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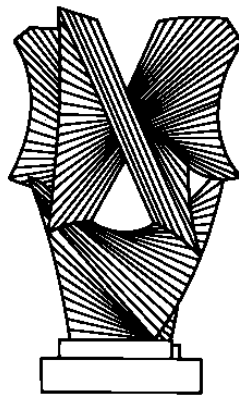
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Criminal Behavior, Sanctions, and Income Taxation: An Economic Analysis

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**THE LAW SCHOOL
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Criminal Behavior, Sanctions and Income Taxation: An Economic Analysis

Avraham D. Tabbach*

I. INTRODUCTION

This paper incorporates the theory of the taxation of risk taking into an economic model of income-producing crimes and examines the deterrent effects of different income tax rules.¹ In particular, the paper explores the deterrent effects of taxing legal and illegal income and of the tax treatment of monetary and nonmonetary sanctions.

The key insight is that taxation may, in addition to changing the relative expected returns from legal and criminal activities, affect the riskiness of crime and the willingness to bear risk. For example, taxing returns and allowing deductions for sanctions reduces the risk associated with crime. Taxing income also, however, reduces individuals' wealth and may in general reduce their willingness to assume risk.

The net effect of taxation may lead to some surprising results. For example, taxing legal and exempting criminal activities may not necessarily result in more crime. Similarly, taxing both legal work and crime but disallowing deductions for fines does not unambiguously lower crime. Additionally, allowing deductions for fines may lead to more crime. If punishment takes the form of imprisonment, the tax system reduces the

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¹ This paper heavily draws on the public finance literature on taxation and risk taking. See Evsey D. Domar and Richard A. Musgrave, Proportional Income Taxation and Risk-Taking, 58 Q.J. Econ. 388 (1944); J. Tobin, Liquidity Preference as Behavior Toward Risk, 25 Rev. Econ. Stud. 65 (1958); Jan Mossin, Taxation and Risk Taking: An Expected Utility Approach, 35 *Economica* 74 (1968); Joseph E. Stiglitz, The Effects of Income, Wealth and Capital Gains Taxation on Risk-Taking, 83 Q.J. Econ. 263 (1969); Anthony B. Atkinson and Joseph E. Stiglitz, Lectures on Public Economics 97–127 (1987); Agnar Sandmo, The Effects of Taxation on Savings and Risk Taking, in 1 *Handbook of Public Economics* 265 (Alan J. Auerbach and Martin Feldstein eds. 1985).

loss of income associated with being imprisoned, thus resulting effectively in a partial deductibility regime.

The precise results depend on the specific form of sanctions, tax rules, tax rates, risk attitudes, and the basis of comparison. Some comparisons provide clear results. For example, for risk aversion, disallowing deductions for fines leads unambiguously to less crime in comparison to allowing such deductions, even when tax rates are adjusted to maintain government revenues constant. If, however, fines are adjusted properly, deductibility and nondeductibility are identical.

An important possibility is that individuals will not report illegal income. Even so, taxation affects criminal behavior because it affects the trade off between legal and illegal activity. Moreover, much illegal income is in fact reported. For example, many offenses are committed in the course of running an otherwise legitimate business, such as a messenger service that double parks or a trucking company that overloads. In addition, many offenders who commit white-collar crimes, such as those who violate antitrust laws, those who commit fraud, or those who engage in insider trading, are likely to report their illicit gains. If tax rates are sufficiently high, the effects of taxation or nontaxation of these activities and of allowing or denying deductions for sanctions can be large.

The paper is organized as follows. Part II gives legal background and reviews relevant prior literature. Part III presents a simple model of crime based on Ehrlich's model. Part IV considers the effects on crime of several income tax regimes. It begins with a tax system that taxes legal but exempts criminal activities (Tax Regime I). It moves to a tax regime that taxes both legal work and crime and allows full deductions for fines (Tax Regime II). It ends with an income tax system that disallows such deductions

(Tax Regime III). Part V compares the effects of taxation among the different tax regimes under the alternative assumptions that fines or total revenues are held constant. Part VI discusses how imprisonment fares under taxation and effectively introduces a partial deductibility regime (Tax Regime IV). Part VII discusses several limitations of the analysis. Part VIII offers a conclusion.

II. LEGAL BACKGROUND AND RELEVANT PRIOR LITERATURE

Prior literature on criminal behavior and law enforcement has generally overlooked the tax laws and the role they might play in deterrence policy. For the most part, the criminal choice problem has been modeled while implicitly ignoring income taxation.² This apparent disregard may be the result of a misleading perception that taxation does not apply to criminal activities. But the long-standing legal position under U.S. and many other income tax systems is that illegal income is taxable. From the very beginning of federal income taxation the Supreme Court interpreted the term “income,” currently found in section 61 of the Internal Revenue Code, to include illicit gains.³ And after the landmark decision *James* essentially all income-producing crimes are subject to

² See, for example, Gary S. Becker, *Crime and Punishment: An Economic Approach*, 76 *J. Pol. Econ.* 169 (1968); Isaac Ehrlich, *Participation in Illegitimate Activities: A Theoretical and Empirical Investigation*, 81 *J. Pol. Econ.* 521 (1973); David L. Sjoquist, *Property Crime and Economic Behavior: Some Empirical Results*, 63 *Am. Econ. Rev.* 439 (1973); Michael. K. Block and John. M. Heineke, *A Labor Theoretic Analysis of the Criminal Choice*, 65 *Am. Econ. Rev.* 314 (1975); Peter Schmidt and Ann D. Witte, *An Economic Analysis of Crime and Justice* 142-216 (1983); David J. Pyle, *The Economics of Crime and Law Enforcement* 8-28 (1983); John M. Heineke, *Economic Models of Criminal Behavior: An Overview*, in *Economic Models of Criminal Behavior* 1 (John M. Heineke ed. 1978). Several exception will be discussed *infra*. Note also that the literature on taxation and risk taking has also ignored the criminal problem. See, for example, Stiglitz and Atkinson, *supra* note 1; Sandmo, *supra* note 1.

³ *United States v. Sullivan*, 274 U.S. 259 (1927). Note, however, that the Internal Revenue Code of 1913 explicitly levied tax on income, among others, from “any *lawful* business carried on for gain or profit.” See Revenue Act of 1913, ch. 16, sec 2B Stat. 167 (emphasis added). The word *lawful* was eliminated in 1916. See Revenue Act of 1916, ch. 463, sec 2(a), 39 Stat. 757.

taxation.⁴ Moreover, the income tax laws contain several explicit and implicit rules that deal with various aspects of the taxation of illegal activities. For example, under the so-called public policy doctrine, criminal expenses, such as bribes, are nondeductible.⁵ On the other hand, the ‘legitimate’ costs of running an illegal business, such as salaries and rent,⁶ and also the costs of criminal litigation are deductible.⁷ As to the taxation of sanctions, Congress enacted, as part of the Tax Reform Act of 1969, section 162(f) of the Code, which codified the landmark decision *Tank Truck Rentals*, to explicitly deny deductions for fines and other similar penalties in computing taxable income.⁸ Section 162(f), however, does not apply to private penalties such as punitive damages, which are generally deductible.⁹ The tax treatment of *nonmonetary* sanctions such as imprisonment, in its turn, stems from general income tax principles that regard income but not utility the touchstone of taxation. To the extent that imprisonment imposes pure displeasure on offenders, it is nondeductible. To the extent that it affects offenders’ stream of income, however, it is as if deductible.

Three exceptions to the common disregard of the income tax laws in modeling illegal behavior should be noted. One concerns tax evasion. Not surprisingly, the

⁴ See *James v. United States* 366 U.S. 213 (1961). The *James* decision overturned an earlier decision according to which embezzled money was not taxable because the offender had a legal obligation to disgorge his income. See *Commissioner v. Wilcox* 327 U.S. 404 (1946). See also *Ruthkin v. United States* 343 U.S. 130 (1952). Regarding the taxation of illegal income see also Boris I. Bittker, *Taxing Income From Unlawful Activities*, 25 *Case Western L. Rev.* 130 (1974).

⁵ I.R.C. § 162(c).

⁶ See *Commissioner v. Sullivan* 356 U.S. 30 (1958).

⁷ See *Commissioner v. Tellier* 383 U.S. 687 (1966).

⁸ See *Tank Truck Rentals Inc. v. Commissioner* 356 U.S. 30 (1958). Section 162 (f) applies to business expenses but not to losses or to the nonbusiness costs of earning income. The Treasury published regulations that applied the statutory standard of disallowance under section 162(f) to section 212 (nonbusiness costs of earning income). See *Treas. Reg. § 1.212-1(p)*. Regarding I.R.C. § 165 (business losses), the pre and post 1969 judicial public policy doctrine that has evolved and that denies deductions for fines is applicable. See, for example, *Holt v. Commissioner*, 69 T.C. 75 (1977). See also James W. Colliton, *The Tax Treatment of Criminal and Disapproved Payments*, 9 *Va. Tax Rev.* 273 (1989).

⁹ See *Rev. Rul. 80-211*, 1980-2 C.B. 57, 57-58. But see I.R.C. § 162(g).

literature on tax evasion examines the effects of several features of taxation on evasion, including, for example, the effects of tax rates and progressivity.¹⁰ For some reason, however, the idea that taxation may affect criminal behavior has not been integrated into general models of crime, even though tax evasion and other income-producing crimes are not economically so different. In any event, tax evasion models do not capture the various deterrent aspects of the tax laws because they are based on the implicit assumption that the income derived from evading taxes is not itself subject to tax. In effect, the literature on tax evasion models a specific form of crime, tax evasion, on the assumption that income derived from legal activities is taxed, while income derived from criminal activities is exempt (see tax regime I).

A second, more explicit exception deals with the taxation of legal income. In analyzing the effects of excise taxes and import restrictions on income producing crimes, Hillman and Katz also examined the effects of imposing (or increasing) a tax on legal income, while assuming without explanation that illegal income is untaxed.¹¹ They conclude that such a tax will *unambiguously* increase illegal activity, if leisure time is predetermined (fixed). Hillman and Katz analysis and results are driven by their uncommon formulation of the criminal choice problem, according to which in case of punishment offenders derive constant utility (not affected by the returns to legal activities).¹² If, however, standard formulations of the criminal choice problem are employed, the effects of taxation of legal income are no longer *unambiguous*. As we show, a tax imposed solely on legal income may result in a decrease in the level of crime.

¹⁰ The seminal work is Michael G. Allingham and Agnar Sandmo, *Income Tax Evasion: A Theoretical Analysis*, 1 *J. Pub. Econ.* 323 (1972). See in general Gareth D. Myles, *Public Economics*, 383–411 (1995).

¹¹ Arye L. Hillman and Eliakim Katz, Note, *Excise Taxes, Import Restrictions, and the Allocation of Time to Illegal Income-Earning Activity*, 4 *Int'l Rev. Law and Econ.* 213 (1984).

¹² See *id* at 215. See also note _____ *infra*.

A third and perhaps more relevant exception to the common disregard has to do with the tax treatment of monetary sanctions. In a critical analysis of section 162(f), Png and Zolt show that in comparison to a world with no taxation (assumed to deter efficiently), the current U.S. income tax regime that disallows deductions for monetary sanctions imposes higher burden on offenders (and therefore results in over-deterrence), while a tax regime that allows such deductions imposes the same level of burden (and therefore maintains efficient deterrence).¹³ Aside from lack of generality—in the sense that their work only deals with legal businesses that cause external harm—Png and Zolt assume that offenders are risk neutrals. While such an assumption is not uncommon, it takes out much of the interesting effects of taxation and also stands in odds with standard models of crime that emphasize its risky nature and the importance of offenders' risk attitudes. Once the assumption of risk neutrality is dropped for the more plausible assumption of risk aversion, the results obtained by Png and Zolt change dramatically. A tax regime that allows full deductions for monetary sanctions generally (though not unambiguously) lessen the burden on offenders, in comparison to no taxation, which means it may encourage the commission of crimes. Additionally, a tax regime that disallows deductions for fines does not unambiguously reduce crime.

The work of Png and Zolt or of Hillman and Katz, in any case, has not fully explored the effects of taxation on crime. For one, they do not deal with the effects of

¹³ See I.P.L. Png and Eric M. Zolt, Efficient deterrence and the Tax Treatment of Monetary Sanctions, 9 *Int'l Rev. L. and Econ.* 209 (1989); Eric M. Zolt, Deterrence Via Taxation: A Critical Analysis of Tax Penalty Provision, 37 *UCLA L. Rev.* 343 (1989). Png and Zolt also demonstrated that it is possible to maintain the efficient level of crime under an income tax regime that disallows deduction for fines, if the primary sanction is downward adjusted to reflect offenders' marginal tax rates. Based on this work, Polinsky and Shavell argued that the current tax regime that allows deductions for punitive damages incurred in the production of income is efficient and desirable. A. Mitchell Polinsky and Steven Shavell, Punitive Damages: An Economic Analysis, 111 *Harv. L. Rev.* 869, 928–31 (1998).

taxation on crime when punishment takes the form of imprisonment.¹⁴ Nor do they analyze the effects of exempting illegal income from taxation in comparison to taxing it (with or without deductions for fines). As this paper shows taxation or exemption of criminal activities and the tax treatment of imprisonment may also have interesting, counterintuitive effects on crime.¹⁵

III. A SIMPLE ECONOMIC MODEL OF CRIME IN A NO-TAX WORLD

This part presents a simplified version of Ehrlich's model of participation in legal and criminal activities, a model that implicitly assume a world with no taxation. Like other models of property crimes, the model formulates the criminal choice as a labor supply decision under uncertainty.¹⁶ The model, nevertheless, can also capture the case of legal businesses that choose among activities or inputs part of which are illegal, such as a messenger service that decides whether and to what extent to double park. The no-tax model serves as a convenient benchmark for evaluating the effects of taxation on crime.¹⁷ In fact, it may serve as a real basis for comparison, because certain crimes, for example, double-parking, can be committed in either a personal or a business capacity, and certain offenders may be exempt or effectively exempt from taxation.

