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TAXATION AND INCOME LAUNDERING*

by

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A B S T R A C T

The economic literature on criminal behavior has overlooked the constraints offenders might face in spending their illegal returns and consequently their demand for appropriate laundering channels. This paper inquires into the individual's decision to participate in illegal activities, when illegal returns must be laundered to avoid detection. Two alternative laundering channels are considered: declaring illegal returns as income stemming from a legal source and smuggling them abroad to be repatriated as a foreign bank loan. The paper examines the relationships between laundering, participation in illegal activities and taxation as well as the desirability of announcing a tax amnesty aimed at raising revenue out of the underground economy.

TAXATION AND DIRTY MONEY LAUNDERING

Gideon Yaniv

I. INTRODUCTION

Obscuring the real origin of dirty (illegally acquired) money by making it appear as stemming from a legal source is a fraudulent maneuver usually attributed to organized crime attempting to penetrate legitimate business. However, as being reported by Clarke and Tigue (1976), money 'laundering' is widely practiced by individual 'white-collar' criminals as well, seeking to enjoy the proceeds of bribary, embezzlement or stock manipulations without drawing the attenton of the tax authorities. While dirty money may be laundered on an international scale, involving its smuggling to a secret Swiss or Caribbean bank account and its repatriation in the disguise of a legitimate bank loan, it may also be laundered domestically by declaring it as proceeds stemming from a legitimate enterprise.[1] Both methods have their costs: the former involves the risk of theft, destruction or confiscation as well as the use of expensive courier and bank services; the latter requires the payment of the appropriate taxes.

With the recent exception of Walter's (1985) analytical study of the international market for financial secrecy, the economic literature on criminal behavior has so far overlooked the constraints offenders might face in spending their illegal returns and consequently their demand for appropriate laundering channels. This paper makes a second step towards filling this gap, inquiring into the individual's decision to participate in illegal work as well as to launder his dirty money either by declaring it as income stemming from a legal source or by smuggling it abroad and repatriating it as a forein bank loan.[2] Section II develops the basic framework for the analysis of such behavior and derives entry and optimum conditions. Section III examines the individual's response to variations in the income tax rate, which may help control the accumulation of dirty money as well as the offender's choice between the alrternative laundering channels. Section IV confronts the individual with a tax amnesty program under which money laundering, although being allowed legally, might still be practiced illegally, given that the amnesty tax rate exceeds the illegal laundering cost rates. Aside from discussing the individual's behavior under the amnesty program, this section addresses the question of the desirability to the tax collector of declaring a tax amnesty, and the problem of selecting the optimal amnesty tax rate. Section V concludes with some related remarks.

II. THE WORK - LAUNDERING DECISION

Consider an individual who owns a small customer-service business (restaurant, car wash, laundery, etc.), the proceeds from which (net of operational costs) are subject to a constant tax rate, Θ. Following Ehrlich (1973) and Sjoquist (1973), suppose that the individual may allocate a fixed amount of time to either legal work (within his business) or to illegal work (such as drug dealing, gambling, gun running, prostitution, etc.). Denoting by h the fraction of time devoted to illegal work, suppose that illegal returns, m(h), generating the individual's stock of dirty money, as well as his business proceeds, w(1-h), are a monotonically increasing (at constant or decreasing marginal rates) function of working time (i.e., $m'(h)>0$, $w'(1-h)>0$ and $m''(h)\leq 0$, $w''(1-h)\leq 0$). Suppose also that at the beginning of the period the individual possesses a stock of (legally acquired and fully declared) liquid assets of value A (including his borrowing opportunities against income in future periods).

Suppose now that the individual has reasons to believe that his spending behavior is being observed by the tax authorities. More specifically, suppose that the individual believes that his detection of possessing dirty money (and consequently of having been engaged in illegal activities) is *certain* if he attempts spending (i.e., consuming or investing) in excess of his (after-tax) legal means - but is not possible otherwise.[3] Suppose, however, that the individual dislikes the idea of 'stashing' his dirty money until a safer time emerges (it might either be found, decompose or be erosed in value by inflation). He thus considers the option of laundering his dirty money either domestically by declaring it as proceeds stemming from his legal business or internationally by smuggling it, with the aid of a courier, to a secret foreign bank account and repatriating it in the form of a legitimate bank loan. His (subjective) risk of being detected participating in illegal activities will then be limited to the possibility that his laundering maneuver will be exposed, either as a result of the abolishment of foreign banks secrecy or through random auditing of his tax return by the tax authorities.

