee.

The instrument, PIE facility location availability, will be used in two different ways for Indiana, Tennessee and pooled data. First, a two stage instrumental variable (IV) model is used where the factors predicting participation, including location, are regressed in the first stage. The second stage uses recidivism as the dependent variable and the predicted values from the first stage are used to instrument the participation variable. The second use of the PIE facility location instrument is as an independent variable in a logit regression. The primary difference in this logit and the first logit

specifications is the use of the PIE location variable as an instrument in place of the potentially biased PIE participation variable.

IV.C.3: Results

Fifty-four models are necessary to capture the three specification variations for the effects of inmate participation on one-, two-, and three-year recidivism for the full sample and employed inmates in Indiana, Tennessee and the pooled sample. The full results for all covariates are presented in appendix B: 1-18. The first model is a logit specification for one-year recidivism events in Indiana's full sample. Model 2 is a logit specification with the PIE facility availability variable included for one-year recidivism events in Indiana's full sample. Model 3 is the IV specification for one-year recidivism events in Indiana's full sample. Models 1, 2, and 3 are presented in appendix B.1. Models 4 through 6 follow the same pattern (logit, logit with PIE facility, IV) for Indiana full sample two-year recidivism events and are in appendix B.2. Models 7 through 9 are for the three-year events. Models 10 through 18 are the same as the full sample models described above but for the Indiana working inmates sample models.

Models 19 through 36 are the Tennessee full and working one-, two- and three-year, logit, logit with PIE facility and IV specifications following the same pattern as the Indiana results. Models 37 through 54 are the pooled sample variations on the above formats. The tables in the following section only present the participation variable coefficients. This is because the effect of PIE participation on inmate recidivism is the primary focus of this paper.

Appendix C.1 contains the first-stage regression results from the two-stage IV process. The coefficients, along with their significance, of the endogenous and exogenous variables used to predict participation are presented. The primary variable of interest in the first-stage is the PIE facility location, the instrument for the IV specification. PIE facility location does not have a statistically significant effect on recidivism when controlling for participation (thus can be appropriately excluded from the second-stage, as is discussed later) but does show a statistically significant effect on participation in the Indiana, Tennessee, and pooled sample results.

IV.C.3.a: Indiana Results

The logit regression results examine the odds that an inmate recidivates given various demographic characteristics. Logit regressions examine the probability that the dependent variable equals one in binomial logistic regression (recidivism = 1, i.e. the inmate was re-incarcerated). A positive logit coefficient means the independent variable has the effect of increasing the odds of recidivism. A negative logit coefficient means the independent variable has the effect of decreasing the odds of recidivism. Only the sign and significance can be determined from the coefficient. To interpret the size of the effect it is necessary to calculate the odds ratio.

The odds ratio is the exponetiated logit regression coefficient (e^{β_i}). The odds ratio of primary interest in this study is the ratio of the odds of participant recidivism to the odds of non-participant recidivism. The odds of an event is the ratio of two probabilities, the probability of an event and a non-event, or, in this case, the probability of recidivism or not. The odds vary depending on the values of the independent variables (e.g.

different ages have different associated recidivism probabilities). However, what remains constant is the ratio of these odds. The odds of recidivism for both participants and non-participants are the ratios of the probability of recidivism to the probability of no recidivism. Thus, the ratio of the calculated odds show how much greater (odds ratio greater than 1) or less (odds ratio less than 1) are the odds that the participant is to recidivate relative to a non-participant. A point of emphasis here is that, as described above, e^{β_i} illustrates the change in the odds of an individual's recidivism, not the change in the probability of their recidivism.

Logits are used in log-linear analysis in preference to odds ratios because of their mathematical properties, as odds ratios are asymmetric in interpretation. This asymmetry disappears when one takes the natural log of the odds ratios. That is, odds ratios asymmetrically vary from zero to one on the negative side and one to infinity on the positive side. Logits vary symmetrically from zero to minus infinity on the negative side and from zero to plus infinity on the positive side. Both measures carry the same information, but the odds ratio is easier to interpret intuitively.

The effects of the participation variable on the odds of recidivism for Indiana inmates are presented in IV.C.3 Table 1. This table includes results from the one-, two-, and three-year recidivism periods for the logit, the logit with the PIE facility instrument as a covariate, and the two stage IV specifications. The results of the other covariates included in these models are presented in Appendix B. Global tests with the null hypothesis that all the coefficients are zero are performed on all of the full results. The

full models' likelihood ratio's chi-squares are all found to be high enough to conclude that the null hypothesis is rejected in all cases.

IV.C.3. Table 1: Effects of PIE Participation on Recidivism: Indiana

	Logit			Logit w/ Facility Instrument			IV		
All Inmates:	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
PIE Participation on One-Year Recidivism	-0.226***	(0.0049)	0.798	-0.110**	(0.0484)	0.895	-0.167***	(0.0054)	0.846
PIE Participation on Two-Year Recidivism	-0.163***	(0.0046)	0.849	-0.082**	(0.0435)	0.921	-0.109***	(0.0053)	0.896
PIE Participation on Three-Year Recidivism	-0.140***	(0.0051)	0.869	-0.059*	(0.0352)	0.942	-0.079***	(0.0044)	0.924
Working Inmates:									
PIE Participation on One-Year Recidivism	-0.190***	(0.0104)	0.827	-0.082*	(0.0492)	0.921	-0.149***	(0.0127)	0.861
PIE Participation on Two-Year Recidivism	-0.142***	(0.0101)	0.868	-0.057*	(0.0313)	0.944	-0.095***	(0.0139)	0.909
PIE Participation on Three-Year Recidivism	-0.127***	(0.0098)	0.881	-0.042*	(0.0249)	0.959	-0.066***	(0.0121)	0.936

Note: Coefficients are from the participation variables in models 1-18. Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 30,369 observations in all inmates models. 8,198 observations in working inmate models.

The logit with facility instrument uses the PIE facility availability as a proxy for the participation variable in the logit regression. Thus, the participation variable is removed and replaced with the exogenous facility variable. The IV specification, as discussed before, is included due to concern that some unmeasured characteristics are being captured in the logit coefficients. Hausman tests between the primary logit and the IV estimate can indicate, or potentially rule out, endogeneity. Hausman tests are conducted between the logit and IV coefficients in the three recidivism periods for both full and working samples. The null hypothesis for this test is that the difference between the coefficients is equal to zero or that the results from the different specifications are

statistically the same. In all cases, the F-statistics are large enough (p-values <.001) to reject the null hypothesis, thus concluding that there are statistically significant differences in the logits and IV results. Specifically these results suggest that an unmeasured or omitted variable has a significant effect on the consistency of the logit estimator. With potential endogeneity confirmed, the conclusion is that the IV estimator is the most consistent estimate of the effects of participation on recidivism. Therefore, the IV estimates are the focus in the following discussion.

In addition to these Hausman tests, a test of whether the PIE location variable is appropriately excluded from the second stage of the IV recidivism model is conducted. Thus, PIE participation is included in the logit with instrument model to control for the effects of this variable. Holding PIE participation constant, the PIE location is not expected to have an independent effect on recidivism. None of the specifications result in a significant coefficient for the PIE location variable confirming that this variable is appropriately excluded from the second stage in the IV specification. This test is repeated in the Tennessee and pooled sample results.

The one year Indiana full sample PIE participation coefficients are negative and significant. This implies that inmate participation in a PIE program significantly reduces the odds of the participant's recidivism relative to all inmates. As discussed previously, the magnitude of the effects can not be seen in the coefficient. The odds ratio captures the size of the effect. The IV specification, the most consistent estimator, shows an odds ratio of 0.846 indicating a 15.4% reduction in the odds of recidivism.

The two-year recidivism period coefficients for the full sample are similar to the one-year results in their signs and significance. The odds ratio illustrates a change in the odds of recidivism by a factor of 0.896 for the IV specification. This suggests that participation could reduce the odds of recidivism by 10.4%.

The three-year coefficients for the full sample are also consistent with theory and similar to the one- and two-year results. The odds ratios illustrate a change in the odds of recidivism by a factor of 0.924 for the IV odds ratio. The three-year time frame is the most scrutinized in this literature and the IV specification shows a 7.6% reduction in the recidivism odds for participants.

The lower panel of IV.C.3 Table 1 examines only inmates who are employed while incarcerated or 8,198 observations in the working inmates sample. The Indiana working inmates sample coefficients, consistent with the full sample, are negative and significant. This implies that inmate participation in a PIE program significantly reduces the odds of recidivism relative to other working inmates. Again, the magnitude of the effects can not be seen in the coefficient thus the odds ratio is used to capture the size of the effect.

In the one-year IV specification the odds of recidivism are multiplied by a factor 0.861, indicating there is a 13.9% reduction in the odds of recidivism. The working sample results show a smaller effect of inmate participation on the odds of one-year recidivism than the full sample results. This is not inconsistent with the idea that there may be some unmeasured motivation to work in the employed inmates. This decrease in

PIE participation effectiveness relative to working inmates is also exhibited in the two- and three-year period results.

The two-year recidivism period coefficients for the working inmates sample are similar to the one-year results. The odds ratios illustrate a smaller change in the odds of recidivism within two years than the full sample results. The odds of recidivism are changed by a factor of 0.909 for the IV specification. This suggests that participation may reduce the odds of recidivism by 9.1%.

The three-year coefficients for the working inmates sample confirm a significant decrease in participant recidivism. The odds ratios illustrate a change in the odds of recidivism by a factor of 0.936 for the IV odds ratios, or 6.4% reduction in the recidivism odds for participants.

IV.C.3.b: Tennessee Results

The regressions performed on the Indiana data that were detailed above are now repeated in the same manner for the Tennessee data. The results for the PIE participation variable (or its proxy) from the Tennessee released inmate sample are presented in IV.C.3 Table 2.

IV.C.3. Table 2: Effects of PIE Participation on Recidivism: Tennessee

	Logit			Logit w/ Facility Instrument			IV		
All Inmates:	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
PIE Participation on One-Year Recidivism	-0.251***	(0.0068)	0.778	-0.140**	(0.0645)	0.869	-0.194***	(0.0055)	0.824
PIE Participation on Two-Year Recidivism	-0.188***	(0.0081)	0.829	-0.106**	(0.0532)	0.899	-0.141***	(0.0059)	0.868
PIE Participation on Three-Year Recidivism	-0.173***	(0.0096)	0.841	-0.090**	(0.0439)	0.914	-0.123***	(0.0071)	0.884
Working Inmates:									
PIE Participation on One-Year Recidivism	-0.231***	(0.0159)	0.794	-0.092**	(0.0398)	0.912	-0.153***	(0.0184)	0.858
PIE Participation on Two-Year Recidivism	-0.183***	(0.0188)	0.833	-0.074*	(0.0384)	0.929	-0.118***	(0.0199)	0.889
PIE Participation on Three-Year Recidivism	-0.157***	(0.0223)	0.855	-0.064*	(0.0344)	0.938	-0.103***	(0.0177)	0.902

Note: Coefficients are from the participation variables in models 19-36. Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 25,142 observations in all inmates models. 6,537 observations in working inmate models.

As with the Indiana specifications, Hausman tests are conducted between the logit and IV coefficients in the three recidivism periods for both full and working samples. The null hypothesis for the tests is that the difference between the coefficients is equal to zero. In all cases in the Tennessee comparisons the F-statistics are large enough (p-values <.001) to reject the null hypothesis. The conclusion is again that there are statistically significant differences in the results of the logit and IV models and in the logit with the location proxy and the IV models. Specifically these results suggest that an unmeasured or omitted variable has a significant effect on the consistency of the logit estimator.

The Tennessee results are similar to the Indiana results. The one-year Tennessee full sample PIE participation coefficients are all negative and significant. This again suggests that inmate participation in a PIE program significantly reduces the odds of the

participant's recidivism relative to all inmates. The odds ratio captures the size of the significant negative effect. For the one-year IV the odds of recidivism are multiplied by a factor of 0.824, or there is a 17.6% reduction in the odds of recidivism.

The two-year recidivism period coefficients for the full sample are similar to the one-year results. The odds ratios illustrate a change in the odds of recidivism by a factor of 0.868 for the IV specification. This suggests that participation could reduce the odds of recidivism by 13.2%.

The three-year coefficients for the full sample are again consistent with theory and similar to the one- and two-year results. The odds ratios illustrate a change in the odds of recidivism by a factor of 0.884 for the IV odds ratio. The three-year time frame shows an 11.6% reduction in the recidivism odds for PIE participants.

The lower portion of Table 2 examines only inmates who are employed while incarcerated or 6,537 observations in the working inmates sample. The Tennessee working inmates sample coefficients, consistent with the full sample, are negative and significant. This further suggests that inmate participation in a PIE program significantly reduces the odds of the participant's recidivism relative to other working inmates. Again, as the magnitude of the effects can not be seen in the coefficient, the odds ratio is used to capture the size of the effect.

In the one-year IV specification the odds of recidivism are multiplied by a factor of 0.858, or there is a 14.2% reduction in the odds of recidivism. The two-year recidivism period coefficients for the working inmates sample are similar to the one-year results. The odds ratios illustrate a smaller change in the odds of recidivism within two

years than the full sample results. The odds of recidivism are changed by a factor of 0.889 for the IV specification. This suggests that participation may reduce the odds of recidivism by 11.1%. The three-year coefficients for the working inmates sample confirm a significant decrease in participant recidivism. The odds ratios illustrate a change in the odds of recidivism by a factor of 0.902 for the IV odds ratio or an 9.8% reduction in the recidivism odds for PIE participants.

IV.C.3.c: Pooled Sample Results

As discussed previously, the Indiana sample and Tennessee sample are combined into a larger pooled sample to reassess the results. This creates a larger sample for analysis across two prison systems with PIE operations. The pooled sample model results for the PIE participation variable are presented below in Table 3.

IV.C.3. Table 3: Effects of PIE Participation on Recidivism: Pooled Sample

	Logit			Logit w/ Facility Instrument			IV		
All Inmates:	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
PIE Participation on One-Year Recidivism	-0.234***	(0.0055)	0.791	-0.121**	(0.0604)	0.886	-0.176***	(0.0052)	0.839
PIE Participation on Two-Year Recidivism	-0.172***	(0.0058)	0.842	-0.091**	(0.0468)	0.913	-0.120***	(0.0067)	0.887
PIE Participation on Three-Year Recidivism	-0.151***	(0.0061)	0.860	-0.070*	(0.0408)	0.932	-0.094***	(0.0072)	0.911
Working Inmates:									
PIE Participation on One-Year Recidivism	-0.203***	(0.0101)	0.816	-0.086**	(0.0430)	0.917	-0.150***	(0.0120)	0.860
PIE Participation on Two-Year Recidivism	-0.155***	(0.0103)	0.856	-0.064*	(0.0381)	0.938	-0.103***	(0.0129)	0.902
PIE Participation on Three-Year Recidivism	-0.137***	(0.0114)	0.872	-0.050*	(0.0341)	0.951	-0.078***	(0.0124)	0.925

Note: Coefficients are from the participation variables in models 37-54. Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 55,511 observations in all inmates models. 14,735 observations in working inmate models.

Hausman tests are again conducted between the logit and IV coefficients in the three recidivism periods for both full and working samples. The null hypothesis for each test is that the difference between the coefficients is equal to zero. In all cases in the pooled sample comparisons the F-statistics are large enough (p-values <.001) to reject the null hypothesis. The conclusion is again that there are statistically significant differences in the results of the logit and IV models. Specifically these results suggest that an unmeasured or omitted variable has a significant effect on the consistency of the logit estimator.

The pooled sample results are similar to the results seen from the Indiana and Tennessee models. The one-year pooled full sample PIE participation coefficients are all seen to be negative and significant. This again implies that inmate participation in a PIE program significantly reduces the odds of the participant's recidivism relative to all inmates. For the one-year IV specification the odds of recidivism are multiplied by a factor of 0.839, or there is a 16.1% reduction in the odds of recidivism.

The two-year recidivism period coefficients for the full sample are similar to the one-year results. The odds ratios illustrate a change in the odds of recidivism by a factor of 0.887 for the IV specification. This suggests that participation could reduce the odds of recidivism by 11.3%.

The three-year coefficients for the full sample are again consistent with the one- and two-year results in their signs and significance. The odds ratios illustrate a change in the odds of recidivism by a factor of 0.911 for the IV odds ratio. The three-year time frame shows an 8.9% reduction in the recidivism odds for PIE participants.

The lower panel of Table 3 examines only inmates who are employed during incarceration or 14,735 observations in the working inmates sample. The pooled working inmates sample coefficients, again consistent with the full sample, are negative and significant.

In the one-year IV specification the odds of recidivism are multiplied by a factor of 0.860, or there is a 14.0% reduction in the odds of recidivism. The two-year recidivism period coefficients for the working inmates sample are similar to the one-year results. The odds ratios illustrate a smaller change in the odds of recidivism within two years than the full sample results. The odds of recidivism are changed by a factor of 0.902 for the IV specification. This suggests that participation may reduce the odds of recidivism by 9.8%. The three-year coefficients for the working inmates sample confirm a significant decrease in participant recidivism. The odds ratios illustrate a change in the odds of recidivism by a factor of 0.925 for the IV odds ratio, or a 7.5% reduction in the recidivism odds for PIE participants.

Table 4 shows the full sample results of logit and IV specifications with the inclusion of an age and participation interaction term. This variable examines the effect of the PIE participant's age on the odds of recidivism to determine if the PIE program's effect for different aged inmates.

IV.C.3. Table 4: PIE Participation with Age Interaction: Full Sample

	Logit			IV		
Indiana Inmates:	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
PIE Participation on One-Year Recidivism	-0.222***	(0.0045)	0.801	-0.155***	(0.0059)	0.856
Adjusted Age*PIE Participation Interaction	0.016*	(0.0088)	1.016	0.009*	(0.0062)	1.010
PIE Participation on Two-Year Recidivism	-0.152***	(0.0043)	0.859	-0.093***	(0.0051)	0.911
Adjusted Age*PIE Participation Interaction	0.019*	(0.0110)	1.020	0.019*	(0.0104)	1.019
PIE Participation on Three-Year Recidivism	-0.134***	(0.0040)	0.874	-0.072***	(0.0049)	0.931
Adjusted Age*PIE Participation Interaction	0.024*	(0.0128)	1.024	0.021*	(0.0113)	1.021
Tennessee Inmates:						
PIE Participation on One-Year Recidivism	-0.237***	(0.0057)	0.789	-0.176***	(0.0065)	0.839
Adjusted Age*PIE Participation Interaction	0.009*	(0.0052)	1.009	0.006*	(0.0038)	1.006
PIE Participation on Two-Year Recidivism	-0.180***	(0.0049)	0.835	-0.123***	(0.0067)	0.884
Adjusted Age*PIE Participation Interaction	0.010*	(0.0061)	1.010	0.009	(0.0061)	1.009
PIE Participation on Three-Year Recidivism	-0.160***	(0.0064)	0.852	-0.108***	(0.0078)	0.898
Adjusted Age*PIE Participation Interaction	0.017	(0.0088)	1.017	0.012	(0.0073)	1.012
Pooled Sample:						
PIE Participation on One-Year Recidivism	-0.228***	(0.0050)	0.796	-0.163***	(0.0061)	0.849
Adjusted Age*PIE Participation Interaction	0.013*	(0.0074)	1.013	0.008*	(0.0052)	1.008
PIE Participation on Two-Year Recidivism	-0.163***	(0.0045)	0.849	-0.105***	(0.0057)	0.900
Adjusted Age*PIE Participation Interaction	0.016*	(0.0090)	1.016	0.015*	(0.0087)	1.015
PIE Participation on Three-Year Recidivism	-0.145***	(0.0050)	0.865	-0.086***	(0.0061)	0.918
Adjusted Age*PIE Participation Interaction	0.021*	(0.0112)	1.021	0.017*	(0.0097)	1.017

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10.