¹⁴ Png and Zolt, *supra* note _____ at 209. Note that the legal literature that dealt with the tax treatment of monetary sanctions, including the *Tank Truck Rental* decision, also addressed the deterrent effects of allowing or disallowing deductions for fines. However, they were largely preoccupied with a comparison between a deductibility and nondeductibility rule. They did not consider the effects of taxing criminal activity or the issue of how much deterrence is appropriate. They did not address the effects on crime of changes in tax rates as well.

¹⁵ This paper, however, is not going to deal with all the various aspects of the income tax system, such as the tax treatment of criminal expenses or litigation costs. A more comprehensive model should take these tax rules into account as well.

¹⁶ See Ehrlich, *supra* note 2, at 522; Sjoquist, *supra* note 2, at 439–40; Block and Heineke, *supra* note 2, at 314; See also in general Schmidt and Witte, *supra* note 2, at 143.

¹⁷ It is customary to generally analyze the effects of taxation in comparison to the hypothetical no-tax case. See, for example, Png and Zolt, *supra* note _ at 211; See also the literature on taxation and risk taking Stiglitz and Atkinson, *supra* note 1.

A. The No-Tax Model of Crime

Assume then that individuals can participate in only two market activities, legal work and crime, and that they make a choice regarding their optimal allocation of time between these two activities at the beginning of a given period. No training or other entry costs are required in either of the activities and movement between them is costless. A total amount of time, say, T can be allocated between these two activities, a fraction a to the criminal activity and a fraction $1 - a$ to the legal one, where $0 \leq a \leq 1$. Time allocated to leisure activities (all other nonmarket activities) is fixed.¹⁸

The returns in both activities are assumed to increase linearly with working time. Legal work is safe, in the sense that its net returns, w , wage per hour, for example, are given with certainty.¹⁹ Crime is risky, however, in the sense that its net returns are conditional upon, at least, two states of the world: punishment at the end of the period with (subjective) probability p , and escaping punishment, with (subjective) probability $1 - p$.

Assume that the probability of punishment is independent of the amount of time allocated to criminal activity.²⁰ If successful, offenders are assumed to receive the net gains of their crimes, c per hour, for example, which are assumed to take a monetary or monetary-like form.²¹ But if punished their returns are reduced by a fine, f , which also

¹⁸ The majority of models of crime make this assumptions see in general Schmidt and Witte, *supra* note 2, at 178-179. See also discussion in part VII. B *infra* concerning relaxing this assumption.

¹⁹ The majority of models of crime make this assumption see in general Schmidt and Witte, *supra* note 2, at 174-75. But see suggestion in part VIII note *infra*.

²⁰ See in general Schmidt and Witte, *supra* note 2, at 178-179. See also Png and Zolt, *supra* note __, at 211.

²¹ Almost all models of crime assume that the returns to crime (and legal work) include also the monetary value of any psychic gains and costs associated with it. See in general Schmidt and Witte, *supra* note 2, at 176-177. The effects of allowing the returns to crime and legal work to include non monetary elements are discussed in part VII. C. *infra*.

increases linearly with time allocated to criminal activities.²² For mere simplicity, assume that the gains to crime are given with certainty and that the fine imposed on a crime is always greater than these gains ($f > c$).

According to standard models, the fine inflicted on offenders can be easily interpreted as the monetary equivalent of imprisonment.²³ For the purpose of investigating the effects of taxation on crime, it is useful, however, to first analyze the cases of monetary sanctions, and later (part VI) examine how imprisonment fits into the analysis. To that end, further assume that individuals have initial wealth, W , that is sufficient to pay any amount of fines.

Under the forgoing assumptions, the criminal choice problem can be formulated as choose a (subject to $0 \leq a \leq 1$) which maximizes

$$E[U(\cdot)] = pU(Y) + (1 - p)U(X)$$

Where:

$$X = W + (1 - a)Tw + aTc$$

$$Y = W + (1 - a)Tw + aT(c - f)$$

are terminal wealth at the end of the period given nonpunishment and punishment respectively, and $U(\cdot)$ is the individual's von Neumann-Morgenstern utility function assumed to have terminal wealth as its only argument.²⁴ Given this constraint

²² The returns to both legal and criminal activities and the fine imposed on crimes can be represented with a linear function of time allocated to criminal activities, where $c'(aT) = c$, $w'((1 - a)T) = w$, and $f'(aT) = f$. In so doing, the current model simplifies Ehrlich's model, which assumes decreasing marginal returns to legal work and crime and increasing marginal sanctions.

²³ See, in general, Schmidt and Witte, *supra* note 2, at 178–79. A noticeable exception is Michael K. Block and Robert C. Lind, An Economic Analysis of Crimes Punishable by Imprisonment, 4 J. Legal Stud. 479 (1975).

²⁴ We assume then that individuals behave as if they were interested in maximizing expected utility of a one period wealth. In so doing we clearly deviate from most models of crime see in general (a side from tax

optimization problem, one can explore how individuals who exhibit indifference or aversion to risk choose to allocate their time between legal and criminal endeavors and the conditions for these individuals to refrain, participate, or specialize in crime.²⁵

1. The Decision of Risk Neutrals Individuals

Begin with risk neutral individuals (risk neutrals). Risk neutrals decide how to allocate their time between legal and criminal activities solely on the basis of the expected returns to these activities. Within our framework, a risk neutral will specialize in a single activity. If the expected returns to crime exceed those to legal work a risk neutral will specialize in crime; otherwise she will specialize in legal work.²⁶ Algebraically, the specialization condition in either crime or legal work is $c - pf > w$. To have a positive level of crime, crime, to some risk neutrals, must pay, in the sense that its expected returns be positive and greater than the returns to legal work. If the probability and severity of punishment is the same to all, the fraction of risk neutrals who engage in full-time criminal activity (and the aggregate level of crime) becomes a question of the distribution of the returns to legal work and crime. The fraction of risk

evasion models). See Schmidt and Witte, *supra* note 2, at 178–79. See Allingham and Sandmo, *supra* _____, at 324.

²⁵ Risk aversion reflects the more reasonable and common assumption with respect to human behavior, and to the extent that the economic theory of crime regards offenders as regular, simple individuals, to criminal behavior as well. Risk neutrality has its own merits as well. For one, it is employed for analytical purposes. Second, it may be reasonable with respect to firms. Third, it may describe real behavior when frequent and recurring offenses are involved. An alternative assumption that deserves examination (in light of taxation) is that offenders are risk seeking (especially when imprisonment is considered). However, because of lack of space we choose not to analyze this possibility.

²⁶ This follows from the assumption that the returns to legal and criminal activities exhibit constant marginal returns. If the returns to legal work or crime were assumed to exhibit diminishing marginal returns, it is quite possible risk neutrals would combine both activities. They would choose the point where the *marginal* expected returns to crime equal the *marginal* returns to legal work. This alternative, however, does not change our results.

neutrals for whom the condition $c - pf > w$ holds will specialize in crime; the rest will specialize in legal work.

2. *The Decisions of Risk Averse Individuals*

Risk neutrality eliminates much of the interesting features of the legal work-crime decision. Consider then those who display aversion to risk (risk averters). In contrast to risk neutrals, risk averters takes into account not only the expected returns to each activity but also the risk associated with it.²⁷ They may, depending on these factors, specialize in either legal or criminal activity, or allocate their time between these activities. If the returns to legal work exceed or equal the expected returns to crime, risk averters will definitely specialize in legal work. Thus, a sufficient condition to specialize in legal work is $w \geq c - pf$. If, however, the expected returns to crime exceed those to legal work, that is, if $c - pf > w$, risk averters may still specialize in legal work as long as the additional expected returns they derive from crime are not great enough to compensate them for assuming any risk, or combine legal and criminal activities and therefore trade off some of the certainty associated with legal work for the higher expected returns associated with crime. If the difference is great enough they may even end up specializing in crime.

For risk averters, the distributions of the returns to legal work, the expected returns to crime, initial wealth, and the *degree* of risk aversion in the population determine the fraction of those who specialize in legal work, combine legal and criminal

²⁷ For simplicity we will measure the risk associated with crime as the dispersion of the returns to crime around the expected returns (variance), even though we are aware of the problems that might be associated with such a measure. See also Stiglitz, *supra* note 1, at 269.

activities, or specialize in crime. For a given distribution of returns to legal and criminal activities, risk averters engage in less crime than risk neutrals. This simple result follows because the risky nature of crime itself has a deterrent effect on risk averters. In the following we will concentrate on those risk averters who combine legal work and crime.

Figure 1 presents graphically our simple model. Wealth in state x of the world is measured along the horizontal axis, while wealth in state y on the vertical axis. W represents initial wealth.

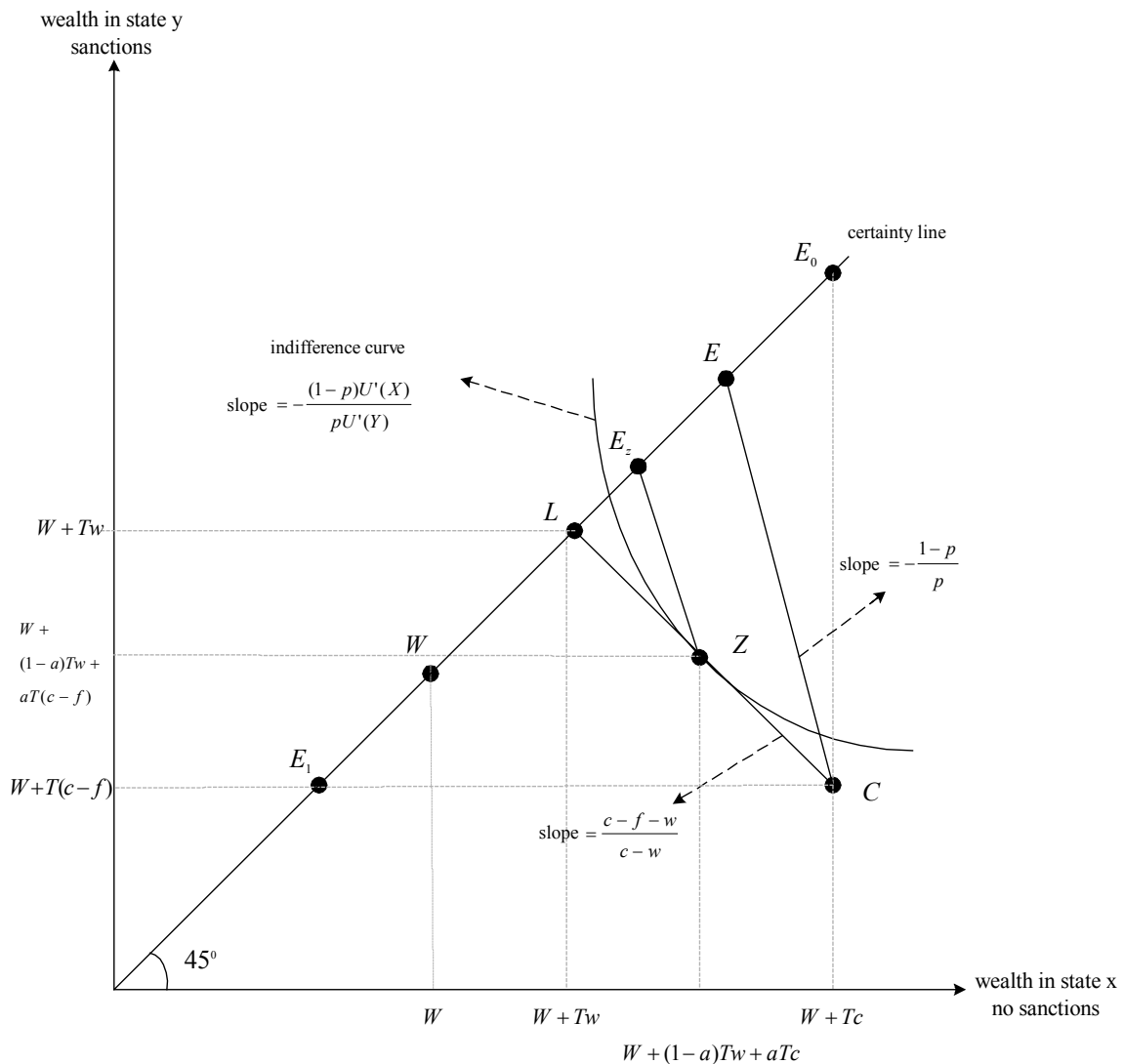


Figure 1 – The legal work-crime choice in a no-tax world

If the individual specializes in either legal work or crime, she is at point L or C respectively. C lies in our diagram southeast to L and W because $c > w$ and $c < f$. LC represents terminal wealth from different divisions of time between legal work and crime, or the wealth opportunity locus. L also measures the expected wealth from specializing in legal work, while E , which lies on the 45 diagonal line, or the certainty line, represents the expected wealth from specializing in crime. Given the size of c and f , E could lie anywhere between points E_0 and E_1 along the certainty line depending on the size of p , where E_0 and E_1 correspond to the expected wealth for $p = 0$ and $p = 1$ respectively. In our diagram E is depicted above L . This is the necessary and sufficient condition for risk neutrals to *specialize* in crime, while it is the necessary condition for risk averters to *participate* in crime.

