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Bachelor's Degree in

Economics and Business

Public Economics

Tax evasion under behavioural lenses:

some insights and instruments to foster compliance.

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Introduction

"The Republic lies in the civic sense of duty of those that pay taxes, because this is necessary to make Italy work and thus for social welfare".[1]

Sergio Mattarella.

This quote is an extract from the traditional New Year's Eve speech made by the Italian President of the Republic Sergio Mattarella on December 31st, 2022. It is a call for social cohesion and responsibility about a topic that has historically been controversial and critical in Italy. Tax evasion in Italy was estimated to be €122 billion in 2019, but has been reducing with time (Osservatorio sui Conti Pubblici Italiani, 2019)[2]. However, although Italy is one of the European countries that suffer the most from it, it is an issue that is spread worldwide. Due to its importance, it is not a surprise that tax evasion is also the subject of many studies in academic literature.

An important contribution, that is the basis of most theoretical models on tax evasion, is that by Allingham and Sandmo (1972), that will be presented in Section 1.2. The standard model regards the evasion decision as a gamble in which taxpayers decide how much income to declare, based on the probability of detection and a monetary punishment. This model is powerful and gives interesting insights on the topic, but tax evasion is a more complex issue that depends on motivations that go beyond the economic ones. Indeed, taxpayers may be afraid of the social consequences of being caught, such as shame and guilt, they may be moved by a civil duty, or they may base their decision on irrational arguments and computations, among others. Understanding that there was room for an extensive analysis in this sense was perhaps the spark that lit my interest in studying this topic in detail and, ultimately, writing this thesis about it. The undeniable importance of tax evasion and the urgency of finding policies to mitigate it also contributed.

This thesis will look into the academic literature on tax evasion to gradually build some insights both concerning the determinants and the solutions to the phenomenon. In doing so, theories and concepts from behavioural economics will be extensively used. The first chapter has the scope of introducing

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[1] The original sentence in Italian is:" La Repubblica è nel senso civico di chi paga le imposte perché questo serve a far funzionare l'Italia e quindi al bene comune." Source:
https://www.repubblica.it/politica/2022/12/31/news/discorso_fine_anno_presidente_mattarella-381513208/
Video: https://www.youtube.com/watch?v=HjuAuSWutm8&t=557s
[2] More info on OCPI website: https://osservatoriocpi.unicatt.it/ocpi-pubblicazioni-l-evasione-fiscale-e-contributiva-in-italia

the tools that will be needed to analyse experiments on tax evasion. Section 1.1 will be an introduction on tax evasion, also considering the comparison with tax avoidance and introducing tax progressivity and how the underground economy is estimated. In section 1.2 and 1.3 the standard model, that is the main reference point for any theoretical consideration that will be made during the thesis, will be introduced and its comparative statics will be analysed. The final part of the chapter, namely sections 1.4 and 1.5, will introduce the behavioural tools that will be needed in chapter two, that are the *prospect theory* by Kahneman and Tversky (1979) and mental accounting. The second chapter, the very core of the thesis, will start by making use of the extensive meta-analysis by Alm and Malézieux (2021), that carefully analyses some important determinants of the evasion decision by putting together results from 70 tax evasion games. Then, in section 2.2, the discussion will focus on the several possible behavioural determinants of tax evasion, exploiting the tools introduced in section 1.5 and further concepts. Moreover, sections 2.3 and 2.4 will be used to propose some possible instruments to fight tax evasion. The two sections will analyse respectively the fiscal and non-fiscal solutions. Finally, the third chapter will be reserved to explore further the issue of tax evasion. In section 3.1, the thesis will go beyond income tax evasion and look into VAT and payroll tax evasion. Section 3.2 will present the role that electronic payments can play in tax evasion, especially VAT evasion. As tax evasion is not an isolated phenomenon, but it is something that exists within a political world, the last section will briefly discuss what the political consequences of the fight against tax evasion may be.

Chapter One: Defining tax evasion and introducing behavioural concepts.

1.1 Definitions

Before analysing tax evasion, its determinants, and its possible solutions, it is useful to take a look at the context in which it develops and provide some definitions. The first distinction to examine, one that is not always clear cut, is that between tax evasion and tax avoidance. Tax evasion consists in intentionally declaring a lower economic activity to decrease taxable income and, ultimately, taxes due. On the other hand, tax avoidance is a reorganisation of the economic activity aimed at decreasing taxable income. As claimed on United Kingdom's government website, this may come at a cost for the taxpayer, as forgone income, and can also involve artificial transactions aimed at achieving the outcome of having a lower tax base. It is an act that is within the law, but against its spirit. Overall, legality of such mechanism is often tested in court and is contested by the public.

Importantly, tax evasion and tax avoidance are linked with each other as the latter may substitute the former. This is because if a government strengthens enforcement of tax evasion rules, then a company or an individual may simply start avoiding taxes. Alstadsæter et al. (2022) investigated this issue and identified two opposite effects from theory: on the one hand, less tax evasion means that entities declare a higher level of income, which may put them in a higher tax bracket, then making avoidance relatively more attractive. On the other hand, entities that are already in the highest tax bracket would not face this issue, as they are in that bracket regardless of improved techniques against tax evasion. In the first case, they would be substitutes, whereas in the second they would not. However, when empirically analysing the case of a Norwegian tax amnesty program, the authors found out that the taxes paid increased sharply although the taxpayers had significant tax avoidance alternatives available[3]. A further behaviour is that of tax planning, which consists in taking advantage of the tools that the government provided, in the form of deductions, allowances, rebates, among many. It is a legal and perfectly compliant way of conducting business, but its distinction with tax avoidance is very blur.[4]

Tax evasion and tax avoidance are part of the black, shadow, or hidden economy, that are synonyms expressing activities implying a transaction that is not declared. Notwithstanding whether they derive

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[3] Alstadsæter et al. (2022) investigate on this topic and come up with three possible explanations. Firstly, they argue that this lack of substitution may be due to its high fixed costs, as avoidance opportunities may involve buying expensive immovable assets or moving to another country. Secondly, they check whether such opportunities may be available only for the wealthiest individuals of this already wealthy sample. Finally, they hypothesise that only the most aggressive individuals would try to avoid taxation. Whereas the first two hypothesis are not reflected in data, there is some evidence of the latter, but results are overall weak.

[4] More information on tax planning can be found at: https://www.theguardian.com/sustainable-business/avoiding-tax-legal-but-ever-ethical