For the interaction term the age variable is adjusted to remove the mean age of the PIE participant so that the coefficient represents the effect for the average inmate. The first stage predicted values for participation are also used to adjust the interaction term in the IV specification. The interaction term coefficient can be combined with the participation variable's coefficient to see the effects of PIE participation relative to an inmate's age. With the exception of the two-year and three-year Tennessee IV, the coefficients in the table a consistently positive and statistically significant at the 10% level indicating that an inmate whose age is above the mean would see an offset to the participation coefficient. This indicates the PIE program may be more effective for younger participants. This is consistent with the idea that younger inmates may have less human capital and therefore receive a greater benefit from education or training.

IV.C.3. Table 5: PIE Participation with Age Interaction: Working Sample

	Logit			IV		
Indiana Inmates:	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
PIE Participation on One-Year Recidivism	-0.180***	(0.0084)	0.835	-0.142***	(0.0091)	0.868
Adjusted Age*PIE Participation Interaction	0.009*	(0.0054)	1.009	0.003	(0.0069)	1.003
PIE Participation on Two-Year Recidivism	-0.136***	(0.0091)	0.873	-0.089***	(0.0108)	0.915
Adjusted Age*PIE Participation Interaction	0.013*	(0.0072)	1.013	0.009	(0.0077)	1.009
PIE Participation on Three-Year Recidivism	-0.113***	(0.0107)	0.893	-0.058***	(0.0113)	0.944
Adjusted Age*PIE Participation Interaction	0.016*	(0.0099)	1.016	0.011	(0.0084)	1.011
Tennessee Inmates:						
PIE Participation on One-Year Recidivism	-0.209***	(0.0134)	0.811	-0.150***	(0.0175)	0.861
Adjusted Age*PIE Participation Interaction	0.011	(0.0075)	1.011	0.007	(0.0080)	1.007
PIE Participation on Two-Year Recidivism	-0.169***	(0.0106)	0.844	-0.099***	(0.0162)	0.906
Adjusted Age*PIE Participation Interaction	0.015	(0.0098)	1.015	0.010	(0.0117)	1.010
PIE Participation on Three-Year Recidivism	-0.145***	(0.0141)	0.865	-0.083***	(0.0171)	0.920
Adjusted Age*PIE Participation Interaction	0.022*	(0.0131)	1.022	0.016	(0.0123)	1.016
Pooled Sample:						
PIE Participation on One-Year Recidivism	-0.191***	(0.0104)	0.825	-0.144***	(0.0125)	0.865
Adjusted Age*PIE Participation Interaction	0.009	(0.0063)	1.010	0.005	(0.0073)	1.005
PIE Participation on Two-Year Recidivism	-0.145***	(0.0097)	0.861	-0.092***	(0.0130)	0.911
Adjusted Age*PIE Participation Interaction	0.014*	(0.0082)	1.014	0.009	(0.0093)	1.009
PIE Participation on Three-Year Recidivism	-0.126***	(0.0120)	0.882	-0.068***	(0.0136)	0.934
Adjusted Age*PIE Participation Interaction	0.018*	(0.0112)	1.018	0.013	(0.0100)	1.013

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10.

Table 5 follows the same format as before for the working inmates sample. The size and sign of the coefficients are similar to the full sample results. However, in these specifications the interaction term's coefficients are not consistently statistically significant. The demographic variable coefficients were consistent with the full results presented in appendix B.

To further explore the effects of PIE program participation, several other measures related to the intensity or level of participation are examined. Rather than inmate participation being a binary response, the time in the program, the ratio of time in the program to time served, and the time from PIE termination to release are each examined. These variables provide insight in to the effects of different levels of exposure to the PIE program.

The first variation, time in the PIE program, uses the number of months in the program as an independent variable in place of binary participation in the same regression formats discussed previously. However, Table 6 only includes the logit and IV specifications. The availability of the PIE facility does not serve as a good proxy for months in the program and therefore the logit with instrument specification is omitted. Inmates who did not participate in the PIE program have zero months of participation. The full results are consistent with the results from the previous models which are located in Appendix B. The full sample and working inmate sample variations for Indiana, Tennessee, and a pooled sample follow. The full sample results for the time in the PIE program variable are in IV.C.3 Table 6.

IV.C.3. Table 6: Months of PIE Participation on Recidivism: Full Sample

	Logit			IV		
Indiana Inmates:	**Coefficient**	**(SE)**	**Odds Ratio**	**Coefficient**	**(SE)**	**Odds Ratio**
Time in PIE on One-Year Recidivism	**-0.038*** **	**(0.0124)**	**0.963**	**-0.029** **	**(0.0121)**	**0.971**
Time in PIE on Two-Year Recidivism	**-0.026** **	**(0.0139)**	**0.974**	**-0.020***	**(0.0112)**	**0.980**
Time in PIE on Three-Year Recidivism	**-0.023** **	**(0.0125)**	**0.977**	**-0.018***	**(0.0109)**	**0.982**
Tennessee Inmates:						
Time in PIE on One-Year Recidivism	**-0.046** **	**(0.0177)**	**0.955**	**-0.039** **	**(0.0142)**	**0.962**
Time in PIE on Two-Year Recidivism	**-0.035***	**(0.0201)**	**0.966**	**-0.027***	**(0.0159)**	**0.974**
Time in PIE on Three-Year Recidivism	**-0.031** **	**(0.0185)**	**0.969**	**-0.023***	**(0.0130)**	**0.977**
Pooled Sample:						
Time in PIE on One-Year Recidivism	**-0.040*** **	**(0.0133)**	**0.961**	**-0.031** **	**(0.0132)**	**0.969**
Time in PIE on Two-Year Recidivism	**-0.028** **	**(0.0148)**	**0.972**	**-0.023***	**(0.0139)**	**0.977**
Time in PIE on Three-Year Recidivism	**-0.026** **	**(0.0155)**	**0.974**	**-0.020***	**(0.0120)**	**0.980**

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10.

For the full sample, the results illustrate that an additional month of participation in the PIE program has a significant effect on inmate recidivism. The odds of recidivism, relative to those for a non-participant, decrease with additional months of participation.

This is consistent with the previous human capital arguments that propose that additional amounts of education or training reduce recidivism. The coefficients vary slightly across states and time periods but are consistently negative and significant.

The working inmates sample for the time in the PIE program follows as IV.C.3 Table 7. The full results are consistent with the results in Appendix B. The results from the months of participation variable for working inmates only again indicate a reduction in the odds of participant recidivism with increased exposure to the program.

IV.C.3. Table 7: Months of PIE Participation on Recidivism: Working Inmate Sample

	Logit			IV		
Indiana Inmates:	**Coefficient**	**(SE)**	**Odds Ratio**	**Coefficient**	**(SE)**	**Odds Ratio**
Time in PIE on One-Year Recidivism	**-0.025****	**(0.0131)**	**0.975**	**-0.020***	**(0.0129)**	**0.980**
Time in PIE on Two-Year Recidivism	**-0.019***	**(0.0116)**	**0.981**	**-0.011***	**(0.0109)**	**0.989**
Time in PIE on Three-Year Recidivism	**-0.017***	**(0.0102)**	**0.983**	**-0.008***	**(0.1033)**	**0.992**
Tennessee Inmates:						
Time in PIE on One-Year Recidivism	**-0.034***	**(0.0171)**	**0.967**	**-0.026***	**(0.0154)**	**0.974**
Time in PIE on Two-Year Recidivism	**-0.027**	**(0.0189)**	**0.973**	**-0.021**	**(0.0164)**	**0.979**
Time in PIE on Three-Year Recidivism	**-0.023***	**(0.0155)**	**0.977**	**-0.015**	**(0.0144)**	**0.985**
Pooled Sample:						
Time in PIE on One-Year Recidivism	**-0.029****	**(0.0146)**	**0.971**	**-0.021***	**(0.0131)**	**0.979**
Time in PIE on Two-Year Recidivism	**-0.023***	**(0.0133)**	**0.977**	**-0.018**	**(0.0143)**	**0.982**
Time in PIE on Three-Year Recidivism	**-0.019***	**(0.0116)**	**0.981**	**-0.011**	**(0.0132)**	**0.989**

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10.

The same level of significance as the full inmate sample is not observed although all of the coefficients are again negative and most have some level of significance. The magnitude of the effect as illustrated by the odds ratio is smaller in this variation, potentially indicating that some of the benefit from working in a PIE program may simply be the benefit from working.

To examine this measure of the time spent in the PIE program further, the original PIE participation variable is included in a re-specification of the previous model. Thus, the model includes, along with the demographic variables, the months of participation in the PIE program and the PIE participation dummy variable. This allows PIE participation to have a non-linear effect on recidivism. The logit model results are presented in Table 8. The IV specification is omitted in this examination because there is only one valid instrument for the two potentially endogenous variables, participation and months of participation.

IV.C.3. Table 8: Months of PIE Participation and Participation: Full Sample

	Logit		
Indiana Inmates:	**Coefficient**	**(SE)**	**Odds Ratio**
Time in PIE on One-Year Recidivism	**-0.021****	**(0.0103)**	**0.979**
PIE Participation on One-Year Recidivism	**-0.202*****	**(0.0413)**	**0.817**
Time in PIE on Two-Year Recidivism	**-0.014***	**(0.0094)**	**0.986**
PIE Participation on Two-Year Recidivism	**-0.149*****	**(0.0404)**	**0.862**
Time in PIE on Three-Year Recidivism	**-0.007**	**(0.0073)**	**0.993**
PIE Participation on Three-Year Recidivism	**-0.127*****	**(0.0418)**	**0.881**
Tennessee Inmates:			
Time in PIE on One-Year Recidivism	**-0.029***	**(0.0151)**	**0.971**
PIE Participation on One-Year Recidivism	**-0.232*****	**(0.0571)**	**0.793**
Time in PIE on Two-Year Recidivism	**-0.021***	**(0.0142)**	**0.979**
PIE Participation on Two-Year Recidivism	**-0.176*****	**(0.0584)**	**0.839**
Time in PIE on Three-Year Recidivism	**-0.014**	**(0.0123)**	**0.986**
PIE Participation on Three-Year Recidivism	**-0.157*****	**(0.0566)**	**0.855**
Pooled Sample:			
Time in PIE on One-Year Recidivism	**-0.025***	**(0.0143)**	**0.975**
PIE Participation on One-Year Recidivism	**-0.209*****	**(0.0463)**	**0.811**
Time in PIE on Two-Year Recidivism	**-0.019***	**(0.0116)**	**0.981**
PIE Participation on Two-Year Recidivism	**-0.165*****	**(0.0473)**	**0.848**
Time in PIE on Three-Year Recidivism	**-0.010**	**(0.0103)**	**0.990**
PIE Participation on Three-Year Recidivism	**-0.143*****	**(0.0488)**	**0.867**

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10.

The participation variable coefficients results in Table 8 are consistent in sign, size, and statistical significance with the main results presented in Tables 1, 2, and 3. No differences in the sign or statistical significance of the coefficients are evident. There is some small variation in the magnitude of the effect illustrated by the odds ratios. However, the inclusion of the participation variable in the model does appear to affect the time in the PIE program coefficients. Relative to the logit results in Table 6, the signs are still the same, but the size and statistical significance of the coefficients are reduced.

Table 9 presents the results from the above format, including participation and time of participation, for the working inmate sample. Again, the participation variable coefficients results are consistent in sign, size, and statistical significance with the main results presented in Tables 1, 2, and 3. No differences in the sign or statistical significance of the coefficients are evident. There is a slight variation in the magnitude of the effect illustrated by the odds ratios. The inclusion of the participation variable in the model again appears to affect the time in the PIE program coefficients. After including the participation variable, the signs of the time in the program coefficients are still the same but the size and statistical significance of the coefficients are reduced.

IV.C.3. Table 9: Months of PIE Participation and Participation: Working Sample

	Logit		
Indiana Inmates:	**Coefficient**	**(SE)**	**Odds Ratio**
Time in PIE on One-Year Recidivism	**-0.018***	**(0.0114)**	**0.982**
PIE Participation on One-Year Recidivism	**-0.176*****	**(0.0128)**	**0.839**
Time in PIE on Two-Year Recidivism	**-0.011***	**(0.0074)**	**0.989**
PIE Participation on Two-Year Recidivism	**-0.131*****	**(0.0122)**	**0.877**
Time in PIE on Three-Year Recidivism	**-0.005**	**(0.0090)**	**0.995**
PIE Participation on Three-Year Recidivism	**-0.101*****	**(0.0121)**	**0.904**
Tennessee Inmates:			
Time in PIE on One-Year Recidivism	**-0.024***	**(0.0143)**	**0.976**
PIE Participation on One-Year Recidivism	**-0.211*****	**(0.0151)**	**0.810**
Time in PIE on Two-Year Recidivism	**-0.018**	**(0.0154)**	**0.982**
PIE Participation on Two-Year Recidivism	**-0.165*****	**(0.0158)**	**0.848**
Time in PIE on Three-Year Recidivism	**-0.013**	**(0.0133)**	**0.987**
PIE Participation on Three-Year Recidivism	**-0.145*****	**(0.0154)**	**0.865**
Pooled Sample:			
Time in PIE on One-Year Recidivism	**-0.019***	**(0.0124)**	**0.981**
PIE Participation on One-Year Recidivism	**-0.185*****	**(0.0137)**	**0.831**
Time in PIE on Two-Year Recidivism	**-0.013***	**(0.0094)**	**0.987**
PIE Participation on Two-Year Recidivism	**-0.150*****	**(0.0140)**	**0.861**
Time in PIE on Three-Year Recidivism	**-0.008**	**(0.0112)**	**0.992**
PIE Participation on Three-Year Recidivism	**-0.124*****	**(0.0143)**	**0.883**

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10.

The next measure of intensity examined is the ratio of time in the PIE program to the time served in prison. This explores the question of the effects of the portion of the inmate's sentence spent in the program on recidivism. The regression results from this independent variable in the Indiana, Tennessee, and pooled samples did not produce a significant coefficient and therefore are not presented. There could many reasons for the lack of significance. For example, if two inmates receive the same level of benefit from the same amount of time in the PIE program but one inmate serves one year and the other serves ten, the effects of PIE as a portion of the time served may be skewed. Also, some prisoners were incarcerated before the PIE program was instituted, thus some early participant ratios may be structurally different then those incarcerated after 1994. Again,

the reasons for the lack of significance are not known and therefore no conclusions can be drawn.

The final intensity measure, months from PIE termination date to time of release, is explored. Inmates who are not participants have no data for this category. One could argue that inmates with shorter periods would be more likely to apply the acquired skills outside of prison. Thus, this variable is of interest. However, again the coefficients do not show significance and therefore are not presented. It is observed that many of the inmates who are terminated from the program are released in the same month. Generally, those with longer periods between participation and release have shorter periods of participation but that is not always the case. The inmate with a longer termination to release period may have developed enough skills or saved enough money to be successful upon release. Those who were successful in gaining employment in a PIE program, although not retained in the program, may have better job interview skills or may be more personable and subsequently may be more successful in post-prison employment. Once more, the basis for the lack of significance is conjecture. It appears that the most informative intensity measure is the number of months in the PIE program.

IV.D: Conclusions from Empirical Examination

The empirical examination explored the hypothesis that participation in a PIE program reduces inmate recidivism relative to that of the non-participant. To test this hypothesis, data were obtained from the Indiana and Tennessee Departments of Corrections on inmates who had been released and potentially re-incarcerated from 1997-

2004 and 1996-2006 respectively. This allows for comparisons between two similar systems and provides more robust results.

The data from the states' Offender Information Systems provides details of demographic characteristics and incarceration history including age, gender, race, educational background, marital status, offense type, sentence, infraction data, facility where incarcerated, subsequent incarcerations, and information on PIE program participation. These variables may affect recidivism. An examination of the two data sets confirms that the observations are similar to national estimates for their characteristics. Also illustrated were notable differences in age, education, and sentence length for PIE participants versus the average prisoner.

To explore which characteristics potentially affect recidivism, and therefore better understand which characteristics need to be controlled, contingency tables were generated. These tables examined the significance of the differences in recidivism rates between the demographic categories. Significant differences were identified in age, race, gender, time served, education, prior recidivism, crime type and PIE participation. Thus, with many influences on recidivism, the effects of these factors must be held constant to be able to examine the true effects of PIE participation. As a controlled, randomized experiment is not feasible with human subjects, a quasi-experimental design was proposed where observational data is used and a control group is matched based off the characteristics of the treatment group.

The logit regression procedure provides a maximum likelihood estimate for the case of a dichotomous dependent variable. The coefficient of the independent variable illustrates the change in the odds of recidivism. The logit regression is subject to the same potential biases as generalized linear models. With observational data, the primary bias of concern is endogeneity. Observable biases were eliminated by matching the characteristics of the control group to those of the PIE group so that no evidence of significant differences in the means exists in the Indiana, Tennessee, or pooled samples.

Unobserved biases remained as a concern. Omitted or unmeasured variable effects may be captured by a correlated independent variable. To control for this the logit was re-specified using an instrument for participation. The IV approach allows the effects of participation to be isolated from unmeasured characteristics, such as ability, which belong in the error term. The best instrument identified was the PIE facility availability. While other instruments were explored, the PIE facility location was the only instrument identified that met both the correlation with participation and non-correlation with the error requirements.

Given the one-, two, and three-year recidivism time periods, the Indiana, Tennessee, and pooled data sets, the full sample and working sample variations, and the logit, logit with location, and IV specifications, 54 primary regressions were necessary to fully examine the PIE participation effects question. The results confirm the hypothesis that PIE participation reduces inmate recidivism with all PIE coefficients being negative and significant.

The Indiana analysis consistently produces negative and significant PIE participation coefficients in the logit, logit with instrument, and IV models. Hausman tests between the logit and the IV estimates indicate that the IV estimator is the most consistent estimate of the effects of participation on recidivism. Thus, the IV estimates are preferred as the logit estimates may suffer from an endogeneity bias.

The one-year Indiana full-sample IV coefficient indicates a 15.4% reduction in the odds of recidivism. The two-year IV estimate suggests that PIE participation could reduce the odds of recidivism by 10.4%. The three-year time frame is the most scrutinized in this literature and the IV estimate indicates a 7.6% reduction in the recidivism odds. The working inmates sample coefficients, consistent with the full sample, are all seen to be negative and significant. In the one-year IV specification there is an indication of a 13.9% reduction in the odds of recidivism. The two-year recidivism period IV results suggest that participation reduces the odds of recidivism by 9.1%. The three-year IV odds ratio suggests a 6.4% reduction in the recidivism odds for PIE participants.

The Tennessee one-year full sample PIE participation coefficients are all negative and significant. Hausman tests again indicate that there are differences in the results of the logit and IV models. Specifically, these results suggest that an unmeasured or omitted variable has a significant effect on the consistency of the logit estimator making the IV results the preferred estimator.

The one-year Tennessee full-sample IV specification indicates a 17.6% reduction in the odds of participant recidivism. The two-year recidivism period IV results suggest reduced odds of recidivism of 13.2%. The three-year IV odds ratio indicates a reduction in the odds of recidivism by 11.6%. The Tennessee working inmates sample one-year IV specification indicates a 14.2% reduction in the odds of recidivism. The two-year recidivism period shows the odds of recidivism decline by 11.1%. The three-year IV odds ratio suggests a 9.8% reduction in the recidivism odds for participants.