LE stands for the expected wealth as a function of time allocation between legal and criminal activity, that is, the expected wealth opportunity locus. E_z , for example, measures the expected wealth that corresponds to Z , and is achieved by a parallel to EC .²⁸ By moving along LC (from L to C) risk averters increase the amount of time they allocate to crime and thus increase the risk they assume. At the same time they move along LE (achieved by parallels to EC) and increase the expected wealth they receive. Put differently, by moving along LC and LE risk averters trade off certainty for higher expected wealth.

LC represents the wealth opportunity locus. Its slope measures then the rate of transformation of wealth between states y and x of the world. The indifference curve in

²⁸ Lines EC and $E_z Z$ have the same slope, $-\frac{1-p}{p}$.

figure 1 represents different allocation of wealth between states y and x that confer the same expected utility, given the probability these states of the world occur. Its slope represents then the marginal rate of substitution of wealth between these two states of the world. Each risk averter chooses a specific division of time between legal work and crime where her indifference curve is tangent to the wealth opportunity locus, that is, where she equates her subjective marginal rate of substitution between wealth in states y and x with her marginal rate of transformation between wealth in these states. This time allocation choice is the interior solution to the maximization problem described above, which can be denoted a^* .²⁹ In the case shown in figure 1, the time allocation choice, a^* , is at Z . The expected wealth that corresponds to this choice is at E_z .

B. Some Comparative Static Results

Before we turn to incorporate taxation into this simple model, it is useful to obtain some comparative statics that will show the deterrent effects of punishment and the indeterminate deterrent aspects of wealth (wealth effects). These results will be employed in subsequent exploration of the effects of different tax regimes. Formal proof regarding risk averters can be found in the Appendix.³⁰

1. The Effects of Punishment

Examine first how changes in the severity of punishment affect the amount of crime. To do so, consider an increase in punishment, f , while holding all other variables

²⁹ See the Appendix.

³⁰ In the Appendix, we also derive comparative statics regarding the effects of changes in the returns to legal work and crime. As will become clear these results have a straightforward tax interpretation.

constant. An increase in the level of punishment reduces the expected returns to crime. It makes crime relatively less “attractive” than legal work. It creates then the familiar substitution effect that should lead individuals to substitute crime for legal work. For risk neutrals this substitution effect is the only effect in force. If prior to the increase in punishment a risk neutral specialized in legal work, the change would reinforce her specialization. If she specialized in crime, she might completely shift to work depending on the size of the increase. While an increase in punishment does not necessarily affect the behavior of *each and every* risk neutral, in the aggregate, for a continuous distribution of returns to legal work or crime, the fraction of risk neutrals who specialize in crime is reduced. The larger the increase, the greater the decline in risk-neutral offenders.

In addition to reducing the expected returns to crime, an increase in f increases the risk associated with crime.³¹ It makes crime riskier. It therefore may create, what we shall term, a risk related substitution effect. While this substitution effect has no impact on risk neutrals, it should lead risk averters to further substitute crime for legal work.³² For risk averters then an increase in punishment creates two distinct effects—a reduction in expected returns and an increase in the level of risk associated with crime—both operate to reduce crime.

2. The Effects of Changing Individuals' Initial Wealth

Examine next how crime changes with wealth. At first glance, it might seem that wealth should have no effect on the legal work-crime choice, because it does not influence the returns to legal work, or the expected returns to crime, or the risk associated

³¹ Because the risk associated with crime in terms of variance is $\sigma^2 = a^2 T^2 f^2 p(1-p)$.

³² [Literature regarding mean preserving shifts?]

with crime. And indeed for risk neutrals the level of wealth is irrelevant. However, because the level of wealth may affect the amount of risk, risk averters are willing to assume, it may influence to great extent their legal work-crime decision. The idea is that with different levels of wealth the degree of risk aversion may change.

How risk aversion changes with wealth can be derived from the properties of the Arrow-Pratt absolute risk aversion function, $R_A(\cdot) = -\frac{U''(\cdot)}{U'(\cdot)}$, which measures the risk premium demanded to bear an uncertain event of a fixed monetary value as a function of wealth.³³ Those who exhibit *constant* absolute risk aversion, which means their degree of risk aversion does not change with wealth, will not alter the amount of time they devote to crime as a result of a change in wealth. Those, on the other hand, who display *increasing* absolute risk aversion, which means they are more risk averse as they are richer, are going to decrease their criminal activity as their wealth increases. Those, however, who demonstrate *decreasing* absolute risk aversion, which imply they are less risk averse as they are richer, are going to increase their criminal activity.

Arrow hypothesized that absolute risk aversion is a decreasing function of wealth. This hypothesis, which amounts to suggesting that the willingness to engage in small bets of fixed size increases with wealth, is very intuitive and supported by everyday observation and empirical work.³⁴ It also has become the common assumption in the literature on risk aversion. The literature on criminal behavior, however, routinely considers the possibilities that individuals exhibit constant or increasing absolute risk

³³ See Kenneth J. Arrow, *Aspects of The Theory of Risk-Bearing*, 28–45 (1965); John W. Pratt, *Risk Aversion in the small and in the large*, 32 *Econometrica* 122 (1964).

³⁴ See, for example, Arrow, *supra* note _____ at 35.

aversion; the latter has even received some empirical support.³⁵ Accordingly, we will not commit ourselves to any one hypothesis.

IV. INCORPORATING INCOME TAXATION INTO THE ECONOMIC MODEL OF CRIMINAL BEHAVIOR

This part incorporates taxation into the model of crime and examines how it affects the decision to engage in criminal activities. More generally, it explores how changes in tax rates within different tax regimes affect the level of crime. The latter is rather important because changes in tax rates take place every now and then, and rarely, if ever, their effects on crime are considered.

Three forms of tax regimes are considered. Each may describe the real legal position with respect to certain illegal activities. Under Tax Regime I, income derived from legal activities is subject to taxation but income derived from criminal activities is exempt. Such a regime may describe the taxation of certain hardcore crimes, such as theft or drug trafficking, where illegal income is arguably untaxed.³⁶ It can also apply to crimes where the tax authority, for some reason, seems to fail to recognize the income-enhancing element of the crime. The most paramount (and tricky) example is probably tax evasion.³⁷ And indeed, as will become evident, the effects of such a regime are

³⁵ See, for example, Schmidt and Witte, *supra* note 2, at 161, 213. Note, however, that the authors suggest that the proxy they used to measure initial wealth may have not been satisfactory.

³⁶ That is, offenders seem unlikely to report and pay taxes on their income from these hardcore crimes, and the tax authority, on its part, appears unlikely to pursue and collect taxes, even when offender are caught and punished. But see, for example, Wood v. United States 863 F. 2d 417 (1989) (unreported drug proceeds were taxed upon an IRS audit), or Aldrich v. Commissioner 112 T.C. 304 (1999) (espionage income to a CIA employee was taxed). See also I.R.C. § 280E. Tax Regime I has also some historical relevancy see *supra* note _____.

³⁷ Income derived from tax evasion *should* be taxable, even though it is usually not. To clarify, suppose that a taxpayer has \$1000 taxable income all of which she under reports. With 40 percent tax rate this means that the taxpayer derives additional \$400 in illegal income that presumably are also taxable. The situation

similar to results obtained in models of tax evasion. Under tax regime II, individuals are taxed on their illegal income but may deduct their fines. Tax Regime II reflects then the normative legal position that would prevail but for section 162(f) of the code and also the current tax position regarding punitive damages. Under Tax Regime III, individuals are still taxed on their illicit gains, but they are not allowed to deduct their fines. Tax Regime III then stands for the current legal position under section 162(f). In part VI we will consider a fourth regime (Tax Regime IV) under which sanctions are partially deductible. Such a regime reflects the case of imprisonment.

Throughout we assume that taxes on either legal work or crime are proportional, which means we deal with linear tax systems. We also follow the literature on taxation and risk taking and assume that revenues from taxation are used to finance government spending that enters individuals' utility function in an additively separable fashion.³⁸ Finally, we assume that taxes, on either legal work or crime, are truthfully reported and fully paid. That is, we assume full compliance with the tax laws. While this assumption is restrictive and potentially unrealistic, it allows us to analyze the effects of taxation on crime without the additional complication of secondary violation of the tax laws. In addition, as discussed above, compliance with the tax laws may well be common for many types of crimes. In any case, tax regime I, that is, the exclusion of illegal income from taxation altogether, can be interpreted as accounting for full tax evasion.

of the taxpayer is no different than it would be if she paid the due taxes and immediately stole them from the tax collector. The gains from such a theft would clearly be taxable.

³⁸ That is, utility is given by $E(U) + \delta(G)$. See, for example, Atkinson and Stiglitz, *supra* note 1, at 104, note 4. This is a critical assumption because it means that the choice of time allocated to crime depends on taxation vis a vis a (loss) wealth effect but is completely independent of government spending. Below we consider how our results change if we assume that taxation redistributes towards offenders, thus generating a wealth gain.

We begin, as noted, with a comparison of the different tax regimes to the no-tax world. Then, we will make comparisons among the different regimes on the alternative assumptions that tax rates and fines are held constant or that revenues are held constant (fines are adjusted). A formal analysis can be found in the appendix.

A. Taxing Income from Legal Activities while Exempting Income from Criminal Activities

– Tax Regime I

Examine first the effects of a tax regime that imposes a proportional tax at rate t on legal income but exempts from taxation illegal income. Such a regime has, within our basic model, a simple interpretation. It amounts to reducing the returns to legal work by the applicable tax rate. Terminal wealth that enters the utility function becomes then

$$X_l = W + (1 - a)Tw(1 - t) + aTc$$

$$Y_l = W + (1 - a)Tw(1 - t) + aT(c - f)$$

Expected utility becomes

$$E[U(\cdot)] = pU(Y_l) + (1 - p)U(X_l)$$

For $t = 0$ the model reduces to our simple no-tax model of crime. A tax imposed solely on legal work creates within our model two effects. It makes legal work relatively less “attractive” than crime in terms of expected returns. That is, it creates a substitution effect towards crime. It also makes those individuals who at least partly engage in legal work poorer. The tax generates then an income effect as well. While the tax does not affect the risk associated with the legal work-crime choice and therefore does not create a

substitution effect in these terms,³⁹ its effects on wealth may influence the amount of risk, risk averters are willing to assume.⁴⁰

1. Risk Neutrals

For risk neutrals, a tax imposed on legal work only reduces the relative attractiveness of legal work in comparison to crime. The condition for specialization in crime becomes $c - pf > w(1 - t)$, which in comparison to the no-tax model generally implies that more risk neutrals will specialize in crime. Higher (lower) tax rates also lead to higher (lower) crime rates.

2. Risk Averters

For risk averters, the tax effects are more complex and may produce some counterintuitive results. The necessary condition to enter the criminal market is now $c - pf > w(1 - t)$, which embodies the idea of substitution toward crime. In addition, the tax makes risk averters who partly engage in legal work poorer and may, therefore, affect the extent to which they will be willing to assume the risk associated with crime. Whether risk averters are willing to incur more, less, or the same amount of risk as a result of the tax depends on the properties of absolute risk aversion. Risk averters who exhibit *constant* absolute risk aversion in the relevant region of their utility function would be willing to incur the same amount of risk before and after the tax. The tax generates then

³⁹ This is simple because the risk measured as $\sigma^2 = a *^2 T^2 f^2 p(1 - p)$ is independent of the returns to legal work. More generally, adding or subtracting a fixed amount across all states of the world does not affect the variance.

⁴⁰ This income effect, which we shall term a risk related income effect, should be distinguished from the usual income effect in models of taxation and labor supply (under certainty). The latter income effect arising from the demand for leisure as function of wealth is not present in our model because we assume that leisure time is fixed. But see part VII B. *infra* for relaxing this assumption.

no risk related income effect. In such a case, the substitution effect caused by the tax should unambiguously lead to more crime. Risk averters who exhibit *increasing* absolute risk aversion would be willing to bear more risk. The income effect in this case operates in the same direction as the substitution effect and should reinforce an increase in crime. If risk averters, however, demonstrate *decreasing* absolute risk aversion, they will be willing to bear less risk after the imposition of the tax. In this case, the income effect runs in opposite direction to the substitution effect. It operates to induce risk averters to decrease the level of crime. The combined effect in such a case depends on the relative magnitude of the substitution and income effects. As in other situations, it is possible the income effect will more than offset the substitution effect. That is, it is possible that a tax imposed on legal work will increase (decrease) the amount legal work (crime).