from monetary or non-monetary transactions, both legal activities, such as tax evasion and avoidance, and illegal activities, such as gambling, prostitution, and counterfeiting, are part of such informal sector (Lippert and Walker, 1997). Shadow economy accounts for a very large share of the total national production, and this share is correlated with the development level of the country. Indeed, the average share of the shadow economy from 1991 to 2015 accounts for roughly 7.2% in Switzerland, 10.7% in the Netherlands, 14% in Sweden and Norway, but also 25% for Italy, 29.1% for Bulgaria and 30.1% for Romania. (Medina and Schneider, 2018). From a global standpoint, 2007 data by Schneider et al. (2010) show that mean shadow economy share in developing countries is 26.2%, with some countries (Ukraine, Peru, Bolivia, Thailand, Myanmar, Tanzania) above 50%. Such levels of hidden economy hinder economic development, as they make tax revenue insufficient to provide public goods (such as healthcare and education). Furthermore, as argued by De Soto (2001), a large informal sector makes capital "dead", in the sense that if a property is not officially owned it is harder to use in the marketplace. Informal properties cannot be used as a collateral, cannot be transferred and are also easier to expropriate, thus decreasing incentive to invest on them. This makes business more uncertain and restricted only to well-known people and individuals cannot protect themselves in case of cheating or theft. As a final remark, by adding do-it-yourself activities, or in general terms activities having economic value but not involving a transaction, to the definition of shadow economy, we get the unmeasured economy.
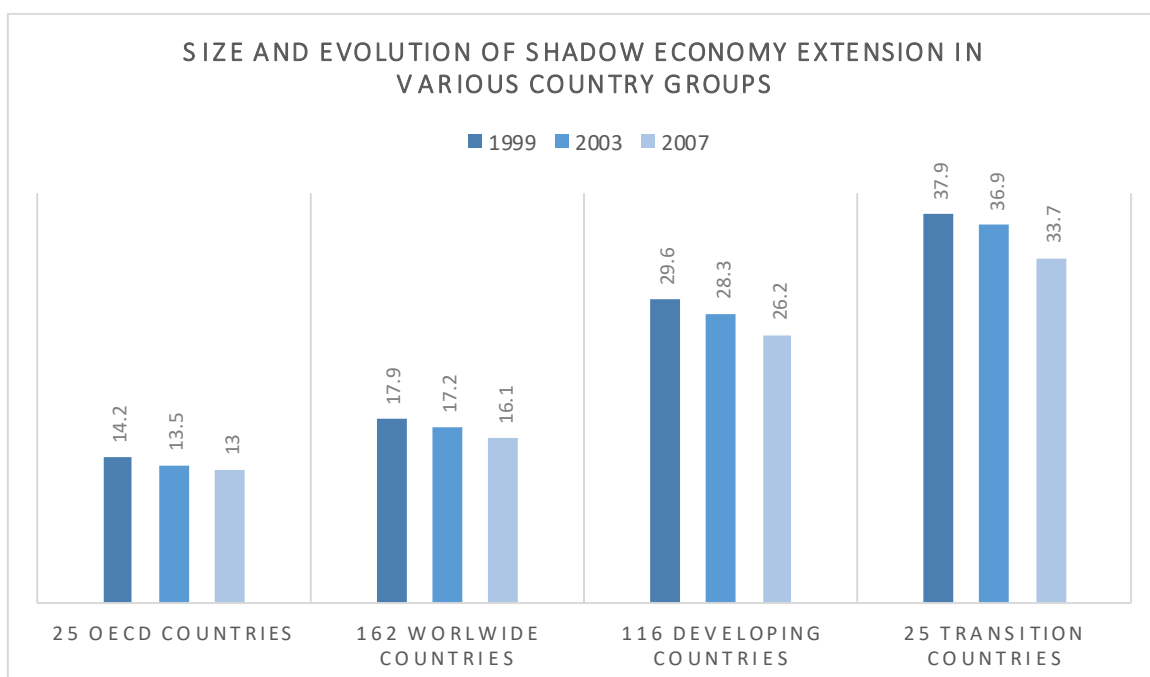
Figure 1.1: Size and evolution of shadow economy in selected country groups. (As a percentage of the official GDP)

Source: Schneider et al., (2010)

In addition, one should briefly delve into the progressivity of taxation. Art. 53 of the Italian constitution claims that the tax system is to be based on progressivity, as citizens should contribute

to public expenses depending on their ability to pay. For this purpose, let's define the average and marginal tax rate. The average tax rate defines how much an individual must pay on average for a single unit of income Y:

$$T_A = \frac{T(Y)}{Y}$$

The marginal tax rate defines how much they should pay for an additional unit of income earned:

$$T_M = \frac{\partial T(Y)}{\partial Y}$$

Thus, a system is progressive when $T_A < T_M$ (so that average tax rate increases as Y increases), regressive when $T_A > T_M$ (average tax rates decreases as Y increases) and flat when $T_A = T_M$. As I will argue in the next chapters, progressivity and equity of taxation are recurrent concepts in the context of determinants of tax evasion. Equity is related to the concept of "ability to pay". It can be *horizontal,* meaning that those with similar resources should pay a similar amount, and *vertical,* which means that those having more ability should pay more. The individual ability to pay is established by estimating a personal tax (a tax based on individual characteristics), also considering deductions, a reduction of the tax base, and tax credit, a reduction of the tax due. Other than generating a progressive system, they are also implemented to incentive spending on specific goods, such as education and healthcare, and redistribute resources towards those having a lower type or income.

Finally, one should consider the estimation methods that can be used to measure tax evasion. Intuitively, tax evasion is the difference between income and expenditure, but as both variables can be undeclared, the measure can be biased. The most frequent methods are survey evidence and observation of other economic variables. In the case of survey evidence, the prevailing issue is that of concealment of the truth by the person answering the survey, even if anonymity is ensured. However, this issue can be overcome by using data collected for other purposes, such as the Family Expenditure Survey, in which citizens record their expenses and income in a diary. Data from those who have an income that cannot escape taxes is used to estimate the link between income and expenditure. Based on expenditure, with this method it is possible to infer the income of those who can avoid taxation. On the other hand, we can estimate evasion using economic indicators based on two approaches: direct input approach and monetary approach. With the former, we use an input to estimate what the output should be. An input often used for this scope is electricity. An example of this can be found in the paper by Pinotti (2015), in which he estimated the cost of criminality on society and used electricity to verify that the real aggregate economic activity was compatible with his estimates. This is because electricity is used for both official and shadow economic activity, thus representing the total economy. The monetary approach, on the other hand, estimates the unobserved economy by analysing the demand for cash in the economy. A similar approach was first suggested

by Cagan (1958) and then progressively refined. As described by Tanzi (1983), there are some possible variants to the monetary approach, all of them facing some criticism. Two of them are the fixed-ratio and the currency-denomination approach. The former relies on the assumptions that there is a ratio that would have remained the same with time, if one ignores the extent of the hidden economy, and that there was a base period in which no economic activity was hidden, which is the late 1930s for Guttman and either late 1930s or mid 1970s for Feige. Different reference ratios have been proposed by scholars. Guttman proposed C/D, that is circulating currency over demand deposits, whereas Feige estimates it as MV/GNP, in which the numerator is money supply times velocity and the denominator the gross national product. Fluctuations in these ratios are used to infer the shadow economy. On the other hand, the currency-denomination approach relies on the idea that some bills, especially those larger than \$100, are more used for shadow economy activities. Variations in the composition of currency holding are studied to evaluate the extent of the shadow economy. As reported by Tanzi (1983), the first method is criticised as there is no known reason why such ratios should be constant in time and estimates, both with Guttman's and Feige's ratios, are high. On the other hand, the fact that inflation may change the real value of banknotes and thus currency holdings composition is the reason why the currency-denomination approach is often criticised. However, starting from Tanzi's (1983) contribution, a currently widely used approach emerged: the Currency Demand Approach (CDA). As explained by Ardizzi et al (2011, p. 2): "The CDA measures the size of the shadow economy in two stages: 1) the econometric estimation of an aggregate money demand equation, with a specific component related to cash transactions in the underground sector; 2) the computation of the value of these shadow transactions via the quantity theory of money. The key assumptions for the first-stage estimation are that shadow transactions are settled in cash to avoid traceability, and that the main cause of the underground economy is a high tax burden."

1.2 Standard model

Before introducing behavioural considerations to the analysis of tax evasion, it is necessary to outline the standard model of tax evasion. This model was developed by Allingham and Sadmo (1972) and slightly modified by Yitzhaki (1974), whose contribution is to introduce a fine on the undeclared income as punishment for evasion. This model regards the evasion decision as a gamble.

The individual earns an income Y that is unobservable by the tax collector and known to the individual. The tax is levied according to a tax rate t, that we assume constant, on the declared income X, that is the only variable that the taxpayer can determine. The taxpayer faces a probability p of being audited and having to demonstrate its real income. If $X < Y$, they will have to pay a fine on the unpaid tax $t(Y - X)$ equal to $Ft(Y - X)$.

Thus, in the state of the world in which the taxpayer evades and is not caught their income is:
$$Y^{nc} = Y - tX$$

If they are indeed caught, they will have to pay the fine, thus:

(1) $$Y^c = (1 - t)Y - Ft(Y - X)$$

With $(1 - t)Y$ being the income after the tax is paid. The taxpayer is caught with a probability $0 \leq p \leq 1$, depending on the exogenously defined audit probability rate. As the taxpayer is rational, they will set X so that their individual expected utility is maximised. This is formally defined as:

(2) $$Max_{\{X\}} E[U(X)] = [1 - p]U(Y^{nc}) + pU(Y^c)$$

This result is a simplification of reality, as p may be unknown to the taxpayer and punishment may also be in a different form, as a jail sentence (Allingham and Sadmo, 1972). Nonetheless, the model still delivers adequate results.

