Tax evasion and deductible expenses

Piolatto, Amedeo

Toulouse School of Economics - GREMAQ

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Amedeo Piolatto*
Université de Toulouse 1 (GREMAQ)

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Abstract

Public finance is strongly affected by tax evasion, which implies that public sector resources are very limited. Most of the analysis on how to fight tax evasion focused on the ways to deter evasion through incentives to people not to evade.

This model has a different approach: instead of directly rewarding/punishing agents, it gives incentives to an agent to ensure that some other agents are obliged to declare their revenue. In particular, the idea is to give incentives to consumers (through itemised deductions) to declare their expenditure. This forces sellers to declare their earnings or, at least, it makes it more costly for them to convince buyers to buy on the black market.

I show that under few conditions, for a given level of taxation, it is optimal to allow for partial itemised deductions.

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*amedeo.piolatto@gmail.com

"When there is an income tax, the just man will pay more and the unjust less on the same amount of income" (Plato (nd))

1 Introduction

Public finance is strongly affected by tax evasion, which implies that public sector resources are very limited. It seems very hard to quantify the impact of evasion on tax proceeds from an empirical point of view. According to Franzoni (1999), the US federal tax gap[1] has been estimated at about 17%. Some older and more conservative estimations by Cowell (1985) indicate that in the 80's the black economy represented, in most western countries, 5% to 15% of GDP. According to McKay (1998) in 1994 the black economy counted for between 27% (Italy) and 6% (Switzerland) of GDP. This last study is in line with Schneide's (2005) recent statistics.

Probably the most well known works on tax compliance are Allingham and Sandmo (1972) and (1991). In the last two decades, many articles have been published on tax avoidance and tax evasion[2] and many surveys are now available (among the most complete, Slemrod and Yitzhaki (1998) focuses on tax avoidance and it is more theory oriented while Andreoni, Erard, and Feinstein (1998) is more concerned with empirical works).

Even if, from the public budget constraint, it seems clear that something should be done to fight tax evasion, from a social welfare point of view, it is not so clear-cut. On the one hand, it is generally expensive to minimize evasion. On the other hand, taxes are distortive and evasion might partially overcome this distortion:[3] an interesting analysis of welfare consequences of

[1] Tax gap, according to the United States Department of Treasury, measures the extent to which taxpayers do not file their tax returns and pay the correct tax on time.

[2] The difference between tax evasion and tax avoidance is mainly that the first one consists of not declaring some earnings that, by law, an agent is supposed to declare, while tax avoidance consists of abusing some laws or, often, using the lack of detail in some laws, to reduce the tax burden.

[3] Especially in the presence of information asymmetries, the government might not be

tax evasion is developed by Davidson, Martin, and Wilson (2007). Moreover, if evasion were negatively correlated with income, tax evasion might have some redistributive effects.[4] From a theoretical perspective, it is very difficult to state that fighting evasion is *per se* useful for social purposes. An interesting discussion introducing many arguments for and against tax evasion, taking into account the impact of the social welfare function and of the model structure, is provided in section 7 of Cowell (1985).

Stating that, from a social point of view, it is always desirable to reduce evasion could be considered too strong an assumption. Some reasons a welfare planner or a politician might have for doing it could be, for instance, to increase tax proceeds whenever needed, or to promote the country's image on an international ground. Other reasons might be that evasion is illegal and thus, as for any other illicit activity, the government makes an effort to fight it. As underlined, for instance, in Fortin, Lacroix, and Montmarquette (2000), black money is more likely to finance other illegal activities. Thus, by reducing evasion, the government would reduce funds spent on illicit activities. One more rationale might be that agents in the economy have concerns for equality and can have a sort of disutility in knowing other people evade, thus evading taxes might be interpreted as a negative externality.