The substitution and income effects can be seen in figure 2. After the imposition of tax on legal work the wealth opportunity locus tilts downward to L_1C . Its slope becomes less steep.⁴¹ The shift from the old optimal choice, Z , to the new optimal choice, Z' , can be decomposed to an income effect – the shift from Z to Q which is the point on the new indifference curve with the same slope as the original wealth opportunity locus – and a substitution effect – the shift from Q to Z' . The latter is always in the direction of more crime. The direction of the former, however, depends on the absolute risk aversion function. In figure 2 the income effect is in the direction of less crime (which means decreasing absolute risk aversion), but the combined effect results in

⁴¹ Note that this downward tilt implies that risk averters who did not specialize in crime prior to the tax cannot maintain their pre tax expected utility. However, they can maintain any level of their pre tax risk or any level of their pre tax expected wealth because the expected wealth opportunity locus has merely lengthened downward.

ambiguous effect on the amount of unreported income)⁴² and on portfolio allocation (an increase in tax rates where capital gains are exempt has ambiguous effect on the amount invested in risky assets).⁴³ Moreover, the same ambiguity also results from comparative statics regarding changes in the returns to legal work. This is not surprising because tax regime I merely reduces the returns to legal work.⁴⁴

B. Taxing Income from Legal and Criminal Activities and Allowing Full Deductions for Fines – Tax Regime II

We move now to examine the consequences of subjecting both legal work and crime to taxation including deductions (with refunds if necessary) for fines. For that end, assume that a tax t is imposed on income from all sources, legal or criminal, and that losses are fully deductible. Assume further full compliance with the tax laws and that such compliance has no effect on the probability of punishment. The criminal choice problem can be then formulated as choose a that maximizes:

$$E[U(\cdot)] = pU(Y_{II}) + (1-p)U(X_{II})$$

Where now $X_{II} = W + (1-a)Tw(1-t) + aTc(1-t)$

$$Y_{II} = W + (1-a)Tw(1-t) + aT(c-f)(1-t)$$

Again, for $t = 0$ the problem reduces to the no-tax model of crime.

⁴² See, Allingham and Sandmo, *supra* note __, at 328.

⁴³ See, Stiglitz, *supra* note 1, at 274-275; Atkinson and Stiglitz, *supra* note 1, at 116-117.

⁴⁴ This result stands in contrast to the result obtained by Hillman and Katz for the case where leisure time is fixed. See *supra* note ____ at 218-219. Hillman and Katz conclude that in such a case the effects of taxation on time allocated to illegal activity is *unambiguously* positive. This is so, because in their formulation of the criminal choice problem a reduction in the returns to legal work does not change income (or utility) in case the offender is punished. In other words, they as if assume that all the returns to legal work are confiscated. In terms of our model (or standard models) this is equivalent to assuming that the level of punishment changes (in the same direction and the same amount) as the returns to legal work change. This seems highly implausible. In our view, such a formulation fails to isolate the effects of changes in the returns to legal work. Moreover, it eliminates the income effect in terms of risk that drives our results.

A tax with full deductions for fines reduces the expected returns to both legal and criminal activities proportionally. Therefore, it does not change their relative attractiveness in these terms. The reduction in the level of punishment, however, reduces the risk associated with crime and therefore changes the riskiness of crime. The tax then creates a risk-related substitution effect, but does not create a substitution effect in terms of expected returns. The tax also generates an income effect. It makes individuals regardless of their time allocation decision poorer. Like before, this income effect may influence the criminal choice because it may change the willingness to assume risk.

Taxing income from criminal activity and allowing deduction for fines put the government in effect in the position of a full partner in the criminal business.⁴⁵ Not only does the government benefits in the gains offenders make in case they escape punishment, but the government also shares the very loss it inflicts upon them when they are caught and punished. Full deductions for fines can also be thought of as a form of a partial insurance the government provides to offenders against the “risk” of being fined.⁴⁶ Insurance, quite ironically, offenders could not purchase (legally) in private markets.⁴⁷

⁴⁵ The analogy of taxation as creating a partnership between the government and offenders was made long time ago in the legal literature. See, for example, *Steinberg v. United States*, 14 F. 2d 564, 569 (2d. Cir. 1926). See also Bittker, *supra* note , at 131, 144–45. This analogy, however, was based on the very fact of participating in the gains of criminal activity and not necessarily in its losses. It was also primarily made as a moral argument against taxation of criminal activities. The analogy that an income tax with full loss offset turns the government into a silent (non voting) partner in a business or an investment was made in the economic literature on taxation and risk taking. See, for example, Domar and Musgrave, *supra* note 1 at 389; Stiglitz and Atkinson, *supra* note 1 at 104.

⁴⁶ On the effects of certain deductions as an implicit insurance see Louis Kaplow, *The Income Tax as Insurance: The Casualty Loss and Medical Expense Deductions and the Exclusion of Medical Insurance Premiums*, 79 Calif. L. Rev. 1485, (1991); Louis Kaplow, *Income Tax Deductions for Losses as Insurance*, 82 Am. Econ. Rev. 1013 (1992).

⁴⁷ It is not disputed that insurance against criminal fines or penalties would be void as violative of public policy see, for example, *Northwestern National Casualty Co. v. McNulty* 307 F.2d 432, 440–41 (5th Cir. 1962). Compare also with Kimberly A. Pace, *The Tax Deductibility of Punitive Damage Payments: Who Should Ultimately Bear the Burden for Corporate Misconduct?* 47 Ala. L. Rev. 825, 853-855 (1996).

These aspects of the tax enable offenders to increase their criminal activities without necessarily increasing the after tax risk they assume. Tax regime II therefore may cause the counterintuitive result of inducing crime.

1. Risk Neutrals

For risk neutrals the imposition of a tax with full deductions for fines reduces the expected returns to both legal work and crime proportionally. The condition for specializing in crime becomes then $(c - pf)(1 - t) > w(1 - t)$, which, after dividing by the positive term $(1 - t)$, is precisely the condition for specialization in the no-tax world. Risk neutrals then specialize in crime exactly as they did before the tax was introduced. The crime rate at large will accordingly be unaltered. Because these results hold irrespective of the tax rate, any increase or decrease in tax rates will also have no effect on crime. If, for example, punishment in absence of taxation is set to deter efficiently, a tax regime with full deductions for fines will maintain the efficient level of crime.⁴⁸

2. Risk Averters

Consider next the effects of a tax with full deductions for fines on risk averters. As noted, such a tax does not create a substitution effect in terms of expected returns, which implies that the necessary condition to enter the criminal market is unaltered. The tax, however, reduces the amount of risk associated with crime and therefore creates a risk related substitution effect that should lead risk averters to substitute crime for legal

⁴⁸ This simple result is similar to the results derived by Png and Zolt, *supra* note _____ at 215, and by Polinski and Shavell, *supra* note ___ at 928-929 (the latter with regard to punitive damages). Note, however, that these results depend critically on the assumption that time allocated to leisure activities is fixed. See part VII. B *infra*.

work. In addition, the tax generates a risk related income effect. As before, this income effect depends on how risk aversion changes with wealth.

Under the assumption of either *constant* or *increasing* absolute risk aversion, a tax with full deductions for fines unambiguously leads to an increase in the level of criminal activity. On the other hand, under the standard assumption of decreasing absolute risk aversion the results are not conclusive. The risk related substitution effect leads to more crime, while the risk related income effect to less. Depending on the magnitude of these effects, it is possible that tax regime II will increase, decrease, or leave unchanged the level of crime.

3. The Special Case of Zero Returns to Legal Work

As we have seen, for risk averters, under general conditions, the effects on crime of a tax with full deductions for fines are ambiguous. The ambiguity, however, disappears if we assume that the returns to legal work are zero. That is, for example, for the special case of nonvoluntary unemployment.⁴⁹ In such a case, a tax with full deductions for fines leads unambiguously to more crime.

With zero returns to legal work, the optimization problem can be expressed as choose a that maximizes

$$E[U(\cdot)] = pU(Y_{w=0}) + (1-p)U(X_{w=0})$$

Where $X_{w=0} = W + aTc(1-t)$

$$Y_{w=0} = W + aT(c-f)(1-t)$$

⁴⁹ The case of zero returns to legal work can also be interpreted with respect to legal business engaging in externalities as the case where there is a unique (and therefore nonsubstitutable) illegal input in the production.

Even under this formulation, however, risk averters may still choose not to allocate their entire available time to crime. They may decide not to do so not because they value more leisure time (this is ruled out by the assumption that leisure time is fixed), but in order to avoid the additional risk associated with more crime. The necessary condition to enter the criminal market requires that the after tax expected returns to crime be positive, that is $(c - pf)(1 - t) > 0$, which is equivalent to the necessary condition that would hold in the no-tax case, $c - pf > 0$.

Offenders who can increase the amount of time they allocate to crime according to the formula $a' = \frac{a^*}{1 - t}$, where a^* is the optimal choice in the absence of taxes and t is the prevailing tax rate, can maintain (after tax) their pre tax risk exposure, expected wealth, and most importantly expected utility. Because the same exact optimal choice in terms of wealth, risk, and utility is attainable after the tax, offenders will choose it. Their new time allocation choice, however, is associated with higher level of crime. Offenders who cannot adjust the amount of time they allocate to crime according to the above formula, because of the time constraint, will nevertheless increase it to maximum to mitigate the effects of the tax.⁵⁰ The ambiguity present in the general case resolves itself then for the special case of zero returns to legal work.

Figure 3 depicts this result. Since $w = 0$, the wealth and expected wealth opportunity locus in the no-tax world or for $t = 0$ are WC and WE respectively. After tax, W , representing risk averters who allocate no time to crime, is unaltered. C ,

⁵⁰ The ability to maintain pre tax expected utility constant depends crucially on the condition that $\frac{a^*}{1 - t} \leq 1$, that is, that the time constraint is not violated. This condition depends on the values of a^* and t . For any given t there is a correspondent a' such that $t + a' = 1$. This a' determines the critical time allocation choice for maintaining expected utility constant.

representing risk averters who spent full time in crime, shifts to C_t , which also lies on WC , and E shifts to E_t . The wealth and expected wealth opportunity locus therefore merely shrink to WC_t and WE_t , respectively, and the shrinkage in percentage terms equals the tax rate.

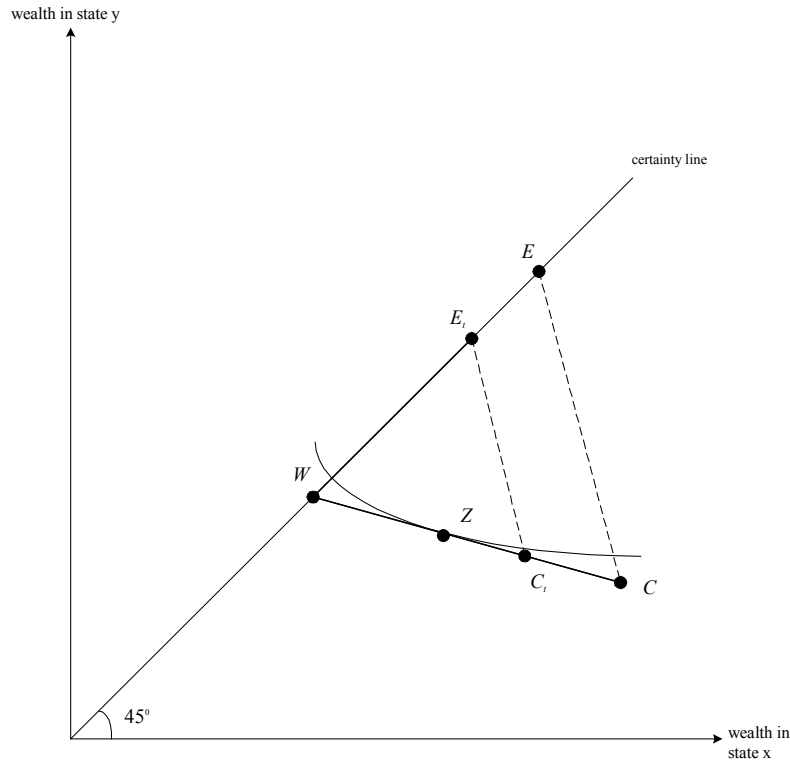


Figure 3 – Full deductions for fines for the case of zero returns to legal work ($w = 0$)

Risk averters who, for example, maximize expected utility at point Z prior to the tax ($a^* = \frac{WZ}{WC}$), or indeed, at any point on the segment WC_t , will maximize and maintain their expected utility at the same point after the tax. But point Z after the tax is imposed means that a portion $\frac{WZ}{WC_t}$ that equals $\frac{a^*}{1-t}$ is allocated to crime. That is, risk averters will increase their criminal activity. The critical point for maintaining expected utility

constant, in terms of figure 3, is given by C_i . As the tax rate increases, less risk averters will find it possible to maintain their expected utility constant. The crime rate however will keep growing.

C. Taxing Income from Legal and Criminal Activities but Disallowing Deductions for

Fines – Tax Regime III

After examining the effects of a tax system with full deductions for fines, we can consider now the consequences of disallowing such deductions, that is, of a tax regime such as the current U.S. income tax system. As before, the effects of taxation can be analyzed in terms of substitution and income effects.