The pooled sample results are similar to the separate Indiana and Tennessee results. The pooled full sample PIE participation coefficients are all negative and significant indicating that inmate participation in a PIE program significantly reduces the odds of the participant's recidivism. Hausman tests again conclude that there are statistically significant differences in the results of the logit and IV models.

The one-year pooled-sample IV regression coefficient indicates a 16.1% reduction in the odds of recidivism. The two-year ratio suggests that participation could reduce the odds of recidivism by 11.3%. The three-year IV coefficient shows an 8.9% reduction in the recidivism odds for participants. The working inmates sample coefficients, again consistent with the full sample, are negative and significant. In the one-year IV specification there is an indication of a 14.0% reduction in the odds of recidivism. The two-year recidivism period coefficient for the working inmates suggests that participation may reduce the odds of recidivism by 9.8%. The three-year coefficient's odds ratio indicates a 7.5% reduction in the recidivism odds for participants.

The empirical work confirms that the PIE inmate work program reduces the odds of recidivism for inmates in the Indiana and Tennessee programs. The few other studies that have examined the PIE program suffer from shortcomings such as smaller samples, shorter time periods in a single state, and ignoring the question of endogeneity. These issues have been addressed in this study. The results here may have far reaching policy implications as this cost effective program has been shown to have the added benefit reduced recidivism.

V. PRIVATE AND SOCIAL RETURNS TO PRISON LABOR

This section develops a potential framework for policy analysis. The potential beneficiaries of the PIE program are revisited. The monetary returns to the inmates and to society as a whole are quantified. Potential uses and extensions of this analysis are discussed.

V.A: Beneficiaries of PIE

This section addresses some of the policy implications of the reduced recidivism and cost effectiveness of the PIE program. PIE benefits are shared by the prisoner and members of society. The prisoner gets job skills, earnings and savings, and an opportunity to spend time working. Others benefit from the various wage deductions. These beneficiaries are the compensated victims, the inmates' families and taxpayers who experience a lower tax burden with the offset to the costs of incarceration. Society as a whole also benefits if the PIE program reduces recidivism as they are exposed to a lower level of criminal activity. These PIE benefits are derived from the previously explored human capital acquisition arguments that change the inmate's earnings profile as well as reduce the cost of incarcerating a PIE participating inmate.

V.B: Theoretical Returns

The idea that there quantifiable returns to increasing an individual's human capital and that these benefits extend beyond the individual as illustrated in the human capital theory models is the logic behind the following analysis. After participation in a training or education program the lifetime earnings potential, and criminal decision

process, have been altered. The theorized effect is a net positive gain to the individual and to society. Western, et al (2001) claims that a prison record will consistently reduce the earnings potential of an ex-inmate by 10%-30%. However, Bechtel and Smith (2005) find that post-release PIE participants earn, on average, approximately 25% more than their non-PIE counterparts. Thus, one would expect a difference in the lifetime earnings of PIE participants relative to their non-participant counterparts. The calculations in this section of the paper are a preliminary attempt to quantify and illustrate not only these changes in private returns but also the additional social returns. These estimates are compared to the participants' counterparts to illustrate the returns to the PIE program.

V.C: Analytic Framework

Hannah (2007) provides a useful observation on the divergence of state and corporate objectives. From a (state-private enterprise) joint venture perspective, the simplified financial perspective is: Net sales - purchases from private sector - other expenses = Net income (shared per agreement between public agency and private firm). While the firm's theoretical objective is clearly profit maximization, the state's objective is conflicted because of its responsibilities to society. This can be illustrated by two examples that illustrate the range of considerations.

In the first example, assume a state's share of net income is $1 million, an amount that could be used to completely offset the annual cost of incarceration (approximately $40,000 per year) of 25 inmates who are participating in the program. Further assume that these prisoners have a recidivism rate of zero, and each finds gainful employment upon release. From the point of view of the state, the program is financially a breakeven

proposition and the social rate of return is positive because no further incarceration expenses are incurred and the released prisoners are taxpaying members of the public.

In the second example, assume the state's share of the joint venture nets a $1 million loss because of low productivity requiring 50 inmates to achieve the same level of production as in the first example. One can see that if social return weighs heavily in the state's economic reasoning, then the recidivism rate and wages derived from gainful employment upon release are the primary concerns, even under conditions of a financial net loss from a prison work program. However, from an economic perspective this is short-sighted reasoning since a more efficient operation is more viable in the long term, and increased labor productivity arguably leads to business growth and employment growth. If this example is illustrative of reality, and if prisoner employment is a viable alternative to idle incarceration, then a greater degree of economic congruency is required between the decision makers in corrections departments and the private enterprise sector.

An aggregation of state-level net social returns would not necessarily equate to social welfare at the national level. Kling and Krueger (2001) paint a rather bleak picture of the economic contribution by computing that if all prisoners were employed full-time at minimum wage, GDP would only increase by 0.2 %. However, they underscore that such a measure is not very informative, especially when the positive social benefits of decreased recidivism are rarely measured with confidence.

Also, to be considered are the private returns or returns to the individual. The worker has increased his human capital through participation in a PIE program and should earn higher wages in the remainder of his work life. The higher wages benefit not

only the individual, but also society in the form of higher lifetime tax contributions. The combined private return and the social returns are examined more thoroughly in the following model.

V.D: Total Returns Model

Following Hannah's (2007) insight, a model estimating both private and social returns follows. The social returns may be more appropriately viewed as the societal burden as the returns are consistently negative. As discussed above, Hannah's work includes the firm's perspective in the private returns estimate. However, while the firm's returns can certainly be measured, observation of PIE company's earnings is not publicly available and thus will be omitted. The model does capture the private returns to the individual. And, by integrating important social variables into this model, the approach more completely accounts for the state's and society's perspectives than has been previously modeled. The difference between the average participant and average non-participant provides a look at the marginal social benefit to the PIE program.

The following models compare non-participating inmates and PIE participating inmates. Note that this model would be further complicated by considering additional variables, such as prisoner turnover or length of program participation. The perspective is only a first-level analysis and does not consider the secondary impacts of additional job creation derived from the input markets for prison manufacturing, the domestic retention vs. off-shoring of jobs, or whether product markets are captive or competitive. Also, there may be some question as to the inclusion of a lower recidivism rate for program

participants in the model relative to their non-participant counterparts. However, this rational was established in Section IV.

The models address both social and private returns to inmates in a manner similar to that used in human capital acquisition decisions where the lifetime benefits of additional education or training are estimated and discounted appropriately. The participant's return can then be compared to the non-participant's return to examine the differences attributable to the individual's participation in the PIE program.

In the following model, the burden on societal resources, or net social returns (NSR), to the program from the government's and society's perspective are estimated by combining program payments, taxes, and costs. The model first captures the PIE required payments and taxes withheld from the participant while incarcerated (P_I). For the non-participant comparison this value is zero as no deductions are required. The model then captures (T_X) the positive contribution of taxes collected on potential post-release earnings as well as the cost of a re-incarceration period given the odds of recidivism. The expectation here, from the consensus in the human capital literature, is that an individual with increased skills receives higher wages than the individual without that skill set. In accordance with the PIE program goals, the inmate will have obtained a marketable skill that he would not have possessed otherwise. Therefore, participants are expected to contribute more tax dollars over their working lifetime. The final element of the NSR component is the cost of the individual's initial period of incarceration (C_P).

Thus,

$$NSR = P_I + T_R - C_P \qquad \text{(V.D.1)}$$

where

$$P_I = (t_p + \delta + \phi + \nu + e)\bar{s} \quad . \qquad \text{(V.D.2)}$$

P_I captures the amount of taxes, deductions, and other compensation paid by the participant during his incarceration. For the non-participants this value is zero. Included for participants are the total taxes (t_p) the participant pays on their PIECP wages including federal, state, Social Security and Medicare. Petersik's (2003) examination of the beneficiaries of PIE inmate wages estimates this value to be approximately 10.3% of wages. Deductions are made for room and board (δ) and the aforementioned study estimates this to be approximately 32.8% of wages. Next, deductions for family support (ϕ) are captured. Petersik reports this as an average of only a 0.8% wage deduction in his study. He explains this deduction is only used in the PIE system for child support and that this low value is likely due to lack of child support orders, where in absences of a court requirement, PIE programs may perceive a lack of authority to require the deduction. He further notes that neither the courts nor families seem to be pursuing the support obligations. The next component captures compensation to victims' programs (ν) and other court ordered restitution estimated to be 9.2% of the PIE wages. Finally, employer contributions (e) for social security OASDI and HI, unemployment insurance, and workers compensation found to be, on average, 8.6% of wages (Petersik, 2003). A variable for the average inmates sentence ($\bar{s}$) is included so that the annual estimates are

captured over the average period of incarceration. This is a 57 month estimate, or 4.75 years, which is the average sentence for all state inmates outlined in the NCJ publication number 217995 (U.S. Department of Justice, 2004).

$$T_R = [w_{ri}(y\rho r)t_r](1-\theta_i) + (yI_i)(\theta_i) \qquad \text{(V.D.3)}$$

T_R captures the potential tax revenue generated by the inmate after his release as well as a component to capture the cost of re-incarceration in case of recidivism. Participants are expected to have higher annual earnings than non-participants. The calculation begins with an estimate for the average inmate's annual earnings after release are included (w_{ri}). The average individual (i) is either a participant or non-participant and will earn different wages accordingly. High-, mid-, and low-earnings are used to re-specify the calculation and provide a broader look at potential results. Former inmates are expected to face similar employment prospects as their non-criminal counterparts. However, former inmates are often limited in their vocational choices and are expected to earn 10% to 30% less than their non-convict counterparts (Reynolds, 2004). Thus the high-wage estimate is set at $32,000 which is in line with the Bureau of Labor Statistics (BLS) median real (2000) earnings estimate for men over the age of 25. While some individuals may earn more than this, it serves as a reasonable upper bound. As this estimate is forward looking, the lower bound is set by the $7.25 minimum wage law effective July 24, 2009 with a 40 hour work week for 50 weeks of the year or $14,500. The mid-wage estimate is the average of the high and low estimates. PIE participants are

expected to earn 25% more than a non-participant upon release (Bechtel, 2005) and their wage estimates are adjusted accordingly.

The tax and incarceration component (T_R) continues by adjusting the wage estimate by the labor force participation rate (ρ), which is estimated to be 90.8% for men between 30-44 years old by the BLS. This estimate is used for the PIE and non-PIE inmates as the need for income may not be affected by a prior incarceration period. An adjustment for differing unemployment rates is necessary. Bechtel (2005) estimates that for PIE participants the post-release employment opportunities are no different than the average person. Thus, the employment rate (r) of 95% from BLS estimate for males in this age range is used for PIE workers. Following Bushway (2003) and Holzer, et al (2003) who estimate the unemployment rates for ex-convicts may be in the range of 10%-20%, an employment rate of 85% is used for the non-PIE group. These adjustments compensate for the relative likelihood of participation and employment after incarceration. This potential annual earnings estimate is multiplied by the difference in Social Security's retirement age for individuals born after 1960, which is 67, and the average inmate age at release, which is 32 (U.S. Department of Justice, 2003). More specifically, working years (y) are expected to average 35.

The taxes paid on these potential earnings are the critical component of the social portion of this model. Thus, the anticipated tax contribution is captured by using the former inmates' anticipated tax rate (t_r), which is calibrated according to the IRS tax brackets associated with the earnings estimates.

All of this must be adjusted by the likelihood of the inmate staying out of prison, one minus the recidivism rate $(1-\theta_i)$, which is different for individuals (i) who participate and those who do not. The recidivism rates have been initially calibrated as 66% for non-participants per the U.S. Department of Justice (2000) and 35% for PIE participants per the estimate from the Ohio Department of Rehabilitation and Corrections (1995) study of PIE recidivism rates. These are to be recalibrated to the findings in the preceding sections of this study.

If the individual returns to prison, he will no longer be contributing tax dollars. Rather, he will again be a burden to tax payers. Thus, the likelihood of the individual returning to prison (θ_i) is multiplied by the annual cost (I_i) of continuing to incarcerate the individual during his working years (y) as the final component of the T_R calculation. The U.S. Department of Justice estimate discussed earlier in this paper of $22,650 as an average annual cost is used measure of average annual cost.

$$C_P = (I_i)\bar{s} \qquad \text{(V.D.4)}$$

C_P captures the cost to the prison to incarcerate an individual. The annual cost to incarcerate a prisoner (I_i) is multiplied by average participant's sentence $(\bar{s})$ so that the annual estimates are captured over the entire period of incarceration. This value is somewhat offset by the room and board deduction captured earlier in δ for PIE participants. The room and board deduction for participants is designed to cover the cost

of most necessities and most items for the security, justice, rehabilitation, and daily lives of state prison inmates (Petersik, 2003).

The net private return (NPR), from the individual's perspective, can be estimated by combining the individual's wages and savings while incarcerated and the individual's potential future wages. The difference in the average participant's and non-participant's numbers can be viewed as the marginal private benefit of the PIE program to the PIE participant. There are also returns to the private industries operating in the PIE system. These returns are assumed to be positive or else the typical firm would exit the program. However, as there is no requirement of disclosure of the private companies' records, this return is noted here but not included in the calculation. Rather, the calculation is limited to the individual's private return.

$$NPR = S_I + W_R \tag{V.D.6}$$

where,

$$S_I = (\mu_p + w_{pi})\bar{s} \tag{V.D.7}$$

In the Net Private Return component, S_I captures the average estimated 14% annual mandatory savings (μ_p) outlined by Petersik (2003). Also, the remaining prison wages (w_{pi}) net of all deductions are included. The annual savings and wages component is the multiplied by the average sentence ($\bar{s}$) discussed above so that the annual estimates are captured over the entire period of incarceration.

$$W_R = [(y\rho r(w_{ri}))(1-t_r)](1-\theta_i) + (yw_p)\theta \qquad \text{(V.D.8)}$$

W_R has the same post-release wage adjustments as described above. However, in this portion of the model the average individual's earnings are of interest. Therefore, the individual's adjusted earnings are multiplied by (1- t_r) to capture the private portion. This number is the adjusted as discussed above by one minus the recidivism rate $(1-\theta_i)$ rate to account for the likelihood of remaining out of prison and earning this amount. The former inmate faces a θ_i chance of returning to prison where he is assumed to remain and would be earning non-participant wages.

Again following Hannah (2007), the total net return (TNR) is obtained by adding the Net Social and Net Private Returns. This gives us an estimate of the total dollar benefit to the government and the individual due to the individual's participation in a PIECP program while incarcerated.

$$TNR = NSR + NPR \qquad \text{(V.D.9)}$$

The model could be further calibrated by introducing time value computations, where, rather than assuming any growth in the former inmates earnings (w_r) is offset by inflation, which is not unreasonable and is the assumption for the model, a wage growth

rate (κ) and an inflation discount factor (ι) could be introduced into the model. Thus, the wage (w_{ri}) component of the model becomes:

$$\sum_{i=1}^{\tau} \frac{\left[\left((w_r)(1+\kappa_r)^{\tau}\right)\right]}{(1+\iota)^{\tau}} \qquad \text{(V.D.10)}$$

Where τ is the difference between the former inmate's retirement date and the inmate's release date.

V.E: Results

The results presented here detail the potential returns to the PIE program by comparing the potential social, private, and total contribution and earning differences in the average participant and average non-participant. These working lifetime differences begin to quantify the rehabilitation benefits of the inmate work program.

The results of the social returns model in V.E. Table 1 illustrate the differences in potential tax contributions, tax savings, and contributions to other persons through victims' and family support as well as cost of potential periods of re-incarceration.

V.E. Table 1: Social Returns: Burden to Society

	PIE Participant	Non-PIE-Participant	Difference
High Wage	-$86,446	-$395,001	-$308,556
Mid-Wage	-$223,649	-$459,640	-$235,991
Low-Wage	-$270,127	-$479,789	-$209,661

Three estimates are provided here based on variations in potential prison and non-prison wage levels. These social return figures capture the average societal contributions

from the individual if they remain out of prison less the cost to society if they return to prison. In examining the individual components of this calculation, of note are the positive contributions made by the PIE participants (P_I) while incarcerated. The values range from $37,225 to $48,008 in mandated deductions versus $0 for the non-participants. The tax collection and incarceration cost components (T_R) are all negative values due to the potential for recidivism and the high costs of incarceration. The high-wage and low-wage estimate values for the participants and the non-participants range from -26,886 to -$199,765 and -$287,414 to -$372,201 respectively where the non-participants face a greater likelihood of recidivism and therefore a greater potential re-incarceration cost. The average cost of incarceration during the initial period (C_P) is $107,588 for all individuals. The offset of this cost for PIE participants is captured in the aforementioned room and board deduction.

The above values all combine to show a mid-wage estimated difference in the social costs between PIE-participants and the non-PIE inmates of $235,991. Given the high costs of incarceration and likelihood of recidivism, the average inmate in all situations is seen as a drain on societal recourses. However, the differences column in the table above illustrate that the PIE participant's burden to society is considerably less across all wage estimates.

The private returns model is a more traditional look at potential differences in earnings over an individual's working life as would be seen in a human capital education or training benefit analysis where the work experience translates to higher wages for the PIE participant. Unlike the traditional human capital example where education is an

initial cost, the inmate is captive during the initial period and the inmate's employment decision is a choice between traditional prison jobs and PIE jobs.

V.E. Table 2: Private Returns: Net Gains to the Inmate

	PIE Participant	Non-PIE-Participant	Difference
High Wage	$738,228	$399,700	$338,527
Mid-Wage	$583,421	$309,579	$273,842
Low-Wage	$341,898	$268,791	$73,107

Three estimates are again provided in V.E. Table 2. They illustrate variations in potential prison and non-prison wage levels. Also, as detailed in the previous section, the potential earnings for the average individual are adjusted for the likelihood of employment, labor force participation and recidivism as well as for taxes. As previously discussed, the variation in potential private earnings comes from the differences in wages earned in prison, the higher post incarceration wages for the PIE participants, variations in employment potential, tax rates, and recidivism differences. The mid-wage estimate shows a difference in potential private returns of over a quarter of a million dollars.

Combining the social and private return estimates provides a measure of the total returns to the PIE program in terms of the differences between participants and non-participants. These results are presented in V.E. Table 3.

V.E. Table 3: Total Returns (Social + Private)

	PIE Participant	Non-PIE-Participant	Difference
High Wage	$651,782	$4,699	$647,083
Mid-Wage	$359,771	-$150,061	$509,833
Low-Wage	$71,770	-$210,997	$282,768

The non-participants' private returns do not sufficiently offset their drain on society and have negative or only slightly positive returns associated across the wage estimates with higher wages necessarily resulting in a smaller burden. It is observed that the PIE participant is likely to experience a positive net return across all wage variations. Although the true calculations are subject to the specific individual's characteristics, the preceding estimates give a general idea of the costs associated with the average PIE and non-PIE inmate.

V.F: Conclusions from Private and Social Returns Models

The differences in working life earnings and social contributions for participants and non-participants are seen to be potentially quite large. Previous sections detailed that the PIE participation rate is only around 1% of inmates. The examination of these results leads to the conclusion that expansion of the PIE program would create additional benefits to the individuals and society. Also, omitted from this examination are the benefits to the private firm and to GDP that would increase with program expansion as well.