Most of the economic literature on tax evasion, with some notable exceptions such as Cremer and Gahvari (1993) and Marelli (1984), is mainly devoted to the study of direct taxation. The main assumption is that consumers, being rational, decide whether to evade or not on a simple "cost-benefit" analysis. In reality the issue is, of course, more complex. Models on tax evasion, offering an over-simplified version of it, may fail to give clear policy predictions to avoid or reduce evasion. What comes out from the most recent literature on it is that the legislator has quite a wide set of instruments

able to optimise tax revenues. In the presence of different revenue elasticities, it might be that the second-best choice of government distorts sectors differently and evasion might counterbalance the distortionary effect of taxes.

[4] Of course, with the same social welfare function, if evasion were positively correlated with income, results would be the opposite!

to fight tax evasion (e.g. auditing, fines, incentives not to evade, direct taxes to make it harder to evade). The interaction between those instruments is not always perfectly clear. Sometimes evasion is due to the necessity to hide some illegal activities, thus instruments to fight evasion might reduce but not necessarily eliminate it completely: e.g. McKay (1998) assesses that even with a 0% tax rate, the underground economy would still represent about 4% of GDP, because of illegal activities and due to some economic agents willing to avoid regulation laws.

As underlined by Franzoni (1999), most of the economic analysis of tax evasion has concentrated on how evasion can be deterred through detection and sanctions. More generally, the idea is to give incentives to people not to evade (such as decreasing tax rates) or making it harder for agents to behave illegally (e.g. by increasing consumption taxes, through higher fines or by using more sophisticated audit systems).

The model I propose differs from the afore mentioned models because, instead of directly rewarding/punishing agents, it gives incentives to an agent to ensure others are obliged to declare their revenue. To be more specific, the idea behind this model is to incentivize consumers to declare their expenditure, indirectly forcing sellers to declare their earnings. Consumers can reduce their tax base by a portion of the value of their real expenditure on the legal market.

Giving consumers incentives to declare their purchase forces sellers to declare their earnings or, at least, it makes it more costly for them to convince buyers to buy on the black market. A practical example of a situation in which a similar idea has been used is the French "Aide au Logement": the government partially subsidises finance the rent of the poorest citizens. Flat-owners are forced to declare their renting income or to reduce the rent by the value of the subsidy.

I constructed a model where the deduction rate is, *a priori,* undetermined and I compute, for a given level of taxation, the optimal deductibility rate and show that, under some conditions, this rate is always positive; which

means that, *ceteris paribus*, introducing deductions implies a) a relaxation of the public budget constraint, which can be translated into higher tax proceeds or lower tax rates (or both), and b) a reduction in the size of the underground market.

Through a simple and clear model, I show that in equilibrium it is convenient to have some deductions and that this, meanwhile, reduces the level of tax evasion and increases tax proceeds (or reduces the *per capita* average tax burden). It shows that partial deductibility of expenditures is a sufficient enough incentive for a proportion of citizens to declare their purchases without negatively affecting tax proceeds. The reduction in the amount of collected taxes from citizens is less substantial than the increase in tax proceeds deriving from the reduction in profits-tax evasion. The model could be generalised and applied to a labour supply-demand model or to a more complex general equilibrium model.

The remainder of this paper is structured as follows: in section 2 I explain my assumptions on market structure and the general scenario of the model; subsection 2.1 analytically introduces the model, which is solved in subsection 2.2. Subsection 2.3 analyses tax proceeds and studies the impact of the main variables. The last section concludes.

2 The market structure

Consider an economy with a single consumption good or service sold by N identical firms[5], which, *a priori*, are active on both the legal and black markets.

Each active consumer has a unitary demand for the good, thus (if his reservation price is higher than the market price) a consumer has to decide whether to buy on the legal or underground market, but he does not choose the quantity. The number of active consumers is normalised to N.

[5] I use the generic term "firm" to denote the supply-side player, who might be a producer, a service provider, a retailer... .

Firms are perfectly identical, at equilibrium they always behave in the same way. Consumers are thus indifferent when choosing among them. I assume that, because of this, consumers are spread over all firms, so that we observe a mass, 1, of consumers willing to buy from each firm.[6] Considering only N active agents, total demand for the good is very inelastic.[7] Note that even though total demand (that is, the quantity demanded on both the legal and illegal market) is inelastic and equal to 1, given the interaction between legal and illegal market, the demand on each of the two markets is elastic. Given the previous assumptions, total demand for each firm is always equal to 1, and what really matters is the proportion of legal and illegal goods that are sold.