At this stage, it is possible to plot a graph of the decision the taxpayer faces. Firstly, we will analyse the case of corner solutions:
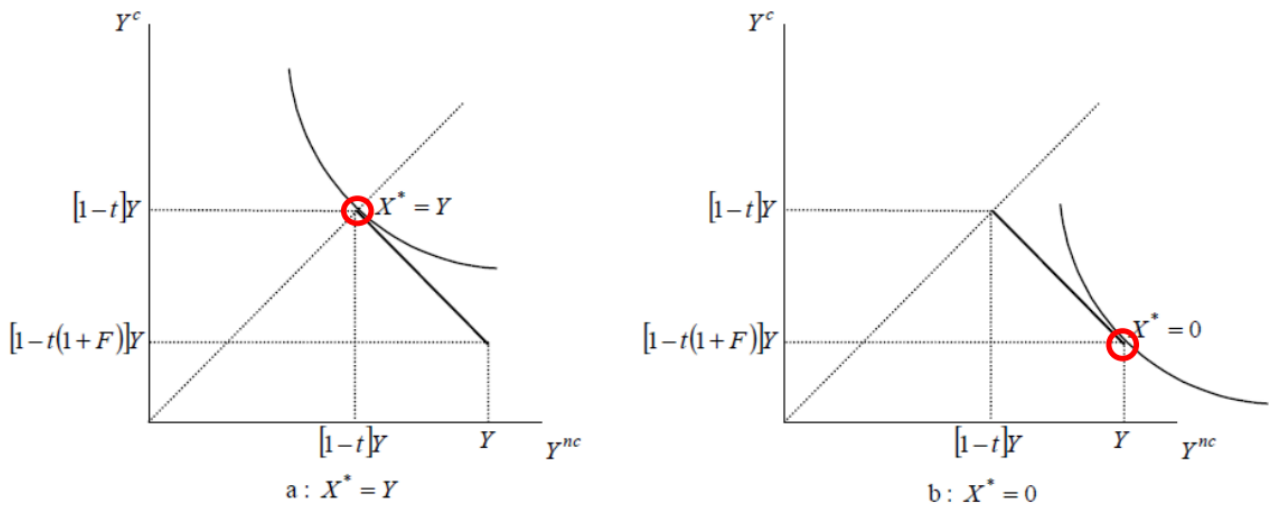
Figure 1.2a: Corner solutions in the standard model. On the left the case of no evasion $X = Y$, on the right that of full evasion $X = 0$.

Source: Hendriks and Myles (2013)

In this plot, the 45° line represents the cases in which there is no evasion, thus $X = Y, Y^c = Y^{nc}$. This is because, both if audit takes place or not, the income is unchanged. Specifically:
$$Y^c = Y^{nc} = (1 - t)Y$$

On the other hand, when $X = 0$, then the taxpayer decides not to declare anything. Here, the two states of the world differ:
$$Y^{nc} = Y$$
$$Y^c = (1 - t)Y - Ft(Y) = [1 - t(1 + F)]Y$$

In the case they are caught, they will need to pay the tax on their whole income, plus a fine on it. All other possible cases, namely the interior solutions, are within the two extremes of full compliance and full evasion. The indifference curves are upward sloping and the equilibrium declaration X^* is achieved in the point in which the budget constraint, the line from $X = Y$ to $X = 0$, is tangent to the indifference curve. In the case of interior solutions, $Y > X^* > 0$. Thus:
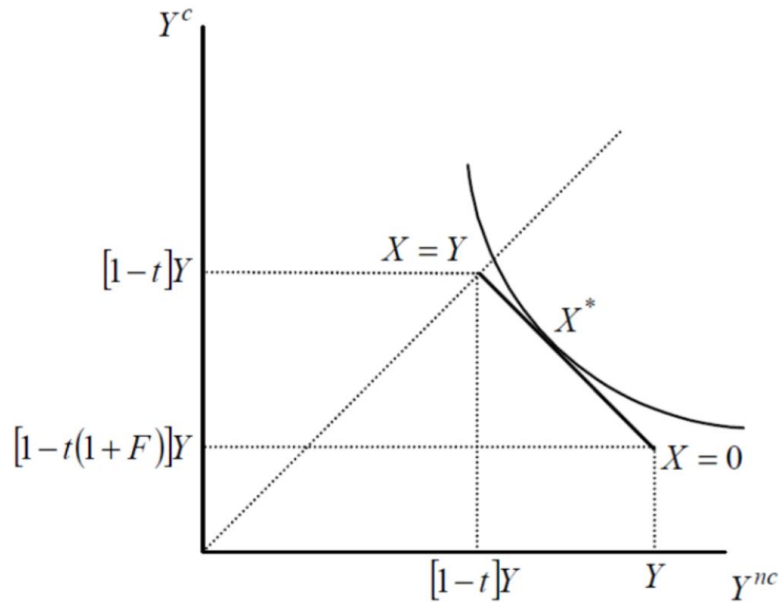
Figure 1.2b: The case of interior solutions.

Source: Hindriks and Myles (2013)

An important fact to notice is that there will be evasion anytime the indifference curves are steeper than the budget constraint at the $45°$ line. Thus, we can find the conditions for evasion to take place. This can be derived formally by total derivation of the expected utility function at the constant utility level. As before, expected utility is:

$$E(U(X)) = (1 - p)U(Y^{nc}) + pU(Y^c)$$

We totally differentiate it and set the result equal to 0 as we must stay in the same indifference curve:

$$(1 - p)U'(Y^{nc})dY^{nc} + pU'(Y^c)dY^c = 0$$

We can rewrite this as:

$$\frac{dY^c}{dY^{nc}} = -\frac{(1 - p)U'(Y^{nc})}{pU'(Y^c)}$$

Here, $U'(Y)$ is the marginal utility of the level of income Y. This defines the slope of the indifference curve. Importantly, at the $45°$ line the marginal utility of income is the same, as $Y^{nc} = Y^c$. This means that we can simplify the terms and find the slope of the indifference curve at the $45°$ line:

$$-\frac{(1 - p)\cancel{U'(Y^{nc})}}{p\cancel{U'(Y^c)}} = -\frac{1 - p}{p}$$

On the other hand, the slope of the budget constraint, which is the slope of the line passing through $X = Y$ and $X = 0$, is:

$$\frac{(1-t)Y - [1 - t(1+F)]Y}{(1-t)Y - Y} = \frac{\cancel{Y}}{\cancel{Y}} \frac{1 - t - (1 - t + F)}{1 - t - 1} = \frac{tF}{-t} = -F$$

As mentioned before, evasion will happen when the slope of the indifference curve at the 45° line is larger than the slope of the budget constraint. Which is:

(3a)
$$\frac{1-p}{p} > F$$

Or equivalently:

(3b)
$$p < \frac{1}{1+F}$$

This means that if the probability of audit is too low with respect to the fine, then evasion will occur. However, the model does not give any information on the extent of evasion and, as it exclusively depends on the value of F and p, it implies that if one taxpayer evades, then every single one should evade (Hashimzade et al., 2013). Moreover, the authors also highlight that, in the case of $F = 1$, which is consistent with penalties imposed in the real world, we would need $p > 0.5$ in order not to have evasion. Nonetheless, this value is not found in reality, but many people still decide not to evade. This inconsistency is one of the main critics to the model, but I will soon discuss some adjustments. A further critic to this model may be that it neglects the non-pecuniary elements of the decision to evade, as the reputation loss in case of detection. Allingham and Sadmo (1972) acknowledge this critical aspect of their model, thus extending it by adding a second variable s in the utility function, representing the variation in utility in case of detection. This variable takes a different value depending on the state of the world which materialises, which are: s_0 if not audited and s_1 if audited. The utility function becomes:

$$E\big(U(X)\big) = (1-p)U(Y^{nc}, s_0) + pU(Y^c, s_1)$$

As it will discussed in Chapter Two, there are plenty of extensions and theories based on the standard model.