A tax that denies deductions for fines reduces the returns to both legal work and crime, but does not alter the level of punishment. The expected returns to crime are reduced therefore proportionally more than the returns to legal work. The tax creates then a substitution effect (toward legal work) in terms of expected returns. Because the tax does not alter the punishment associated with crime, or any other factor that influences risk, it does not create a risk related substitution effect. It does, however, once again, generate an income effect that may influence the willingness to bear risk.

By disallowing deductions for fines, the government relinquishes its position as a full partner in the criminal business. Although it still ‘profits’ from crimes, it no longer shares the very losses it inflicts on offenders. The tax also loses its insurance features. It no longer provides a mandatory partial insurance against the ‘risk’ of punishment. In fact, by disallowing deductions for fines the tax system is possibly used as an additional instrument to discourage offenders.

1. Risk Neutrals

For risk neutrals, a tax with no deductions for fines creates only a substitution effect in terms of expected returns. It reduces the relative attractiveness of crime in comparison to legal work. The specialization condition becomes $c(1-t) - pf > w(1-t)$, which implies that less risk neutrals will specialize in crime. Because such a tax reduces the returns to legal work and crime but does not affect the level of punishment, for sufficiently high tax rates the maximum returns to crime approaches zero and the expected return to crime becomes negative. From the condition of specialization one can derive the critical tax rate that would foreclose all criminal activities, which turns to be $t' = 1 - \frac{pf}{c-w}$. For tax rates lower than t' some risk neutrals will still find it attractive to specialize in crime, while for tax rates higher than t' no risk neutral will engage in crime.

2. Risk Averters

For risk averters, the effects of the tax are once again more complex. In addition to the substitution effect (toward legal work) in terms of expected returns, the tax generates an income effect that may lead to more or less crime, depending on the properties of the absolute risk aversion function (as noted, the tax does not create a risk related substitution effect). In contrast to previous cases, however, the common assumption of decreasing absolute risk aversion reinforces (rather than offsets) the substitution effect. That means a tax with no deductions for fines reduces crime. Increasing absolute risk aversion, on the other hand, is associated with ambiguous results, but sufficiently large tax rates will still foreclose all crime.

To still engage in crime, the slope of $L_t C_t$ must be less steep than the slope of $C_t E_t$, the after tax expected wealth opportunity locus, which equals CE . This is true for $t < 1 - \frac{pf}{c-w}$. The shift from the old optimal choice, Z , to the new optimal choice, Z' , can again be decomposed to an income effect (Z to Q) and a substitution effect (Q to Z'). The latter is always in the direction of less crime. The direction of the former, however, depends on the absolute risk aversion function. In figure 3 there is no income effect (that means constant absolute risk aversion), so the combined effect results in less crime.

V. COMPARISONS AMONG THE DIFFERENT INCOME TAX REGIMES

Thus far we analyzed how various tax regimes affect the level of crime as compared to the no-tax world. The qualitative effects we derived also apply to changes in tax rates within each regime. The results of our analysis are summarized in Table 1 (for risk neutrals) and Table 2 (for risk averters).

Table 1 – The Effects of Different Income Tax Regimes on the Level of Crime

	Tax Regime I Taxing Legal Work	Tax Regime II Full Deductibility	Tax Regime III No Deductibility
Specialization condition	$w(1-t) >< c - pf$	$w(1-t) >< (c - pf)(1-t)$	$w(1-t) >< c(1-t) - pf$
Substitution effect in terms of expected returns*	Yes – toward crime	No	Yes – toward legal work
Level of Crime (in comparison to no-tax world)	Higher	Equal	Lower

* Note: There is no ‘regular’ income effect because leisure time is fixed.

Table 2 – The Effects of Different Income Tax Regimes on the Level of Crime (Risk Averters)

	Tax Regime I (Taxing Legal Work)	Tax Regime II (Full Deductibility)	Tax Regime III (No Deductibility)
Condition to participate in crime	$c - pf > w(1 - t)$	$(c - pf)(1 - t) > w(1 - t)$	$c(1 - t) - pf > w(1 - t)$
Substitution effect in terms of expected returns	Yes – toward crime	No	Yes – toward legal work
Risk-related substitution effect	No	Yes – toward crime	No
Risk-related income effect*	Depending on the Absolute Risk Aversion Function – For Increasing absolute risk aversion (IARA) – Yes, toward crime Constant absolute risk aversion (CARA) – No Decreasing absolute risk aversion (DARA) – Yes, toward legal work		
Level of Crime (in comparison to no- tax world)	Higher – For CARA and IARA Indeterminate – For DARA	Higher – For CARA and IARA Indeterminate – For DARA	Lower – For CARA and DARA Indeterminate – For IARA

* Note: There is no ‘regular’ income effect because leisure time is fixed.

As we noted, comparing crime levels under the different tax regimes to the no-tax world is interesting because it may isolate the effects of taxation on crime and indicate differences in crime rates that are expected between offenders who are and who are not subject to income taxation.⁵¹ Other comparisons in terms of crime rate, however, are also interesting. In particular, comparisons between tax regime I and tax regime II or III, and between tax regime II and tax regime III. The former are appealing because they reflect the choice between exemption and taxation of criminal activities (with or without deductions for fines). The latter is also of great interest because it reflects the choice between a deductibility and nondeductibility regime. Following the legal literature on the taxation of monetary sanctions, including the Supreme Court decision *Tank Truck*

⁵¹ Similarly, it may indicate how changes in tax rates affect crime rates and approximate differences in crime levels associated with offenders in different tax brackets.

Rentals, we conduct our comparisons given that tax rates and fines are held constant. Thereafter we will hold government revenues constant by allowing fines to vary.

A. Tax Rates and Fines Held Constant

Holding tax rates and fines constant produce simple and straightforward results with regard to risk neutrals. From table 1, it is clear that tax regime III results in less crime than either tax regime II or tax regime I and that tax regime II is associated with less crime than tax regime I. The level of crime, CL , among the different regimes including the no-tax world can be then summarized for risk neutrals in the following inequality: $CL_{III} < CL_{II} = CL_n < CL_I$.

As long as risk averters are concerned our previous analyses do not provide either clear or good answers.⁵² To facilitate comparisons among the different regimes we will concentrate on the differences among these regimes and evaluate them.

1. Tax Regime II and Tax Regime III

Tax regime II and tax regime III are similar in that both tax the returns to legal and criminal activities. They differ only in that the former allows while the latter disallows deductions for fines. Therefore, the difference between these two regimes is simply that the former imposes effectively a lower level of punishment than the latter (in the amount of ft). As we showed earlier, a lower level of punishment leads unambiguously to a higher level of crime. Therefore, tax regime II will be associated with

⁵² Table 2 does not provide clear answers because many results cannot be ruled out. For example, according to table 1 tax regime II can be associated with either a lower or a higher level of crime than the no-tax world. At the same time tax regime III can also be associated with a lower or a higher level of crime than the zero tax world. Therefore, one cannot conclude, from these comparisons, whether tax regime II will be associated with a higher or lower level of crime than tax regime III.

more crime than tax regime III. This simple result confirms essentially the reasoning of the landmark decision *Tank Truck Rentals*, which later was codified to section 162(f). In this case, while implicitly comparing a deductibility to a nondeductibility rule, the Supreme Court stated that “[t]o allow the deduction...would but encourage continued violations of state law by increasing the odds in favor of noncompliance.”⁵³ Indeed, in comparison to a nondeductibility rule, a deductibility rule leads to more crime.⁵⁴

2. Tax Regime I and Tax Regime III

In comparing tax regime I to tax regime III one should keep in mind that the former differs from the latter in only one aspect: the *returns* to crime are taxed under the latter but exempt under the former. Other aspects are identical: both regimes tax the returns to legal activities and disallow deductions for fines. The difference between these regimes creates within our analysis two effects. On the one hand, it makes tax regime III relatively less attractive to committing offenses than tax regime I. That is, it creates a substitution effect in terms of expected returns that should lead offenders to commit less crime under tax regime III than under tax regime I. On the other hand, it makes offenders under tax regime III less wealthy than under tax regime I. That means it creates an income effect as well. As we already know, the income effect may lead to more or less crime depending on the properties of the absolute risk aversion function. Under the assumption of constant or decreasing absolute risk aversion, tax regime III will be associated unambiguously with less crime than tax regime I. Under the assumption of

⁵³ See *Tank Truck Rentals Inc*, *supra* note ___ at 35.

⁵⁴ Note, however, that even this simple result does not imply anything about the desirability of either regime. Lower level of crime might mean over, or even, under deterrence as measured from some desired level of crime. Or, in other words, higher level of crime can be inefficient, inequitable, or both.

increasing absolute risk aversion, however, the result is indeterminate. It is possible that tax regime I will be associated with a lower level of crime than tax regime III. That is, it is possible that exemption of criminal activities will lead to less crime than taxation of criminal activities with no deductions for fines. These results are not surprising. They are similar to results obtained in the literature on crime regarding the effects of changes in the returns to crime.⁵⁵ Indeed, as we noted, the sole difference between these two regimes is the taxation of the returns to crime.

3. Tax Regime I and Tax Regime II

In contrast to the previous pair of regimes, the differences between tax regime I and tax regime II are more complex and lead to less clear results. In addition to taxing the returns to crime under the latter but not under the former, the level of punishment is reduced under the latter but remains unchanged under the former. The difference attributed to the taxation or exemption of the returns to crime, as we previously discussed, creates a substitution and an income effect, which generally imply a higher level of crime under tax regime I than under tax regime II, except for increasing absolute risk aversion. The difference attributed to the reduction in the effective level of punishment, however, as we also previously noted, leads unambiguously to more crime under tax regime II. These two differences then largely operate in opposite directions. Therefore, it is hard to say, with respect to risk averters, whether there will be less or more crime under tax regime I or under tax regime II. Put differently, it is hard to say whether exemption of crime from taxation altogether leads to less or more crime than taxation of criminal activities with full deductions for fines.

⁵⁵ See, for example, Schmidt and Witte, *supra* note 2 at 154.

B. Holding Government Revenues Constant – Adjusting Fines

In the previous section we compared the level of crime among the various tax regimes assuming that tax rates and also fines are held constant. Usually, however, alternative tax regimes are evaluated and compared given that government revenues, and not tax rates, are constant. Regularly, that means adjusting tax rates of one tax regime to make for the loss (or surplus) in revenues associated with another tax regime.⁵⁶ In the present case, however, government revenues can be held constant by adjusting primary fines, instead of tax rates. The idea is that government revenues include both revenues from taxes and fines. Fines then can function not merely to deter but also to compensate for lost tax revenues. In the following we will explore the effects on crime of altering fines under one tax regime to compensate for tax revenue loss associated with another tax regime. This will be done by adjusting fines to equate the expected returns offenders anticipate under alternative tax regimes. As will become evident, such a strategy can equalize crime levels among any pair of regimes for risk neutrals, but with one important exception, not for risk averters.

Before we proceed it is worth noting that adjusting primary fines (or tax rates) need not be only a technique to set alternative income tax regimes on the same footing as to revenues. Primary sanctions can be adjusted in an attempt to offset any undesirable effects on crime of taxation. For example, the government can adjust fines as it adopts income taxation, or shifts from one tax regime to another, or as it changes tax rates.

⁵⁶ In our analysis, however, holding tax rates constant may not be so flawed. The reason is that the necessary increase in tax rates falls on all taxpayers, and not merely on the group of taxpayers who engage in crime. Since the latter group is presumably very small in comparison to the former, the necessary tax rate increase will be also very small. In a sense then constant tax rates approximate this very small increase.

1. Tax Regime I and Tax Regime II or III Revisited

To offset the loss in tax revenues resulting from nontaxation of criminal activities, fines under tax regime I need to be higher than they would be under tax regime II or III.

More specifically fines under tax regime I should maintain the relationship

$$f_I = f_{II} + \frac{t}{p}(c - pf_{II}) \quad \text{and} \quad f_I = f_{III} + \frac{ct}{p},$$

with respect to fines under tax regime II or under tax regime III respectively.⁵⁷ If such (individually) designed adjustments are made, tax regime I and tax regime II (or tax regime III) will become equivalent in terms of expected returns, which means that the level of crime under these regimes will be identical to risk neutrals. Following the above adjustment, however, does not maintain the same level of risk within the different regimes. Because tax regime I involves higher returns to crime if crime goes unpunished (because crime is not taxed) and lower returns to crime if crime is detected (because fines are higher), tax regime I will involve greater risk than either tax regime II or III. This means that, for risk averters, tax regime I will be associated with less crime than either tax regime II or III.

These results have an interesting implication. They suggest that if primary sanctions are adjusted properly, a tax regime that exempts criminal activities from taxation can maintain or even reduce crime rates, while at the same time keeping potential total revenues as other tax regimes that tax criminal activities.

Two qualifications are in order. First, because tax regime I involves higher sanctions, it is also more susceptible to solvency problems, that is, to the need to resort to

⁵⁷ These results follow from solving the equations $aT(c - pf_I) = aT(c - pf_{II})(1 - t)$ and $aT(c - pf_I) = aTc(1 - t) - aTpf_{III}$ respectively.

nonmonetary sanctions. If such a need is paramount, then the advantage that tax regime I enjoys may disappear. For example, if the adjustment involves employing imprisonment, it will no longer be true that higher sanctions can compensate for lower tax revenues. In fact, they will require additional expenses and additional taxes. Second, the appropriate adjustment to fines requires information, part of which can be set in advance (the original sanction, the applicable tax rate, and the probability of punishment) and part of which needs to be set individually (the anticipated returns to crime).