All consumers have an identical wealth, R, and are asked to pay taxes, t, on it. Firms are subjected to a profit tax based on the size of their legal sales. Being active on the black market reduces firms' tax burden. On the other hand, behaving against the law might result, with some positive probability, in a fine. The expected value of the fine is assumed to be sufficiently small to ensure some evasion.[8] Of course, if the legislator were able to credibly set a sufficiently high fine to discourage any kind of evasion, this model would not need to exist.

I consider the case of a "profession", such as accountancy, medicine, law or

[6] We can interpret this assumption in many ways. One possibility is that there are some congestion costs and no transportation costs: since at equilibrium all firms propose the same conditions, consumers split among firms to reduce the congestion cost they support. Another example where it would be reasonable to assume this is when agents are uniformly distributed across a round city. There are some transportation costs and firms are equidistant from one another. Since firms are all identical, each consumer buys from the closest firm.

[7] This assumption is introduced to get rid of substitution effects between good consumption and savings.

[8] This assumption might be justified in several ways: on the one hand it might be very hard to audit consumers and/or firms for some particular markets, thus the probability of being punished is very small. Another possibility, in the spirit of Cremer and Gahvari (1993) and Kolm (1973), is that the fine is for some reason bounded above, for instance for limited liability, social cohesion, ethics or political reasons.

engineering. In many countries, these professions are regulated. All members wishing to practice have to pass a national exam to prove their aptitude, subscribe to the "professional association", respect a behavioural code and so forth. Among other obligations, members of the association are often subject to some pricing rules: in some countries, the price of some services might be fixed by the association, bounded above or below or fixed in a given range.

Therefore, I assume that firms are price takers on the legal market, while they can decide the price at which they sell on the underground one. The model is much more general than that and can be applied to a wide range of situations. What is crucial is that firms are not price setters.[9]

I assume that the professional association has imperfect information of what occurs on the market. To fix the price, the association can only observe what occurs on the legal market, as a matter of fact, it can only take into consideration the demand for the legal good and not the illegal one.[10] The legal price p_a is such that firms make some profits.[11] Firms are taking the

[9]Consider the case of a competitive legal market, but also any situation in which a third player is acting in the game, e.g. an authority or institution fixing the price of the legal good. For instance, it might be that the legal market is regulated by an authority, or it is a collusive oligopoly with the cartel agreeing on a common price. Other possibilities might be that firms are just retailers with a (possibly unofficial) sort of RPM agreement with the producer, or they might have a franchise contract limiting firms' behaviour and leading to a common legal-market price.

The way price is determined and by whom is not qualitatively affecting results, nor is it important to know if, from a legal point of view, the entity fixing prices is allowed to do so (as in the case of a regulator) or not (as it would be for the collusive oligopolistic firms or RPM contracts).

[10]This assumption is particularly realistic when the association fixing the price is an independent authority, such as a public regulator. Another possibility is that members of the association have some interest in concealing from the association the fact that they sell on the black market. This might occur for example under a collusive oligopoly, where firms cannot declare to the cartel members that they are breaking the cartel selling on the black market at a different price from the one proposed by the cartel.

[11]This assumption is important because the firm must owe some taxes on its profit.

legal price as given and maximise their profit with respect to the black market price they are proposing. Firms are risk neutral.

Consumers have the same wealth R and utility function and I assume all of them are risk neutral. Consumers have the choice of buying the good on the legal or illegal market. As in a model of vertical differentiation, all agents prefer to buy on the legal market. When the price on the underground market is lower however, some consumers prefer to buy it there. The willingness to pay for the legal good k is the same for every individual. The difference in behaviour among different consumers is due to a factor θ that I describe as "aversion to illegality": basically agents consider for some (personal) reasons that behaving against the law is bad *per se* and, feeling guilty when they buy on the illegal market, their utility of consumption is reduced (this feeling might be due, for example, to ethical or political reasons or reputation concerns).[12]

2.1 The model

The professional association chooses the price in the interest of its members and, in particular, in order to maximise aggregate profits.[13] As previously stated, it takes into account only the demand for legal goods. This results

It may occur because of the cost structure (e.g. under competition we might require an increasing marginal cost function) or because of the market power the professional entity might exert when fixing prices.