1.3 Comparative statistics in the standard model.

Now that the standard model has been introduced, it is worth looking at the interaction between the variables and the effect of their changes. For this scope, I will use the standard model without the variable s, as this approximately gives the same results. Firstly, I will illustrate the effect of an increase in the probability of being audited p. The result of this is that the indifference curve becomes

flatter, as $\frac{1-p\prime}{p\prime} < \frac{1-p}{p}$. Intuitively, this shifts the tangent point between the indifference curve and the budget constraint closer to the 45° line. Graphically, as shown by Figure 1.3a:
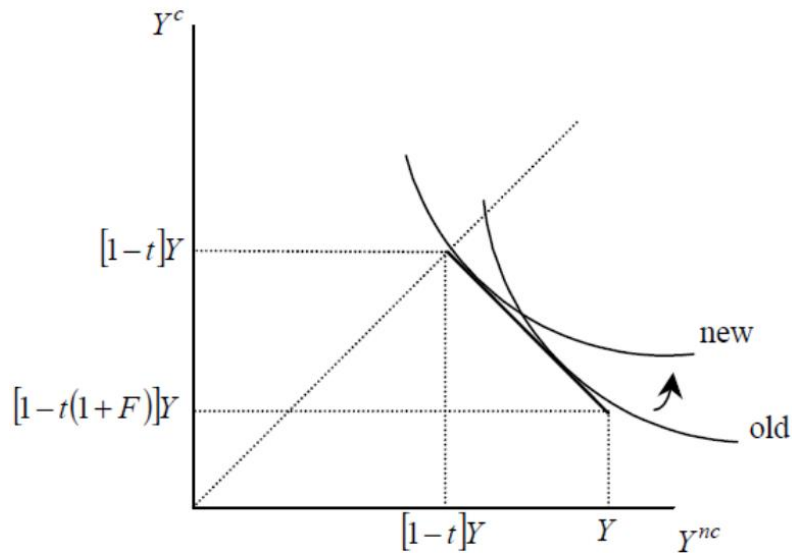
Figure 1.3a: The case of an increase in auditing probability p.

The second instance is that of an increase of the fine rate F. This makes the budget constraint steeper, since $-F\hat{} < -F$, as if the taxpayer was less rich for every amount of declared income X. Or, in other words, the value of income if caught Y^c is lower. As in the previous case, the declared income gets closer to the point $X = Y$. However, instead of a change in the slope of the indifference curve, which meant that the utility was unchanged, in this case taxpayers move to a lower indifference curve X^{new}, which makes them worse off. This is clearer if portrayed graphically:
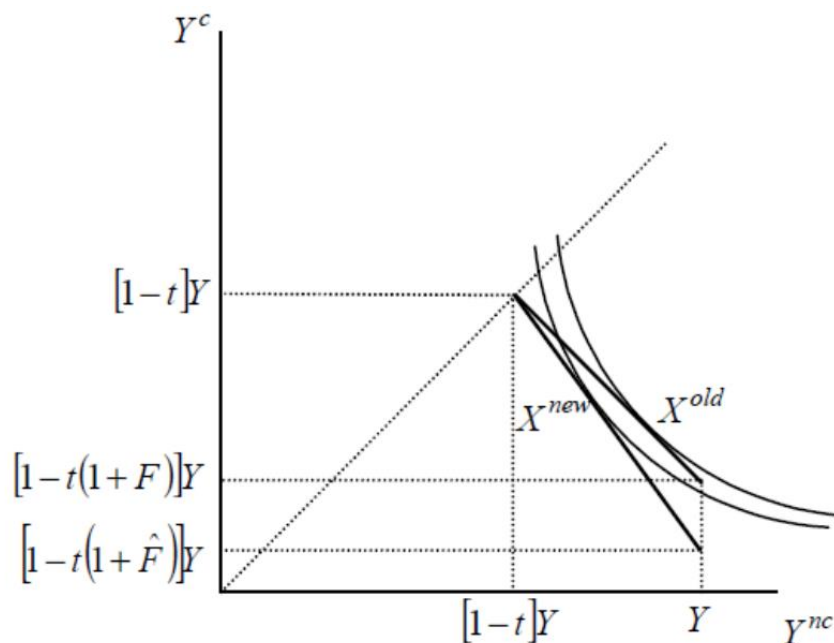
Figure 1.3b: The case of an increase of the fine rate F.

Another possibility is that of an increase in the income of the taxpayer from Y to $Y^\wedge$, which shifts the budget line outwards in a parallel way. Here, the effect is more ambiguous, as it depends on the absolute degree of risk aversion. The Arrow-Pratt measures of risk aversion are the absolute degree of risk aversion $R_A(Y)$ and the relative degree of risk aversion $R_R(Y)$. They are defined as:

$$R_A(Y) = -\frac{U''(Y)}{U'(Y)}$$

$$R_R(Y) = -\frac{U''(Y)Y}{U'(Y)}$$

The first one represents the real amount a person would hold in risky assets for a given level of wealth. The relative degree of risk aversion $R_R(Y)$ shows the percentage amount they would hold in risky assets associated with that income[5]. If $R_A(Y)$ is constant, then the optimum would move as Y changes in a line parallel to the 45° one. The concept of risk aversion, risk neutrality and risk loving will be relevant in the following behavioural analysis of tax evasion. In general terms, $R_A(Y)$ tends to decrease as income increases, which means that the certain compensation demanded while engaging in the risky activity will be lower. This means that wealthier individuals are more likely to bet and, as tax evasion is treated as a gamble within this model, also to evade. Based on this assumption, in the case of an increase in income Y the optimum point would gradually shift away from the 45° line. Similarly, if the taxpayer became more risk averse with an increase in income, then the opposite would take place. This can be graphically portrayed as follows. Assuming a constant $R_A(Y)$:

Figure 1.3c: The case of an increase in income Y or a decrease in tax rate t assuming $R_A(Y)$ constant.

The last case is that of a change in t. Supposing that the tax rate is decreased, there would be an outwards shift of the budget line analogous to that of an increase in income in figure 1.3c. Nonetheless, the actual effect on the optimum depends again on the absolute degree of risk aversion $R_A(Y)$. The behaviour similar to that of the previous case can explained by the fact that a lower t raises the income available. The counterintuitive concept is that, if $R_A(Y)$ is indeed decreasing, a higher tax rate t will reduce the undeclared income $Y - X$. This is because, as the taxpayer becomes poorer, they will also be less willing to evade.

1.4 Introduction to behavioural economics

The previous framework, as most economic models, is based on the assumption that individuals are fully rational and can access all pieces of information available and correctly analyse them based on their true preferences (Reisch and Zhao, 2017). These models are based on the existence of the *homo economicus* from neoclassical economics. Instead, behavioural economics believes that human decision making is affected by many other factors, including limited computational capacities and inconsistent preferences. As explained by Reisch and Zhao (2017), the aim of behavioural economics is that of methodically analyse consumer behaviour to produce a precise and predictable scheme of human behaviour in a specific context. The insights from the field can then be used to produce better policies that will be more precise and effective.

The integration of psychological insights into economic theory gradually began in the 1960s thanks to the American economist Herbert Simon, who introduced the concept of *"bounded rationality"*, opposed to the neoclassical principles. Bounded rationality expresses the concept of a decision-making process that is rational, but within the limits of computational and cognitive skills of humans (Simon, 1990). In other words, bounded rationality is still a rational setting, but decisions do not necessarily follow utility optimisation criteria (Selten, 2001). With time, behavioural economics contribution showed what these bounds of human rationality and the biases are. Furthermore, it has also shed a light on the impact that the context has on decision making behaviour. It will be shown that people, for instance, behave inconsistently when a discount is proposed based on the percentage of the discount on the total price of the product, or if the amount is a loss or a gain. In addition, a customer may buy a product only because it is a good deal and not because they actually maximise their utility function given their own preferences (Maison, 2019). *Homo sapiens*, opposed to *Homo economicus*, is predictably irrational. Decisions will be made following a few strategies and shortcuts depending on many variables, such as the complexity, the nature, and the framing of the problem

(Payne et al., 1993). There is a wide range of biases and heuristics that affect consumer decision making and that can clarify tax evasion patterns, as well as building stronger policies. I am going to analyse them in the next paragraph.

1.5 Relevant behavioural concepts and theories.

1.5.1 Prospect theory

One of the single most important concepts in behavioural economics is that of the *prospect theory*, developed by Kahneman and Tversky (1979). Here expected utility depends on a reference point and is differently shaped whether it is a loss or a gain. In opposition to this, the more classical utility function by Bernoulli is such that a given level of utility corresponds to a given level of wealth. However, before analysing the difference between the theories, it is necessary to take a step back. Imagine there are n outcomes that can happen, each with a probability p_n and yielding a wealth of x_n. What is important to understand at this point is how much an individual would be willing to pay to undertake this bet at a fair price: the *Expected monetary value (EMV)*. Thus, the Expected monetary value one would be willing to pay would be:

$$E(x) = p_1 x_1 + p_2 x_2 + \cdots + p_n x_n = \sum_{i=1}^{n} p_i x_i$$

One may believe that it is rational to try to maximise the EMV of the bet and prefer a bet yielding a higher EMV than the others, or being indifferent between two bets having the same EMV but different probability distribution or payoffs in the possible states of the world. Nonetheless, considering the idea of diminishing marginal utility, this becomes clearly incorrect. Jensen (1967) makes the example of the choice between two different bets, one causing an equally likely gain or loss of $ 100 and one allowing the participant to either win or lose $ 100,000 with equal probability. If we used the concept of Expected monetary value, we would deem the two bets equivalent, but it is quite intuitive that the effect of gaining (or losing) $ 100 is very different from that of receiving (or forgiving) $100,000. It is for this reason we should now refer to the Bernoulli utility function.