Denoting by δ the proportion of dirty money declared as legal income, and assuming that laundering money internationally entails a transaction cost of γ percent of the amount laundered (currency exchange commissions, courier and bank fees, bribes, etc.), the individual's spending capacity if not (randomly) detected, S^{nd}, will be

$$S^{nd} = A + (1-\Theta)[w(1-h) + \delta m(h)] + (1-\gamma)(1-\delta)m(h). \qquad (1)$$

However, if the individual is detected, the real source as well as the exact amount of his dirty money returns will be revealed. Being charged not only with participating in illegal work and possessing dirty money but also with the attempt of laundering his dirty money through either channel,[4] the individual will be obliged to pay a penalty which may take various forms. In general, the penalty may be assumed to be a function of h (or of m(h)), δ (as well as of $1-\delta$) and Θ (taking into account the fact that taxes have already been paid on the domestically laundered amount). The individual's spending capacity if detected, S^d, will thus be

$$S^d = S^{nd} - \pi(h,\delta,\Theta), \tag{2}$$

where $\pi_h>0$, but $\pi_\delta>0$, $\pi_\delta<0$ or $\pi_\delta=0$, depending on whether domestic laundering (hereafter DL) is perceived to be a more, a less, or an equally serious offense than international laundering (hereafter TL) respectively, and $\pi_\Theta\leq0$.[5] Notice that $\pi(0,\delta,\Theta)=0$, but $\pi(h,0,\Theta)\neq0$.

Suppose now that the individual has preferences over spending capacity which may be represented by a Von-Neumann - Morgenstern utilty function, U, and that he chooses h* and δ* so as to maximize the expected utility of his prospect

$$EU(S) = (1-p)U(S^{nd}) + pU(S^d), \tag{3}$$

where p denotes the (exogenously given) probability of detection. The first-order conditions for an interior maximum will be

$$EU_h = (1-p)g(h,\delta,\Theta,\gamma)U'(S^{nd}) - p[\pi_h(h,\delta,\Theta)-g(h,\delta,\Theta,\gamma)]U'(S^d) = 0, \tag{4}$$

where $g(h,\delta,\Theta,\gamma) = [(1-\Theta)\delta + (1-\gamma)(1-\delta)]m'(h) - (1-\Theta)w'(1-h)$ denotes the differential marginal gain of participating in illegal work, and

$$EU_\delta = (1-p)(\gamma-\Theta)m(h)U'(S^{nd}) - p[\pi_\delta(h,\delta,\Theta)-(\gamma-\Theta)m(h)]U'(S^d) = 0. \tag{5}$$

The second-order conditions for the maximization of (3), $EU_{hh}<0$ and $EU_{\delta\delta}<0$, are satisfied upon assuming that the individual is risk-averse [$U''(S)<0$] and that the marginal penalties (π_h and π_δ) are non-decreasing.[6] The additional second-order condition, $EU_{hh}EU_{\delta\delta}>(EU_{h\delta})^2$, is assumed to hold.

Since the expected marginal utility of h is decreasing with h, a sufficient condition for entry into illegal work is that $EU_{h(h=0)}>0$, which implies that $g(0,\delta,\Theta,\gamma)>p\pi_h(0,\delta,\Theta)$. That is, the differential gain from the first hour allocated to illegal work should exceed the expected penalty on this hour. If TL were technically infeasible (so that δ could only be set at 1), the entry condition would reduce into $(1-\Theta)[m'(0)-w'(1)]>p\pi_h(0,1,\Theta)$, and a necessary prerequisite for its existence would be $m'(0)>w'(1)$, similar to Ehrlich's (1973) exposition. Given, however, a choice between DL and TL, the entry condition may also be satisfied when $m'(0)\leq w'(1)$, providing that the weighted laundering cost rate, $\Theta\delta+\gamma(1-\delta)$, is less than the income tax rate. Equation (4) implies also that a necessary prerequisite for an interior optimum is $0<g(h,\delta,\Theta,\gamma)<\pi_h(h,\delta,\Theta)$. Since illegal work is risky, participation should be held before the differential marginal gain falls to zero; the latter, on the other hand, may not exceed the marginal penalty, otherwise the marginal opportunities in illegal work always dominate those in legal work.

Given that $h>0$, laundering is a must. An interior solution to equation (5) (i.e., a division of the amount laundered between *both* DL and TL) necessitates, however, a specific relationship between Θ and γ, depending on the relative severity of the alternative laundering offenses: if $\pi_\delta>0$, i.e., if DL is more severely punishable than TL (because, for instance, the tax collector srongly dislikes the idea of having the tax system used as a money laundering device), γ should exceed Θ (otherwise $\delta^*=0$); if $\pi_\delta<0$, so that TL is more severely punishable (to compensate, for instance, for the fact that it generates no tax revenue), Θ should exceed γ (otherwise $\delta^*=1$). If $\pi_\delta=0$, or, alternatively, if $\gamma=\Theta$, an interior maximum does not exist (the individual adopts the less expensive, *or* the less punishable, channel). In any case, an interior solution requires that $|\pi_\delta(h,\delta,\Theta)| > |(\gamma-\Theta)|m(h)$. That is, the differential marginal penalty on laundering dirty money through either channel should exceed the differential marginal gain. Table 1 summarizes the possible solutions of δ^* for alternative relationships between the severity of punishment and the laundering cost rates. As implied by Table 1, the restrictions above are necessary, yet not sufficient to generate an interior solution. Since the expected marginal utility of δ is decreasing with δ, a sufficient condition for entry into DL and TL is that $EU_{\delta(\delta=0)}>0$ and $EU_{\delta(\delta=1)}<0$, respectively. These

Table 1: *The fraction of dirty money declared as legal income under alternative cost and penalty relationships*

	$\gamma>\Theta$	$\gamma=\Theta$	$\gamma<\Theta$
$\pi_\delta>0$	$0\leq\delta^*\leq1$	$\delta^*=0$	$\delta^*=0$
$\pi_\delta=0$	$\delta^*=1$	?	$\delta^*=0$
$\pi_\delta<0$	$\delta^*=1$	$\delta^*=1$	$0\leq\delta^*\leq1$

conditions do not reuduce, however, to simple relationships between the parameters of the model, since the penalty in case of $\delta=0$ or $\delta=1$ is non-zero.