[12] From a mathematical point of view, this assumption might have been replaced by a "risk-aversion" assumption, simply by some adjustments in the model. Nevertheless I consider that it might be plausible that agents have different ethical beliefs and we might observe illegality-averse people as well as illegality-loving people. Think for example of an agent that, for political reasons, is particularly concerned by the role of central power and of the government. He certainly feels more uncomfortable when buying on the illegal market compared to someone politically against the presence of a government such as, for example, an anarchist.

[13] As long as some profits are ensured, the way the price is fixed is not crucial. I might have simply considered an exogenous price or any pricing criterion leading to a price higher than average cost.

in the price of the legal good being equal to monopoly price, thus ensuring positive profits for each firm even when they do not sell on the black market.[14] Marginal costs are assumed to be constant (and denoted by c).

The professional association's problem is simply

$$\max_{p_a}(1-T)N(p_a-c)q_a(p_a) \tag{1}$$

where $q_a(p_a)$ is the aggregated demand of legal good and T is the tax professionals pay on profits.[15] The generic solution to the problem is given by the F.O.C.

$$p_a = c - q_a\left(\frac{\partial q_a}{\partial p_a}\right)^{-1} \tag{2}$$

The firm takes p_a as given and can propose to their customers to operate legally (subscript a stands for "above-ground"). If the transaction is declared, the seller will have to declare his earning and thus will also have to pay some taxes T on his profits. The two parties can also decide to operate underground (in this case the subscript will be u). Transactions occur at price p_u and the seller will not pay taxes on these transactions.

As already mentioned in the previous section, I assume that a mass of consumers, normalised to N, are willing to pay k, which is higher than the legal price. Each firm serves the mass of consumers with unitary demand.[16]

[14] This is not always the case in the literature on tax evasion. Several articles assume that firm's long term expected profit is null since they make no profit on the above-ground market and moreover expected profits on the black market equal expected fines.

[15] The association, as explained in the previous section, is not taking into account the black market demand. For more details on that, see the previous section and, in particular, footnote (10).

[16] The assumption of perfectly inelastic demand is not crucial for the model results, but it is important to be able to disentangle policy effects and substitution effects. This assumption, from an economic point of view, might be justified in several ways. If we consider services offered by professionals, such as medical care or legal assistance, people often do not have the choice and have to purchase the service at almost any price. Another interpretation might be that we consider only that part of the population having a willingness to pay higher than the legal price of the good (also the maximum price one might pay in equilibrium) when normalising population to N.

I denote by x_a and x_u the quantities demanded by a single individual, with $x_a \in \{0;1\}$, $x_u \in \{0;1\}$ and $x_a + x_u = 1$. Given the normalisation of the number of consumers in the economy, the aggregated demands for each firm are $q_a \in [0;1]$ and $q_u \in [0;1]$. Since firms are identical and the model is perfectly symmetric, q_a and q_u are the same for each firm and the total demand of the market is simply given by Nq_a and Nq_u.

Knowing that the total demand firms face is constant and equal to 1, if one tries to increase his sales on the black market, he is compromising his own legal market. One justification of why it is reasonable to think that his total demand is constant (i.e., each professional is a monopolist on his underground market, any consumer can move from one firm to another) regardless of the selling price is that demand is inelastic and, at equilibrium, all professionals behave in the same way. Moreover, we can assume that negotiations to induce the consumer to operate on the black market take place after the service has already been provided. Of course this implies that the consumer already accepted to buy the service at the legal price from that firm, thus the main point is to know if he will accept to buy the good illegally in exchange for a discount.

I assume that the black price is unilaterally chosen by the firm, by maximising his profits with respect to p_u, taking into account consumers' demand and p_a, and proposing the consumer with a "take it or leave it offer".