There are many other obvious questions for this type of inquiry. How deep is the pool of labor that may produce a positive net return? How significant is the divide between private enterprise goals and the corrections goals in states? Can useful data be obtained from other programs for comparative analysis? The objective was to use a rough analytic approach that captures some of the most important variables to advance empirical work in this area by adding insights from the subfield of forensic economics into the true costs and benefits of the PIE system.

VI. CONCLUSIONS

Given the trends in corrections expenditures and information regarding the high recidivism rates in the United States any reasonable measures to stem these trends are worth exploration. Past examinations have shown reduced recidivism rates to provide a variety of monetary and social benefits for all involved. Reductions in incarceration expenditures and recidivism rates are priorities for state legislators.

The idea of prison work programs is not new. Historically these programs were a cost effective way to operate a prison. After succumbing to union pressures, prisons abandoned these work programs for many years and became warehouses for inmates with few rehabilitation options available. The 1979 Prison Industries Enhancement Certification Program reintroduced the outsourcing of inmate labor and once again provided an offset to incarceration costs.

Most economic theories of crime support the notion that making legal work opportunities more attractive and illegal undertakings less attractive will reduce crime and recidivism. Some theorize that post-release subsidies would make the transition back into society easier. Human capital theory suggests that the acquisition of education and/or job skills should increase the returns to employment and thus accomplish the change in the attractiveness of the criminal activities. The PIE programs forced savings component acts as post release subsidy.

The data obtained were from the Indiana and Tennessee Departments of Corrections. These data were examined through summary statistics and contingency table before being employed in a series of multiple regression models. The logit model

was introduced to more thoroughly and more correctly address the dichotomous dependent recidivism variable. Sample matching, to correct for observable difference, and a two stage IV approach, to control for unobservable differences in individuals, were performed to address endogeneity issues that have been previously overlooked in the literature.

The results from the empirical examination conclude that participation in a PIE program reduces the odds of recidivism. Depending on the data set, the Indiana and Tennessee full sample IV results indicate a reduction of 14.5%-16.2% on the one-year recidivism event, 9%-11.9% for the two-year event, and 6.8%-10.5% for the three year events. The working sample results indicate a reduction of 13%-13.6% on the one-year recidivism event, 8.2%-9.9% for the two-year event, and 5.9%-8.3% for the three year events.

Considering the results from the empirical work in this paper, the conclusion is that private industries entering the prisons may provide some relief to the current condition of increasing costs and populations. The total net return model supports Levitt's (1999) claim that, because the social costs of crime are so high, a policy that reduces recidivism can have a social benefit that far outweighs a prisoner's narrow contribution to GDP. There are many benefits to a variety of members of society. With the more evidence for the link between prison industry programs and reduced recidivism found in this study, future policies may encourage a structure of incentives to private industry to provide increased participation opportunities.

Future studies of the PIE program are necessary to confirm these findings. Future research should include an examination of all 36 PIE programs or more of a national level approach. Also, the work that has been done in evaluating PIE programs does not examine the type of private enterprise in which the inmates are involved (e.g. construction, agriculture, manufacturing, etc.). This may be due to small samples or may have been outside the scope of the research. An interesting future research question would be to examine the industry's effect on recidivism and employment. Further research may focus on examining PIE program or other rehabilitation programs effects on recidivism for specific crimes. This paper begins this inquiry by including a categorical type of crime variable to control for these influences. However, specific crimes within these categories could be examined. Also, while this study assessed PIE workers relative to traditional prison industries like cafeteria and laundry workers, the effectiveness of the PIE program relative to other rehabilitation or vocational programs should be assessed in future studies.

