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Tax Evasion by Individuals

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Abstract

The basic deterrence model of tax evasion is described, its main predictions are derived and limitations and flexibility are outlined. Further, the model is interpreted in light of some key institutional features characterising tax enforcement in OECD countries. Throughout the survey, findings originating from the deterrence model are contrasted with predictions which result from a simple model of criminal activity and law enforcement.

JEL-Classification: H 24, H 26, K 34

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1. Introduction

Tax evasion by individuals represents the attempt to illegally reduce the payment of taxes which have to be remitted by an individual tax payer to below the level prescribed by law.

The analysis of income tax evasion by economists has covered many issues and most extant surveys focus on a selection of relevant aspects.[1] In many of these reviews, the investigation of tax evasion is interpreted as a special case of the approach which is employed in the economic analysis of crime. In this survey, we explicitly adopt such a perspective and relate findings originating from the analysis of income tax evasion to the broader economics literature on crime. In doing so, we first take a theoretical perspective, present the basic deterrence model of tax evasion, derive its main predictions and indicate its restrictions as well as the analytical flexibility. Second, we adopt a more institutional viewpoint and confront the theoretical predictions with basic features of real-world enforcement systems. Finally, we compare selected aspects which are discussed in both the literature on tax evasion and the public enforcement of law.[2]

2. Basic Theory

2.1 Foundations

We consider a representative, risk-averse individual who is endowed with an exogenously given income Y. This income represents the tax basis and is subject to a linear tax at the rate t. the individual can decide on the amount of income X he/ she does not report to tax authorities. Therefore, the gain from evading taxes will equal Xt if tax evasion remains undetected. This takes place with an exogenously given probability p, $0 < p < 1$, and the individual's income then amounts to $Y^S = Y(1 - t) + Xt$. With the opposite probability, $1 - p$, the individual or tax payer will be audited and tax evasion will be detected. In this case, a fine F is imposed and the resulting income equals $Y^C = Y^S - F$. While the fine is assumed to be a function of undeclared income X in the seminal contribution by Allingham and Sandmo (1972), Yitzhaki (1974) argues that the penalty is usually based on the amount of taxes evaded, Xt. Consequently, we define the fine F as a linear combination of both determinants, $F := fX[\alpha t + (1 - \alpha)]$, where f, $f > 0$, is labelled marginal fine. The parameter α, $0 \leq \alpha \leq 1$, depicts the relative importance of the amount of taxes evaded. For $\alpha = 1$ (0), this implies that the fine is solely a function of

[1] See, for example, the contributions by Andreoni et al. (1998), Alm (1999, 2012), Cowell (2004), Slemrod and Yitzhaki (2002), Marchese (2004), Slemrod (2007), Franzoni (2009), and Sandmo (2012).

[2] As reference for the literature on the public enforcement of law we use Polinsky and Shavell (2007).

taxes evaded (undeclared income).[3] As the final building block, we assume that utility u is increasing in disposable income at a decreasing rate, u' > 0 > u'', and that the individual can be described by von Neumann-Morgenstern preferences. Accordingly, expected utility U(X) is given by:

$$U(X) = pu\underbrace{(Y(1-t) + Xt)}_{:=Y^s} + (1-p)u\underbrace{(Y(1-t) + Xt - fX(\alpha t + 1 - \alpha))}_{:=Y^c} \quad (1)$$

Maximising U with respect to the under-declaration, X, yields as first-order condition:

$$U'(X) = pu'(Y^s)t + (1-p)u'(Y^c)(t - f(\alpha t + 1 - \alpha)) = 0 \quad (2)$$

The first term in (2) describes the utility gain from under-declaring an extra unit of income if tax evasion is successful, while the second term depicts the loss because income declines when being punished. The under-declaration which results when these two effects are balanced out is indicated by X*. Note that there will only be an under-declaration if the gain from evading the first Euro of taxes is positive, that is, if U'(X) is greater than zero for X = 0 and, hence, for $Y^s = Y^c$. This implies that there is an upper level for the marginal fine $f_{max} = t/[(1-p)(\alpha t + 1 - \alpha)]$. Furthermore, tax evasion will only be costly if disposable income Y^c shrinks with the under-declaration in the case of detection. Accordingly, there is a minimal marginal fine $f_{min} = (1-p)f_{max} = t/(\alpha t + 1 - \alpha) > t$.[4]

2.2 Central Results

How does the optimal under-declaration, X* > 0, vary with income, Y, the parameters of the tax enforcement system, p and f, and the tax rate, t? The respective effects often depend on whether the fine, F, varies with the tax rate, t, i.e. on the value of the parameter α, and on the relationship between income and the Arrow-Pratt measure of absolute risk aversion, $R_a(Y) := -u''(Y)/u'(Y)$. They are derived formally in Appendix 6.1.