Combining (4) and (5), we obtain (at an interior optimum)

$$\frac{g(h,\delta,\Theta,\gamma)}{\pi_h(h,\delta,\Theta) - g(h,\delta,\Theta,\gamma)} = \frac{(\gamma-\Theta)m(h)}{\pi_\delta(h,\delta,\Theta) - (\gamma-\Theta)m(h)} . \tag{6}$$

That is, the differential marginal gain of participating in illegal work relative to its differential marginal cost should, in equilibrium, equal the differential marginal gain of laundering (through either channel) relative to its differential marginal cost. Condition (6) may, however, be stated in a reduced form as

$$g(h,\delta,\Theta,\gamma)\pi_\delta(h,\delta,\Theta) = (\gamma-\Theta)m(h)\pi_h(h,\delta,\Theta), \tag{7}$$

which will be usefull in the subsequent section.

III. TAX RATE VARIATIONS

If dirty money must be laundered before spending (otherwise detection is certain) and if the tax system serves as a common laundering channel, it follows that the income tax rate may be used to control the accumulation of dirty money as well as to affect offenders' choice between the alternative laundering channels. The individual's response to a possible change in the income tax rate is thus of particular interest.

Suppose first that participation in illegal work is predetermined (at h=**h**). That is, suppose that the individual possesses a fixed amount of dirty money, m(**h**), divided, in case of an interior optimum, in some positive proportions, $0<\delta^*<1$ and $0<1-\delta^*<1$, between DL and TL, respectively. Thus, $\pi_\delta \# 0$ and $\gamma \# \Theta$. Totally differentiating (5) with respect to δ and Θ, an increase in the income tax rate is found to affect the fraction of dirty money laundered through DL according to

$$\frac{d\delta^*}{d\Theta\ (h=\mathbf{h})} = \frac{1}{EU_{\delta\delta}} \{m(h)EU'(S) + p\pi_{\delta\Theta}U'(S^d) +$$

$$(\gamma-\Theta)m(h)(1-p)U'(S^{nd})[(d(h,\delta)+\pi_\delta)R_A(S^d) -$$

$$d(h,\delta)R_A(S^{nd})]\}, \tag{8}$$

where $d(h,\delta) = w(1-h) + \delta m(h)$ denotes total declared income and $R_A(S)=-U''(S)/U'(S)>0$ is the Arrow-Pratt absolute risk - aversion measure.

Under the accepted assumption of decreasing absolute risk-aversion $[R_A(S^d) > R_A(S^{nd})]$, the sign of (8) depends on the relative riskiness of the alternative laundering channels (and the implied relationship between the laundering cost rates necessary for an interior optimum) and on whether or not the penalty function takes any account of the taxes already paid. Assuming first that it does not ($\pi_\Theta=\pi_{\delta\Theta}=0$), an increase in Θ would not only reduce the profitability, on the margin, of laundering money domestically, but would also make the individual less wealthy (whether detected or not), which, under decreasing absolute risk-aversion, tends to reduce risk-taking. Given that DL is more risky (i.e., more severely punishable) than TL, $\gamma-\Theta$ must be assumed positive, so that both the income and substitution effects act to unambiguously discourage the use of the former channel.[7] If, on the other hand, TL is more risky, $\gamma-\Theta$ must be assumed negative. The income effect would act to encourage DL (on the account of discouraging TL) and the sign of (8) would be ambiguous. Ambiguity would also prevail if $\pi_\Theta<0$, which obscures the sign of the income effect, and if, in addition, $\pi_{\delta\Theta}<0$, which may reverse the sign of the substitution effect.

Suppose, alternatively, that the laundering proportions are predetermined ($\delta=\bar{\delta}$). Totally differentiating (4) with respect to h and Θ, an increase in the income tax rate is found to affect participation in illegal work according to

$$\frac{dh^*}{d\Theta}\Big|_{(\delta=\bar{\delta})} = \frac{1}{EU_{hh}}\{[\delta m'(h)-w'(1-h)]EU'(S) + p\pi_{h\Theta}U'(S^d) + g(h,\delta,\Theta,\gamma)(1-p)U'(S^{nd})[(d(h,\delta)+\pi_\Theta)R_A(S^d) - d(h,\delta)R_A(S^{nd})]\}. \quad (9)$$

While the income effect on h, assuming that the penalty takes no account of previously paid taxes, is unambiguously negative (illegal work is curtailed if risk-taking is to be reduced), the substitution effect on h depends upon the way that variations in Θ affect the differential marginal gain from participating in illegal work. If it falls (i.e., if $g_\Theta(h,\delta,\Theta,\gamma) = -\delta m(h) + w'(1-h) < 0$), so that illegal work becomes less attractive on the margin, both the substitution and income effects would act to unambiguously discourage participation in illegal work. This would also be the case if the relative attractiveness of both work activities is not affected. However, if the differential marginal gain rises with the income tax rate (i.e., if $g_\Theta(h,\delta,\Theta,\gamma) > 0$), the substitution effect would act to encourage illegal work and the sign of (9) would be ambiguous. Ambiguity would also dominate if taxes paid on domestically laundered money reduce the expected penalty.