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Appendixes

Appendix A

Figure A.1: Indiana Inmate Incarceration Events, Monthly 1957-1995

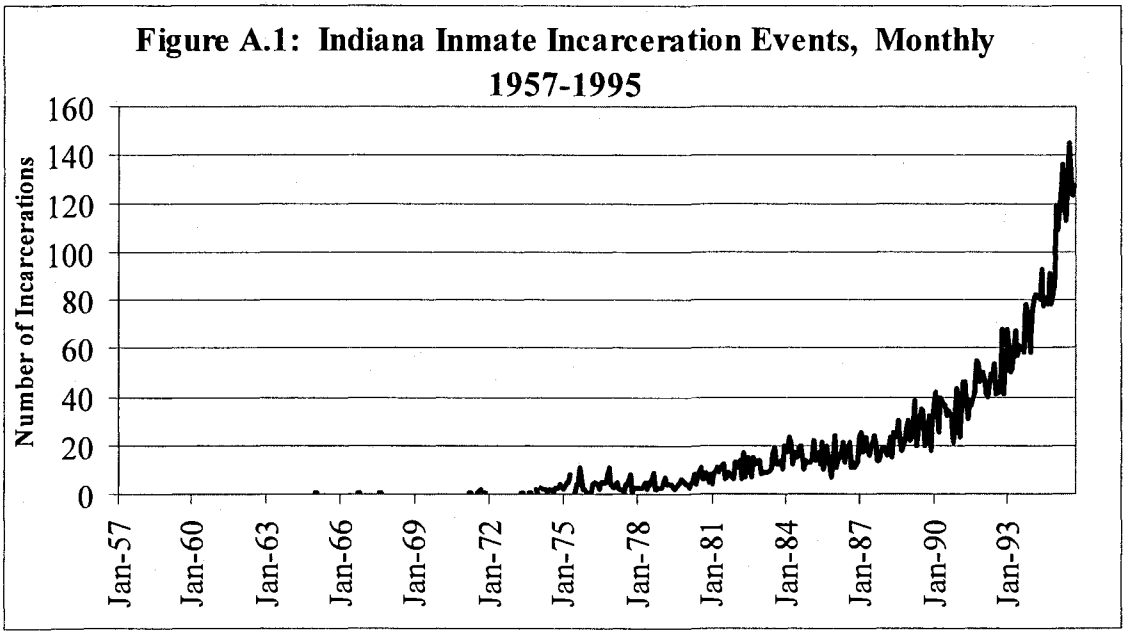


Figure A.2: Indiana Inmate Incarceration Events: Monthly 1996-2004

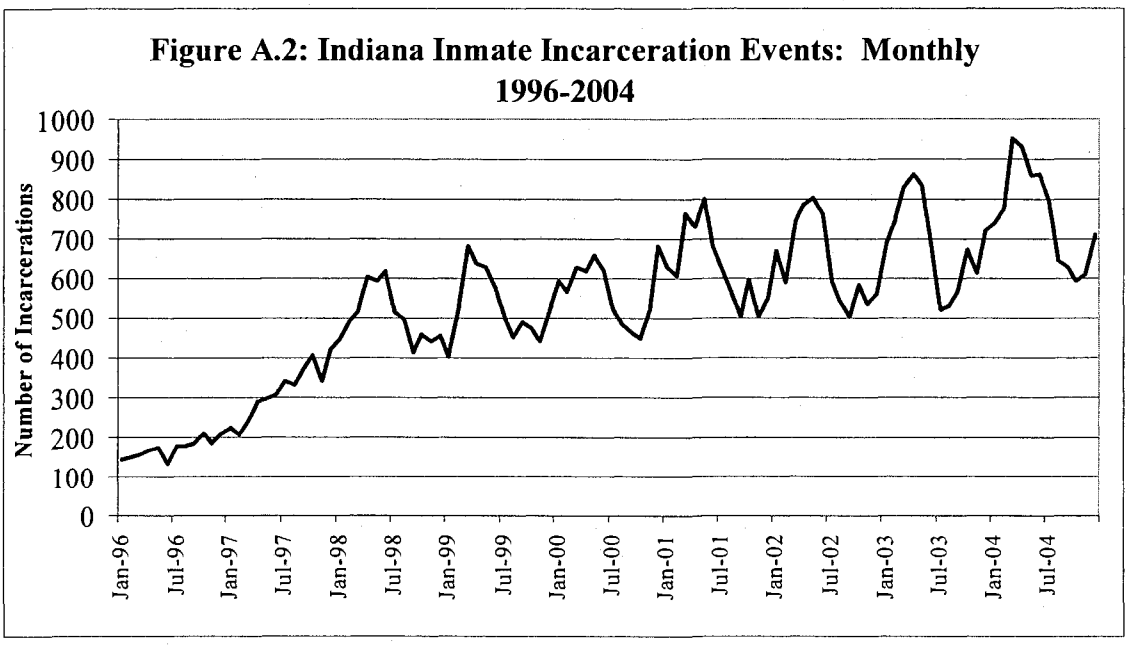


Figure A.3: Indiana Total Incarceration Events by Month, 1997-2004

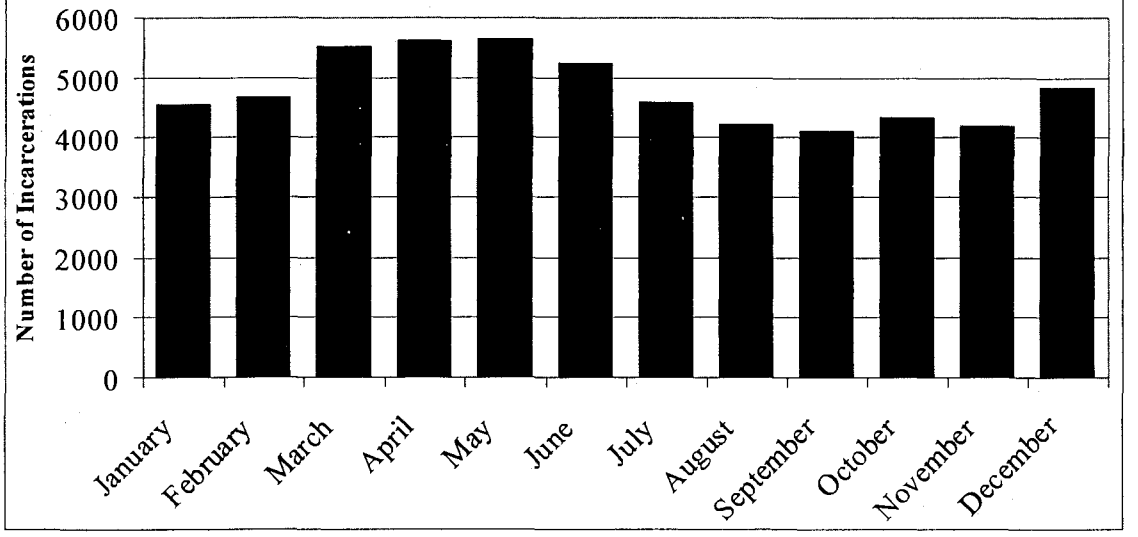


Figure A.4: Indiana Average Incarceration Events per Month, 1997-2004

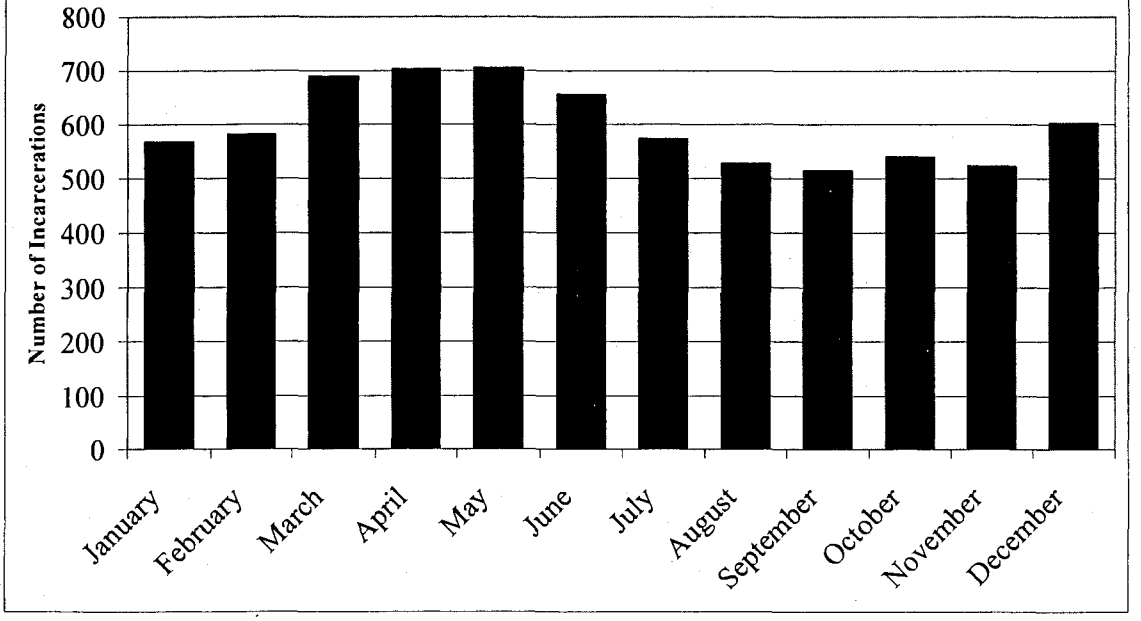


Figure A.5: Indiana Average PIE Employees per Month, 1997-2004

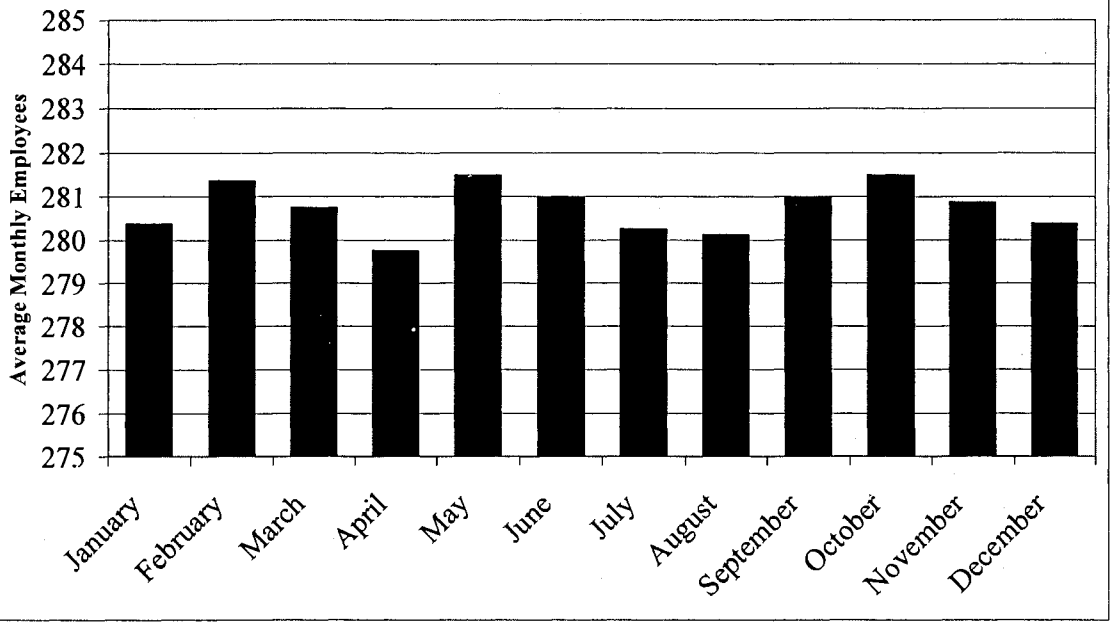


Figure A.6: Tennessee Inmate Incarceration Dates, Monthly 1961-1995

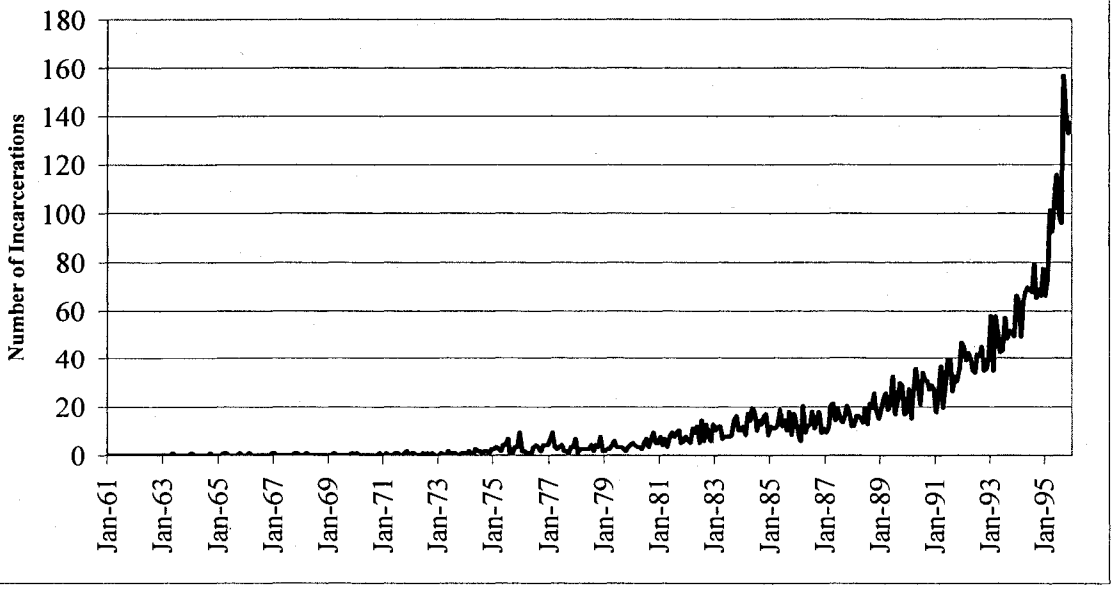


Figure A.7: Tennessee Inmate Incarceration Events, Monthly 1996-2006

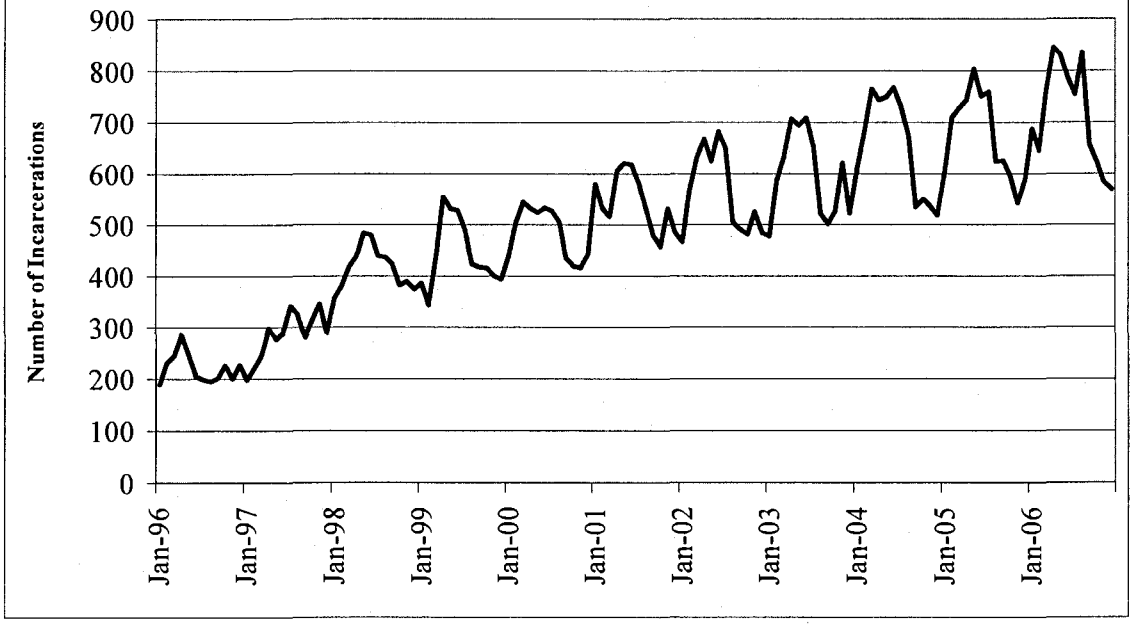


Figure A.8: Tennessee Total Incarceration Events by Month. 1996-2006

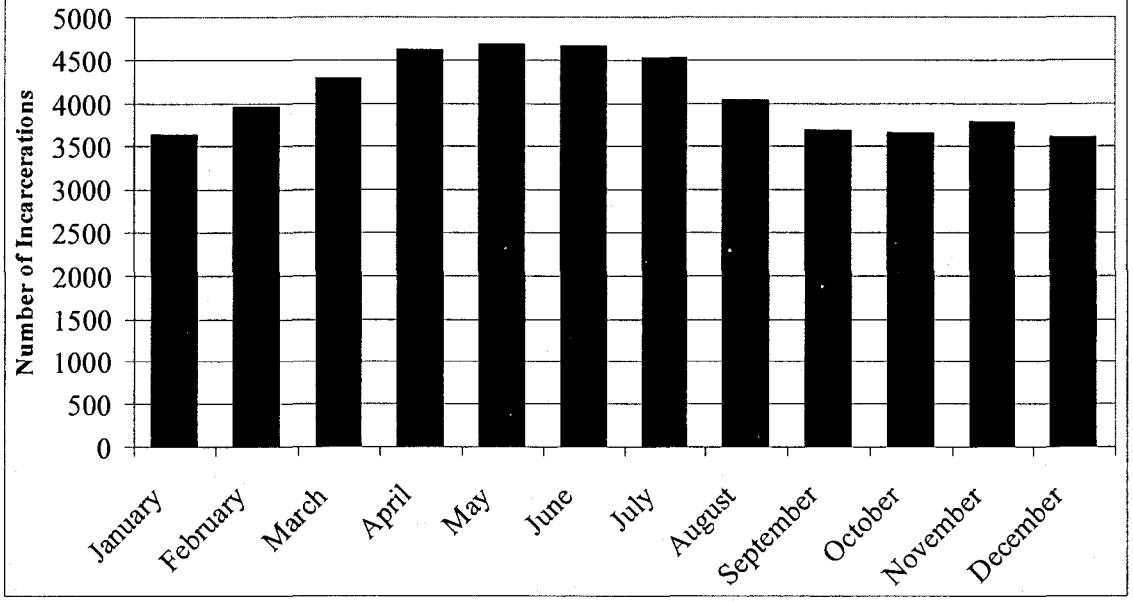


Figure A.9: Tennessee Average Incarceration Events per Month, 1996-2006

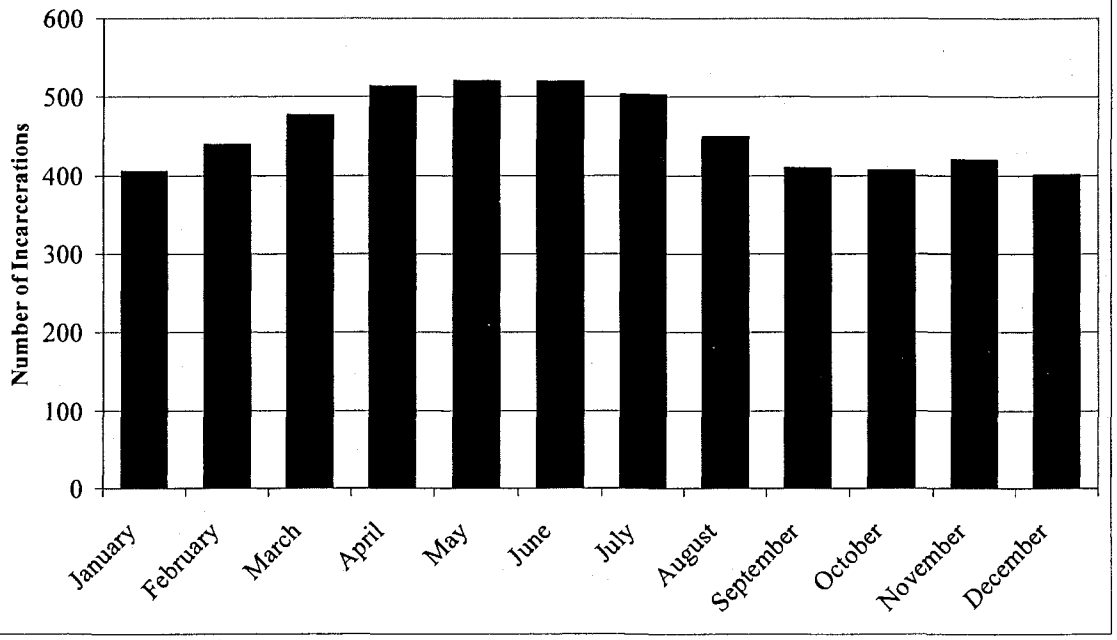
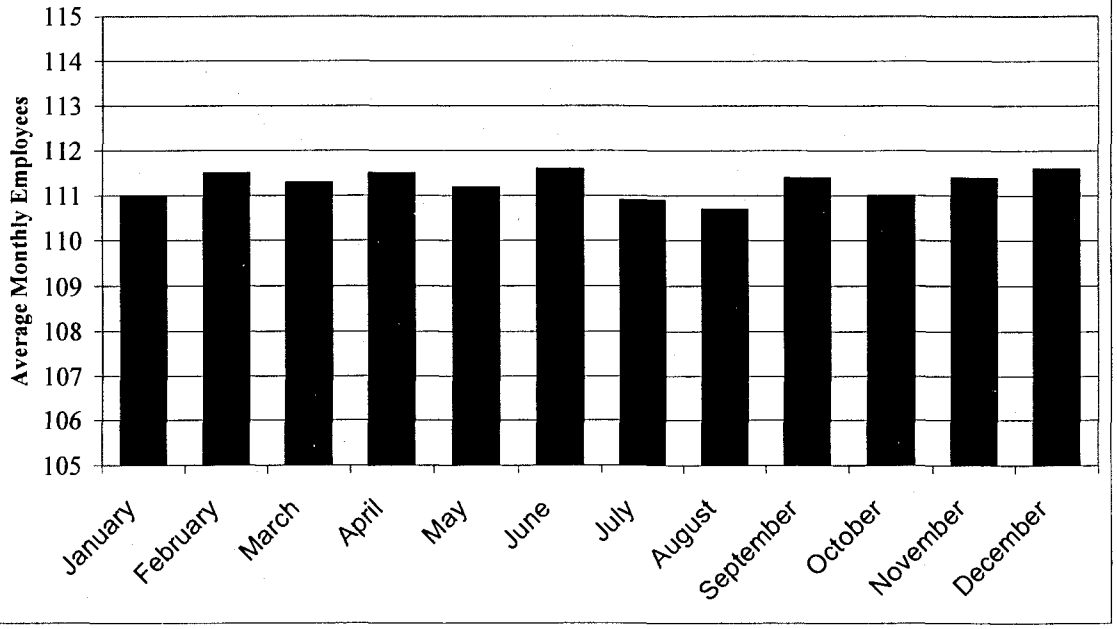


Figure A.10: Tennessee Average PIE Employees per Month, 1996-2006



Appendix B

Appendix B.1. All Covariates: One-Year Recidivism, Indiana, All Inmates

	Logit (model 1)			Logit with PIE Facility (model 2)			IV (model 3)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.256***	(0.0939)	-	1.241***	(0.0961)	-	1.181***	(0.1167)	-
Age	-0.020***	(0.0014)	0.980	-0.027***	(0.0021)	0.973	-0.026***	(0.0018)	0.974
White	-0.308***	(0.0285)	0.735	-0.299***	(0.0292)	0.741	-0.292***	(0.0327)	0.747
Education	-0.111***	(0.0281)	0.895	-0.095***	(0.0239)	0.909	-0.107***	(0.0217)	0.902
Male	0.246***	(0.0183)	1.279	0.241***	(0.0187)	1.273	0.241***	(0.0176)	1.273
Married	0.024*	(0.0089)	1.024	0.027*	(0.0148)	1.028	0.016	(0.0317)	1.017
Prior Recidivism	0.559***	(0.0549)	1.749	0.555***	(0.0423)	1.742	0.560***	(0.0496)	1.751
Economic Crime	0.247***	(0.0133)	1.281	0.243***	(0.0129)	1.276	0.238***	(0.0157)	1.269
Time Served	0.079***	(0.0237)	1.083	0.088***	(0.0242)	1.093	0.089***	(0.0275)	1.094
Security Level	0.173**	(0.0639)	1.190	0.183**	(0.0931)	1.201	0.171**	(0.0839)	1.187
Participation	-0.226***	(0.0049)	0.798	-	-	-	-0.167***	(0.0054)	0.846
PIE Location	-	-	-	-0.110**	(0.0484)	0.895	-	-	-
PrisonI2	0.047	(0.0513)	1.048	0.048	(0.0525)	1.049	0.043	(0.0431)	1.044
PrisonI3	0.103	(0.0782)	1.109	0.101	(0.0800)	1.106	0.094	(0.0796)	1.099
PrisonI4	0.019	(0.0224)	1.019	0.019	(0.0229)	1.019	0.011	(0.0228)	1.015
PrisonI5	0.012	(0.0199)	1.012	0.017	(0.0198)	1.017	0.023	(0.0203)	1.023
PrisonI6	-0.031	(0.0200)	0.969	-0.047	(0.0324)	0.954	-0.029	(0.0203)	0.971
PrisonI7	-0.059	(0.0610)	0.943	-0.050	(0.0699)	0.951	-0.050	(0.0622)	0.952
PrisonI8	0.009	(0.0411)	1.009	0.018	(0.0544)	1.018	0.013	(0.0088)	1.013
PrisonI9	-0.080	(0.0523)	0.923	-0.082	(0.0496)	0.921	-0.070	(0.0533)	0.932
PrisonI10	0.100	(0.0643)	1.105	0.101	(0.0787)	1.106	0.093	(0.0668)	1.097
PrisonI11	-0.052	(0.0361)	0.949	-0.061	(0.0357)	0.941	-0.048	(0.0375)	0.953
PrisonI12	-0.008	(0.0452)	0.992	-0.013	(0.0462)	0.987	-0.015	(0.0469)	0.985
PrisonI13	-0.013	(0.0219)	0.987	-0.020	(0.0218)	0.980	-0.003	(0.0199)	0.997
PrisonI14	0.006	(0.0177)	1.006	0.015	(0.0179)	1.015	0.009	(0.0184)	1.009

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 30,369 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.2. All Covariates: Two-Year Recidivism, Indiana, All Inmates

	Logit (model 4)			Logit with PIE Facility (model 5)			IV (model 6)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.275***	(0.1075)	-	1.259***	(0.1072)	-	1.191***	(0.1021)	-
Age	-0.031***	(0.0020)	0.969	-0.039***	(0.0019)	0.961	-0.031***	(0.0043)	0.969
White	-0.277***	(0.0261)	0.758	-0.262***	(0.0245)	0.769	-0.265***	(0.0334)	0.767
Education	-0.119***	(0.0364)	0.893	-0.106***	(0.0331)	0.899	-0.104***	(0.0308)	0.921
Male	0.253***	(0.0189)	1.288	0.263***	(0.0197)	1.301	0.258***	(0.0181)	1.295
Married	0.028*	(0.0161)	1.029	0.021	(0.0168)	1.021	0.017	(0.0138)	1.017
Prior Recidivism	0.604***	(0.0409)	1.831	0.613***	(0.0427)	1.846	0.620***	(0.0461)	1.859
Economic Crime	0.290***	(0.0167)	1.337	0.296***	(0.0157)	1.344	0.255***	(0.0147)	1.291
Time Served	0.104***	(0.0315)	1.110	0.087***	(0.0295)	1.091	0.084***	(0.0243)	1.088
Security Level	0.191**	(0.0935)	1.211	0.207**	(0.0877)	1.231	0.179**	(0.0837)	1.197
Participation	-0.163***	(0.0046)	0.849	-	-	-	-0.109***	(0.0053)	0.896
PIE Location	-	-	-	-0.082**	(0.0435)	0.921	-	-	-
PrisonI2	0.037	(0.0522)	1.038	0.050	(0.0534)	1.052	0.063	(0.0532)	1.065
PrisonI3	0.096	(0.0796)	1.101	0.092	(0.0814)	1.096	0.087	(0.0811)	1.091
PrisonI4	0.012	(0.0228)	1.012	0.025	(0.0331)	1.025	0.014	(0.0235)	1.039
PrisonI5	0.013	(0.0203)	1.013	0.006	(0.0202)	1.006	-0.001	(0.0209)	0.999
PrisonI6	-0.031	(0.0203)	0.969	-0.038	(0.0273)	0.962	-0.045	(0.0256)	0.956
PrisonI7	-0.042	(0.0621)	0.959	-0.049	(0.0647)	0.953	-0.056	(0.0627)	0.946
PrisonI8	0.011	(0.0418)	1.011	0.004	(0.0436)	1.004	-0.003	(0.0443)	0.997
PrisonI9	-0.035	(0.0533)	0.966	-0.004	(0.0196)	0.996	0.026	(0.0564)	1.027
PrisonI10	0.087	(0.0655)	1.091	0.083	(0.0642)	1.087	0.079	(0.0694)	1.082
PrisonI11	-0.048	(0.0367)	0.953	-0.018	(0.0360)	0.983	0.013	(0.0362)	1.013
PrisonI12	-0.018	(0.0460)	0.982	-0.025	(0.0451)	0.975	-0.032	(0.0551)	0.968
PrisonI13	-0.012	(0.0223)	0.988	-0.019	(0.0218)	0.981	-0.026	(0.0219)	0.974
PrisonI14	0.017	(0.0177)	1.017	0.010	(0.0173)	1.010	0.003	(0.0184)	1.003

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 30,369 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.3. All Covariates: Three-Year Recidivism, Indiana, All Inmates

	Logit (model 7)			Logit with PIE Facility (model 8)			IV (model 9)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.295***	(0.1091)	-	1.286***	(0.1088)	-	1.239***	(0.1042)	-
Age	-0.036***	(0.0037)	0.965	-0.029***	(0.0041)	0.971	-0.040***	(0.0057)	0.961
White	-0.273***	(0.0271)	0.761	-0.264***	(0.0264)	0.768	-0.258***	(0.0255)	0.772
Education	-0.106***	(0.0301)	0.899	-0.095***	(0.0297)	0.909	-0.078**	(0.0272)	0.925
Male	0.256***	(0.0181)	1.292	0.272***	(0.0191)	1.313	0.253***	(0.0201)	1.289
Married	0.034	(0.0344)	1.035	0.024	(0.0333)	1.024	0.028	(0.0322)	1.028
Prior Recidivism	0.624***	(0.0428)	1.867	0.632***	(0.0393)	1.881	0.629***	(0.0360)	1.876
Economic Crime	0.281***	(0.0140)	1.325	0.287***	(0.0138)	1.333	0.270***	(0.0137)	1.310
Time Served	0.112***	(0.0232)	1.119	0.114***	(0.0229)	1.121	0.120***	(0.0226)	1.128
Security Level	0.209**	(0.0486)	1.232	0.202**	(0.0446)	1.224	0.183***	(0.0409)	1.201
Participation	-0.140***	(0.0051)	0.869	-	-	-	-0.079***	(0.0044)	0.924
PIE Location	-	-	-	-0.059*	(0.0352)	0.942	-	-	-
PrisonI2	0.047	(0.0688)	1.048	0.060	(0.0711)	1.062	0.073	(0.0701)	1.076
PrisonI3	0.098	(0.1049)	1.103	0.093	(0.1084)	1.098	0.089	(0.1068)	1.093
PrisonI4	0.017	(0.0300)	1.017	0.015	(0.0310)	1.030	0.014	(0.0306)	1.013
PrisonI5	0.012	(0.0267)	1.012	0.005	(0.0276)	1.005	0.015	(0.0272)	1.015
PrisonI6	-0.028	(0.0268)	0.972	-0.035	(0.0277)	0.965	-0.042	(0.0273)	0.959
PrisonI7	-0.046	(0.0819)	0.955	-0.053	(0.0846)	0.948	-0.060	(0.0834)	0.942
PrisonI8	0.009	(0.0551)	1.009	0.002	(0.0570)	1.002	0.012	(0.0562)	1.012
PrisonI9	-0.053	(0.0702)	0.948	-0.023	(0.0725)	0.977	-0.023	(0.0715)	0.978
PrisonI10	0.087	(0.0863)	1.091	0.083	(0.0892)	1.087	0.079	(0.0879)	1.082
PrisonI11	-0.028	(0.0484)	0.972	-0.079	(0.0500)	0.924	-0.049	(0.0493)	0.952
PrisonI12	-0.004	(0.0606)	0.996	-0.011	(0.0626)	0.989	-0.018	(0.0618)	0.982
PrisonI13	-0.029	(0.0294)	0.971	-0.030	(0.0304)	0.970	-0.036	(0.0299)	0.965
PrisonI14	0.013	(0.0233)	1.013	0.006	(0.0241)	1.006	0.005	(0.0238)	1.005

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 30,369 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.4. All Covariates: One-Year Recidivism, Indiana, Working Inmates

Variable	Logit (model 10)			Logit with PIE Facility (model 11)			IV (model 12)		
	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.404***	(0.1799)	-	1.394***	(0.1850)	-	1.283***	(0.1884)	-
Age	-0.035***	(0.0089)	0.966	-0.046***	(0.0092)	0.955	-0.028***	(0.0087)	0.972
White	-0.237***	(0.0771)	0.789	-0.234***	(0.0703)	0.791	-0.218***	(0.0667)	0.804
Education	-0.093***	(0.0281)	0.911	-0.082***	(0.0231)	0.921	-0.069***	(0.0198)	0.933
Male	0.291***	(0.0671)	1.339	0.298***	(0.0687)	1.348	0.284***	(0.0702)	1.328
Married	0.054*	(0.0308)	1.055	0.046*	(0.0279)	1.047	0.065	(0.0398)	1.067
Prior Recidivism	0.622***	(0.1210)	1.863	0.616***	(0.1207)	1.859	0.628***	(0.1235)	1.875
Economic Crime	0.213***	(0.0676)	1.238	0.206***	(0.0613)	1.229	0.218***	(0.0606)	1.244
Time Served	0.130***	(0.0393)	1.139	0.140***	(0.0397)	1.151	0.137***	(0.0392)	1.147
Security Level	0.146**	(0.0636)	1.157	0.152**	(0.0650)	1.164	0.138*	(0.0753)	1.149
Participation	-0.190***	(0.0104)	0.827	-	-	-	-0.149***	(0.0127)	0.861
PIE Location	-	-	-	-0.082*	(0.0492)	0.921	-	-	-
PrisonI2	0.051	(0.0701)	1.052	0.064	(0.0724)	1.066	0.048	(0.0713)	1.049
PrisonI3	0.035	(0.1068)	1.036	0.031	(0.1103)	1.031	0.126	(0.1088)	1.134
PrisonI4	0.021	(0.0306)	1.021	0.015	(0.0316)	1.034	0.014	(0.0312)	1.017
PrisonI5	0.031	(0.0272)	1.031	0.024	(0.0281)	1.024	0.033	(0.0277)	1.034
PrisonI6	-0.026	(0.0273)	0.974	-0.033	(0.0282)	0.967	-0.040	(0.0278)	0.961
PrisonI7	-0.033	(0.0814)	0.968	-0.039	(0.0841)	0.961	-0.046	(0.0829)	0.955
PrisonI8	0.014	(0.0548)	1.014	0.007	(0.0566)	1.007	0.017	(0.0558)	1.017
PrisonI9	-0.042	(0.0698)	0.959	-0.011	(0.0721)	0.989	-0.008	(0.0711)	0.992
PrisonI10	0.098	(0.0858)	1.103	0.094	(0.0886)	1.099	0.090	(0.0874)	1.094
PrisonI11	-0.031	(0.0481)	0.969	-0.082	(0.0497)	0.921	-0.052	(0.0490)	0.949
PrisonI12	-0.027	(0.0603)	0.973	-0.034	(0.0623)	0.966	-0.041	(0.0614)	0.960
PrisonI13	0.004	(0.0328)	1.004	0.003	(0.0339)	1.003	-0.002	(0.0334)	0.998
PrisonI14	-0.012	(0.0261)	0.988	-0.019	(0.0269)	0.981	-0.020	(0.0266)	0.981