Income, Y, exerts a positive impact on the optimal under-declaration, X*, if the individual exhibits decreasing absolute risk-aversion, R_a, that is, if the willingness to engage in risky activities rises with income. To provide an intuition, note that a higher exogenous income, Y, raises disposable income for a given under-declaration, irrespective of whether tax evasion is

[3] Note that the penalty rates in many OECD countries vary with amount of undeclared taxes, but include fixed components or change with other determinants than the under-declaration (OECD 2009, pp. 136 ff).

[4] While tax evasion is the illegal attempt to reduce tax payments, tax avoidance is often interpreted as its legal counterpart. By setting the detection probability, 1 – p, equal to unity and adding a cost function which increases in the amount of taxes avoided at an increasing rate, the above framework can be amended in order to analyse tax avoidance. Furthermore, many findings derived with regard to tax evasion also hold in an avoidance setting.

detected or not. If this general increase in income makes the individual more willing to take risks, the gain from higher income shrinks by less than the costs in terms of utility. Therefore, the optimal under-declaration, X*, rises. Since the tax basis, Y, becomes larger, the amount of taxes paid, that is (Y – X*)t, may nevertheless increase. If, however, absolute risk aversion, R_a, does not vary with income, there is no income effect and the under-declaration remains constant, while the amount of taxes paid surely increases.

A higher marginal fine, f, and a greater detection probability, (1 – p), both reduce the optimal under-declaration, X*. If the marginal fine, f, rises, two consequences strengthen the incentives to pay taxes. First, there is an income effect since a higher fine payment decreases disposable income, Y^c, if evasion is detected. Therefore, the marginal utility of income in this state of the world rises and the utility loss resulting from the fall in income if penalised becomes larger. Second, the penalty on the last Euro of under-declared income rises. A higher probability of detection, 1 – p, makes it more likely that an income loss occurs. Consequently, the individual responds by reducing the loss in disposable income if this more likely event takes place.

The consequences of a higher tax rate, t, hinge on the specification of the fine and on absolute risk aversion, R_a. Suppose, initially, that the fine, F, depends on the amount of taxes evaded ($\alpha = 1$). The optimal under-declaration, X*, will decline with the tax rate, t, if preferences exhibit constant or decreasing absolute risk aversion, R_a, while the impact is theoretically ambiguous otherwise. For $\alpha = 1$, F is a multiple of the tax rate, t. Accordingly, a rise in t alters the gain and costs from evasion proportionately. Therefore, the impact of the tax rate, t, on the optimal under-declaration, X*, is solely determined by the income effect. A higher tax rate, t, reduces disposable income and does so more if evasion is detected than if it remains unobserved. If a decline in income, in turn, raises absolute risk aversion, the optimal under-declaration, X*, will shrink. If, alternatively, the fine, F, depends on the under-declaration ($\alpha = 0$), X* will rise with the tax rate, t, if absolute risk aversion, R_a, is constant or increasing with income, while the relationship will once again be ambiguous otherwise. In this case, a higher tax rate, t, reduces the penalty relative to the gain from evasion, namely the lower tax payment. A relative decline in the penalty induces the individual to raise the under-declaration, X*, ceteris paribus. This substitution effect will be mitigated or reversed by the income effect which provides greater incentives to under-declare if absolute risk aversion is declining with income.

While the above analysis has assumed a representative individual, one can easily incorporate heterogeneous tax payers, for example, in terms of gross income, Y, the degree of absolute risk aversion, R_a, or the marginal tax rate, t. Thus, the analytical model can be used to predict that individuals facing a higher marginal tax rate, t, are more likely to evade and not to pay any taxes, since the maximal and the minimal fines f_{max} and f_{min} increase with t for $\alpha < 1$.