In 1738 Bernoulli argued that we cannot analyse a gamble considering its price, but we should instead focus on the utility that the transaction yields (Bernoulli, 1738). Bernoulli believes in the maximisation of an expected value, but what individuals should maximise is their utility, not the monetary value. Indeed, he claims that people should maximise the so-called "moral expectation". The Bernoulli utility function is[6]:

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[6] Except when noted, the elaboration of paragraph 1.5 so far is based on: Jensen, N. E. (1967).

$$E[U(X)] = p_1 u(x_1) + p_2 u(x_2) + \cdots + p_n u(x_n) = \sum_{i=1}^{n} p_i u(x_i)$$

When comparing two or more bets, a rational individual will maximise the expected utility from the bet. Before discussing an example, we can assume the utility function to be $U(X) = \sqrt{X}$, which is consistent with the need of a diminishing utility function. Of course, there are many possible utility functions, even convex in the case of risk lovers, depending also on individual preferences. If we consider two bets, one giving $200 for sure and one giving either $400 or $0 with the same probability ($p_1; p_2 = 0.5$), we see that EMV is the same, but the expected utility is different:

$$U(200) = \sqrt{200} = 14.14$$
$$E[U(x_2)] = 0.5 \times (\sqrt{400}) = 0.5 \times 20 = 10$$

This is because the marginal utility of the additional dollar received is decreasing. Evidence of this is that getting $400 gets a level of utility of 20, which is clearly not double the payoff of getting $200. In other words, even if we played this game repeatedly, we would get the same dollar amount, receiving $200 with certainty is better than being uncertain of getting either $400 or $0. We could even take this to the next level by using an example cited by Kahneman and Tversky (1979), in which the two bets have different EMV but the preferrable one would be the one with lower EMV: imagine the decision maker can choose between having $450 with certainty and having $1000 with a 50% chance.[7] Here, the Expected monetary value is:

$$EMV_1 = E(x_1) = 450$$
$$EMV_2 = E(x_2) = 0.5 \times 1,000 = 500$$

So, option 2 has the larger EMV, however:

$$E[U(x_1)] = \sqrt{450} = 21.21$$
$$E[U(x_2)] = 0.5 \times \sqrt{1,000} = 15.81$$

However, option 1 gives the larger expected utility. This is the rational benchmark I am going to start from, as it is the commonly regarded as the decision-making process people undertake.

It is now the time to introduce prospect theory, which was developed by Kahneman and Tversky (1979). The authors asked a broad range of problems to students and faculty in a college in Israel, specifying that they must imagine that they were facing that choice and that there is no correct answer. The problems each person was faced with were randomly selected, as well as the order. In some cases, left and right answers were also switched. They also posed some of the problems to members of the University of Stockholm and the University of Michigan and results were consistent with the ones

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[7] The example by Kahneman and Tversky was based on the Israeli currency and 1000 units of the currency are equal to 1/3 of the median net income of a family.

from Israel. Overall, they found some predictability in the behaviour of the respondents, whose answers often contradict each other but following a constant rationale.

The first inconsistency the authors present is the *certainty effect*, which implies that people overestimate occurring of unlikely events and underestimate almost certain ones. On a side note, a tentative intuition one may have is that this principle may apply also in a tax evasion context, for instance by undervaluing the possibility of an audit taking place. An example of this principle presented by the authors arises from this case: 72 people in Israel have been asked two problems.

Problem 1:	A: 2,500 with $p = 0.33$	B: 2,400 with certainty
A=48.83, B=48.99	2,400 with $p = 0.66$	
	0 with $p = 0.01$	
Problem 2:	C: 2,500 with $p = 0.33$	D: 2,400 with $p = 0.34$
C=16.5, D=16.66	0 with $p = 0.67$	0 with $p = 0.66$

On the left, I have computed the expected utility of the choice under Bernoulli utility function with $U(X) = \sqrt{X}$. We see that, within the two problems, the two options yield approximately the same utility. Nonetheless, results from the survey show that 82% choose B, but 83% choose C. The second problem is equal to the first problem, but a 66% chance of winning 2,400 is removed. Despite this, they found that 61% chose B and then C, which is against the expected utility theory. What happens is that people in problem 1 tend to overestimate the 1% of not getting anything, while ignoring that C comes with a 1% additional probability of receiving 0.

Secondly, they also noticed a pattern called *reflection effect*. Let's start by outlining two other problems (Number of respondents=95):

Problem 3:	A: 4,000 with $p = 0.8$	B: 3,000 with certainty
A=50.6, B=54.77		
Problem 4:	C: 4,000 with $p = 0.2$	D: 3,000 with $p = 0.25$
C=12.65, D=27.39		

Results show that 80% chooses B, but 65% then prefers C to D. This problem shows again the abovementioned evidence of the *certainty effect*. However, we are going to use this problem just to compare the negative of this prospect and its results. The negative prospects are:

Problem 3':	A': -4,000 with $p = 0.8$	B': -3,000 with certainty

Problem 4':   C': -4,000 with $p = 0.2$ D': -3,000 with $p = 0.25$

Here, 92% prefers A over B and 58% prefer D over C (but the latter is not significant at 1% significance level). While in the positive prospect the individuals tended to be risk averse, then preferring a sure gain to an uncertain one, here they are risk seeking, as they avoid losing a lower amount betting on the possibility of not losing anything. In both cases, an excessive emphasis on certain outcomes leads to excessive risk aversion in the positive case and excessive risk seeking in the negative one.

Considering these results, Tversky and Kahneman (1979) developed a new theory. *Prospect theory* consists of two functions: the value function and weighting function. The first large difference with Bernoulli function is that, while Bernoulli focuses on the absolute changes in wealth or welfare, prospect theory is concerned with the final status. Thus, prospect theory evaluates the changes with respect to a reference point, the current wealth. This is a principle that could be transposed to nonfinancial cases. For instance, the authors make the example of the reaction to a change in temperature: a surface may be perceived as cold or hot, but it is so only if compared to a starting condition one is used to. Moreover, the sensitivity to the change is diminishing: one could be able to distinguish a change of 3 °C to one of 6 °C, but it is not easy to perceive the difference between a change of 13 °C and 16 °C. A simple monetary example to explain the importance of the reference point is that one may be willing to walk 20 minutes to a record store to buy a CD if they offer a €5 discount on the original price of €15, but they will not be willing to walk 20 minutes to buy a washing machine discounted from €500 to €495.

The value function is then expected to be concave for gains, so above the reference point, and convex for losses, so below the reference point. Furthermore, it is believed to have another peculiar characteristic: it is steeper for losses than it is for gains. Indeed, Tversky and Kahneman found that people tend to refuse symmetric bets with equal probability of winning or losing the same amount: for instance, having a 50% chance of winning $200 and losing $200. Basically, people evaluate disutility from losing $200 larger than utility from gaining $200. People also tend to prefer bets having lower stakes to those having larger ones. The bet above would be preferred to one entailing a 50% chance of winning or losing $500, for instance. Summing up, the value function by Tversky and Kahneman (1979) should be meet these criteria:

1. Results must be evaluated based on the starting condition, the reference point.
2. Being concave for gains and convex for losses.
3. Being steeper for losses than for gains.

Taking all of this into consideration, this is a hypothetical value function by Tversky and Kahneman (1979):
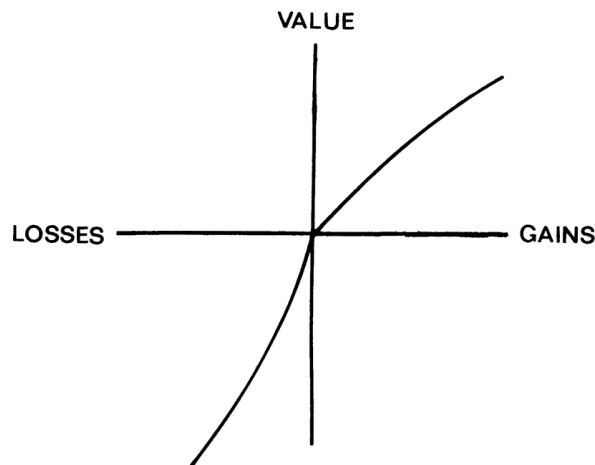
Figure 1.4a: A hypothetical value function.