Allowing the individual to adjust *both* his laundering proportions and illegal work participation to variations in the income tax rate is bound to give rise to further ambiguity. However, making use of equation (7), the Appendix to this paper shows that under a specific penalty function which is linear in δ and $1-\delta$, both h^* and δ^* would respond unambiguously to changes in Θ, providing that DL is more severely punishable than DL. More specifically, illegal work and domestic laundering are found then to be positively and negatively related, respectively, to the income tax rate (i.e., $dh^*/d\Theta>0$) and $d\delta^*/d\Theta<0$). This implies that a *decrease* in the income tax rate would help reduce participation in illegal work as well as the amount of tax escaping the tax collector through TL, $\Theta(1-\delta^*)m(h^*)$. The effect on total tax revenue, $\Theta[w(1-h^*) + \delta^*m(h^*)]$, would, however, be ambiguous.

IV. LEGAL VERSUS ILLEGAL LAUNDERING

In an attempt to increase tax revenue at no resource cost, tax collectors may announce a tax amnesty for a specified period of time, during which all those who owe taxes on illegally earned income are allowed to pay without having to state the exact source of this income and without fear of penalty or criminal prosecution.[8] To compensate for the loss of penalty payments, legal laundering (hereafter LL) may only be possible at a higher than the regular tax rate. Suppose then that a tax amnesty has been announced, allowing taxpayers to launder illegally acquired money at a constant tax rate, $t(\geq\Theta)$. The individual is now faced with the problem of deciding how much of his dirty money to launder legally, and how much (if at all) to attempt to launder illegally (through either channel). The crucial determinants of this decision are the relationships existing between the three cost parameters, t, Θ and γ, as well as the relative severity of the alternative illegal laundering channels. Table 2 specifices the laundering channels relevant for the individual's choice under alternative cost and severity relationships (where D, T and L denote domestic,

Table 2: *Relevant laundering channels under a tax amnesty*

	$\gamma\geq\Theta$				$\gamma<\Theta$	
	$t>\gamma>\Theta$	$t>\gamma=\Theta$	$\gamma\geq t>\Theta$	$\gamma\geq t=\Theta$	$\gamma<\Theta=t$	$\gamma<\Theta<t$
$\pi_\delta>0$	D,T,L	T,L	D,L	L	T,L	T,L
$\pi_\delta=0$	D,L	?,L	D,L	L	T,L	T,L
$\pi_\delta<0$	D,L	D,L	D,L	L	T,L	D,T,L

international and legal laundering, respectively).

Since DL already provides the tax collector with tax (and penalty) revenue at no extra cost, a tax amnesty could simply aim at eliminating incentives for TL. However, as pointed out by Table 2, the amnesty program would not be able to ensure that taxes due do not escape the tax collector, unless $\gamma \geq \Theta$ and t is set at $\gamma \geq t \geq \Theta$. Only then would TL cease to be a relevant option, regardless of the relative severity of the alternative illegal channels; not only is it more (or equally) costly than LL, but it also entails a penalty which the latter does not. Consequently, the individual would be left with a decision between true (or non-specified) and false declaration of his dirty money source. If $t=\Theta$, his choice is straightforward: he will legally launder his entire dirty money stock. If, on the other hand, $t>\Theta$, incentives might still arise for fraudulent declaration at the lower cost. The proportion of dirty money declared as income stemming from a legal source could then be determined by equation (5), where γ is replaced by t, and $\pi_\delta>0$. A sufficient condition for entry into DL would be $t-\Theta > p\pi_\delta$.

Given, however, that the tax collector aims at maximizing expected revenue, is a tax amnesty indeed desirable? To address this question, suppose that h is predetermined (so that the introduction of an amnesty program does not affect the amount of dirty money due to be laundered), and, to make things simple, that h=1 (thus $w(0)=0$), denoting $m(1)=\mathbf{m}$. Suppose also that the penalty function is of the form $\pi(m,\delta) = [\lambda_1\delta + \lambda_2(1-\delta)]m$. Hence, expected revenue in the absence of an amnesty, EV, is given by

$$EV = [(\Theta+p\lambda_1)\delta^* + p\lambda_2(1-\delta^*)]\mathbf{m}, \qquad (10)$$

where $0\leq\delta^*\leq1$. Assuming that running the tax amnesty is costless, we now consider two propositions.