Relating the predictions derived above to the findings obtained in the analysis of crime, it may be observed that the model of criminal activity often employed is based on the assumption that a crime is either committed or not, while the extent of criminal activity per individual is constant. Higher fines and a greater detection probability reduce the incentives to undertake criminal actions, while a higher potential gain will raise them. The latter prediction may be compared to a change in the tax rate, t, derived above. The impact of a higher gross income, or wealth, depends on whether income also increases disposable income when the criminal is penalised, inter alia. However, the degree of risk aversion does not play a role in the basic set-up. These partial differences with respect to the effect of changes in exogenous parameters indicate that predictions can depend crucially on the underlying view of the illegal activity. Does it represent a simple portfolio choice with one safe and another risky asset, as in the case of tax evasion, or does it constitute an endeavour which can be separated from other income-generating activities?

2.3 Extensions

The basic deterrence model of income tax evasion has been expanded in numerous ways. We subsequently sketch two extensions which further clarify the sensitivity of the predictions but also the flexibility of the analytical approach. First, we incorporate the idea that individuals will generally be able to decide on the amount of gross income they earn. This decision is likely to result from a trade-off between higher disposable income on the one hand, and a greater disutility from generating this income on the other. Hence, utility may be given by $U(Y^s, Y)$ and $U(Y^c, Y)$, depending on whether evasion is detected or not. In addition, $\partial U/\partial Y < 0$ captures the disutility of generating income. In an early contribution, Pencavel (1979) showed that virtually all predictions developed above will not necessarily hold in such a setting. The reason is that any activity which makes tax evasion less attractive also reduces the incentives to generate income. This reduction in the tax base, in turn, lowers evasion activities for a given under-declaration and, hence, strengthens the incentives to evade. The net effect is generally uncertain because of the differential changes in the marginal utility of disposable income (that is $\partial U/\partial Y^S$ and $\partial U/\partial Y^C$) and from generating Y (that is $\partial U/\partial Y$). This first extension is an impressive example of the sensitivity of predictions with regard to incorporating additional choice variables.

The individual considered above has occasionally been termed an "amoral" tax payer (Crocker and Slemrod 2005, p. 1595), because the tax evasion decision results solely from the comparison of monetary gains and losses. Therefore, secondly, the question arises how the optimal under-declaration will be affected if there is a norm with regard to paying taxes. In a simple extension of the basic model, it can be presumed that tax evasion imposes a utility loss on individuals who evade taxes. It has, inter alia, been assumed that this loss (1) is constant; (2) increases in the extent of individual tax evasion; (3) depends on how tax revenues are spent; or (4) varies with an aggregate measure of tax evasion (see Alm and Torgler 2011). While the existence of a norm imposes additional costs of tax evasion in cases (1) and (2) and, therefore, mitigates such activities, the impact in cases (3) and (4) is less obvious. This can be illustrated by assuming that the utility loss from violating the norm of paying taxes varies across individuals and becomes weaker the more people evade taxes. Then, the model may have (at least) two equilibria. In the first, many or all individuals evade taxes and the norm does not really bite. In the other equilibrium, few individuals evade taxes. Therefore, the norm imposes substantial costs of evasion and this helps to stabilise the equilibrium with few people under-declaring income. In such a setting, the impact of changes in exogenous parameters can be reversed. To illustrate, suppose that higher fines weaken the societal norm of paying taxes. In this case, more severe penalties will reduce evasion, ceteris paribus, but weaken the norm and may induce a move from a low-evasion to a high-evasion equilibrium. In this case, the standard prediction that higher fines reduce illegal activities may no longer hold. This second extension clarifies that the standard deterrence model of tax evasion is flexible enough to be applicable to tax payers whose preferences include non-monetary components such as norms.

3. An Institutional Perspective

Given the importance of the assumptions underlying the model presented above, it is instructive to view them in light of essential features characterising real world tax and enforcement systems. In most OECD countries, the nominal income tax rises with income, suggesting that the tax system is progressive. Moreover, the marginal tax burden on wages, taking into account exemptions and government benefits, also generally rises with income, although the marginal rate may decline at specific income levels (OECD 2013). Therefore, the tax rate depends on gross income, $t = t(Y)$, or declared income, $Y - X$, in the case of successful evasion. Since it would be optimal to over-declare income if the marginal tax rate is negative, increasing marginal tax rates have usually been analysed. While the impact of changes in the enforcement system is generally unaffected by the nature of the tax system, the consequences of changing the marginal tax rate or the progressivity of the tax schedule can also depend on what individuals decide on, namely the magnitude of the under-declaration (as in this setting) or of voluntary tax payments (cf., for example, Yitzhaki 1987 and Goerke 2003). Consequently, the tax schedule on its own may affect tax evasion.