In prospect theory, the value function is then multiplied by the weighting function. The weighting function is a decision weight that is different from actual probabilities. This problem, taken as all previous ones from Kahneman and Tversky (1979), will highlight some features of the function:

Problem 14:   A: Winning 5,000 with $p = 0.001$ B: Winning 5 with certainty

Problem 14':   C: Losing 5,000 with $p = 0.001$ D: Losing 5 with certainty

Results show that 72% will choose A, but then 83% will choose D. In problem 14, people seem to choose a lottery ticket over its expected value, while in 14' they prefer paying a kind of insurance instead of risking of losing a very large amount. The inconsistency, as shown by the graph by the authors, seems stronger at the extremes:
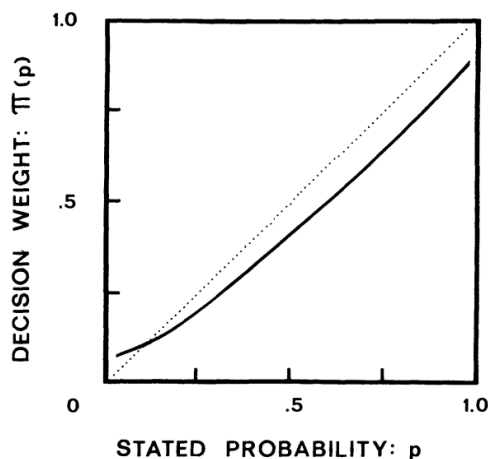
Figure 1.4b: A hypothetical weighting function.

In conclusion, prospect theory provides many insights on human decision making, which can also be applied to tax evasion. Most importantly, it stresses the importance of framing, which was previously considered not influential in economic theory. As claimed by Thaler (1985), the goal of prospect theory is that of predicting behaviour, not prescribing the optimal one.

1.5.2 Mental accounting

Those prescribed by Prospect theory are some of the fallacies in human decision-making behaviour. These deviations, according to Thaler (1980), should be regarded as the rule and not an anomaly in behaviour. Humans are predictably and systematically behaving in a given way due to the already mentioned "bounded rationality". Thaler (1985) starts from prospect theory to highlight the characteristics of the phenomenon of *mental accounting*. The first phase of his analysis consists in the evaluation of *acquisition utility* and *transaction utility*. The first shows the utility coming from the good based on its purchase price, whereas the second the supposed value of the transaction. These concepts relate to how individuals then evaluate expenses and transactions. As portrayed by the author in a couple of examples, people give a different value to a good depending on the context, not on the good itself. A person who must sell a ticket for a hockey match will be asking for a different price based on the original purchase price or context and on whether the buyer is a friend or a stranger. Similarly, imagine during a hot day at the beach a friend comes and offers a beer to a person. Depending on whether the beer was bought in a grocery store or at a five-star hotel, the person will be willing to pay a different amount, even though the good and its utility is the same.

Nonetheless, for our purpose the most relevant concept among those described by Tyler (1985) is that of multiple accounts. What Tyler (1985) found is that most people usually evaluate spending decisions based on the "local temporal budget constraint" and on categories. In other words, people consider if they have already spent a large amount in that timeframe (usually a month) and if they have incurred excessive expenses in that category. Then, if a person faces the proposal to go out for dinner, they will both consider if they spent too much in that period and if they already depleted the "entertainment" or "socialisation" accounts, as well as possibly both at the same time. Another example (Tyler, 1985) of this is the following: a couple went on a trip and caught a fish, which they wanted to take back home. However, the airline lost it and gave a $300 refund. Following this, they went to a fancy restaurant for dinner spending $225, more than they ever did. This is most likely due to the fact that money was coming from an "unexpected gains" account, but if the $300 increase in wealth was due to a higher wage, then likely they would have avoided the dinner. Usually, this process of division in accounts is done naturally, but some families implement a system in which money is physically held in different envelopes. Moreover, Soman and Zhao (2011) also found that division of

wage payment in different envelopes dedicated to a selection of purposes, such as healthcare or education, increases propensity to saving.

These tools, namely *prospect theory* and the concept of *mental accounting* will be useful to understand some behaviours in tax evasion and to design solutions, as it will be discussed in the next chapter.

Chapter Two: Applying behavioural insights to fight tax evasion.

2.1 Insights from tax evasion games.

When delving into the phenomenon of tax evasion one may be overwhelmed by the countless variables that can be added into the study and by their interaction, that often produces counterintuitive results. At times, studies may report different results, often contradictory, and this may inevitably cause a sense of puzzlement. For this reason, I have decided to start the analysis by looking into the results from the recent meta-analysis of 70 experiments on tax evasion by Alm and Malézieux (2021).

A meta-analysis, as defined by Glass (1976), is an analysis of analyses or, in other words, the integration of results of many different studies in one single research. Its benefit is that of summing up and systematise the findings, also considering the unexpected or outlying ones. Alm and Malézieux (2021) analyse 70 Tax Evasion Games (TEGs), laboratory experiments aimed at studying individual behaviour on tax evasion, that have been carried out in 40 years. Their work is based on more than 250,000 observations gathered from more than 16,000 subjects. The analysis is divided in the study of public policy variables, experimental design variables and individual level variables. A crucial distinction is made between the extensive margin, that is the share of taxpayers that declare their full income, and the intensive margin, the percentage of income declared by the taxpayers (Alm and Malézieux, 2021). To make use of notation from the standard model, the extensive margin may be portrayed as the percentage of taxpayers for which $X = Y$, whereas the intensive margin defines the declared income X over the income Y.

A critical result to keep in mind is that tax evasion in TEGs appears to be strongly characterised by a behaviour at the extremes. Considering all the observations from the 70 studies, results are that on average 45% fully comply and 19% fully evade, with only the 36% of declarations having intermediate values. Average compliance in the intensive margin, on the other hand, is estimated at 65% (Alm and Malézieux, 2021). Very similar results are found by Heinemann and Kocher (2013) in the case of a progressive tax system.

2.1.1 Public policy variables

Some examples of public policy variables may be the audit rate and rule, the tax system, and the fine rate, among others. Within the context of the standard model, the decision to declare income is based on the idea that the taxpayers are afraid to be caught and bet on the fact that they will not be discovered (Alm and Malézieux, 2021). This is not fundamentally different from what Becker (1968) argued. He considered the fact that compliance to the law is not to be assumed, and that public authorities need

to invest in methods to deter people from committing the crime and to detect the infringements. Therefore, he developed a model that suggests that there is an optimal level of enforcement that minimises lost income.

Another important feature of the standard model is that audits are random, thus the audit probability p is the same for each taxpayer, regardless of their declaration. Opposed to the random rule, there is an array of different endogenous models that change p based on various conditions. For instance, a rule may impose that if a taxpayer is caught evading, then its declarations in the past years or future years are scrutinised too or, alternatively, that any declaration below a given income is inspected (Malézieux, 2018). Contrary to intuition and findings of Malézieux (2018), results from Alm and Malézieux (2021) claim that having such endogenous systems has an ambiguous effect on compliance. Specifically, the effect on the extensive margin is that of decreasing the number of evaders, although it is not significant (p-value = 0.211), but it would also cause the intensive margin to increase, still not significantly at the 5% confidence level (p-value = 0.097). However, the authors forewarn that this result is likely to be dubious due to the small share of respondents that faced endogenous audit rules, that were of four different kinds, and in most cases the probability they faced was not specified. The possible endogenous audit rules are countless, but the four kinds used in the TEGs included in the meta-analysis were: *risk-based rule, cut-off rule, invest rule, and coordination rule*. The risk-based rule is described in Vossler and Gilpatric (2018) and consists of an audit probability p that depends on the estimated individual risk of evading of the taxpayer, that is a function of the reported income X and of the deductions declared. Secondly, the cut-off rule simply consists of the fact that declarations under a specific threshold have a larger chance of being analysed with respect to higher ones. This is explained by the fact that institutions know income distribution and know when a declaration is suspiciously low (Coricelli et al., 2014). The invest audit is explored by Hsu (2013), that proposes an audit rule in which the participants see the others' declarations and can invest some of the taxes paid to audit the others, as if it was an audit budget for the government. At this point, the audit probability for the group is a function of the amount raised. Finally, the coordination rule was analysed by many studies and therefore has different variants. Tan and Yim (2014) propose the so-called *"bounded rule"*, in which the authority only performs a given number of audits per period due to budget restrictions. Thus, they randomly audit all low declarations, or only some if the budget is not enough. In this context, there is an interaction between the taxpayers as the audit probability depends on the quantity of low declarations by other taxpayers. If one expects many others to evade significantly, then they will be more prone to evade and will evade more. Incorrect expectations are punished by either a fine or an amount that could have been evaded but was not. On

the other hand, Dai (2016) proposes a system in which there is a low audit probability to begin with. Then an audit takes place and if evasion is larger than expected a crackdown period starts. After that, a new audit takes place and audit probability adjusts to the new evasion level. This system is similar to what happens after a terrorist attack, that leads to a spike in police action and control, for instance.