Proposition 1: *(a) If DL is solely practiced, a tax amnesty will help increase expected revenue only if the amnesty tax rate is set sufficiently high to sustain incentives for DL along with LL. However, if TL is solely practiced, a tax amnesty may help increase expected revenue even if the amnesty tax rate is set sufficiently low to eliminate incentives for TL. (b) If both DL and TL are practiced, a tax amnesty will always help increase expected revenue if the amnesty tax rate is set sufficiently high to sustain both DL and TL along with LL.*

To prove the first part of Proposition 1a, notice that if DL is solely practiced ($\delta^*=1$), equation (10) is reduced into $EV^1 = (\Theta+p\lambda_1)\mathbf{m}$. However, expected revenue under a tax amnesty announced at this state, EV^{A1}, will be

$$EV^{A1} = [(\Theta+p\lambda_1)\delta^{*1} + t(1-\delta^{*1})]\mathbf{m}, \qquad (11)$$

where δ^{*1} denotes the proportion of dirty money laundered through DL despite the amnesty. Hence, $EV^{A1} \gtreqless EV^1$ if $(t-\Theta-p\lambda_1)(1-\delta^{*1}) \gtreqless 0$. It thus follows that $EV^{A1}>EV^1$ only if $t>\Theta+p\lambda_1$, which is exactly the condition required to induce $\delta^{*1}>0$. Obviously, expected revenue will only increase if $\delta^{*1}<1$ (i.e., if LL is at all practiced).

To prove the second part of Proposition 1a, notice that if TL is solely practiced ($\delta^*=0$), equation (10) is reduced into $EV^2=p\lambda_2 m$. Expected revenue under a tax amnesty announced at this state, EV^{A2}, will, however, be

$$EV^{A2} = [t\delta^{*2} + p\lambda_2(1-\delta^{*2})]m, \tag{12}$$

where $1-\delta^{*2}$ denotes the proportion of dirty money laundered through TL despite the amnesty. Hence, $EV^{A2} \gtreqless EV^2$ if $(t-p\lambda_2)\delta^{*2} \gtreqless 0$. It thus follows that $EV^{A2}>EV^2$ even if $p\lambda_2 < t < \gamma+p\lambda_2$, which will not suffice to induce $1-\delta^{*2}>0$.

Proposition 1b follows directly from Proposition 1a and may be easily rationalized by applying marginal considerations: each dollar legally laundered under a tax amnesty increases expected revenue by t dollars; this dollar reduces, however, expected revenue by $\Theta+p\lambda_1$ dollars, if it was previously laundered through DL, or by $p\lambda_2$ dollars, if it was previously laundered through TL. Given that the entry conditions into DL and TL prevail, t exceeds both $\Theta+p\lambda_1$ and $p\lambda_2$, so that expected revenue necessarily increases.

Proposition 2: *If both DL and TL are practiced, a tax amnesty which eliminates incentives for TL will unambiguously help increase expected revenue if the amnesty tax rate is set sufficiently high to sustain DL along with LL. However, a tax amnesty which eliminates incentives for DL may not help increase expected revenue even if the amnesty tax rate is set sufficiently high to sustain TL along with LL.*

Tables 1 and 2 indicate that the first part of Proposition 2 relates to the case where the amnesty is announced at $\gamma \geq t \geq \Theta$, and $\lambda_1 > \lambda_2$. To prove this part, define $EV' = [(\Theta+p\lambda_1)\delta^* + p\lambda_1(1-\delta^*)]m = (\Theta\delta^*+p\lambda_1]m$. Since $\lambda_1>\lambda_2$ and $\delta^*<1$, $EV'>EV$. However, $EV^{A1}>EV'$ if $(t-p\lambda_1)(1-\delta^{*1})>\Theta(\delta^*-\delta^{*1})$. It thus follows that $EV^{A1}>EV'>EV$ if t is set above $\Theta+p\lambda_1$ to induce $\delta^{*1}>0$. Notice that $\delta^*<1$ implies that $\delta^{*1} \leq \delta^*$: if TL was previously practiced, it must be replaced by LL, currently offered at more attractive terms.[9]

Tables 1 and 2 indicate that the second part of Proposition 2 relates to the case where the amnesty is announced at $\gamma<t=\Theta$, and $\lambda_2>\lambda_1$. To prove this part, define $EV'' =[(\Theta+p\lambda_2)\delta^* + p\lambda_2(1-\delta^*)]m = (\Theta\delta^*+p\lambda_2)m$. Since $\lambda_2>\lambda_1$ and $\delta^*>0$, $EV''>EV$. However, $EV^{A2}>EV''$ if $(t-p\lambda_2)\delta^{*2}>\Theta\delta^*$. This does not necessarily hold if t is set above $\gamma+p\lambda_2$ to induce $1-\delta^{*2}>0$ (although $\delta^{*2} \geq \delta^*$), since $\gamma<\Theta$.

The common implication of Propositions 1 and 2 is that whenever DL is practiced (either solely or along with TL), a tax amnesty must preserve incentives for DL to ensure an increase in expected revenue. It must not, however, preserve incentives for TL (whenever the latter is practiced). The reason for this discrepancy is that while DL is a source of both taxes and penalties, TL yields no tax revenue. Therefore it is sufficient for the amnesty tax payments to cover just the expected penalties on TL to become worthwhile.