His profits can be written as

$$\pi = (1-T)(p_a - c)q_a + (p_u - c - \frac{F}{2})q_u \tag{3}$$

where the first term represents his profit on the legal market and the second one his expected profit on the illegal one. F is the expected value of the fine when an agent is caught operating on the illegal market. It is supposed to be shared between the professional and the consumer so that each of them pays $\frac{F}{2}$ in expected terms.[17]

[17] As previously underlined, all agents are risk neutral.

The professional's program is then

$$\max_{p_u} \pi \tag{4a}$$

$$s.t. \qquad q_a = 1 - q_u \tag{4b}$$

The solution to (4) is given by the F.O.C.

$$q_u = -\frac{\partial q_u}{\partial p_u}\left(p_u - (1-T)p_a - Tc - \frac{F}{2}\right) \tag{5}$$

Given p_a and p_u, consumers maximise their utility function with respect to the market on which they buy, i.e. they choose the value of the binary variables x_a and x_u.

$$\max_{x_a;x_u} U(x_a; x_u; R) \tag{6a}$$

Where

$$U(x_a; x_u; R) = [k + (R - p_a) - t(R - dp_a)]\, x_a + \left[\theta k + (R - p_u) - tR - \frac{F}{2}\right] x_u \tag{7}$$

Remember that k, the value agents accord to the good, is exogenous and the same for all consumers. R is agents' exogenous wealth, on which they have to pay taxes t. d is the percentage of sales one is allowed to deduct from one's before-tax revenue in order to compute tax base.

θ is the consumers' type, it is interpreted as "illegality aversion" (see section 2 for more details). The lower the value of θ, the more the agent is averse to illegality and thus the less he values the illegally bought good. $(1-\theta)$ corresponds to the perceived loss of value of the service (percentage) when an agent accepts to buy on the black market: obviously the higher this value, the less likely he is to agree to an illegal transaction. θ is a random variable with distribution $\theta \sim U[0,1]$.

Equation (7) represents agents' utility when purchasing. The first term in it is the utility of consumption of the legal good, while the second term is the utility derived from the good when bought on the black market.

Consumers' outside opportunity, that is, their utility when they do not purchase at all, would be $(1-t)R$. By the assumption that agents' willingness to pay is strictly higher than the good price (i.e. $(1-dtp_a) \leq k$), at equilibrium everybody is buying 1 unit of good.

Consumers choose between buying legally or on the underground market. Their choice depends on their type; more precisely, they prefer to declare their purchases as long as

$$[1-dt]\, p_a \leq p_u + \frac{F}{2} + (1-\theta)k$$

from which we obtain

$$\theta \leq 1 + \frac{p_u - [1-dt]\, p_a + \frac{F}{2}}{k} \stackrel{d}{=} \bar{\theta} \tag{8}$$

2.2 Market equilibrium

I first give the conditions under which a firm has interest in selling on the black market and consumers have buying on it. Then I derive the market equilibrium and finally I evaluate the impact of deductions on the main variables.

To ensure that sellers find it more convenient to sell on the black market and thus that they try to convince consumers not to declare their purchase, the price on the black market has to verify the condition

$$p_u \geq \frac{F}{2} + (1-T)p_a + Tc \tag{9}$$

If this condition is not satisfied, no tax evasion is observed.

Concerning consumers, we have one condition to ensure that all consumers are active on one of the two markets, which is basically that consumers' willingness to pay is higher than the price. From equation (7) it is easy to derive the necessary condition to have a positive level of legal

consumption of the good, which is[18]

$$[1 - dt]\, p_a \leq k \tag{10}$$

This condition is assumed to be always verified, otherwise nobody would be willing to buy on the legal market. At the end of this section it will be shown that the aggregated demand for the legal good is always greater than that for the illegal good. As a consequence, if this condition were not satisfied, both the legal and the illegal market would disappear.[19]