The penalty rates in many OECD countries are considerably lower than 100%, even for severe cases of tax evasion (OECD 2009, pp. 136 ff). Additionally, the cursory evidence available suggests that the detection probability with regard to income tax evasion is perhaps as low as 1% (see Slemrod 2007 for corresponding information for the United States). In order to integrate this information into the analytical set-up, suppose that the utility function u is given by $u(Y) = Y^{(1 - a)}/(1 - a)$ and, hence, features constant relative risk aversion, $R_r(Y) := -u''(Y)Y/u'(Y) = a$. Moreover, the fine is a function of the amount of taxes evaded ($\alpha = 1$); the marginal fine, f, equals 2; the detection probability is assumed to be 10% ($p = 0.9$); and the tax rate is set to $t = 1/3$. Substituting these values into the basic model (cf. equations (1) and (2)), the fraction of gross income, Y, which is optimally under-declared will only be less than 100% if relative risk-aversion, R_r, exceeds two (see Appendix 6.2). Moreover, the optimal under-declaration shrinks with R_r, given the above specification of the utility function. If, for example, a value of $R_r = 10$ is assumed, the individual would still under-declare about 22% of gross income (see Appendix 6.2). Therefore, it has been argued that the standard model seriously over-predicts tax evasion for plausible values of relative risk aversion, R_r, such as between one and five, given the parameters of the tax enforcement system observed in most countries (cf. Alm et al. 1992 and Feld and Frey 2002, inter alia).

The response to this criticism has been manifold: Firstly, it has been argued that the payoff of tax payers is not only affected by the monetary gains and cost of evasion activities, but also by the gain of adhering to, or the cost of violating, a social norm, as outlined above. Moreover, the gain may be altered, for example, by whether tax payers can decide on and approve of the use of tax revenues or how they perceive tax authorities. Secondly, the use of alternative specifications of preferences has been suggested, such as rank-dependent expected utility or prospect theory (cf. Alm and Torgler 2011 and Hashimzade et al. 2013). Thirdly, it has been maintained that the numerical example provided above is not an appropriate one with regard to the decision of wage earners, but only with respect to self-employed or small businesses (Slemrod 2007). Wage income is generally subject to withholding regulations. Therefore, the probability that evasion of such income will be detected may approach 100%. A detection probability of 50%, however, would eradicate all evasion incentives in the above numerical example and the deterrence model of tax evasion can, thus, be reconciled with the data.

4. Tax Evasion and the Economics of Crime

As mentioned at the outset, the investigation of tax evasion is often interpreted as an application of the economic analysis of crime. However, the perspectives of the two approaches are fundamentally different. A large majority of contributions on tax evasion asks either positive or incrementally normative questions, such as how the tax structure affects evasion activities or whether a certain tax structure is to be preferred to another.[5] The economic analysis of crime focusses strongly on the enforcement of legal rules by public institutions and the "general problem of public law enforcement may be viewed as one of maximizing social welfare" (Polinsky and Shavell 2007, p. 406). A basic result of this approach is that in the presence of risk-neutral individuals and monetary fines, which have no direct welfare effects, the optimal expected monetary fine should equal the harm caused by a crime. If the sanction is non-monetary, such as a prison sentence, the expected penalty should be lower because a non-monetary sanction increases enforcement costs and, thus, lowers welfare.

In the analysis of tax evasion, however, such normative issues have played a comparatively minor role. In one important exception, Slemrod and Yitzhaki (1987) enquire as to what the optimal size of a tax collection agency is in the presence of risk-averse individuals. For a given amount of tax revenues, less tax evasion mitigates income variability and this reduction in the "excess burden of tax evasion" (Slemrod and Yitzhaki 1987, p. 187) represents the welfare gain from reducing evasion activities. Higher enforcement costs constitute the welfare loss due to fighting tax evasion. The optimal degree of law enforcement is attained when the revenue effect of stricter enforcement still exceeds the resource costs of achieving this revenue impact. The reason is that the revenue gain is mainly distributionary and has no direct

[5] See, for example, the survey by Slemrod and Yitzhaki (2002), in which only one (long) out of eight sections deals with normative issues.

welfare impact in a setting with identical individuals, while costs of enforcement reduce welfare. This finding resembles those obtained in the economic analysis of crime.