What can be said about the optimal amnesty tax rate? consider the case where DL and LL are practiced together. Differentiating (14) with respect to t, equating to zero and rearranging, the maximum expected revenue condition can be written as

$$1-\delta^{*1} = (t-\Theta-p\lambda_1)\frac{d\delta^{*1}}{dt}, \qquad (13)$$

which implies that t should be raised above $\Theta+p\lambda_1$ until the marginal benefit per legally laundered dollar equals the marginal cost. The former is due to the fact that an increse in t increases revenue on the legally laundered fraction of dirty money, $1-\delta^{*1}$. The latter arises from the fact that an increase in t affects the fraction illegally laundered, δ^{*1}, where each additional dollar laundered illegally entails an expected loss of $t-\Theta-p\lambda_1$ dollars.

Notice now that an increase in t generates opposing (negative) income and (positive) substitution effets on δ^{*1}.[10] If the income effect dominates ($d\delta^{*1}/dt<0$), the marginal benefit of increasing t always exceeds the (negative) marginal cost, and the optimal solution will be to set t^* very close to 1. However,if the substitution effect dominates ($d\delta^{*1}/dt>0$, and even if it holds at relatively low values of t only), the marginal benefit may equate the marginal cost at some $\Theta+p\lambda_1<t^*<1$.

Rearranging equation (13), the optimum condition may be stated as

$$1 = \left(1+\frac{t-\Theta-p\lambda_1}{t}\varepsilon\right)\delta^{*1}, \qquad (13')$$

where $\varepsilon=(d\delta/dt)/(t/\delta)$ denotes the elasticity of δ with respect to t. Given that ε is constant, equation (13') can be used to illustrate the simultaneous determination of t^* and δ^{*1} (Figure 1), as well as of total expected revenue and the expected revenue per dollar of dirty money (dotted area). The higher the regular income tax rate, Θ, the greater the marginal benefit of increasing t (recall that $d\delta^*/d\Theta<0$ in this case) and the smaller the marginal cost. A higher Θ will