The aggregated demand on each market depends on the distribution of θ. In particular, because $\theta \sim U[0,1]$, we have that

$$q_a = F(\bar{\theta}) = \bar{\theta} \tag{11a}$$

$$q_u = 1 - F(\bar{\theta}) = 1 - \bar{\theta} \tag{11b}$$

Inequality (10) guarantees that $\bar{\theta} > 0$, while the condition to have $\bar{\theta} \leq 1$ (ensuring that $q_u \geq 0$) is given by

$$0 < p_u \leq (1 - dt)p_a - \frac{F}{2} \tag{12}$$

As long as inequalities (10) and (12) are satisfied, the aggregated demand for the service is

$$q_a = 1 + \frac{p_u - [1 - dt]\, p_a + \frac{F}{2}}{k} \tag{13a}$$

$$q_u = \frac{[1 - dt]\, p_a - p_u - \frac{F}{2}}{k} \tag{13b}$$

[18] Basically this condition ensures that all consumers' willingness to pay is higher than the legal good price and thus at equilibrium we always have $x_a + x_u = 1$. If this condition were not satisfied we would have $x_a = 0$ for everybody, thus $q_a = 0$.

[19] To be precise, the condition to have a positive aggregated demand $q_u > 0$, is $p_u < \theta k - \frac{F}{2}$. It is possible to prove that in equilibrium this condition is never satisfied when $p_a > \frac{k}{[1-dt]}$. Condition 10 is then necessary to have a positive aggregated demand all markets combined, i.e. to have $q_a + q_u > 0$

We now have all the conditions needed to compute the equilibrium: we know under which conditions a firm is willing to sell on the black market and under which conditions consumers are willing to buy. In order for some transactions on the black market to take place, we need these conditions to be compatible with each other. In other words, there must be some room for negotiation: firms selling on the black market are saving money while for consumers there is a cost of buying underground, which is the impossibility to deduct their purchase. If the cost for consumers is smaller than the surplus firms can make, it is rational for both of them to find an agreement in order to exchange the good on the black market. I assume that all market power is given to the firm, which makes a "take-it or leave-it offer".[20]

Combining equations (9) and (12) we can obtain the condition (equation 14) under which both the professional and some consumers are willing to operate on the black market and thus we observe some tax evasion.

$$(T - dt)p_a > F + TC \tag{14}$$

To interpret this condition, it is maybe more convenient to rearrange equation (14) as

$$T(p_a - c) > F + dtp_a \tag{15}$$

The LHS of (15) is the firm's cost declaring a sale and thus the cost of behaving honestly.

The RHS is the total cost of evasion, represented by the total expected cost of the fine, increased by consumers' opportunity cost of evading. In the presence of purchase deductibility, this is an increasing function of the tax rate since, when evading, consumers cannot deduct their expenditures.

It is now possible to derive equilibrium prices and quantities.

[20] Of course, as long as there is some room for negotiation, the way prices are fixed does not really affect the model results. Other possibilities could have been to equally share the surplus or to introduce a bargaining phase during which the two parts try to agree on a given price.

From equations (5) and (13b) we obtain that $\frac{\partial q_u}{\partial p_u} = -\frac{1}{k}$ and

$$p_u = \frac{2 - dt - T}{2} p_a + \frac{Tc}{2} \tag{16}$$

Note that the fine does not affect the price level p_u. This is due to the fact that, in this model, the effect of a change in the fine is perfectly counterbalanced by a change on the quantity exchanged on the black market, so that we do not observe any change in the equilibrium price. In fact, an increase in the expected fine calls for an increase in price from the supply side (because the firm wants to earn more in order to compensate for the expected fine) and for a decrease in price from the demand side (since the higher fine discourages some consumers, provoking a negative shock on the demand curve). Both shocks have a negative impact on the exchanged quantity but the two opposite effects on the price offset each other, both agents (the firm and the consumer) being risk neutral and equally sharing the fine.

The coefficient of p_a in (16) is always positive[21] and smaller or equal to 1. The second term indicates that the underground price is positively affected by the corporate tax: the rationale for this is that selling on the black market implies not declaring some production costs as well, thus T affects the professional opportunity cost of evasion. When declaring his sales, the professional can reduce his gross profit by Tc, thus for every undeclared unit sold, the professional tax burden increases by an amount Tc.