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 8,198 observations in working inmate models. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.5. All Covariates: Two-Year Recidivism, Indiana, Working Inmates

	Logit (model 13)			Logit with PIE Facility (model 14)			IV (model 15)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.382***	(0.1750)	-	1.365***	(0.1784)	-	1.289***	(0.1817)	-
Age	-0.040***	(0.0082)	0.961	-0.046***	(0.0084)	0.955	-0.033***	(0.0086)	0.968
White	-0.233***	(0.0704)	0.792	-0.221***	(0.0638)	0.802	-0.209***	(0.0601)	0.811
Education	-0.101***	(0.0273)	0.904	-0.084***	(0.0248)	0.919	-0.061***	(0.0199)	0.941
Male	0.301***	(0.0653)	1.351	0.293***	(0.0668)	1.341	0.287***	(0.0683)	1.333
Married	0.059*	(0.0351)	1.061	0.051*	(0.0298)	1.052	0.056	(0.0355)	1.058
Prior Recidivism	0.634***	(0.1177)	1.885	0.626***	(0.1174)	1.871	0.636***	(0.1201)	1.889
Economic Crime	0.194***	(0.0555)	1.214	0.195***	(0.0548)	1.215	0.175***	(0.0513)	1.191
Time Served	0.159***	(0.0382)	1.172	0.152***	(0.0391)	1.164	0.163***	(0.0386)	1.177
Security Level	0.139**	(0.0618)	1.149	0.158**	(0.0633)	1.171	0.148*	(0.0795)	1.160
Participation	-0.142***	(0.0101)	0.868	-	-	-	-0.095***	(0.0139)	0.909
PIE Location	-	-	-	-0.057*	(0.0313)	0.944	-	-	-
PrisonI2	0.047	(0.0682)	1.048	0.060	(0.0663)	1.062	0.044	(0.0685)	1.045
PrisonI3	0.019	(0.1039)	1.019	0.014	(0.1063)	1.014	0.109	(0.1058)	1.115
PrisonI4	0.022	(0.0298)	1.022	0.035	(0.0394)	1.035	0.018	(0.0303)	1.018
PrisonI5	0.036	(0.0264)	1.037	0.029	(0.0264)	1.030	0.039	(0.0269)	1.040
PrisonI6	-0.014	(0.0265)	0.986	-0.021	(0.0277)	0.979	-0.028	(0.0268)	0.972
PrisonI7	-0.027	(0.0792)	0.973	-0.034	(0.0826)	0.966	-0.041	(0.0807)	0.960
PrisonI8	0.050	(0.0533)	1.051	0.043	(0.0556)	1.044	0.053	(0.0543)	1.054
PrisonI9	-0.016	(0.0679)	0.984	0.014	(0.0708)	1.015	0.017	(0.0691)	1.018
PrisonI10	0.078	(0.0835)	1.081	0.074	(0.0854)	1.077	0.070	(0.0867)	1.072
PrisonI11	-0.040	(0.0468)	0.961	-0.050	(0.0609)	0.952	-0.019	(0.0486)	0.981
PrisonI12	-0.078	(0.0586)	0.925	-0.085	(0.0577)	0.918	-0.092	(0.0720)	0.912
PrisonI13	0.009	(0.0320)	1.009	0.008	(0.0315)	1.008	0.003	(0.0304)	1.003
PrisonI14	-0.023	(0.0254)	0.977	-0.030	(0.0250)	0.970	-0.031	(0.0242)	0.970

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 8,198 observations in working inmate models. Chi-square of the likelihood ratio;p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.6. All Covariates: Three-Year Recidivism, Indiana, Working Inmates

	Logit (model 16)			Logit with PIE Facility (model 17)			IV (model 18)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.348***	(0.1703)	-	1.366***	(0.1736)	-	1.327***	(0.1768)	-
Age	-0.046***	(0.0076)	0.955	-0.054***	(0.0078)	0.947	-0.028***	(0.0079)	0.972
White	-0.247***	(0.0643)	0.781	-0.212***	(0.0606)	0.809	-0.198***	(0.0595)	0.820
Education	-0.093***	(0.0230)	0.911	-0.070***	(0.0200)	0.932	-0.052***	(0.0152)	0.949
Male	0.309***	(0.0635)	1.362	0.308***	(0.0650)	1.361	0.301***	(0.0665)	1.351
Married	0.048*	(0.0295)	1.049	0.059*	(0.0341)	1.061	0.051	(0.0349)	1.052
Prior Recidivism	0.637***	(0.1146)	1.891	0.648***	(0.1143)	1.912	0.632***	(0.1169)	1.882
Economic Crime	0.199***	(0.0455)	1.221	0.210***	(0.0449)	1.234	0.194***	(0.0443)	1.215
Time Served	0.168***	(0.0372)	1.183	0.160***	(0.0381)	1.174	0.158***	(0.0376)	1.171
Security Level	0.140**	(0.0602)	1.151	0.147**	(0.0616)	1.159	0.138*	(0.0768)	1.148
Participation	-0.127***	(0.0098)	0.881	-	-	-	-0.066***	(0.0121)	0.936
PIE Location	-	-	-	-0.042*	(0.0249)	0.959	-	-	-
PrisonI2	0.042	(0.0663)	1.043	0.055	(0.0645)	1.057	0.039	(0.0667)	1.040
PrisonI3	0.021	(0.1011)	1.021	0.016	(0.1034)	1.016	0.111	(0.1030)	1.117
PrisonI4	0.033	(0.0417)	1.034	0.046	(0.0426)	1.048	0.029	(0.0424)	1.030
PrisonI5	0.029	(0.0257)	1.029	0.022	(0.0257)	1.022	0.032	(0.0262)	1.032
PrisonI6	-0.027	(0.0258)	0.973	-0.034	(0.0269)	0.966	-0.041	(0.0261)	0.960
PrisonI7	-0.038	(0.0771)	0.963	-0.045	(0.0804)	0.956	-0.052	(0.0785)	0.950
PrisonI8	0.029	(0.0519)	1.029	0.022	(0.0541)	1.022	0.032	(0.0528)	1.032
PrisonI9	-0.019	(0.0660)	0.981	0.011	(0.0689)	1.011	0.014	(0.0673)	1.015
PrisonI10	0.086	(0.0812)	1.090	0.082	(0.0831)	1.086	0.078	(0.0844)	1.081
PrisonI11	-0.050	(0.0456)	0.951	-0.101	(0.0455)	0.904	-0.071	(0.0473)	0.932
PrisonI12	-0.057	(0.0571)	0.945	-0.063	(0.0562)	0.938	-0.070	(0.0701)	0.932
PrisonI13	0.004	(0.0311)	1.004	0.003	(0.0306)	1.003	-0.002	(0.0296)	0.998
PrisonI14	-0.037	(0.0247)	0.964	-0.044	(0.0243)	0.957	-0.044	(0.0235)	0.957

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 8,198 observations in working inmate models. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.7. All Covariates: One-Year Recidivism, Tennessee, All Inmates

	Logit (model 19)			Logit with PIE Facility (model 20)			IV (model 21)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.176***	(0.1020)	-	1.184***	(0.1040)	-	1.150***	(0.1080)	-
Age	-0.040***	(0.0038)	0.961	-0.043***	(0.0039)	0.958	-0.029***	(0.0040)	0.971
White	-0.349***	(0.0313)	0.705	-0.341***	(0.0320)	0.711	-0.323***	(0.0326)	0.724
Education	-0.049***	(0.0101)	0.952	-0.042***	(0.0097)	0.959	-0.039***	(0.0097)	0.962
Male	0.301***	(0.0231)	1.351	0.313***	(0.0236)	1.367	0.316***	(0.0242)	1.371
Married	0.037	(0.0289)	1.038	0.043	(0.0288)	1.044	0.052	(0.0353)	1.053
Prior Recidivism	0.614***	(0.0321)	1.847	0.625***	(0.0320)	1.868	0.618***	(0.0328)	1.855
Economic Crime	0.313***	(0.0421)	1.368	0.329***	(0.0416)	1.389	0.331***	(0.0410)	1.393
Time Served	0.125**	(0.0585)	1.134	0.149**	(0.0599)	1.161	0.135**	(0.0549)	1.145
Security Level	0.114***	(0.0318)	1.121	0.132***	(0.0325)	1.141	0.138***	(0.0321)	1.148
Participation	-0.251***	(0.0068)	0.778	-	-	-	-0.194***	(0.0055)	0.824
PIE Location	-	-	-	-0.140**	(0.0645)	0.869	-	-	-
PrisonT2	0.036	(0.0284)	1.037	0.039	(0.0276)	1.040	0.024	(0.0286)	1.024
PrisonT3	-0.033	(0.0224)	0.968	-0.037	(0.0229)	0.963	-0.018	(0.0228)	0.982
PrisonT4	-0.025	(0.0294)	0.975	-0.012	(0.0301)	0.988	-0.029	(0.0299)	0.971
PrisonT5	0.050	(0.0434)	1.051	0.043	(0.0433)	1.044	0.053	(0.0442)	1.054
PrisonT6	-0.017	(0.0314)	0.983	-0.024	(0.0328)	0.976	-0.031	(0.0317)	0.969
PrisonT7	0.096	(0.0601)	1.101	0.089	(0.0627)	1.093	0.082	(0.0612)	1.086
PrisonT8	0.033	(0.0327)	1.034	0.027	(0.0342)	1.027	0.036	(0.0333)	1.037
PrisonT9	-0.040	(0.0255)	0.961	-0.009	(0.0266)	0.991	-0.006	(0.0260)	0.994
PrisonT10	0.009	(0.0371)	1.009	0.005	(0.0380)	1.005	0.001	(0.0385)	1.001
PrisonT11	-0.019	(0.0293)	0.981	-0.070	(0.0292)	0.932	-0.040	(0.0304)	0.961

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 25,142 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.8. All Covariates: Two-Year Recidivism, Tennessee, All Inmates

	Logit (model 22)			Logit with PIE Facility (model 23)			IV (model 24)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.199***	(0.0992)	-	1.180***	(0.1012)	-	1.212***	(0.1060)	-
Age	-0.033***	(0.0037)	0.968	-0.026***	(0.0038)	0.974	-0.021***	(0.0035)	0.979
White	-0.326***	(0.0305)	0.722	-0.289***	(0.0312)	0.749	-0.264***	(0.0317)	0.768
Education	-0.041***	(0.0098)	0.959	-0.035***	(0.0098)	0.966	-0.029***	(0.0090)	0.971
Male	0.314***	(0.0225)	1.369	0.324***	(0.0230)	1.382	0.303***	(0.0235)	1.355
Married	0.043	(0.0281)	1.044	0.048	(0.0354)	1.049	0.050	(0.0362)	1.051
Prior Recidivism	0.634***	(0.0312)	1.885	0.628***	(0.0312)	1.873	0.630***	(0.0319)	1.879
Economic Crime	0.306***	(0.0410)	1.358	0.307***	(0.0404)	1.360	0.315***	(0.0399)	1.371
Time Served	0.139**	(0.0569)	1.149	0.152**	(0.0622)	1.164	0.141**	(0.0614)	1.152
Security Level	0.112***	(0.0309)	1.118	0.118***	(0.0317)	1.125	0.131***	(0.0313)	1.140
Participation	-0.188***	(0.0081)	0.829	-	-	-	-0.141***	(0.0059)	0.868
PIE Location	-	-	-	-0.106**	(0.0532)	0.899	-	-	-
PrisonT2	0.031	(0.0276)	1.032	0.035	(0.0269)	1.035	0.019	(0.0278)	1.019
PrisonT3	-0.037	(0.0263)	0.964	-0.041	(0.0269)	0.959	-0.022	(0.0268)	0.978
PrisonT4	-0.031	(0.0286)	0.969	-0.018	(0.0293)	0.982	-0.036	(0.0291)	0.965
PrisonT5	0.051	(0.0422)	1.052	0.044	(0.0421)	1.045	0.054	(0.0430)	1.055
PrisonT6	-0.006	(0.0306)	0.994	-0.013	(0.0319)	0.987	-0.020	(0.0308)	0.980
PrisonT7	0.087	(0.0585)	1.091	0.080	(0.0610)	1.083	0.073	(0.0596)	1.076
PrisonT8	0.023	(0.0319)	1.023	0.016	(0.0332)	1.016	0.026	(0.0324)	1.026
PrisonT9	-0.047	(0.0248)	0.954	-0.036	(0.0259)	0.964	-0.033	(0.0253)	0.967
PrisonT10	0.014	(0.0361)	1.014	0.010	(0.0369)	1.010	0.006	(0.0375)	1.006
PrisonT11	-0.026	(0.0285)	0.974	-0.077	(0.0284)	0.926	-0.047	(0.0296)	0.954

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 25,142 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.9. All Covariates: Three-Year Recidivism, Tennessee, All Inmates

Variable	Logit (model 25)			Logit with PIE Facility (model 26)			IV (model 27)		
	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.196***	(0.0966)	-	1.175***	(0.0984)	-	1.182***	(0.0959)	-
Age	-0.029***	(0.0036)	0.971	-0.019***	(0.0037)	0.981	-0.016***	(0.0034)	0.984
White	-0.299***	(0.0296)	0.741	-0.281***	(0.0303)	0.755	-0.247***	(0.0309)	0.781
Education	-0.039***	(0.0089)	0.962	-0.029***	(0.0078)	0.971	-0.019***	(0.0065)	0.983
Male	0.323***	(0.0219)	1.381	0.320***	(0.0224)	1.377	0.308***	(0.0229)	1.361
Married	0.034	(0.0274)	1.035	0.040	(0.0273)	1.041	0.050	(0.0279)	1.052
Prior Recidivism	0.639***	(0.0304)	1.894	0.642***	(0.0303)	1.901	0.647***	(0.0310)	1.909
Economic Crime	0.312***	(0.0399)	1.366	0.302***	(0.0394)	1.353	0.325***	(0.0389)	1.384
Time Served	0.132**	(0.0531)	1.141	0.148**	(0.0660)	1.159	0.138**	(0.0652)	1.148
Security Level	0.117***	(0.0301)	1.125	0.115***	(0.0308)	1.122	0.111***	(0.0304)	1.118
Participation	-0.173***	(0.0096)	0.841	-	-	-	-0.123***	(0.0071)	0.884
PIE Location	-	-	-	-0.090**	(0.0439)	0.914	-	-	-
PrisonT2	0.041	(0.0372)	1.042	0.044	(0.0362)	1.045	0.029	(0.0374)	1.029
PrisonT3	-0.027	(0.0308)	0.973	-0.032	(0.0315)	0.968	-0.013	(0.0314)	0.987
PrisonT4	-0.018	(0.0278)	0.982	-0.005	(0.0285)	0.995	-0.022	(0.0283)	0.978
PrisonT5	0.060	(0.0411)	1.062	0.053	(0.0410)	1.055	0.063	(0.0418)	1.065
PrisonT6	-0.012	(0.0297)	0.988	-0.019	(0.0310)	0.981	-0.026	(0.0300)	0.974
PrisonT7	0.078	(0.0569)	1.081	0.071	(0.0594)	1.074	0.064	(0.0580)	1.066
PrisonT8	0.033	(0.0310)	1.034	0.027	(0.0323)	1.027	0.036	(0.0316)	1.037
PrisonT9	-0.043	(0.0308)	0.958	-0.032	(0.0322)	0.969	-0.029	(0.0314)	0.972
PrisonT10	0.009	(0.0351)	1.009	0.005	(0.0359)	1.005	0.001	(0.0365)	1.001
PrisonT11	-0.017	(0.0277)	0.983	-0.037	(0.0277)	0.964	-0.007	(0.0288)	0.994

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 25,142 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.10. All Covariates: One-Year Recidivism, Tennessee, Working Inmates

	Logit (model 28)			Logit with PIE Facility (model 29)			IV (model 30)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.372***	(0.1834)	-	1.348***	(0.1786)	-	1.365***	(0.1884)	-
Age	-0.028***	(0.0074)	0.972	-0.021***	(0.0062)	0.979	-0.016***	(0.0050)	0.984
White	-0.250***	(0.0474)	0.779	-0.267***	(0.0485)	0.766	-0.247***	(0.0494)	0.781
Education	-0.039***	(0.0092)	0.962	-0.030***	(0.0082)	0.970	-0.019***	(0.0061)	0.981
Male	0.278***	(0.0235)	1.320	0.286***	(0.0240)	1.331	0.293***	(0.0246)	1.341
Married	0.060	(0.0513)	1.062	0.056	(0.0512)	1.058	0.046	(0.0523)	1.047
Prior Recidivism	0.585***	(0.0499)	1.795	0.602***	(0.0498)	1.825	0.611***	(0.0509)	1.842
Economic Crime	0.337***	(0.0476)	1.401	0.333***	(0.0470)	1.395	0.326***	(0.0464)	1.385
Time Served	0.147***	(0.0329)	1.158	0.137***	(0.0337)	1.147	0.131***	(0.0332)	1.140
Security Level	0.102**	(0.0407)	1.107	0.104**	(0.0416)	1.110	0.111**	(0.0519)	1.118
Participation	-0.231***	(0.0159)	0.794	-	-	-	-0.153***	(0.0184)	0.858
PIE Location	-	-	-	-0.092**	(0.0398)	0.912	-	-	-
PrisonT2	0.051	(0.0321)	1.052	0.054	(0.0395)	1.055	0.038	(0.0408)	1.039
PrisonT3	-0.043	(0.0259)	0.958	-0.048	(0.0319)	0.954	-0.028	(0.0264)	0.972
PrisonT4	-0.021	(0.0292)	0.979	-0.008	(0.0299)	0.992	-0.025	(0.0298)	0.975
PrisonT5	0.070	(0.0400)	1.072	0.063	(0.0399)	1.065	0.073	(0.0528)	1.075
PrisonT6	-0.016	(0.0417)	0.984	-0.023	(0.0435)	0.977	-0.030	(0.0421)	0.970
PrisonT7	0.070	(0.0541)	1.073	0.064	(0.0564)	1.066	0.057	(0.0551)	1.058
PrisonT8	0.024	(0.0292)	1.024	0.017	(0.0305)	1.017	0.027	(0.0297)	1.027
PrisonT9	-0.045	(0.0272)	0.956	-0.034	(0.0284)	0.967	-0.031	(0.0277)	0.970
PrisonT10	0.013	(0.0359)	1.013	0.009	(0.0367)	1.009	0.005	(0.0373)	1.005
PrisonT11	-0.019	(0.0481)	0.981	-0.039	(0.0480)	0.962	-0.009	(0.0500)	0.991