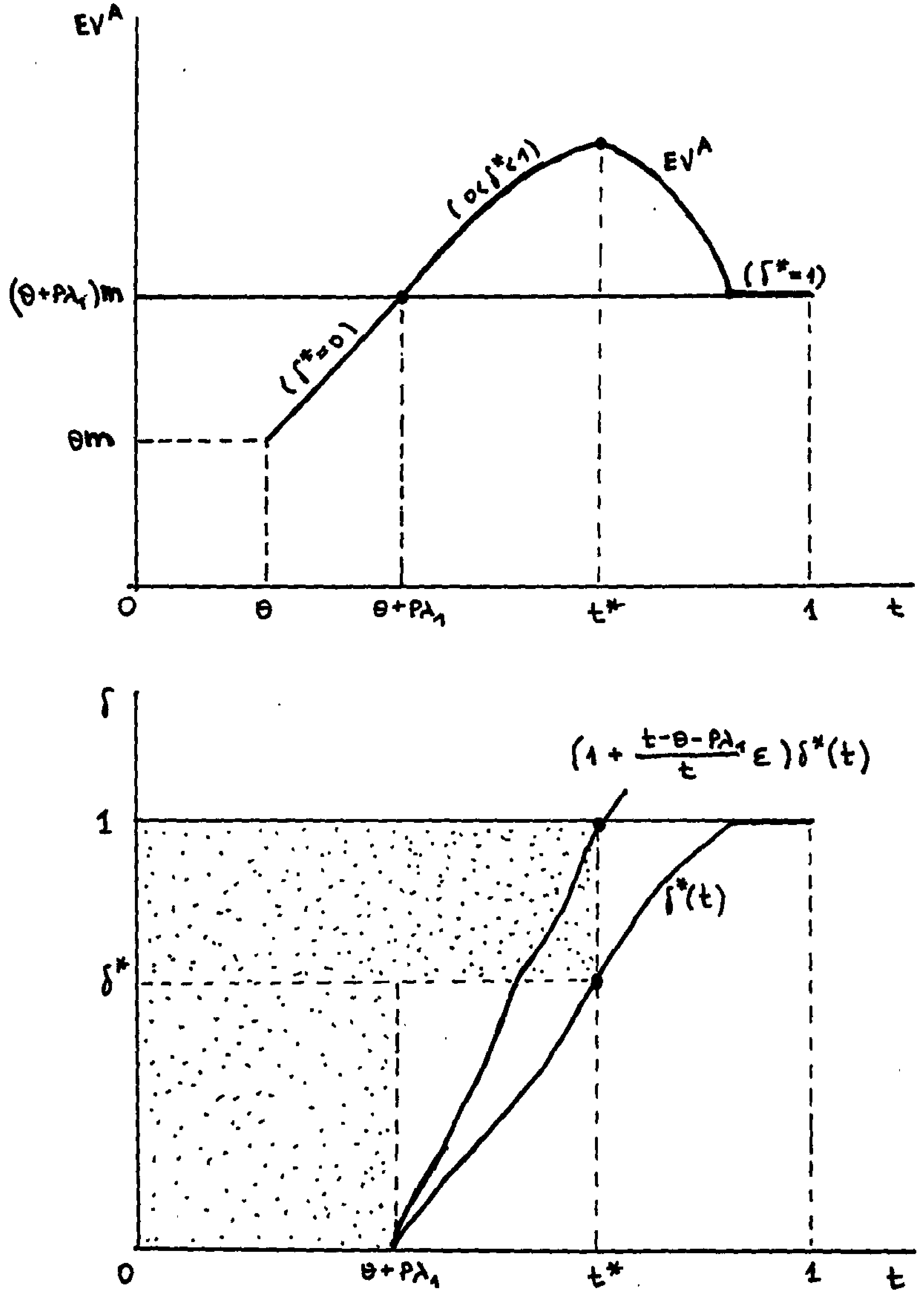

Figure 1: *The optimal amnesty tax rate (t*), the fraction of dirty money laundered legally (1-δ*), total expected revenue (EVA) and expected revenue per dollar of dirty money (dotted area)*

thus be associated with a higher t*. The latter, however is inversely related to ε.

V. CONCLUDING REMARKS

We have inquired into the individual's decision to participate in illegal work when illegal returns must be laundered to avoid detection. Two alternative laundering channels have been considered: declaring illegal returns as income stemming from a legal source (which involves the payment of the taxes due) and smuggling them abroad to be repatriated as a foreign bank loan. The relationships existing between the relative cost rates and the relative severity of punishment of the alternative laundering channels have been shown to play a crucial role in determining the individual's use of each channel as well as his response to possible changes in the income tax rate. A tax amnesty aimed at eliminating incentives for international (non-taxable) laundering has been found to be successful only under a very specific relationship among the cost parameters of the legal (i.e., the amnesty) and the illegal laundering channels. If both illegal channels were initially practiced, government expected revenue will unambiguously increase only if the amnesty tax rate is set sufficiently high to sustain incentives for illegal *domestic* laundering.

While money which has been earned legally but concealed from the tax authorities must also be laundered, the present paper's interest has been restricted to the laundering of money which has been the product of a criminal act (and concealed from the authorities by its nature). Obviously, a rational underreporter of legal income would not consider redeclaration as a reasonable laundering option, unless different income sources are subject to different rates of taxation. In this case, discussed by Yaniv (1990), incentives may rise for a special form of tax evasion under which total income is truly declared while its true *composition* is not. Income source misreporting may then be viewed as a technique of laundering (sometimes less expensively) an unreported higher-taxed income by overreporting a lower-taxed source of income. One weakness of the existing theory of tax evasion initiated by Allingham and Sandmo (1972) is its disregard of laundering considerations, especially .the adverse implications that laundering costs might bear on the decision to evade. Combating laundering opportunities migh turn out to be a non-less efficient way of controlling evasion than conventional sanctions against taxevaders.

APPENDIX

To derive the individual's response to changes in the income tax rate when both his laundering proportions and illegal work participation are variable, suppose that the penalty function is of the form $\pi(h,\delta) = [\lambda_1\delta + \lambda_2(1-\delta)]m(h)$, where $\lambda_1>1$, $\lambda_2>1$ and $\lambda_1 \neq \lambda_2$. The equilibrium condition (7) would then become

$$[\lambda_1(1-\gamma) - \lambda_2(1-\Theta)]m'(h) = (\lambda_1-\lambda_2)(1-\Theta)w'(1-h), \qquad (7')$$

which is independent of δ. This implies that at the optimum

$$\frac{dh^*}{d\Theta} = -\frac{\lambda_2 m'(h) + (\lambda_1-\lambda_2)w'(1-h)}{[\lambda_1(1-\gamma)-\lambda_2(1-\Theta)]m''(h) + (\lambda_1-\lambda_2)(1-\Theta)w''(1-h)}, \qquad (9')$$

providing that both legal and illegal marginal returns strictly decrease with working time.[11] Hence, (9') is unambiguously positive for $\lambda_1>\lambda_2$, but ambiguous for $\lambda_1<\lambda_2$.

Notice now that

$$\frac{d\delta^*}{d\Theta} = \frac{d\delta^*}{d\Theta}_{(h=h)} + \frac{d\delta^*}{dh}\frac{dh^*}{d\Theta}, \qquad (8')$$

where equation (5) implies that

$$\frac{d\delta^*}{dh} = \frac{(\gamma-\Theta)m(h)(1-p)U'(S^{nd})}{EU_{\delta\delta}}\{g(h,\delta,\Theta,\gamma)R_A(S^{nd}) +$$

$$[\pi_h(h,\delta) - g(h,\delta,\Theta,\gamma)]R_A(S^d)\}, \qquad (8'')$$

under the assumed penalty function. That is, an increase in the amount of dirty money due to be laundered will discourage DL if $\gamma>\Theta$, but encourage DL if $\gamma<\Theta$.