2. Tax Regime II and Tax Regime III Revisited

To offset the loss in tax revenues resulting from the deductibility of fines, fines should be higher under tax regime II than under tax regime III. Specifically, fines under these regimes should maintain the relationship $f_{II} = \frac{f_{III}}{1-t}$. If such a relationship holds, tax regime II and tax regime III will be identical not only in terms of expected returns, but also in terms of risk offenders anticipate from engaging in legal and criminal activities. This means that these two regimes will be associated with the same level of deterrence and crime with respect to both risk neutral and risk averters.⁵⁸ Because the sole difference between a deductibility and nondeductibility regimes is the effective level of punishment, specifically, ft ,⁵⁹ it is not surprising that adjustments to the primary

⁵⁸ Note, however, that the actual level of crime depends of course on the base line. If, for example, the level of punishment under tax regime III is set to deter efficiently, then shifting to tax regime II and at the same time increasing the level of fine according to the above formula will maintain the efficient level of crime. If, on the other hand, the level of punishment under tax regime III will be decreased according to the above formula, then the level of crime under tax regime III will be equivalent to that under tax regime II, but it will not be efficient.

⁵⁹ Indeed nondeductibility of fines is usually characterized (in comparison to a deductibility rule) as a tax penalty. See, for example, Stanley S. Surrey and Paul R. McDaniel, *Tax Expenditures*, 222–23 (1985); Zolt, *supra* note__ at 350–51.

sanctions, either an increase under tax regime II or reductions under tax regime III, will do the same trick.

The equivalency between tax regime II and tax regime III, given appropriate adjustments to primary sanctions, suggests that allowing or disallowing deductions for fines are in itself less important than the combined effect of income taxation and criminal sanctions. In this respect, it undermines the focus of the Supreme Court and Congress on a comparison between a deductibility and nondeductibility regimes in terms of their effects on crime.⁶⁰ An interesting question that arises is whether criminal sanctions under current law, that is, under a nondeductibility regime, are adjusted, in any way, for taxation. For example, whether criminal sanctions are adjusted downward to reflect the level of deterrence associated with a deductibility rule or the no-tax world. Some considerations suggest that they are not, and, more generally, that taxation is not considered in setting criminal sanctions. If criminal sanctions were adjusted for taxation, we would expect to find two standards of criminal sanctions: one that applies to those offenders who are not subject to taxation (those who commit crimes in their personal capacity or those who are exempt from taxation), and another, adjusted downward, that governs those who are. In reality, however, we do not find such dual schedules of sanctions. In many instances, for example, double parking, uniform sanctions are inflicted on all offenders. And even in cases where nonuniform sanctions are imposed, the severity of sanctions is not in any sense tied to taxation. We would also expect that the level of punishment, inflicted on those offenders who are subject to taxation, would

⁶⁰ See *Tank Truck Rentals Inc supra* note ____ .

generally move together with changes in tax rates. In the real world, however, we do not observe any change in the severity of sanctions triggered by changes in tax rates.⁶¹

The equivalency between tax regime II and tax regime III, given appropriate adjustments to fines, seems to hold more generally. First, given appropriate adjustments to fines, both regimes are equivalent in terms of crime and revenues. Second, the information needed to make the necessary adjustments to whichever tax regime is not great. In fact, all that is required is knowledge of the level of the primary sanction and the prevailing tax rate. Third, previous literature asserts that the choice may depend on administrative costs. The claim is that if sanctions and tax rates are set by different agencies (federal or state), tax regime II may be less costly to administer than tax regime III adjusted downward because it allows the same sanction to apply to offenders who are and who are not subject to income taxation, and because it does not require adjustments to fines when tax rates change.⁶² This assertion, however, holds only for risk neutrals. If offenders are risk averse the claim falls. As we showed earlier, tax regime II is generally (but not unambiguously) associated with less deterrence than the no-tax world, while tax regime III is generally (but again not unambiguously) associated with more deterrence. Regardless then of the choice between tax regime II and tax regime III, two schedules of sanctions should be employed. Moreover, because the level of deterrence under either tax regime II or III changes with tax rates, primary sanctions should be adjusted under any of these regimes as tax rates change. If sanctions and taxes are set by different agencies, however, an important difference between the two regimes is who gets the additional revenues. If fines are nondeductible, as under current law, the federal government

⁶¹ Consider, for example, some major changes in tax rates the Tax Reform Act of 1986 _____, all of which were not coupled by changes in criminal sanctions.

⁶² See Png and Zolt, *supra* note _____ at 215–16.

receives the additional revenues (higher taxes). If, on the other hand, fines are deductible (but adjusted upward), then states or other agencies rip additional revenues (higher fines).⁶³ Clearly, this may not be so important, if the federal government can channel the additional revenues to the states or other agencies.

VI. THE CASE OF IMPRISONMENT – TAX REGIME IV

In analyzing the effects of taxation on crime we assumed that punishment takes the form of monetary sanctions, specifically fines. This seems a bit restrictive because offenders are usually subject to both monetary and nonmonetary sanctions.⁶⁴ In the following we will consider then the effects of taxation on crime when punishment takes the form of imprisonment and compare these effects to the case of fines. The case where both imprisonment and fines are employed is straightforward.

To make the comparison feasible we will assume that imprisonment and fines can be equivalent in terms of deterrence. More precisely, we will assume there is a rate of exchange between fines and imprisonment so as to leave offenders indifferent. We will also assume that offenders are risk averse with respect to imprisonment.⁶⁵

⁶³ On the basis of this difference one commentator argued for a deductibility rule coupled with higher fines for environmental sanctions in order to maintain funds to rebuild the environment. See Comment: Should Environmental Monetary Sanctions Be Deductible? 26 B.C. Envtl. Aff. L. Rev. 435 (1999). Another commentator argued for a nondeductibility rule with lower punitive damages to mitigate the distortions resulting from the windfall plaintiffs receive in punitive damages cases. See A note: An Economic Analysis of the Plaintiff's Windfall from Punitive Damage Litigation, 105 Harv. L. Rev. 1900 (1992).

⁶⁴ Only in rare criminal cases, such as violation of traffic laws (double parking, overloading of trucks and the like) is the assumption that punishment takes the form of fines reasonable. Such an assumption, however, is also applicable to punitive damages situations.

⁶⁵ Offenders can exhibit different risk attitudes with respect to wealth and imprisonment. See Block and Lind, *supra* note_ at 480–82 (suggesting that individuals are risk seekers in imprisonment); A. Michell Polinsky and Steven Shavell, On the Disutility and Discounting of Imprisonment and the Theory of Deterrence, 28 J. Legal Stud. 1; Alon Harel and Uzi Segal, Criminal Law and Behavioral Law and Economics: Observation on the Neglected Role of Uncertainty in Deterring Crime, 1 Am. Law Econ. Rev. 276, 295–298 (1999). As noted, because of lack of space we do not model the case of risk seeking.

To understand how imprisonment fares under taxation, we must have some understanding about how imprisonment affects crime. By and large, imprisonment deters crime by imposing costs on offenders, part of which are utility related and part of which are income related (we ignore the preventive effect of imprisonment). Imprisonment inflicts pure displeasure on offenders by restricting their choices over consumption of goods and services as well as of leisure time. Those who are incarcerated do not enjoy the freedom to do as they please, consume what they desire, or be with whom they want. The value placed on these restrictions is the disutility associated with imprisonment.⁶⁶ Imprisonment also affects offenders' consumption power. It reduces their present and future stream of income. Those who are imprisoned cannot generally earn income, either legally or illegally, during the period of incarceration. And no less importantly, they suffer from a reduction in their future (legitimate) earning capacity.⁶⁷

Income taxation in general and taxation of legal income in particular affect the different costs associated with imprisonment quite differently. Because income taxation does not tax utility but only income, it does not alter the costs of imprisonment that are utility related, but does reduce by the applicable tax rate the income related costs. In effect, then, the income tax system operates as if it 'disallows' deductions for the disutility associated with imprisonment, but 'allows' deductions for the income loss.⁶⁸

⁶⁶ See, Becker, *supra* note 2 at 179; Shavell and Polinsky, *supra* note _____ at 3. Imprisonment also provides benefits, but it is fair to say that imprisonment imposes a net disutility.

⁶⁷ [**Empirical evidence** ____]. Note that the reduction in offenders' earning ability concerns probably only legal activities. It is probably the case that imprisonment actually increases the ability to generate illicit income vis a vis the process of learning and networking. For simplicity I will ignore such an increase. The reduction in future earning capacity can be also associated with conviction rather than incarceration. To that extent there will be no difference between imprisonment and fines.

⁶⁸ To illustrate, suppose that an offender, under the no-tax world, is subject to one year in prison which is equivalent to \$50,000 fine. Suppose further that this one year in prison can be roughly decomposed as follows: \$10,000 represent pure disutility; \$20,000 stand for lost annual earnings; and \$20,000 correspond to the present value of future foregone income. Consider now the effects of introducing a 30% income tax.

Note that the effects of taxation on imprisonment are not conditioned upon the taxability of the activity that gives rise to the infliction of punishment. That is, the income tax operates effectively as ‘disallowing’ deductions for the utility costs and ‘allowing’ deduction for the income related costs of imprisonment *regardless* of whether the primary criminal activity is or is not subject to tax. In contrast, if the primary activity is not taxed, fines will be nondeductible because they were not incurred in producing taxable income. The above insight has very interesting implications when criminal activities are exempt (tax regime I). It means that when punishment takes the form of imprisonment, taxation of legal activities further encourages the commission of crime, because it reduces the effective level of punishment. It also implies that in comparison to an equivalent fine, imprisonment will be associated with more crime.⁶⁹

The effects of taxation on imprisonment also mean that the income tax system operates with respect to imprisonment as a partial deductibility regime (or equivalently as a partial no deductibility regime), assuming the primary activity is taxed (Tax Regime IV). The criminal choice problem can be formulated as choose a that maximize:

$$E[U(\cdot)] = pU(Y_{IV}) + (1-p)U(X_{IV})$$

Where now $X_{IV} = W + (1-a)Tw(1-t) + aTc(1-t)$

$$Y_{IV} = W + (1-a)Tw(1-t) + aTc(1-t) - aTf(1-\beta t)$$

If punishment takes the form of imprisonment, the income tax will not affect the disutility costs associated with imprisonment, leaving them equal to \$10,000. It will, however, reduce the income related costs of imprisonment by the applicable tax rate. With a 30% tax rate, these costs will amount only to \$28,000 instead of \$40,000. In total, then, the income tax decreases the real costs of imprisonment from \$50,000 to \$38,000 (which is by less than the applicable tax rate).

⁶⁹ This logic applies also to nonincome producing crimes. That is, we should expect the level of nonincome producing crimes punishable by imprisonment to be higher than those punishable by an equivalent fines under taxation.

where f is the monetary equivalent of imprisonment (assumed to equal the fine) and β is the portion of f that is income related ($0 \leq \beta \leq 1$), or the degree of deductibility. This formulation has several implications. First, it means that the effects of taxation, including changes in tax rates, on crime depend on β , that is, on the degree of deductibility. If β is large enough (approaches one), the case of imprisonment comes close to the case of fines under full deductions (tax regime II). That means we should generally (but not unambiguously) expect the introduction of taxation, or increases in tax rates, to lead to more crime. On the other hand, if β is small enough (approaches zero), then taxation with respect to imprisonment fares more or less like nondeductibility regime (tax regime III). That is, we should in general anticipate taxation, or increases in tax rates, to lead to less crime. If, however, β takes middle values, it becomes essentially impossible to say the direction of the effects. Taxation may increase, decrease, or even leave unchanged the level of crime under a wide range of assumptions. In general then the effects of income taxation on crime in case of imprisonment are ambiguous.

A corollary result involves the comparison between imprisonment and fines. Imprisonment, in contrast to an equivalent fine, will be associated with less crime with respect to tax regime II (and as we showed also with respect to tax regime I), and with a more crime with respect to tax regime III. The reason is straightforward. The portion of the real costs of imprisonment that are actually nondeductible increases the effective level of punishment, in comparison to the full deductibility regime, which implies a decrease in the level of crime. Similarly, the portion of the costs of imprisonment that is effectively deductible reduces the severity of punishment, in comparison to the no deductibility regime, which result in an increase in the level of crime.

The comparison between fines and imprisonment focused solely on their different effects on the level of crime. Fines and imprisonment are extremely different in their effects on revenues. Fines are a mere transfer of wealth from offenders to the public and are therefore a source of revenues. Imprisonment, on the other hand, actually requires real and nontrivial amount of expenditures, or, in other words, imprisonment requires additional taxes.

VII. SEVERAL EXTENSTIONS AND LIMITATIONS

To explore the effects of taxation on crime we adopted a simple model of crime, largely based on standard models. To that model we incorporated the theory of the taxation of risk taking. These two bodies of literatures (the economics of crime and taxation and risk taking) were proved to be sensitive (in various degrees) to the underlying structures of the problem studied. In the following we will deal briefly with several (but not all) of the assumptions we made. In particular, we will look at the assumptions regarding government revenues and spending, leisure time, and the returns to legal work and crime. Not surprisingly, our results are also sensitive to the various assumptions.