Importantly, both at the experimental level and in real settings taxpayers do not know the audit probability. Theoretically, as noted by Alm (1988), uncertainty has negative consequences on decision making and financial planning, especially in the case of risk averse individuals, albeit the overall welfare effect is unclear. Vossler and Gilpatric (2018) claim that, at least from a theoretical standpoint, uncertainty hinders tax evasion as individuals tend to expect a larger punishment. In the case of experiments, also Choo et al. (2015) report no net effect of ambiguity on tax evasion. Likewise, Alm et al. (1992) performed a laboratory experiment that gave unclear results: when taxpayers perceive that they receive some public good in exchange for their contribution uncertainty shrinks compliance, while when they expect nothing in return it increases. Importantly, the initial compliance in the case of the public good is profoundly larger. A possible explanation the authors provide is that taxpayers know that in this case their declaration marginally affects the amount of public goods they would receive, and they can imagine that also the other members of society are facing the same incertitude, so they try to match their response. In Table 2.1 the results of the experiment by Alm et al. (1992):

	Mean	Standard Deviation
No Public Good, Base case	0.262	0.067
No PG, Fine uncertainty	0.374	0.082
No PG, Tax uncertainty	0.370	0.067
No PG, Detection uncertainty	0.481	0.087
Public Good, Base case	0.557	0.072
PG, Fine uncertainty	0.501	0.082
PG, Tax uncertainty	0.398	0.067
PG, Detection uncertainty	0.519	0.074

Table 2.1: Average compliance rate in the experiment (intensive margin).

Source: Alm et al. (1992)

As far as auditing is concerned, also the probability of being audited p is relevant. Among the public policy variables, the audit probability p seems to be the more consistent. Alm and Malézieux (2021) find that increasing p has a positive and significant effect on the extensive margin, so it makes more

taxpayers fully compliant. This is what also Blackwell (2010) and Malézieux (2018) found. Surprisingly, it also makes the intensive margin decrease. Alm and Malézieux (2021) believe that a possible reason for this result could be that some groups may have a more developed non-compliance attitude, such as the case of students, as also hypothesised by Choo (2015). The result that some groups tend to be less compliant is found also by Alm and Malézieux (2021): students have a positive but insignificant effect on the extensive margin (p-value = 0.143) and a negative effect on the intensive one, as students seem to declare 11% less taxes than non-students. Whereas age seems to have no effect on compliance, being a male has a negative and highly significant impact on both margins (p-value = 0.001). Nonetheless, due to the abovementioned considerations, the result that higher p decreases the intensive margin should be handled with care.

The audit probability p is also related to the fine rate F. Indeed, audit probability and fine rate interact in a positive way in the extensive margin and in a negative way in the intensive one, in both cases with a high significance (Alm and Malézieux, 2021). Nevertheless, the authors report that an increase in the fine rate F leads to effects in the same direction of those of audit probability p, but considerably smaller and, in the case of the intensive margin, also not significant (p-value = 0.359). Despite these considerations on their undecided effect on the intensive margin, both variables have a positive effect on compliance (Alm and Malézieux, 2021).

Furthermore, also the introduction of tax amnesty programs and the tax system are factors that, although not present in the standard model, should be analysed. As reported in their meta-analysis, Alm and Malézieux (2021) found that tax amnesty programs have a negative effect both on the extensive and the intensive margin, albeit the latter case is significant only at the 10% significance level (p-value = 0.070). Similarly, a flat tax system has a negative effect, but it is highly significant in both margins. Doerrenberg and Peichl (2013) assert that this may be due to the fact that individuals may be averse to inequality, especially in the less affluent classes, making tax morale and tax progressivity positively correlated. Based on their results, this effect would be positive for all taxpayers, although the utility from progressivity decreases with income. Heinemann and Kocher (2013) also find that a flat tax system decreases the amount of full compliers (for which $X = Y$) and intermediate declarations in favour of those that fully evade. Full compliers decrease from approximately 45% to 35%, whereas full evaders raise from less than 20% to around 35%. Overall, the transition from one system to the other causes winners and losers. The latter will be more likely to evade so that they gain back part of the amount lost and the former more compliant, as also found by Albarea et al. (2021). Both studies also remind of the importance of the reference point when

considering the impact of such transition, as taxpayers will evaluate the shift in policy comparing the *status quo ante* and the new system, not in absolute terms. Furthermore, they will consider changes according to the loss and gain domains portrayed by Kahneman and Tversky (1979). Results from Heinemann and Kocher (2013) also confirm that income augments the odds of the taxpayer preferring the flat tax system and they also suggest that honest taxpayers usually prefer the progressive one.

Finally, in the case of the tax rate t the standard model and results by Alm and Malézieux (2021) seemingly contradict each other. In the standard model, as described in section 1.2, the outcome of an increase in the tax rate is unsure as it depends on the individual absolute degree of risk aversion $R_A(Y)$. On the contrary, for the authors an increase in t leads to a highly significant decrease of the extensive margin (p-value < 0.001), whilst no net effect is found on the intensive one (p-value = 0.836).

2.1.2 Experimental and individual-level variables

Some more information can also be considered as far as experimental and individual-level variables are concerned. The first surprising but reassuring result by Alm and Malézieux (2021) is that framing the questions with tax related terms does not impact the results significantly, which supports the reliability of TEGs in discovering tax evasion patterns as they appear to be externally valid. Moreover, they also found that redistribution of taxes that yields a personal benefit has a highly significant impact on both margins. This effect is even stronger when they know that taxes will be redistributed to third entities (ie. No profit organisations, students, or research funds). Regarding individual-level variables, age has a small positive effect on compliance that is significant only at the 5% level, whereas being a male has a negative and highly significant effect on both the intensive and extensive margin. Importantly, income seems to decrease the extensive margin, but no net effect is found on the intensive one.

2.2 Description of some possible behavioural determinants of tax evasion.

Now that the single variables have been analysed in an experimental context that reflects more closely their role in a real setting, it is the time to look at some possible behavioural considerations that may be useful to understand tax evasion conduct. Indeed, social environment and tax morale, as well as concepts deriving from consumer behaviour, such as framing and mental accounting, all have a place in the context of tax evasion. Crucially, these factors are of great help in explaining why some countries face higher evasion even if they have similar parameters.

2.2.1 The role of shame and guilt

As already mentioned in section 2.1, the standard model and most of the experiments are usually based on the economics of crime approach that claims that individuals pay their taxes only out of fear of getting caught. However, until now such fear was mostly due to an economic reasoning linked to the fines one would receive, the audit probability and risk aversion. For instance, a taxpayer may decide to comply because they prefer a certain amount to the risky payoff they would get if they evaded. Coricelli et al. (2010) highlight that often in such model the cost of cheating is simply the difference between what the evader could have got and what they are left with after having been caught. Moral considerations on the social responsibility of paying taxes, as well as a non-economic form of penalty when caught evading always remained in the background. Conversely, literature on this topic is quite rich. Specifically, there are two dimensions to focus on. On the one hand, individuals may feel anxious about the consequences of being caught on their social status, although also positive emotions may be involved. On the other hand, they may also value the feeling of being lawful and compliant with their civil duties.