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 6,537 observations in working inmate models. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.11. All Covariates: Two-Year Recidivism, Tennessee, Working Inmates

	Logit (model 34)			Logit with PIE Facility (model 35)			IV (model 36)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.281***	(0.1784)	-	1.304***	(0.1756)	-	1.322***	(0.1781)	-
Age	-0.034***	(0.0072)	0.967	-0.028***	(0.0074)	0.972	-0.020***	(0.0062)	0.980
White	-0.243***	(0.0461)	0.784	-0.257***	(0.0472)	0.773	-0.247***	(0.0481)	0.781
Education	-0.029***	(0.0083)	0.971	-0.039***	(0.0083)	0.962	-0.034***	(0.0082)	0.967
Male	0.281***	(0.0228)	1.325	0.289***	(0.0234)	1.336	0.299***	(0.0239)	1.349
Married	0.053	(0.0499)	1.054	0.048	(0.0498)	1.049	0.040	(0.0509)	1.041
Prior Recidivism	0.581***	(0.0486)	1.788	0.599***	(0.0484)	1.821	0.616***	(0.0495)	1.853
Economic Crime	0.346***	(0.0463)	1.414	0.338***	(0.0457)	1.402	0.330***	(0.0452)	1.392
Time Served	0.124***	(0.0307)	1.132	0.131***	(0.0314)	1.140	0.120***	(0.0310)	1.128
Security Level	0.103**	(0.0404)	1.109	0.112**	(0.0498)	1.119	0.107*	(0.0554)	1.113
Participation	-0.183***	(0.0188)	0.833	-	-	-	-0.118***	(0.0199)	0.889
PIE Location	-	-	-	-0.074*	(0.0384)	0.929	-	-	-
PrisonT2	0.034	(0.0433)	1.035	0.037	(0.0421)	1.038	0.022	(0.0435)	1.022
PrisonT3	-0.028	(0.0304)	0.972	-0.033	(0.0311)	0.968	-0.013	(0.0310)	0.987
PrisonT4	-0.006	(0.0284)	0.994	-0.015	(0.0291)	0.985	-0.032	(0.0290)	0.968
PrisonT5	0.053	(0.0389)	1.055	0.046	(0.0388)	1.047	0.056	(0.0397)	1.058
PrisonT6	-0.001	(0.0406)	0.999	-0.008	(0.0423)	0.992	-0.015	(0.0409)	0.985
PrisonT7	0.054	(0.0526)	1.056	0.047	(0.0549)	1.048	0.040	(0.0536)	1.041
PrisonT8	0.007	(0.0284)	1.007	0.001	(0.0296)	1.001	0.010	(0.0289)	1.010
PrisonT9	-0.030	(0.0338)	0.970	-0.019	(0.0353)	0.981	-0.016	(0.0345)	0.984
PrisonT10	-0.003	(0.0349)	0.997	-0.007	(0.0357)	0.993	-0.011	(0.0362)	0.989
PrisonT11	-0.004	(0.0468)	0.996	-0.024	(0.0467)	0.976	-0.029	(0.0486)	0.971

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 6,537 observations in working inmate models. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.12. All Covariates: Three-Year Recidivism, Tennessee, Working Inmates

	Logit (model 31)			Logit with PIE Facility (model 32)			IV (model 33)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.272***	(0.1736)	-	1.291***	(0.1709)	-	1.315***	(0.1733)	-
Age	-0.028***	(0.0070)	0.972	-0.019***	(0.0072)	0.981	-0.016***	(0.0061)	0.984
White	-0.260***	(0.0449)	0.771	-0.250***	(0.0459)	0.779	-0.242***	(0.0468)	0.785
Education	-0.020***	(0.0059)	0.980	-0.029***	(0.0059)	0.971	-0.027***	(0.0059)	0.973
Male	0.287***	(0.0222)	1.332	0.297***	(0.0227)	1.346	0.301***	(0.0233)	1.351
Married	0.041	(0.0486)	1.042	0.050	(0.0484)	1.051	0.037	(0.0496)	1.038
Prior Recidivism	0.585***	(0.0472)	1.795	0.605***	(0.0471)	1.833	0.624***	(0.0482)	1.866
Economic Crime	0.339***	(0.0451)	1.404	0.345***	(0.0445)	1.412	0.336***	(0.0439)	1.399
Time Served	0.129***	(0.0286)	1.138	0.135***	(0.0293)	1.145	0.122***	(0.0289)	1.130
Security Level	0.109**	(0.0539)	1.115	0.115**	(0.0551)	1.122	0.100**	(0.0498)	1.106
Participation	-0.157***	(0.0223)	0.855	-	-	-	-0.103***	(0.0177)	0.902
PIE Location	-	-	-	-0.064*	(0.0344)	0.938	-	-	-
PrisonT2	0.018	(0.0583)	1.018	0.021	(0.0567)	1.021	0.006	(0.0586)	1.006
PrisonT3	-0.013	(0.0357)	0.987	-0.018	(0.0365)	0.982	-0.023	(0.0363)	0.977
PrisonT4	0.009	(0.0277)	1.009	0.022	(0.0283)	1.022	0.005	(0.0282)	1.005
PrisonT5	0.037	(0.0379)	1.038	0.030	(0.0378)	1.031	0.040	(0.0386)	1.041
PrisonT6	0.014	(0.0395)	1.014	0.007	(0.0412)	1.007	0.005	(0.0398)	1.005
PrisonT7	0.038	(0.0512)	1.039	0.031	(0.0534)	1.031	0.024	(0.0522)	1.024
PrisonT8	-0.009	(0.0276)	0.991	-0.016	(0.0288)	0.984	-0.006	(0.0282)	0.994
PrisonT9	-0.015	(0.0420)	0.985	-0.004	(0.0439)	0.996	-0.001	(0.0428)	0.999
PrisonT10	-0.020	(0.0340)	0.981	-0.024	(0.0347)	0.977	-0.028	(0.0353)	0.973
PrisonT11	-0.023	(0.0455)	0.977	-0.043	(0.0454)	0.958	-0.013	(0.0473)	0.987

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 6,537 observations in working inmate models. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.13. All Covariates: One-Year Recidivism, Pooled, All Inmates

	Logit (model 37)			Logit with PIE Facility (model 38)			IV (model 39)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.233***	(0.0942)	-	1.228***	(0.0931)	-	1.217***	(0.1093)	-
Age	-0.027***	(0.0023)	0.974	-0.033***	(0.0026)	0.968	-0.027***	(0.0026)	0.973
Education	-0.089***	(0.0204)	0.914	-0.077***	(0.0174)	0.926	-0.089***	(0.0162)	0.922
Male	0.264***	(0.0196)	1.303	0.265***	(0.0194)	1.304	0.264***	(0.0196)	1.306
Married	0.028*	(0.0162)	1.029	0.032*	(0.0190)	1.033	0.029	(0.0320)	1.029
Prior Recidivism	0.577***	(0.0446)	1.782	0.579***	(0.0361)	1.784	0.579***	(0.0412)	1.786
Economic Crime	0.270***	(0.0238)	1.310	0.272***	(0.0224)	1.314	0.270***	(0.0252)	1.310
Time Served	0.095***	(0.0304)	1.100	0.109***	(0.0296)	1.116	0.105***	(0.0319)	1.111
Security Level	0.154**	(0.0625)	1.167	0.166**	(0.0652)	1.181	0.160**	(0.0622)	1.174
Participation	-0.234***	(0.0055)	0.791	-	-	-	-0.176***	(0.0052)	0.839
PIE Location	-	-	-	-0.121**	(0.0604)	0.886	-	-	-
PrisonI2	-0.016	(0.0497)	0.984	-0.015	(0.0509)	0.985	-0.020	(0.0520)	0.980
PrisonI3	0.087	(0.0762)	1.091	0.085	(0.0779)	1.088	0.078	(0.0776)	1.081
PrisonI4	-0.039	(0.0281)	0.962	-0.039	(0.0287)	0.962	-0.043	(0.0286)	0.958
PrisonI5	0.006	(0.0198)	1.006	0.011	(0.0197)	1.011	0.017	(0.0201)	1.017
PrisonI6	0.045	(0.0311)	1.046	0.029	(0.0319)	1.029	0.047	(0.0326)	1.048
PrisonI7	-0.069	(0.0646)	0.934	-0.040	(0.0740)	0.961	-0.030	(0.0658)	0.971
PrisonI8	0.066	(0.0435)	1.069	0.075	(0.0445)	1.078	0.022	(0.0456)	1.022
PrisonI9	-0.023	(0.0554)	0.977	-0.025	(0.0525)	0.975	-0.013	(0.0564)	0.987
PrisonI10	0.063	(0.0620)	1.065	0.064	(0.0635)	1.066	0.056	(0.0644)	1.058
PrisonI11	-0.058	(0.0359)	0.943	-0.067	(0.0448)	0.935	-0.054	(0.0373)	0.947
PrisonI12	-0.014	(0.0449)	0.986	-0.019	(0.0460)	0.981	-0.021	(0.0467)	0.979
PrisonI13	0.030	(0.0229)	1.030	0.023	(0.0228)	1.023	0.040	(0.0227)	1.041
PrisonI14	0.049	(0.0344)	1.050	0.058	(0.0348)	1.060	0.052	(0.0357)	1.053
PrisonT1	0.064	(0.0408)	1.066	0.067	(0.0513)	1.069	0.070	(0.0424)	1.073
PrisonT2	-0.027	(0.0275)	0.974	-0.024	(0.0268)	0.977	-0.039	(0.0277)	0.962
PrisonT3	-0.049	(0.0288)	0.953	-0.053	(0.0366)	0.948	-0.034	(0.0222)	0.967
PrisonT4	-0.083	(0.0411)	0.920	-0.070	(0.0555)	0.932	-0.035	(0.0521)	0.965
PrisonT5	0.044	(0.0431)	1.045	0.037	(0.0430)	1.037	0.047	(0.0439)	1.048
PrisonT6	0.059	(0.0333)	1.061	0.052	(0.0347)	1.053	0.045	(0.0336)	1.046
PrisonT7	0.077	(0.0636)	1.080	0.099	(0.0664)	1.104	0.092	(0.0648)	1.097
PrisonT8	0.032	(0.0347)	1.033	0.045	(0.0362)	1.046	0.055	(0.0353)	1.057
PrisonT9	0.018	(0.0270)	1.018	0.048	(0.0361)	1.049	0.051	(0.0275)	1.053
PrisonT10	-0.028	(0.0358)	0.973	-0.032	(0.0366)	0.969	-0.036	(0.0371)	0.965
PrisonT11	-0.025	(0.0282)	0.975	-0.050	(0.0396)	0.951	-0.046	(0.0293)	0.955

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 55,511 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.14. All Covariates: Two-Year Recidivism, Pooled, All Inmates

	Logit (model 40)			Logit with PIE Facility (model 41)			IV (model 42)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.248***	(0.1016)	-	1.233***	(0.1012)	-	1.217***	(0.0971)	-
Age	-0.032***	(0.0026)	0.969	-0.037***	(0.0026)	0.964	-0.028***	(0.0034)	0.972
White	-0.292***	(0.0271)	0.746	-0.271***	(0.0262)	0.762	-0.265***	(0.0273)	0.767
Education	-0.088***	(0.0253)	0.916	-0.084***	(0.0230)	0.919	-0.064***	(0.0199)	0.938
Male	0.275***	(0.0198)	1.316	0.282***	(0.0203)	1.325	0.274***	(0.0164)	1.315
Married	0.034	(0.0219)	1.034	0.027	(0.0234)	1.029	0.028	(0.0173)	1.028
Prior Recidivism	0.615***	(0.0362)	1.850	0.617***	(0.0368)	1.853	0.624***	(0.0346)	1.866
Economic Crime	0.296***	(0.0256)	1.344	0.298***	(0.0247)	1.348	0.275***	(0.0188)	1.318
Time Served	0.116***	(0.0405)	1.123	0.107***	(0.0411)	1.113	0.104**	(0.0483)	1.109
Security Level	0.165**	(0.0671)	1.180	0.179**	(0.0631)	1.196	0.163**	(0.0652)	1.178
Participation	-0.172***	(0.0058)	0.842	-	-	-	-0.120***	(0.0067)	0.887
PIE Location	-	-	-	-0.091**	(0.0468)	0.913	-	-	-
PrisonI2	-0.026	(0.0506)	0.975	-0.013	(0.0518)	0.987	0.000	(0.0515)	1.000
PrisonI3	0.028	(0.0775)	1.028	0.075	(0.0793)	1.078	0.019	(0.0790)	1.019
PrisonI4	-0.046	(0.0222)	0.955	-0.033	(0.0323)	0.968	-0.020	(0.0229)	0.981
PrisonI5	0.007	(0.0201)	1.007	0.005	(0.0201)	1.005	-0.007	(0.0207)	0.993
PrisonI6	0.045	(0.0215)	1.046	0.038	(0.0289)	1.038	0.031	(0.0271)	1.031
PrisonI7	-0.052	(0.0658)	0.950	0.056	(0.0685)	1.057	0.049	(0.0664)	1.050
PrisonI8	0.068	(0.0443)	1.071	0.061	(0.0461)	1.063	0.054	(0.0469)	1.056
PrisonI9	0.023	(0.0564)	1.023	0.053	(0.0390)	1.055	0.084	(0.0597)	1.087
PrisonI10	0.050	(0.0631)	1.052	0.046	(0.0619)	1.048	0.042	(0.0669)	1.043
PrisonI11	-0.054	(0.0365)	0.947	-0.024	(0.0358)	0.977	0.007	(0.0359)	1.007
PrisonI12	-0.024	(0.0457)	0.976	-0.031	(0.0448)	0.969	-0.038	(0.0548)	0.963
PrisonI13	0.031	(0.0233)	1.031	0.024	(0.0228)	1.024	0.017	(0.0229)	1.017
PrisonI14	0.031	(0.0185)	1.031	0.024	(0.0336)	1.024	0.017	(0.0283)	1.017
PrisonT1	0.002	(0.0108)	1.002	0.013	(0.0110)	1.013	0.054	(0.0414)	1.055
PrisonT2	-0.032	(0.0268)	0.969	-0.018	(0.0261)	0.982	-0.044	(0.0269)	0.957
PrisonT3	-0.043	(0.0256)	0.958	-0.042	(0.0262)	0.959	-0.038	(0.0266)	0.963
PrisonT4	-0.038	(0.0279)	0.963	-0.024	(0.0285)	0.976	-0.042	(0.0290)	0.959
PrisonT5	0.045	(0.0420)	1.046	0.038	(0.0419)	1.038	0.048	(0.0428)	1.049
PrisonT6	0.023	(0.0324)	1.023	0.063	(0.0337)	1.065	0.028	(0.0326)	1.028
PrisonT7	0.057	(0.0619)	1.058	0.047	(0.0646)	1.048	0.038	(0.0631)	1.038
PrisonT8	0.051	(0.0337)	1.053	0.035	(0.0352)	1.035	0.054	(0.0344)	1.056
PrisonT9	0.010	(0.0263)	1.010	0.021	(0.0274)	1.021	0.024	(0.0268)	1.025
PrisonT10	-0.023	(0.0348)	0.977	-0.027	(0.0356)	0.974	-0.031	(0.0361)	0.970
PrisonT11	-0.032	(0.0275)	0.968	-0.044	(0.0274)	0.957	-0.013	(0.0285)	0.987

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 55,511 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.15. All Covariates: Three-Year Recidivism, Pooled, All Inmates

	Logit (model 43)			Logit with PIE Facility (model 44)			IV (model 45)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.259***	(0.0914)	-	1.247***	(0.0927)	-	1.231***	(0.0966)	-
Age	-0.034***	(0.0031)	0.967	-0.027***	(0.0033)	0.973	-0.036***	(0.0041)	0.965
White	-0.282***	(0.0234)	0.754	-0.270***	(0.0232)	0.763	-0.282***	(0.0225)	0.775
Education	-0.083***	(0.0200)	0.920	-0.075***	(0.0193)	0.928	-0.057***	(0.0172)	0.944
Male	0.279***	(0.0161)	1.322	0.287***	(0.0169)	1.332	0.272***	(0.0174)	1.313
Married	0.035	(0.0271)	1.035	0.028	(0.0264)	1.028	0.035	(0.0256)	1.036
Prior Recidivism	0.629***	(0.0328)	1.876	0.634***	(0.0307)	1.885	0.635***	(0.0286)	1.887
Economic Crime	0.292***	(0.0182)	1.339	0.291***	(0.0183)	1.338	0.288***	(0.0179)	1.335
Time Served	0.118***	(0.0270)	1.126	0.124***	(0.0305)	1.132	0.126***	(0.0298)	1.135
Security Level	0.178**	(0.0697)	1.196	0.174**	(0.0705)	1.191	0.159**	(0.0716)	1.173
Participation	-0.151***	(0.0061)	0.860	-	-	-	-0.094***	(0.0072)	0.911
PIE Location	-	-	-	-0.070*	(0.0408)	0.932	-	-	-
PrisonI2	0.010	(0.0670)	1.010	0.002	(0.0692)	1.002	0.015	(0.0683)	1.015
PrisonI3	0.040	(0.1022)	1.041	0.036	(0.1056)	1.036	0.031	(0.1041)	1.031
PrisonI4	-0.041	(0.0293)	0.960	-0.028	(0.0302)	0.973	-0.045	(0.0298)	0.956
PrisonI5	0.006	(0.0265)	1.006	0.029	(0.0274)	1.029	0.009	(0.0270)	1.009
PrisonI6	0.029	(0.0284)	1.029	0.022	(0.0293)	1.022	0.034	(0.0289)	1.034
PrisonI7	0.049	(0.0867)	1.051	0.050	(0.0896)	1.052	0.036	(0.0883)	1.036
PrisonI8	0.038	(0.0584)	1.038	0.031	(0.0603)	1.031	0.037	(0.0595)	1.037
PrisonI9	0.004	(0.0743)	1.004	0.015	(0.0768)	1.016	0.016	(0.0757)	1.016
PrisonI10	0.040	(0.0832)	1.041	0.046	(0.0860)	1.048	0.042	(0.0847)	1.043
PrisonI11	-0.034	(0.0481)	0.966	-0.036	(0.0497)	0.964	-0.029	(0.0490)	0.971
PrisonI12	-0.010	(0.0603)	0.990	-0.017	(0.0623)	0.983	-0.024	(0.0614)	0.976
PrisonI13	0.014	(0.0307)	1.014	0.013	(0.0317)	1.013	0.007	(0.0312)	1.007
PrisonI14	0.027	(0.0244)	1.027	0.030	(0.0252)	1.030	0.019	(0.0248)	1.019
PrisonT1	0.022	(0.0452)	1.023	0.031	(0.0442)	1.032	0.028	(0.0482)	1.029
PrisonT2	-0.022	(0.0361)	0.978	-0.019	(0.0351)	0.981	-0.034	(0.0363)	0.966
PrisonT3	-0.044	(0.0300)	0.957	-0.048	(0.0307)	0.953	-0.029	(0.0306)	0.972
PrisonT4	-0.024	(0.0277)	0.976	-0.031	(0.0277)	0.969	-0.028	(0.0276)	0.972
PrisonT5	0.054	(0.0408)	1.056	0.047	(0.0407)	1.048	0.057	(0.0416)	1.059
PrisonT6	0.026	(0.0315)	1.027	0.019	(0.0328)	1.019	0.031	(0.0318)	1.032
PrisonT7	0.058	(0.0603)	1.059	0.045	(0.0629)	1.046	0.032	(0.0614)	1.032
PrisonT8	0.042	(0.0328)	1.043	0.045	(0.0342)	1.046	0.055	(0.0334)	1.057
PrisonT9	0.014	(0.0327)	1.015	0.025	(0.0341)	1.026	0.028	(0.0333)	1.029
PrisonT10	-0.028	(0.0339)	0.973	-0.032	(0.0346)	0.969	-0.036	(0.0352)	0.965
PrisonT11	-0.023	(0.0267)	0.977	-0.007	(0.0267)	0.993	-0.013	(0.0278)	0.988