Given p_u, through (13b) it is possible to compute the exchanged quantity as a function of the price of the legally exchanged good, which is:

$$q_u = \frac{1}{2k} \left[(T - dt) p_a - (F + Tc) \right] \tag{17}$$

Furthermore, combining equations (2), (4b), (16) and (17), we obtain the

[21] This means that prices are positively correlated, which implies that they are strategic complements and, as we will see later on, quantities are strategic substitutes.

equilibrium prices p_a and p_u, and the equilibrium quantities q_a and q_u:

$$p_a = \frac{F + 2k + (2T - dt)c}{2(T - dt)} \tag{18}$$

$$p_u = \frac{(2 - dt - T)(F + 2k) + 2Tc(1 - dt)}{4(T - dt)} + \frac{(2 - dt)c}{4} \tag{19}$$

$$q_a = \frac{1}{2} + \frac{F + cdt}{4k} \tag{20}$$

$$q_u = \frac{1}{2} - \frac{F + cdt}{4k} \tag{21}$$

Clearly, this is the interior solution. To have an interior solution, in addition to (10), we need the following conditions to be fulfilled:

$$T > dt \tag{22a}$$

$$cdt + F \leq 2k \tag{22b}$$

Condition (22a) means that, to have some evasion, the cost of being honest for a firm has to be higher than the opportunity cost of not being honest for a consumer. That is to say, the tax the firm saves when operating on the black market has to be higher than the tax reduction the consumer would obtain if he declared a purchase. This condition says that for transactions to take place on the black market, there must be some room for negotiation between professionals and consumers. If one of the previous conditions were not satisfied, we would have a corner solution, with $q_a = 1$; $q_u = 0$ and $p_a = \frac{k}{1-td}$.

Note that (22a) implies that $\frac{\partial q_u}{\partial p_a} = \frac{T-dt}{2k} > 0$ and $\frac{\partial q_a}{\partial p_a} = -\frac{T-dt}{2k} < 0$, and thus the good is normal and illegal sales are positively correlated with legal price. Measures aimed at reducing the price of the legal good then indirectly reduce tax evasion.

Given the expressions for q_a and q_u we can also compute the impact of a

change in the wealth tax and in the deduction rate:

$$\begin{aligned}
\frac{\partial q_a}{\partial d} &= \frac{ct}{4k} > 0 \\
\frac{\partial q_a}{\partial t} &= \frac{cd}{4k} > 0 \\
\frac{\partial p_a}{\partial d} &= \frac{[F + 2k + Tc]\, t}{2(T - dt)^2} > 0
\end{aligned}$$

The impact of an increase in the deduction rate is unambiguous: it pushes legal good prices upward and it reduces evasion. Combining results from $\frac{\partial q_a}{\partial p_a} < 0$ and $\frac{\partial q_a}{\partial d} > 0$ and $\frac{\partial p_a}{\partial d} > 0$ we can conclude that the direct impact of d on q_a is bigger than the one on p_a, which explains the reason why the total effect on q_a is positive even though we observe an increase in legal price.

2.3 Tax proceeds

In many countries, especially in eastern and southern Europe, deductions are not a widely used policy instrument: e.g. in OECD (1990) estimations indicate that in Italy and Spain, but also in the UK and Ireland, allowed deductions represent at most 5% to 9% of taxable income and that in most of OECD countries itemised deductions are always below 15%, with , exceptions made for a few countries. Among OECD countries, in France and Scandinavian countries deductions are more frequent, with rates between 25% and 30%.

The aim of this model is to show that under some quite general conditions (mainly: markets concerned by tax evasion and with limited expected fines), allowing people to deduct purchases might result in a reduction in tax evasion without negatively affecting the public budget constraint.