Given the different perspectives, the literature on tax evasion and the contributions on public law enforcement have also approached many extensions of the basic settings in alternative ways. To illustrate, we consider the nature of penalties and settlements.

From an economics of crime perspective, non-monetary sanctions, such as prison sentences, can have two advantages over fines. Firstly, the financial means of a tax evader may be insufficient to pay a fine. However, imprisonment is feasible irrespective of wealth so that non-monetary penalties may still deter illegal activities when monetary fines no longer have this effect. Secondly, imprisonment generally limits future crimes. Such an incapacitation effect is less likely to occur in the case of monetary penalties. One important disadvantage of non-monetary penalties is the higher cost of enforcing such penalties. In most countries, the penalties for evading personal income taxes are represented by monetary fines. However, for severe cases of tax evasion, prison sentences can also be imposed (cf. OECD 2009, Table 31). Nonetheless, questions such as (1) what are the effects of monetary and non-monetary penalties on tax evasion?; (2) when should imprisonment be used and sentences be suspended?; and (3) what is the optimal combination of fines and imprisonment?, have not figured prominently in contributions on tax evasion. This is in contrast to the literature on public law enforcement.

Settlements, that is, agreements between an offender and authorities to terminate or avoid a court trial in exchange for accepting a penalty, have received substantial attention in the economic analysis of crime. Settlements can be desirable because they reduce the costs of law enforcement. Furthermore, risk-averse individuals may prefer certain penalties to uncertain court outcomes. The main disadvantage of settlements is that they will be attractive to offenders only if they effectively imply a lower penalty. This dilutes the deterrence effect of sanctions. In addition, a settlement may hinder the detection of all illegal activities of an offender and can prevent the development of precedents. While such aspects of settlements have been discussed in the literature on the public enforcement of law (Polinsky and Shavell 2007, p. 435 f), there are few relevant contributions relating to tax evasion (Macho-Stadler and Pérez-Castrillo 2004, Franzoni 2004).

The relative infrequency of settlements may be due to the fact that trials in cases of tax evasion are much less frequent than for criminal activities such as theft, fraud, physical injury or murder. However, the perspective can also be reversed. Often, tax authorities impose a penalty. This procedure may be interpreted as the tax authority's (pre-trial) proposal of a settlement. Accordingly, the relevant question in the context of tax evasion may not be whether settlements are beneficial, but why they are used so extensively.

The two above examples clarify that the investigation of topics analysed in the public enforcement of law may also generate additional insights in the context of income tax evasion. Other such issues may relate to the self-reporting of past tax evasion activities, the treatment of repeat offenders, the employment of tax advisors, corruption among enforcement agents and the role of marginal deterrence. The analysis of such topics will be especially rewarding if institutional features of tax evasion activities are taken into account. Such investigations would help to clarify whether or not predictions based on general models of illegal behaviour carry over to the more specific settings applicable to the investigation of income tax evasion.

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6. Appendix

6.1 Comparative Statics

The derivatives of the first-order condition (2) with respect to income, Y, and the tax rate, t, are given by:

Income Y:

$$\frac{\partial U'}{\partial Y} = pu''(Y^s)t(1-t) + (1-p)u''(Y^c)(t - f(\alpha t + 1 - \alpha))(1-t)$$

$$= (1-t)[pu''(Y^s)t + (1-p)u''(Y^c)(t - f(\alpha t + 1 - \alpha))]$$

$$= (1-t)\left[pu''(Y^s)t - \frac{pu'(Y^s)t}{u'(Y^c)}u''(Y^c)\right]$$

$$= \underbrace{(1-t)tpu'(Y^s)}_{(+)}[R_a(Y^c) - R_a(Y^s)] \tag{A.1}$$

Tax rate t:

Assume α = 1:

$$\frac{\partial U'}{\partial t}_{|\alpha=1} = pu''(Y^s)(X-Y) + (1-p)u''(Y^c)(1-f)(X(1-f)-Y)$$

$$= pu'(Y^s)\left[\frac{u''(Y^s)(X-Y)}{u'(Y^s)} - \frac{u''(Y^c)(X(1-f)-Y)}{u'(Y^c)}\right]$$

$$= pu'(Y^s)[R_a(Y^c)(X(1-f)-Y) - R_a(Y^s)(X-Y)] \tag{A.2}$$

For $R_a(Y^c) \geq R_a(Y^s)$, the derivative is negative because $X(1-f) - Y < X - Y < 0$ holds.