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 55,511 observations. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.16. All Covariates: One-Year Recidivism, Pooled, Working Inmates

	Logit (model 46)			Logit with PIE Facility (model 47)			IV (model 48)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.317***	(0.1520)	-	1.339***	(0.1537)	-	1.308***	(0.1564)	-
Age	-0.033***	(0.0071)	0.968	-0.039***	(0.0069)	0.962	-0.024***	(0.0062)	0.976
White	-0.241***	(0.0573)	0.786	-0.245***	(0.0534)	0.782	-0.228***	(0.0509)	0.796
Education	-0.075***	(0.0189)	0.928	-0.067***	(0.0155)	0.936	-0.052***	(0.0129)	0.949
Male	0.287***	(0.0455)	1.333	0.293***	(0.0461)	1.341	0.287***	(0.0464)	1.332
Married	0.056	(0.0464)	1.057	0.048	(0.0397)	1.049	0.058	(0.0468)	1.060
Prior Recidivism	0.610***	(0.0839)	1.840	0.613***	(0.0829)	1.846	0.622***	(0.0836)	1.864
Economic Crime	0.257***	(0.0518)	1.292	0.246***	(0.0478)	1.280	0.255***	(0.0466)	1.291
Time Served	0.136***	(0.0314)	1.145	0.138***	(0.0318)	1.149	0.135***	(0.0310)	1.145
Security Level	0.131***	(0.0477)	1.140	0.136***	(0.0485)	1.146	0.130**	(0.0564)	1.139
Participation	-0.203***	(0.0101)	0.816	-	-	-	-0.150***	(0.0120)	0.860
PIE Location	-	-	-	-0.086**	(0.0430)	0.917	-	-	-
PrisonI2	-0.012	(0.0679)	0.988	0.001	(0.0701)	1.001	-0.015	(0.0691)	0.985
PrisonI3	0.019	(0.1040)	1.019	0.015	(0.1074)	1.015	0.109	(0.1059)	1.116
PrisonI4	-0.037	(0.0298)	0.964	-0.024	(0.0308)	0.976	-0.041	(0.0303)	0.960
PrisonI5	0.025	(0.0270)	1.025	0.018	(0.0279)	1.018	0.027	(0.0275)	1.028
PrisonI6	0.050	(0.0343)	1.051	0.043	(0.0298)	1.044	0.036	(0.0294)	1.037
PrisonI7	-0.013	(0.0862)	0.987	-0.038	(0.0890)	0.962	-0.007	(0.0878)	0.993
PrisonI8	0.033	(0.0580)	1.033	0.036	(0.0600)	1.036	0.045	(0.0591)	1.047
PrisonI9	0.015	(0.0739)	1.016	0.017	(0.0763)	1.017	0.020	(0.0752)	1.021
PrisonI10	0.030	(0.0827)	1.030	0.026	(0.0854)	1.026	0.022	(0.0842)	1.022
PrisonI11	-0.038	(0.0478)	0.963	-0.040	(0.0494)	0.961	-0.058	(0.0487)	0.944
PrisonI12	-0.033	(0.0599)	0.967	-0.040	(0.0619)	0.960	-0.047	(0.0610)	0.954
PrisonI13	0.047	(0.0343)	1.048	0.046	(0.0354)	1.047	0.041	(0.0349)	1.041
PrisonI14	0.031	(0.0272)	1.031	0.024	(0.0281)	1.024	0.023	(0.0277)	1.024
PrisonT1	0.031	(0.0201)	1.031	0.034	(0.0251)	1.035	0.028	(0.0234)	1.028
PrisonT2	-0.012	(0.0311)	0.988	-0.009	(0.0383)	0.991	-0.025	(0.0396)	0.975
PrisonT3	-0.019	(0.0253)	0.981	-0.024	(0.0298)	0.976	-0.044	(0.0304)	0.957
PrisonT4	-0.037	(0.0285)	0.963	-0.024	(0.0291)	0.976	-0.031	(0.0290)	0.969
PrisonT5	0.023	(0.0398)	1.023	0.026	(0.0397)	1.026	0.025	(0.0524)	1.026
PrisonT6	0.022	(0.0442)	1.022	0.015	(0.0461)	1.015	0.018	(0.0446)	1.018
PrisonT7	0.011	(0.0573)	1.011	0.013	(0.0598)	1.013	0.017	(0.0584)	1.017
PrisonT8	0.043	(0.0309)	1.043	0.036	(0.0323)	1.036	0.046	(0.0315)	1.047
PrisonT9	0.012	(0.0288)	1.013	0.023	(0.0301)	1.024	0.026	(0.0294)	1.027
PrisonT10	-0.024	(0.0346)	0.977	-0.028	(0.0354)	0.973	-0.032	(0.0359)	0.969
PrisonT11	-0.025	(0.0464)	0.975	-0.045	(0.0463)	0.956	-0.015	(0.0482)	0.986

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 14,735 observations in working inmate models. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.17. All Covariates: Two-Year Recidivism, Pooled, Working Inmates

Variable	Logit (model 49)			Logit with PIE Facility (model 50)			IV (model 51)		
	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.327***	(0.1629)	-	1.335***	(0.1646)	-	1.309***	(0.1772)	-
Age	-0.037***	(0.0066)	0.963	-0.041***	(0.0068)	0.959	-0.028***	(0.0065)	0.972
White	-0.237***	(0.0531)	0.789	-0.233***	(0.0493)	0.792	-0.221***	(0.0467)	0.801
Education	-0.076***	(0.0182)	0.926	-0.071***	(0.0165)	0.932	-0.052***	(0.0135)	0.950
Male	0.294***	(0.0442)	1.342	0.291***	(0.0448)	1.338	0.294***	(0.0452)	1.338
Married	0.058	(0.0432)	1.059	0.049	(0.0402)	1.050	0.050	(0.0437)	1.052
Prior Recidivism	0.616***	(0.0816)	1.853	0.617***	(0.0807)	1.853	0.629***	(0.0814)	1.877
Economic Crime	0.247***	(0.0443)	1.281	0.241***	(0.0436)	1.273	0.229***	(0.0410)	1.258
Time Served	0.147***	(0.0302)	1.159	0.144***	(0.0309)	1.155	0.148***	(0.0301)	1.161
Security Level	0.127**	(0.0506)	1.136	0.142***	(0.0546)	1.142	0.134**	(0.0598)	1.144
Participation	-0.155***	(0.0103)	0.856	-	-	-	-0.103***	(0.0129)	0.902
PIE Location	-	-	-	-0.064*	(0.0381)	0.938	-	-	-
PrisonI2	-0.016	(0.0660)	0.984	-0.003	(0.0643)	0.997	-0.019	(0.0664)	0.981
PrisonI3	0.003	(0.1012)	1.003	-0.002	(0.1035)	0.998	0.093	(0.1031)	1.097
PrisonI4	-0.036	(0.0290)	0.965	-0.023	(0.0384)	0.977	-0.040	(0.0295)	0.961
PrisonI5	0.030	(0.0263)	1.031	0.023	(0.0262)	1.024	0.033	(0.0268)	1.034
PrisonI6	0.024	(0.0281)	1.024	0.017	(0.0293)	1.017	0.029	(0.0284)	1.030
PrisonI7	-0.012	(0.0839)	0.988	-0.024	(0.0875)	0.976	-0.031	(0.0854)	0.969
PrisonI8	0.034	(0.0565)	1.035	0.028	(0.0589)	1.028	0.038	(0.0575)	1.039
PrisonI9	0.041	(0.0719)	1.042	0.072	(0.0750)	1.074	0.075	(0.0732)	1.078
PrisonI10	0.041	(0.0805)	1.042	0.037	(0.0823)	1.038	0.033	(0.0836)	1.034
PrisonI11	-0.046	(0.0466)	0.955	-0.056	(0.0550)	0.946	-0.025	(0.0483)	0.975
PrisonI12	-0.029	(0.0583)	0.971	-0.033	(0.0574)	0.968	-0.039	(0.0680)	0.962
PrisonI13	0.033	(0.0334)	1.033	0.032	(0.0329)	1.033	0.026	(0.0318)	1.027
PrisonI14	0.020	(0.0265)	1.020	0.013	(0.0261)	1.013	0.012	(0.0252)	1.012
PrisonT1	0.031	(0.0214)	1.031	0.025	(0.0211)	1.025	0.028	(0.0218)	1.028
PrisonT2	-0.029	(0.0419)	0.972	-0.026	(0.0408)	0.975	-0.041	(0.0421)	0.960
PrisonT3	-0.044	(0.0295)	0.957	-0.049	(0.0302)	0.952	-0.030	(0.0300)	0.971
PrisonT4	-0.022	(0.0277)	0.978	-0.031	(0.0283)	0.969	-0.038	(0.0282)	0.963
PrisonT5	0.047	(0.0387)	1.048	0.040	(0.0386)	1.041	0.050	(0.0394)	1.052
PrisonT6	0.018	(0.0430)	1.018	0.011	(0.0448)	1.011	0.004	(0.0434)	1.004
PrisonT7	0.034	(0.0557)	1.035	0.028	(0.0581)	1.028	0.030	(0.0568)	1.031
PrisonT8	0.026	(0.0301)	1.027	0.019	(0.0314)	1.020	0.029	(0.0306)	1.030
PrisonT9	0.027	(0.0358)	1.028	0.038	(0.0374)	1.039	0.041	(0.0365)	1.042
PrisonT10	-0.020	(0.0336)	0.981	-0.023	(0.0344)	0.977	-0.027	(0.0349)	0.973
PrisonT11	-0.010	(0.0451)	0.990	-0.030	(0.0450)	0.970	-0.035	(0.0469)	0.965

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 14,735 observations in working inmate models. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix B.18. All Covariates: Three-Year Recidivism, Pooled, Working Inmates

	Logit (model 52)			Logit with PIE Facility (model 53)			IV (model 54)		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.301***	(0.1439)	-	1.325***	(0.1646)	-	1.299***	(0.1772)	-
Age	-0.040***	(0.0062)	0.961	-0.044***	(0.0064)	0.957	-0.019***	(0.0061)	0.981
White	-0.251***	(0.0491)	0.778	-0.224***	(0.0471)	0.799	-0.212***	(0.0461)	0.808
Education	-0.068***	(0.0151)	0.934	-0.058***	(0.0131)	0.943	-0.044***	(0.0102)	0.957
Male	0.301***	(0.0430)	1.352	0.303***	(0.0436)	1.355	0.299***	(0.0439)	1.351
Married	0.046	(0.0295)	1.047	0.055	(0.0357)	1.057	0.046	(0.0328)	1.047
Prior Recidivism	0.620***	(0.0794)	1.859	0.634***	(0.0785)	1.885	0.629***	(0.0792)	1.877
Economic Crime	0.249***	(0.0381)	1.282	0.254***	(0.0376)	1.289	0.244***	(0.0367)	1.276
Time Served	0.155***	(0.0291)	1.168	0.151***	(0.0297)	1.164	0.146***	(0.0290)	1.157
Security Level	0.130**	(0.0544)	1.139	0.136**	(0.0517)	1.146	0.126**	(0.0567)	1.134
Participation	-0.137***	(0.0114)	0.872	-	-	-	-0.078***	(0.0124)	0.925
PIE Location	-	-	-	-0.050*	(0.0341)	0.951	-	-	-
PrisonI2	-0.021	(0.0643)	0.979	-0.006	(0.0625)	0.992	-0.009	(0.0646)	0.977
PrisonI3	0.005	(0.0985)	1.005	0.000	(0.1007)	1.000	0.095	(0.1003)	1.099
PrisonI4	-0.024	(0.0406)	0.976	-0.011	(0.0415)	0.989	-0.028	(0.0413)	0.972
PrisonI5	0.023	(0.0256)	1.023	0.016	(0.0255)	1.016	0.026	(0.0260)	1.026
PrisonI6	0.001	(0.0279)	1.001	0.004	(0.0285)	1.004	0.003	(0.0276)	1.003
PrisonI7	-0.018	(0.0816)	0.982	-0.025	(0.0851)	0.976	-0.032	(0.0831)	0.969
PrisonI8	0.047	(0.0549)	1.049	0.040	(0.0573)	1.041	0.050	(0.0560)	1.052
PrisonI9	0.038	(0.0699)	1.039	0.069	(0.0730)	1.071	0.072	(0.0712)	1.074
PrisonI10	0.050	(0.0783)	1.051	0.046	(0.0801)	1.047	0.042	(0.0813)	1.042
PrisonI11	-0.036	(0.0453)	0.964	-0.021	(0.0452)	0.980	-0.002	(0.0470)	0.998
PrisonI12	-0.063	(0.0567)	0.939	-0.070	(0.0559)	0.933	-0.076	(0.0697)	0.926
PrisonI13	0.047	(0.0325)	1.048	0.046	(0.0320)	1.047	0.041	(0.0309)	1.041
PrisonI14	0.006	(0.0258)	1.006	-0.001	(0.0254)	0.999	-0.001	(0.0246)	0.999
PrisonT1	0.031	(0.0201)	1.031	0.027	(0.0208)	1.027	0.025	(0.0200)	1.025
PrisonT2	-0.024	(0.0565)	0.976	-0.021	(0.0550)	0.979	-0.036	(0.0568)	0.964
PrisonT3	-0.029	(0.0346)	0.971	-0.034	(0.0354)	0.967	-0.039	(0.0352)	0.962
PrisonT4	-0.008	(0.0275)	0.992	-0.005	(0.0276)	0.995	-0.022	(0.0274)	0.978
PrisonT5	0.031	(0.0377)	1.032	0.024	(0.0376)	1.024	0.034	(0.0384)	1.035
PrisonT6	0.042	(0.0418)	1.043	0.035	(0.0436)	1.036	0.034	(0.0422)	1.034
PrisonT7	0.048	(0.0542)	1.049	0.041	(0.0566)	1.042	0.034	(0.0552)	1.035
PrisonT8	0.048	(0.0293)	1.050	0.042	(0.0305)	1.042	0.042	(0.0298)	1.043
PrisonT9	0.042	(0.0445)	1.043	0.053	(0.0464)	1.055	0.056	(0.0454)	1.058
PrisonT10	-0.036	(0.0327)	0.965	-0.040	(0.0335)	0.961	-0.034	(0.0340)	0.967
PrisonT11	-0.029	(0.0439)	0.971	-0.049	(0.0438)	0.952	-0.019	(0.0456)	0.981

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10. 14,735 observations in working inmate models. Chi-square of the likelihood ratio:p-val <.0001; Hosmer and Lemeshow Goodness-of-Fit Test: p-val<.0001.

Appendix C

Appendix C.1. First Stage Results: Effects on Participation, Full Sample

	Indiana			Tennessee			Pooled Sample		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	0.952***	(0.1583)	-	0.829***	(0.2094)	-	0.913***	(0.1485)	-
Age	0.049***	(0.0137)	1.050	0.060***	(0.0181)	1.062	0.053***	(0.0128)	1.055
White	-0.117**	(0.0503)	0.889	-0.081***	(0.0378)	0.921	-0.090**	(0.0403)	0.902
Education	0.114***	(0.0306)	1.121	0.081***	(0.0273)	1.084	0.101***	(0.0234)	1.106
Male	0.278***	(0.0195)	1.321	0.374***	(0.0182)	1.454	0.318***	(0.0158)	1.374
Married	0.076*	(0.0404)	1.079	0.112*	(0.0567)	1.119	0.091*	(0.0437)	1.095
Prior Recidivism	-0.104***	(0.0237)	0.901	-0.158***	(0.0202)	0.854	-0.125***	(0.0185)	0.882
Economic Crime	0.247**	(0.1245)	1.280	0.159***	(0.0776)	1.173	0.213**	(0.0878)	1.237
Time Served	0.285***	(0.0665)	1.330	0.198***	(0.0747)	1.219	0.252***	(0.0579)	1.286
Security Level	-0.070*	(0.0415)	0.932	-0.039	(0.0387)	0.961	-0.058*	(0.0328)	0.944
PIE Location	0.239***	(0.0127)	1.271	0.291***	(0.0176)	1.338	0.260***	(0.0122)	1.298

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10.

Appendix C.2. First Stage Results: Effects on Participation, Working Inmates

	Indiana			Tennessee			Pooled Sample		
Variable	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio	Coefficient	(SE)	Odds Ratio
Intercept	1.083***	(0.1643)	-	0.982***	(0.2174)	-	1.051***	(0.1541)	-
Age	0.037***	(0.0109)	1.038	0.054***	(0.0144)	1.055	0.047***	(0.0102)	1.048
White	-0.092***	(0.0310)	0.912	-0.059***	(0.0218)	0.943	-0.076***	(0.0227)	0.927
Education	0.103***	(0.0293)	1.109	0.074***	(0.0258)	1.077	0.097***	(0.0224)	1.102
Male	0.186***	(0.0242)	1.204	0.270***	(0.0226)	1.311	0.221***	(0.0196)	1.247
Married	0.086*	(0.0525)	1.091	0.066*	(0.0437)	1.069	0.079*	(0.0407)	1.082
Prior Recidivism	-0.124***	(0.0345)	0.883	-0.112***	(0.0294)	0.894	-0.119***	(0.0269)	0.887
Economic Crime	0.272**	(0.1315)	1.313	0.203**	(0.1074)	1.225	0.245**	(0.1012)	1.278
Time Served	0.221***	(0.0712)	1.248	0.241**	(0.1027)	1.273	0.229***	(0.0696)	1.258
Security Level	-0.046*	(0.0243)	0.955	-0.021	(0.0226)	0.979	-0.036	(0.0196)	0.965
PIE Location	0.213***	(0.0142)	1.237	0.252***	(0.0196)	1.286	0.228***	(0.0136)	1.257

Note: Standard errors in parentheses. ***p<0.01; **p<0.05; *p<0.10.

Institutional Review Board Approval

July 6, 2007

Mr. Jeff Hopper
Department of Economics and Finance
jdhopper@mtsu.edu

Re: "Effects of Private Enterprise in Prison Labor Markets"
IRB #: 05-274, Exempt Research

Dear Investigator:

The above protocol was originally approved as falling under expedited review on August 26, 2005. Upon further review, I found your study to be exempt from Institutional Review Board (IRB) continued review and sent you a letter on August 15, 2006 confirming same.

The exemption is pursuant to 45 CFR 46.101(b)(4) which involves the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

I made this determination because you stated in your application that, "all data is secondary, no individuals will be contacted, interviewed, or tested." Furthermore, you confirmed that, "all personal identification is removed from the data set. I understand that there have been no changes to your research focus or methodology. As you are aware, any change to the protocol must be submitted to the IRB before implementing this change.

You will need to submit an end-of-project report to the Office of Compliance upon completion of your research. Complete research means that you have finished collecting data and you are ready to submit your thesis and/or publish your findings. Should you not finish your research within the three (3) year period, you must submit a Progress Report and request a continuation prior to the expiration date. Please allow time for review and requested revisions

If you need further assistance, please call me at 494-8918. Once your research is completed, please send us a copy of your final report to the Office of Compliance.

Sincerely,

Tara M. Prairie, Compliance Officer