A. Tax Revenues, Fines, and Expenditures

In examining the effects of taxation on the level of crime we assumed that tax revenues are spent on a public good that enters the utility function in a separable way. We did not, however, consider revenues from fines or account for expenses involving the operation of the criminal justice system, including those associated with enforcement and

punishment. These deficiencies can be overcome easily by extending the assumption to read: *total* government revenues from both taxes and fines are used to finance public goods including the operation of the criminal justice system that enters the utility function in a separable way. We can also assume in this respect that changes in revenues do not influence the criminal justice system budget, and, on the other hand, that changes in the operation of the criminal justice system, for example, a change in police force, result in a change in the composition of government spending accordingly.

Government revenues and spending including spending on the criminal justice system can clearly affect offender's behavior. In the analysis thus far, the assumption that revenues finance public goods that enter the utility function separately implied that taxation creates a wealth loss to all taxpayers, which, in turn, implied that taxation might affect offenders behavior depending on whether offenders are more or less risk averse as they are poorer. If we assume alternatively that revenues are redistributed to all individuals in a form of lump sum transfer, the effects of taxation and accordingly our results will change. Under this assumption, the tax system generates a wealth effect that differs among three classes of taxpayers. Taxpayers who pay more than they receive suffer a wealth loss after the tax is imposed. Taxpayers who pay less than they receive actually experience a wealth increase as a result of the tax. And taxpayers who happen to obtain exactly what they pay bear no wealth effect at all. The alternative assumption then generates either a smaller wealth loss or actually a wealth gain. If we concentrate on the possibility that taxation and spending redistributes towards those individuals who engage in crime because, for example, they are the poorer, then the results relating to absolute risk aversion are reversed. While constant absolute risk aversion still implies that the

income effect as no real impact, decreasing absolute risk aversion suggests now that taxation operates to increase crime and increasing absolute risk aversion to decrease it.

The effects and results of such analysis are summarized in table 3.

Table 3 – Effects of taxation on crime if taxation redistributes towards offenders (Risk Averters)

	Tax Regime I Taxing Legal Work	Tax Regime II Full Deductibility	Tax Regime III No Deductibility
Condition to participate in crime	$c - pf > w(1-t)$	$(c - pf)(1-t) > w(1-t)$	$c(1-t) - pf > w(1-t)$
Substitution effect in terms of expected returns	Yes – toward crime	No	Yes – toward legal work
Risk-related substitution effect	No	Yes – toward crime	No
Risk-related income effect*	Depending on the Absolute Risk Aversion Function – For Increasing absolute risk aversion (IARA) – Yes, toward legal work Constant absolute risk aversion (CARA) – No Decreasing absolute risk aversion (DARA) – Yes, toward crime		
Level of Crime (in comparison to the no-tax world)	Higher – For CARA and DARA Indeterminate – For IARA	Higher – For CARA and DARA Indeterminate – For IARA	Lower – For CARA and IARA Indeterminate – For DARA

* Note: There is no ‘regular’ income effect because leisure time is fixed.

B. Relaxing the Assumption that Leisure Time is Fixed

The basic model of criminal behavior we adopted assumes that the amount of time individuals devote to leisure activities is fixed.⁷⁰ Therefore, the choice they face has

⁷⁰ Note that many interpretations of Ehrlich’s model understand it to assume (essentially) that leisure time is fixed. See, for example, Schmidt and Witte, *supra* note 2 at 155; Pyle, *supra* note 2 at 15; Heineke, *supra* note 2 at 20. Ehrlich, however, is more general. He basically analyzes the comparative static effects of changes in his model’s parameters with respect to the *relative* time allocation between legal and criminal activities thus allowing leisure time to vary. He later asserts that the obtained behavioral implications would strictly apply to the absolute level of participation in legal and criminal activities if changes in market opportunities did not affect the demand for time in leisure activities, and indicates briefly the results if this was not the case. See, Ehrlich, *supra* note 2, at 529–32.

been strictly between legal and criminal income-producing activities. This is unrealistic and restrictive since individuals can vary the amount of time they allocate to leisure activities as well. Moreover, disregarding the leisure-work boundary seems particularly odd when dealing with taxation given that the criminal choice problem is constructed as a labor supply decision. Yet, a similar disregard can be found in several models that deal with the effects of taxation on labor supply under conditions of uncertainty.⁷¹

If we allow leisure time to vary we can expect the effects of taxation on crime to become more ambiguous.⁷² Allowing leisure time to vary introduces two additional, well-known effects into the analysis. On the one hand, taxation makes leisure relatively cheaper than either legal or criminal work and thus more attractive. This should lead to substituting away from legal work and crime toward leisure (the substitution effect). In this respect, taxation would generally reduce the amount of time devoted to both legal and criminal income-producing activities. On the other hand, taxation causes individuals to be poorer. This may lead, in addition to affecting the willingness to bear risk, to an increase in time allocated to both legal work and crime as long as leisure is a normal good (the usual income effect). These substitution and income effects work in opposite direction, and to evaluate their combined effect requires information as to their magnitudes. We don't possess knowledge regarding the elasticity of the labor supply, which includes in our case both legal and criminal labor.⁷³ If the substitution and income

⁷¹ See, for example, S. M. Kanbur, Risk Taking and Taxation, 15 J. Pub Econ. 163 at 165 note 3 (1981) (exploring the effects of income taxation on the choice between safe and risky occupations); Jonathan Eaton and Harvey S. Rosen, Taxation, Human Capital, and Uncertainty, 70 Am. Econ. Rev. 365 (1980) (exploring the effects of income taxation on occupation choice where the returns to human capital is uncertain).

⁷² Even Hillman and Katz, who obtain *unambiguous* positive effect of taxation on legal income on crime, where leisure time is fixed, obtain *ambiguous* results when leisure time can vary. See Hillman and Katz, note ____ *supra* at 216–17.

⁷³ To the extent that legal labor supply is concerned the data indicates that _____

effects are more or less equal in magnitude, however, the assumption that leisure time is fixed is effectively warranted and therefore the results we obtain will hold. Otherwise, our results will need to be modified. It will no longer be true, for example, that an income tax with full deductions for fines maintains the same level of deterrence and crime for risk neutrals. Such a regime may either increase or decrease the level of crime.

It is worth emphasizing that leisure activities include both legal and criminal nonmarket activities. Therefore, an increase (decrease) in leisure time does not necessarily mean a decrease (increase) in the level of criminal activities in general, but rather a decrease (increase) in the level of income-producing crimes.

C. Nonmonetary Returns to Legal and Criminal Activities

In formulating the model of criminal behavior we assumed that the returns to legal and criminal activities are monetary in nature. In doing so we deviated from standard models, which assume these returns are either monetary or can be monetized. The reason we ignored any psychic aspects of the returns to legal work and crime lies in the inherently different tax treatment of monetary and nonmonetary elements. In part VI we discussed in details the effects of taxation on punishment, when punishment takes a nonmonetary form. Here we will mention briefly the effects of allowing the returns to legal work and crime to include psychic costs and gains.

Allowing the returns to legal work and crime to include nonmonetary aspects opens our analysis to a wide range of possibilities, including under or over-taxation of either legal work or crime. This, in turn, may be expected to add more complexity and ambiguity. If, for example, the returns to legal work are solely monetary, while the

returns to crime include psychic gains, income taxation will effectively under tax crime. It will be equivalent to a partial taxation (or partial exemption) of crime. Alternatively, if crime involves a great amount of psychic costs, due to offenders' adherence to the law, for example, income taxation will effectively over-tax crime, which will be equivalent to a partial gross income taxation of crime. Similar formulations will follow if we assume legal work is associated with nonmonetary returns. Analyzing the effects of taxation on crime in these cases will probably be more complex and the results less clear.⁷⁴

VIII. CONCLUSION

The paper incorporates the theory of the taxation of risk taking into an economic model of income producing crimes and examines the deterrent effects of different tax rules. This incorporation is natural because the criminal problem is routinely modeled as a labor supply (or a portfolio) decision under uncertainty. It is also important because legal work and crime are subject to various income tax rules, especially if tax rates are sufficiently high. The key insight of the analysis is that taxation may influence not only the relative expected returns from legal and criminal activities, but also the riskiness of crime and the willingness to assume risk. The net effect of taxation may lead then to an increase or decrease in the level of crime. While our theoretical model produces some simple and clear results, in general, due to the substitution and income effect, the results are ambiguous. Like in portfolio models of taxation and risk taking our analysis is also sensitive to its underlying assumptions. Future work can extend the analysis in several directions. First, it can investigate the robustness of our results under less restrictive

⁷⁴ It is probably possible to formulate the cases where punishment takes the form of imprisonment and the returns to legal work and crime include psychic elements by letting the tax rates that are associated with these elements take different values. That is, with differential taxation.

assumptions.⁷⁵ Second, it can examine the effects of other tax rules, such as those concerning the deductibility of litigation costs, on the level of crime. Third, it can explore the welfare implications of the analysis, given that the analysis was concerned with positive aspects. In addition, our theoretical analysis requires empirical work. Such work, in the spirit of Clotfelter or Feldstein, for example, may support the idea that taxation and tax rates affect criminal behavior, and can also indicate the direction and magnitude of the effect.⁷⁶ Empirical researchers can take advantage of historical changes of tax regimes or, more importantly, of the frequent changes in tax rates. Such empirical work will be most valuable for policy makers in designing criminal sanctions and tax rules and also when contemplating changes in tax rates.

APPENDIX

In this Appendix we derive formally the comparative statics results found in section III and section IV. The following notation will be used.

T = total amount of time to be allocated to market activities;

a = fraction of time to be allocated to criminal activities ($0 \leq a \leq 1$);

w = constant returns per unit of time (per hour, for example) to legal work;

c = constant returns per unit of time (per hour, for example) to crime;

f = constant fine per unit of time devoted to crime (severity of punishment);

p = probability of punishment (assumed to be independent of amount of crime);

⁷⁵ For example, allowing for several criminal (risky) activities or for no safe legal work. Compare, for example, in the public finance literature with Atkinson and Stiglitz, *supra* note 1, at 123-124; Sandmo, *supra* note 1, at 297-98.

⁷⁶ See Charles T. Clotfelter, Tax Evasion and Tax Rates: An Analysis of Individuals Returns, 68 Rev. Econ. and Stat. 363 (1983); Martin Feldstein, Personal Taxation and Portfolio Composition: An Econometric Analysis, 44 Econometrica 631 (1976).

t = the prevailing proportional tax rate;

W = initial wealth;

X_i = terminal wealth at the end of the period given nonpunishment

Y_i = terminal wealth at the end of the period given punishment

$U(\cdot)$ = the individual's von Neumann-Morgenstern utility function assumed to be a function of terminal wealth; $U'(\cdot) > 0$; $U''(\cdot) < 0$.

$R_A(\cdot) = -\frac{U''(\cdot)}{U'(\cdot)}$ = the individuals' absolute risk aversion function; $R'_A \geq 0$.

A. A Model of Crime in a No-Tax World

The criminal problem is to choose a (subject to $0 \leq a \leq 1$) that maximizes:

$$(A1) \quad E[U(\cdot)] = pU(Y) + (1-p)U(X)$$

Where:

$$(A2) \quad X = W + (1-a)Tw + aTc$$

$$(A3) \quad Y = W + (1-a)Tw + aT(c-f)$$

Assuming throughout an interior maximum solution, that is risk averters who combine legal work and crime, the first and second order conditions that must hold are respectively:

$$(A4) \quad E'U = Tp(c-f-w)U'(Y) + T(1-p)(c-w)U'(X) = 0$$

$$(A5) \quad E''U = D = T^2p(c-f-w)^2U''(Y) + T^2(1-p)(c-w)^2U''(X) < 0$$

The second order condition (A5) is satisfied by the assumption of risk aversion,

$U''(\cdot) < 0$. The first order condition can be rewritten as

$$(A6) \quad \frac{-(1-p)U'(X)}{pU'(Y)} = \frac{c-f-w}{c-w}$$

The first order condition implies that risk averters choose the optimal point where the marginal rate of substitution of wealth between states y and x of the world (the left hand term) equals the marginal rate of transformation of wealth between these states of the world (the right hand term). We will denote the optimal choice of a as a^* .

We shall now examine how a^* depends on the parameters of the model f, W, w, c .

1. The Effects of Punishment

To examine the effects of punishment, we differentiate the first order condition (A4) with respect to f , solve for $\frac{\partial a^*}{\partial f}$, and obtain:

$$(A7) \quad \frac{\partial a^*}{\partial f} = \frac{Tp}{D} [U'(Y) + aT(c-f-w)U''(Y)] < 0$$

That is, an increase (decrease) in the level of punishment unambiguously reduces (increases) the fraction of time allocated to crime.