Total public income is given by tax proceeds from the corporate tax on profits, the tax on wealth (net of purchase deductions) and the expected income raised through fines:

$$TP = N\left[T(p_a - c)q_a + Fq_u + t(R - dp_a q_a)\right] \tag{23}$$

or, equivalently, $TP = N\left[\left[(T - td)p_a - Tc\right] q_a + Fq_u + tR\right]$.

Optimal behaviour for a social planner might mean either keeping tax proceeds constant, reducing taxes as much as possible, or keeping taxes constant and raising as much money as possible.

The aim of my work is to study the impact of deduction on tax evasion and on tax proceeds. To do that, I used the simplest possible model, also to show that tax evasion can be reduced through a very simple scheme. One drawback of this model is that it cannot be used to compute the optimal tax rate: the assumption on demand inelasticity and the fact that consumers cannot hide their wealth together imply that rising t would increase tax revenue without distorting consumers' behaviour or increasing tax evasion. Thus, if one wanted to maximise BC with respect to t, the solution would be $t = 1$.

Maximising TP with respect to T is no more helpful because a variation of the corporate tax implies a reduction in p_a that perfectly offsets the wished increase in public revenue, since $\frac{\partial p_a}{\partial T} = -\frac{p_a - c}{(T - dt)}$.[22]

The most appealing feature of this model is that it is simple and it perfectly captures the effects of deductions on taxes and evasion. The relevant question this model can answer concerns finding, for a given level of taxation, the level of deduction which maximises public tax proceeds.

In other words, it solves the government's problem:

$$\max_d N\left[T(p_a - c)q_a + Fq_u + t(R - dp_a q_a)\right]$$
$$s.t. \quad p_a = \frac{[F + 2k + (2T - dt)c]}{2(T - dt)}$$
$$q_a = \frac{1}{2} + \frac{(F + cdt)}{4k}$$

the solution of which is $d = \frac{2k - F}{ct}$.

[22] To be more precise, a change in T affects both the size and the slope of the demand and supply functions for both q_a and q_u. The equilibrium quantity remains the same, but the price falls. This implies that the government collects a larger share of profits (because of the increase in T) but legal profits are smaller, since p_a dropped.

Of course I considered the equilibrium result, taking into account only the interior solution to the problem given that, if we were in presence of no evasion, there would be no reasons to find instruments to reduce it!

The maximisation problem yields a clear-cut result: as long as the conditions to ensure a certain level of evasion in the economy are satisfied and if the expected fine for evasion is sufficiently low (that is $F < 2k$), it is always beneficial for society to have a positive level of deduction.

This model indicates that, of course, the best remedy against tax evasion would be to increase fines and audit probability (assuming no or few costs of auditing) but when this is not feasible (e.g. because of some difficulties to audit, limited liability...), using a system of indirect incentives, such as the one described, offers the legislator a tool to decrease evasion without negatively affecting tax proceeds.

Starting from a situation where deductions are not available, under the few assumptions of having evasion and $F < 2k$, deductions do not eliminate evasion completely but they help in reducing it. This means that the legislator could, by introducing them, reduce taxes keeping tax proceeds unaffected, or keep taxes constant and increase tax proceeds.

3 Concluding remarks

The aim of this work was to investigate what the consequences are of using itemised deductions to reduce evasion and to show that, in a wide range of situations, it is beneficial to allow a given level of deductions.

Through a simple model and without any restrictive assumption, I showed that introducing deductions in a market characterised by tax evasion and difficulties in punishing tax evaders, the cost of introducing deductions (that is, the drop in tax proceeds) is more than compensated for by a fall in tax evasion and by the subsequent increase in tax proceeds due to the larger population paying taxes.

The example I used to introduce the model is quite specific, but the model

applies to a wide range of situations and its results are robust.

An interesting extension of the model could be to study welfare considerations. It is clear that the honest part of the population should be better off, since tax proceeds are higher without any additional cost for them. The impact on the other agents is less clear, since on the one hand they are now paying more taxes but on the other hand they can profit from better public services and derive more utility from the legal good consumption.

Another possible extension could be to consider the implications in terms of optimal behaviour for a politician, that is: would it be strategically optimal, for a politician aiming to be elected, to propose such a policy?

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