Assume next that $\alpha = 0$ holds and note that $f > f_{min} > t$:

$$\frac{\partial U'}{\partial t}_{|\alpha=0} = pu'(Y^s) + (1-p)u'(Y^c) + (X-Y)[pu''(Y^s)t + (1-p)u''(Y^c)(t-f)]$$

$$= pu'(Y^s)\frac{f}{f-t} + (X-Y)\left[pu''(Y^s)t - \frac{pu'(Y^s)t}{u'(Y^c)}u''(Y^c)\right]$$

$$= \underbrace{pu'(Y^s)\frac{f}{f-t}}_{(+)} + \underbrace{(X-Y)pu'(Y^s)t}_{(-)}[R_a(Y^c) - R_a(Y^s)] \tag{A.3}$$

6.2 Numerical Example

Assume $u(Y) = Y^{(1-a)}/(1-a)$, implying that $R_r(Y) = -u''(Y)Y/u'(Y) = a$, and suppose, additionally, that the under-declaration can be expressed as a fraction β, $0 \leq \beta < 1$, of gross income, Y, such that $X = \beta Y$. The individual chooses β optimally in order to maximise expected utility, U(β), as expressed by a modified equation (1). Moreover, the penalty is a function of undeclared income (α = 1).

Given the above restrictions, the counterpart to the first-order condition (2) is given by:

$$pY^{-a}[1-t+\beta t]^{-a} + (1-p)Y^{-a}[1-t+\beta t-f\beta t]^{-a}(1-f) = 0 \qquad (A.4)$$

Plugging in f = 2 and cancelling common terms, (A.4) can be rewritten:

$$\frac{p}{[1-t+\beta t]^{a}} = \frac{1-p}{[1-t+\beta t-f\beta t]^{a}} \qquad (A.5)$$

This equality can hold only if p > 1 – p, that is, if the detection probability, 1 – p, is less than 50%.

For p = 0.9, as presumed in the main text, (A.5) can be rearranged to yield:

$$1-t+\beta t = 9^{\frac{1}{a}}(1-t-\beta t) \qquad (A.6)$$

Setting t = 1/3 and solving this expression for the optimal value of β, we obtain:

$$\beta^{*}(a) = \frac{2(9^{\frac{1}{a}}-1)}{1+9^{\frac{1}{a}}} \qquad (A.7)$$

For $a = R_r = 10$ as assumed above, β* = 0.2188 results.

Figure 1: Optimal Under-Declaration and Arrow-Pratt Measure of Relative Risk-aversion

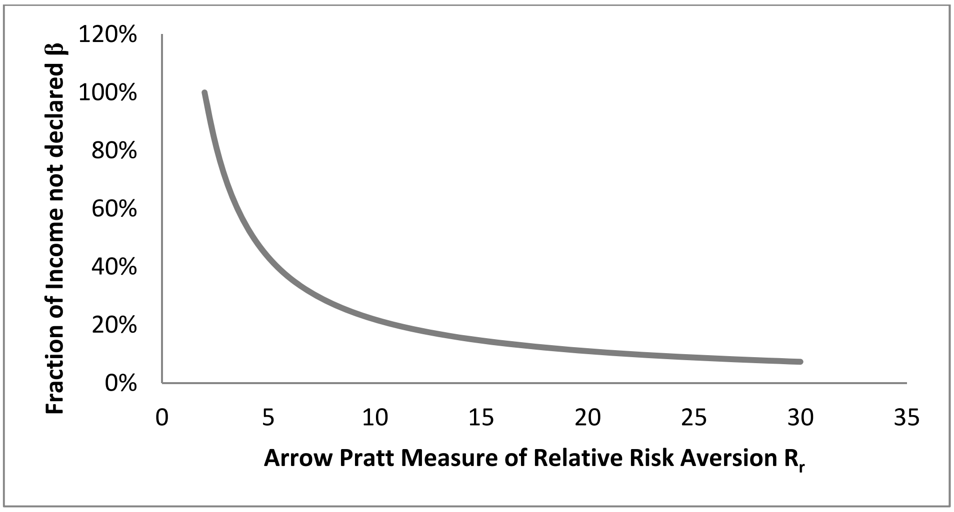

Figure 1 depicts the relationship between the constant Arrow-Pratt measure of relative risk aversion, $R_r = a$, and the optimal fraction, $\beta^*(a) = \beta^*(R_r)$, of income not declared, as expressed by (A.7).

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