2. The Effects of Wealth

To investigate how a^* changes with wealth, we differentiate the first order condition

(A4) with respect to W , solve for $\frac{\partial a^*}{\partial W}$, and obtain:

$$(A8) \quad \frac{\partial a^*}{\partial W} = -\frac{1}{D} [Tp(c-f-w)U''(Y) + T(1-p)(c-w)U''(X)]$$

Substituting from the first order condition (A4) and using the absolute risk aversion function, we can rewrite this as

$$(A9) \quad \frac{\partial a^*}{\partial W} = \frac{T}{D}(1-p)(c-w)U'(X)[R_A(X) - R_A(Y)]$$

It is easy to see that $\frac{\partial a^*}{\partial W} \geq 0$ as $R'_A(\cdot) \leq 0$.

That is, an increase in the level of wealth increases, decreases, or leaves unchanged the fraction of time allocated to crime as absolute risk aversion decreases, increases, or is left unchanged.

3. The Effects of Changes in the Returns to Legal Work⁷⁷

To explore the effects of an increase in the returns to legal work, we differentiate the first order condition (A4) with respect to w , solve for $\frac{\partial a^*}{\partial w}$, and obtain:

$$(A10) \quad \frac{\partial a^*}{\partial w} = -\frac{1}{D}[-TpU'(Y) + (1-a)T^2p(c-f-w)U''(Y) - T(1-p)U'(X) + \\ + (1-a)T^2(1-p)(c-w)U''(X)]$$

Substituting from the first order condition (A4) and employing the absolute risk aversion function, we can rewrite this as

$$(A11) \quad \frac{\partial a^*}{\partial w} = \frac{TpU'(Y)f}{D(c-w)} + \frac{T^2}{D}(1-a)(1-p)(c-w)U'(X)[R_A(X) - R_A(Y)]$$

The first term is clearly negative. The second term, however, is either negative, zero, or positive depending on the value of $R_A(X) - R_A(Y)$. For $R'_A \geq 0$, that is, for

$R_A(X) \geq R_A(Y)$, the second term is zero or negative respectively, which means that

$\frac{\partial a^*}{\partial w} < 0$. That is, the fraction of time devoted to criminal activities decreases with the

⁷⁷ Compare the results of this section with Appendix_.

returns to legal work. For $R'_A < 0$, that is, for $R_A(X) < R_A(Y)$, the second term is positive and therefore $\frac{\partial a^*}{\partial w}$ is indeterminate.

4. The Effects of Changes in the Returns to Crime⁷⁸

To explore the effects of changes in the returns to crime, we differentiate now the first order condition (A4) with respect to c , solve for $\frac{\partial a^*}{\partial c}$, and obtain:

$$(A12) \quad \frac{\partial a^*}{\partial c} = -\frac{1}{D} [TpU'(Y) + aT^2p(c-f-w)U''(Y) + T(1-p)U'(X) + aT^2(1-p)(c-w)U''(X)]$$

Substituting from the first order condition (A4) and using the absolute risk aversion function, this can be rewritten as:

$$(A13) \quad \frac{\partial a^*}{\partial c} = -\frac{TpU'(Y)f}{D(c-w)} + \frac{aT^2}{D}(1-p)(c-w)U'(X)[R_A(X) - R_A(Y)]$$

The first term is clearly positive. The second term, however, is either negative, zero, or positive depending on the value of $R_A(X) - R_A(Y)$. For $R'_A \leq 0$, which implies $R_A(X) \leq R_A(Y)$, the second term is zero or positive respectively, which means that $\frac{\partial a^*}{\partial c} > 0$. That is, the fraction of time devoted to criminal activities increases with the returns to crime. For $R'_A > 0$, which implies $R_A(X) > R_A(Y)$, the second term is negative and therefore $\frac{\partial a^*}{\partial c}$ is indeterminate.

⁷⁸ Compare the results of this section with the results derived in part V. A2.

B. Taxing Income from Legal Activities while Exempting Income from Criminal Activities

– Tax Regime I

After the imposition of a tax on legal work only, the criminal problem is to choose a (subject to $0 \leq a \leq 1$) that maximize:

$$(A14) \quad E[U(\cdot)] = pU(Y_I) + (1-p)U(X_I)$$

where:

$$(A15) \quad X_I = W + (1-a)Tw(1-t) + aTc$$

$$(A16) \quad Y_I = W + (1-a)Tw(1-t) + aT(c-f)$$

For $t = 0$ this choice is the same choice as in the no-tax world. Therefore if a^* is the interior solution in the no-tax world, it is also the optimal choice for $t = 0$. The first and second order conditions that must hold are respectively:

$$(A17) \quad EU' = Tp[c-f-w(1-t)]U'(Y_I) + T(1-p)[c-w(1-t)]U'(X_I) = 0$$

$$(A18) \quad EU'' = D = T^2p[c-f-w(1-t)]^2U''(Y_I) + T^2(1-p)[c-w(1-t)]^2U''(X_I) < 0$$

The second order condition (A18) is satisfied by the assumption of risk aversion.

To investigate how a^* , or indeed any optimal a for a given t , changes with t , we differentiate the first order condition (A17) with respect to t and solve for $\frac{\partial a^*}{\partial t}$. We

obtain:

$$(A19) \quad \frac{\partial a^*}{\partial t} = -\frac{1}{D} [TwpU'(Y_I) - T^2wp(1-a)[c-f-w(1-t)]U''(Y_I) + \\ + Tw(1-p)U'(X_I) - T^2w(1-p)(1-a)[c-w(1-t)]U''(X_I)]$$

Substituting from the first order condition and rearranging we can rewrite this as

$$(A20) \quad \frac{\partial a^*}{\partial t} = \frac{Twf(1-p)U'(X_I)}{D[c-f-w(1-t)]} - \frac{T^2w(1-a)(1-p)[c-w(1-t)]}{D} [R_A(X_I) - R_A(Y_I)]$$

The first term is positive. The second term, however, is either positive, negative, or zero depending on the value of $R_A(X_I) - R_A(Y_I)$. For $R'_A \geq 0$, which implies $R_A(X_I) \geq R_A(Y_I)$, the second term is zero or positive respectively, which means that $\frac{\partial a^*}{\partial t} > 0$. That is, the fraction of time devoted to criminal activities increases with the tax rate. For $R'_A < 0$, which means that $R_A(X_I) < R_A(Y_I)$, the second term is negative and therefore $\frac{\partial a^*}{\partial t}$ is indeterminate.⁷⁹

C. Taxing Income from Legal and Criminal Activities and Allowing Full Deductions for

Fines – Tax Regime II

1. The General Case of Positive Returns to Legal Work

The criminal problem, after the imposition of a tax with full deductions for fines, can be formulated as choose a (subject to $0 \leq a \leq 1$) that maximize:

$$(A21) \quad E[U(\cdot)] = pU(Y_{II}) + (1-p)U(X_{II})$$

Where now:

$$(A22) \quad X_{II} = W + (1-a)Tw(1-t) + aTc(1-t)$$

$$(A23) \quad Y_{II} = W + (1-a)Tw(1-t) + aT(c-f)(1-t)$$

For $t = 0$ this maximization problem reduces to the problem in the no-tax world. Therefore, a^* is also the interior solution to this problem for $t = 0$. The first and second order conditions that must hold are respectively.

⁷⁹ Compare this result to Appendix A3.

$$(A24) \quad EU' = Tp(c - f - w)(1 - t)U'(Y_{II}) + T(1 - p)(c - w)(1 - t)U'(X_{II}) = 0$$

$$(A25) \quad EU'' = D = T^2 p(c - f - w)^2(1 - t)^2 U''(Y_{II}) + T^2(1 - p)(c - w)^2(1 - t)^2 U''(X_{II}) < 0$$

This second order condition (A25) is also satisfied for risk aversion.

The effects of taxation or changes in tax rates within tax regime II can be investigated by differentiating the first order condition (A24) with respect to t and solving for $\frac{\partial a^*}{\partial t}$, we

obtain:

$$(A26) \quad \frac{\partial a^*}{\partial t} = \frac{T}{D} [p(c - f - w)U'(Y_{II}) + (1 - p)(c - w)U'(X_{II})] + \\ + \frac{(1 - t)T^2}{D} [pa(c - f - w)^2 U''(Y_{II}) + pw(c - f - w)U''(Y_{II}) + \\ a(1 - p)(c - w)^2 U''(X_{II}) + w(1 - p)(c - w)U''(X_{II})]$$

Substituting from the first order condition and rearranging we can rewrite this as

$$(A27) \quad \frac{\partial a^*}{\partial t} = \frac{(1 - t)T^2}{D} [ap(c - f - w)^2 U''(Y_{II}) + a(1 - p)(c - w)^2 U''(X_{II}) + \\ - w(1 - p)(c - w)U''(X_{II})[R_A(X_{II}) - R_A(Y_{II})]]$$

The first term is negative. So are the first two terms in the square bracket. The last term in this bracket, however, is positive, negative, or zero depending on the value of $R_A(X_{II}) - R_A(Y_{II})$. For $R'_A \geq 0$, that is for $R_A(X_{II}) \geq R_A(Y_{II})$, the last term is zero or negative respectively, which means that $\frac{\partial a^*}{\partial t} > 0$. That is, the fraction of time devoted to crime increases with the tax rate. For $R'_A < 0$, that is, for $R_A(X_{II}) < R_A(Y_{II})$, the last term in the bracket is positive and therefore $\frac{\partial a^*}{\partial t}$ is indeterminate.

2. The Special Case of Zero Returns to Legal Work

With full deductions for fines and zero returns to legal work, the optimization problem is to choose a that maximizes:

$$(A28) \quad E[U(\cdot)] = pU(Y_{w=0}) + (1-p)U(X_{w=0})$$

Where

$$(A29) \quad X_{w=0} = W + aTc(1-t)$$

$$(A30) \quad Y_{w=0} = W + aT(c-f)(1-t)$$

Denoting a° the interior optimal solution for $t = 0$, which is also the optimal choice in a no-tax world (for zero returns to legal work), or for any given t , the two order conditions that must hold are respectively:

$$(A31) \quad E'U = Tp(c-f)(1-t)U'(Y_{w=0}) + T(1-p)c(1-t)U'(X_{w=0}) = 0$$

$$(A32) \quad E''U = D = T^2p(c-f)^2(1-t)^2U''(Y_{w=0}) + T^2(1-p)c^2(1-t)^2U''(X_{w=0}) < 0$$

The second order condition (A32) is once again satisfied for risk aversion.

Differentiating the first order condition (A31) with respect to t and solving for $\frac{\partial a^\circ}{\partial t}$, we

obtain:

$$(A33) \quad \frac{\partial a^\circ}{\partial t} = \frac{a^\circ}{1-t} > 0$$

D. Taxing Income from Legal and Criminal Activities but Disallowing Deductions for

Fines – Tax Regime III

Under a tax that disallows deductions for fines, the criminal choice problem can be expressed as choose a (subject to $0 \leq a \leq 1$) that maximize:

$$(A34) \quad E[U(\cdot)] = pU(Y_{III}) + (1-p)U(X_{III})$$

Where now:

$$(A35) \quad X_{III} = W + (1-a)Tw(1-t) + aTc(1-t); \text{ or}$$

$$(A36) \quad Y_{III} = W + (1-a)Tw(1-t) + aT[c(1-t) - pf]$$

This problem also reduces to the no-tax world problem for $t = 0$, and a^* is therefore the interior solution for $t = 0$. The two order conditions that must hold are respectively:

$$(A37) \quad Tp[c(1-t) - f - w(1-t)]U'(Y_{III}) + T(1-p)(c-w)(1-t)U'(X_{III}) = 0$$

$$(A38) \quad T^2 p[c(1-t) - f - w(1-t)]^2 U''(Y_{III}) + T^2 (1-p)(c-w)^2 (1-t)^2 U''(X_{III}) < 0$$

The second order condition (A38) is satisfied for $U''(\cdot) < 0$. Differentiating the first order

condition (A37) with respect to t and solving for $\frac{\partial a^*}{\partial t}$, we obtain:

$$(A39) \quad \frac{\partial a^*}{\partial t} = \frac{T}{D} [p(c-w)U'(Y_{III}) + Tp[c(1-t) - f - w(1-t)][ac + (1-a)w]U''(Y_{III})] + \\ + \frac{T}{D} [(1-p)(c-w)U'(X_{III}) + T(1-p)(c-w)(1-t)[ac + (1-a)w]U''(X_{III})]$$

Substituting from the first order condition and rearranging we can rewrite this as

$$(A40) \quad \frac{\partial a^*}{\partial t} = \frac{T}{D} [p(c-w)U'(Y_{III}) + (1-p)(c-w)U'(X_{III}) + \\ - T(1-p)(c-w)(1-t)[ac + (1-a)w]U'(X_{III})[R_A(X_{III}) - R_A(Y_{III})]]$$

The first term is negative, while the first two terms in the square bracket are positive. The last term in the bracket is either positive, negative, or zero depending on the value of $R_A(X_{III}) - R_A(Y_{III})$. For $R'_A \leq 0$, that is for $R_A(X_{III}) \leq R_A(Y_{III})$, the last term is zero or positive respectively, which means that $\frac{\partial a^*}{\partial t} < 0$. The fraction of time allocated to crime

decreases with the tax rate. For $R'_A > 0$, that is, for $R_A(X_{III}) > R_A(Y_{III})$, the last term in the bracket is negative and therefore $\frac{\partial a^*}{\partial t}$ is indeterminate.

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