Substituting (8), (8") and (9') into (8') reveals that the sign of (8') is unambiguous (negative) only if $\lambda_1>\lambda_2$ and $\gamma>\Theta$. We thus conclude that if DL is more severely punishable than TL, $dh^*/d\Theta>0$ and $d\delta^*/d\Theta<0$.

F O O T N O T E S

[1]Clarke and Tigue (1976) report: " On an average day, a New Jersey gambler may actually wash thirty to fifty cars in each of his car wash locations. He can claim, however, that he has washed ninety to a hundred cars. Meanwhile, more gambling profits, disguised as the income from the forty phantom cars daily, are being fed into the receipts. In each of his car washes the gambler can now legitimately wash fifty cars as well as about two hundred dollars in dirty money." (p. 134).

[2]While money which has been earned legally but concealed from the tax authorities is also "dirty", the term "dirty money" used throughout this paper refers solely to money which has been the product of a criminal act and concealed from the authorities by its nature.

[3]Of course, the individual may actually enjoy some safe margins of overspending, since the tax authorities are unable to observe *every* dollar of expenditure. Allowing for such margins, while complicating the presentation, would not affect the qualitative implications of the model.

[4]Having paid the taxes on his domestically laundered amount may not serve as a justification for abolishing the latter charge, since these taxes should have been paid in the first place upon declaring the actual source of his dirty money. As pointed out by Clarke and Tigue (1976), most 'white-collar' criminals commit two crimes: the first by acquiring the dirty money and the second by evading taxes on money that obviously cannot be declared.

[5]For example, the penalty function may take the form of $\pi(h,\delta,\Theta) = [\lambda_1\delta(1-\Theta) + \lambda_2(1-\delta)]m(h)$, where $\lambda_1>1$ and $\lambda_2>1$. This implies that $\pi_h = [\lambda_1\delta(1-\Theta) + \lambda_2(1-\delta)]m'(h) > 0$, $\pi_\delta = [\lambda_1(1-\Theta)-\lambda_2]m(h) \gtreqless 0$ if $\lambda_1(1-\Theta) \gtreqless \lambda_2$, and $\pi_\Theta = -\lambda_1\delta m(h) < 0$.

[6]Differentiating (4) with respect to h we have

$$EU_{hh} = (1-p)[g(h,\delta,\Theta,\gamma)]^2U''(S^{na}) + p[\pi_h-g(h,\delta,\Theta,\gamma)]^2U''(S^a) + (1-p)g_h(h,\delta,\Theta,\gamma)U'(S^{na}) - p[\pi_{hh}-gh(h,\delta,\Theta,\gamma])U'(S^a),$$

which is negative under risk-aversion, given $\pi_{hh}\geq 0$, since $g_h(h,\delta,\Theta,\gamma)\leq 0$. Differentiating (5) with respect to δ yields

$$EU_{\delta\delta} = (1-p)[(\gamma-\Theta)m(h)]^2U''(S^{na}) + p[\pi_\delta-(\gamma-\Theta)m(h)]^2U''(S^a) - p\pi_{\delta\delta}U''(S^a),$$

which is negative under risk-aversion, given $\pi_{\delta\delta}\geq 0$.

[7]It is interesting to note that the effect of an increase in the income tax rate on *understated* income - given a fixed

penalty rate - has been found by Allingham and Sandmo (1972) to be ambiguous. The reason for this discrepancy is that while the income effect on understating or overstating is negative, the substitution effect on understating is *positive*.

[8]Tax amnesties, although those destined to raise taxes due on legally earned income which has been concealed from the authorities, have recently begun to attract much attention in the tax evasion literature (see, for example, Lerman (1986) and Malik and Schwab (1991)).

[9]Table 1 suggests that rather than announcing a tax amnesty in this case, tax collectors could raise all taxes due on illegal income simply by reversing the relative severity of the alternative illegal laundering channels. This, however, would not ensure an increase in expected revenue. To see why, suppose that tax collectors switch between λ_1 and λ_2, inducing the individual to specialize in DL. Expected revenue would then be $(\Theta+p\lambda_2)m$, which exceeds EV only if $\Theta(1-\delta^*)>p(\lambda_1-\lambda_2)\delta^*$. That is, only if the taxes now collected on the dirty money previously laundered internationally exceed the loss of penalty payments on the amount previously laundered domestically, which is now subject to a lower penalty rate.

[10]Since overstating income subjected to taxation at the rate Θ implies understating income subjected to taxation at the rate t, a change in the amnesty tax rate would affect the fraction laundered through DL in the same way as a change in the regular tax rate has been found by Allingham and Sandmo (1972) to affect tax evasion: encouraging it, on the one hand, as it becomes more profitable on the margin, but discouraging it, on the other hand, as it makes the taxpayer less wealthy.

[11]This, however, implies that $\pi_{hh} = [\lambda_1\delta + \lambda_2(1-\delta)]m''(h) < 0$. The second-order condition for the maximization of expected utility, $EU_{hh}<0$, must thus be assumed to hold regardless of the above implication (see footnote 6).

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