Coricelli et al. (2010) conducted an interesting experiment on 1440 subjects in which they were able to establish emotions of respondents by measuring Skin Conductance Response (SCR), a form of electrodermal activity, based on Bradley (2000)[8]. The values of SCR are paired with a self-reported measure of arousal in order to study the emotions felt by respondents while participating to the experiment. Results by Coricelli et al. (2010) portray that the full evasion decision takes more time than the full compliance one but less than intermediate compliance. Importantly, they also found that many individuals experience arousal, that is positively correlated with the amount evaded, which is probably due to the higher share of income that they can keep to themselves. A similar measure is that of *hedonic valence*, that measures the way in which emotions are charged and their strength. Low valence means negative emotions, high valence positive ones (Vazard, 2022). Not surprisingly, evaders report a lower hedonic valence when faced with an audit with respect to a complier. However, each group reaction is also strongly affected by some kind of resentment due to missed evader detection or relief thanks to avoided losses. In fact, non-audited evaders show very low valence when they have been audited and high valence when they have not been, as they know that they successfully

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[8] Skin conductance activity increases when individuals are exposed to elements that elicit emotions. The sources and the emotions may be in many forms. Skin conductance is useful because its value is quite consistent across kinds of stimuli. Bradley (2000) carried out an extensive work in defining emotions and hinted that SCR could be a good instrument to measure them, thanks to its consistency. For this reason, Coricelli et al. (2010) decided to use it to investigate the emotional aspects of tax evasion, together with the self-reported declaration of arousal.

evaded. Similarly, compliers demonstrate higher pleasure when they are audited, since they know that they avoided being caught thanks to their behaviour.

On the other hand, Jacquemet et al. (2020) investigate on lying in the context of tax evasion focusing on the role of declarations under oath. They also study the relationship between compliance and response time, confirming the same conclusion of Coricelli et al. (2010) and noticing that oath does not alter answer time. Nonetheless, Jacquemet et al. (2020) argue that oath has a large and significant influence on overall compliance. Oath does not affect much the full evaders, but deeply changes the behaviour of individuals that comply only partially. The authors' hypothesis is that intermediate individuals do not have a clear-cut idea on whether to evade and spend much time in evaluating the trade-off, but when oath is introduced, it makes them lean towards full compliance. Indeed, whereas full evasion remains pretty much unchanged at around 10%, full compliance shifts from 15% to approximately 40%, considering the results of their repeated experiment. Finally, they also portray the decision of the possible groups of individuals:
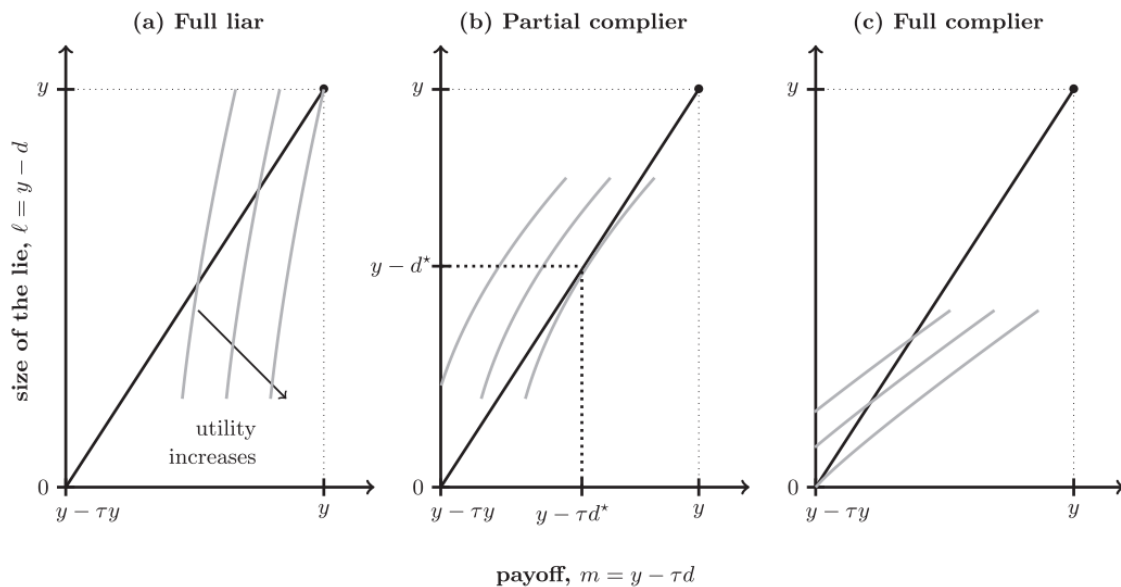
Figure 2.2: Optimal compliance for the three taxpayer groups.
Source: Jacquemet et al. (2020)

In this model m is the final payoff, y is the income, τ is the tax rate, d is the income declared and l is the size of the lie, whose cost is increasing. Utility, on the other hand, is given by:

$$U(m, l) = m - c(l)$$

This would be consistent with the abovementioned hypothesis that the partial evaders do not have a strong preference, so they declare something in between.

Looking at Jacquemet et al. (2020) it seems that there are three kinds of taxpayers that, although they all face similar conditions, have an inherently different behaviour. This idea is also analysed in Antoci et al. (2014), in which they relax the implicit assumption of a single *homo economicus* taxpayer that is used in the standard model to analyse the peculiar features of each kind of taxpayer. These types coexist in society and their distribution varies in time. Antoci et al. (2014) find three different kinds of taxpayers: cheaters, honest taxpayers, and punishers. Cheaters are selfish free riders that engage actively in hiding their real income. On the other hand, honest taxpayers and punishers are both non-selfish, but they are not the same. Honest taxpayers are moved by some higher moral rule and always declare their full income regardless of any opportunity to cheat. The authors compare them with some Kantian entity that embodies the categorical imperative. This implies, in other words, an absolute pursuit of universal moral laws.[9] Finally, punishers share similar features to those of honest taxpayers but are also willing to act to impede others to evade, which can be done by informing the authorities of others' evasion or by social stigma. Punishers are also willing to incur extra costs to do so. Antoci et al. (2014) apply these categories to evolutionary games, whose theoretical findings are that type heterogeneity in population has a non-negligible impact and that the *homo economicus* approach, that overlooks tax morale considerations, cannot predict long run evolution of evasion trends. Specifically, what the authors argue is that the social interaction between the different types of taxpayers has a deep effect on tax evasion behaviour that also depends on what groups form the society and their prevalence within it. For instance, when the society is made of cheaters and honest citizens only evasion will likely continue indefinitely as no incentive to comply is given to cheaters. Thus, the long-run equilibrium will either be a coexistence of the two groups or a full evasion one. The authors call honest taxpayers "second-order evaders", as they do not oppose to tax evasion. To the contrary, they believe that in a society with a sufficient number of punishers, then tax evasion can be eradicated, as with time cheaters face increasingly strong tax morale. However, Dufwenberg and Nordblom (2018) remind that the state should not count on guilt to reduce evasion, since a decrease in audits due to the expected guilt would simultaneously decrease guilt and make evasion more likely.

In this context, another contribution is that by Masclet et al. (2019), that studied whistle-blower programs to fight tax evasion, that are instances in which the government promises a prize to those

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[9] Intriguingly, Laffont (1975) too was theorising so-called "Kantian economics", that were aimed at overcoming the idea of a *homo economicus* whose goal was just to maximise utility. Laffont (1975) studied contexts in which a large population is better off by coordinating positive collective behaviour.

that signal that another person may be evading. These programs have been made in many countries, including Italy. The authors performed an experiment in which individuals must report their income, that is randomly chosen by the computer, and they are taxed 40%. The government does not know the true income but can audit it at a cost and the audit is random, but likelihood is endogenously dependent on how high the declaration is. At a later stage, taxpayers get to see the declared income of three other members and can decide whether to audit them or not, but they receive no reward (as the authors wanted to check whether complying with the law was enough to stimulate peer-review). Individuals may decide to review out of willingness to make sure that the others follow the law and out of fairness, so that when declarations are low, they want to punish the other member. Results show that both are sufficient reasons, that individuals want to audit the others with little hesitation and that peer-review significantly affects compliance rate. However, authors warn that results must be interpreted with care due to ethical and feasibility issues for a large-scale implementation of a similar instrument.

2.2.2 Discriminative stimuli and social norms

The extensive discussion of discriminative stimuli that will follow may seem unrelated to tax evasion. However, I decided to include it because I believe that the introduction of similar experiments to tax evasion would be beneficial and further research should be done on this topic. For instance, one could argue that disorder may affect well-being and reduce the willingness to comply to the law and pay taxes or, similarly, that corruption at the government level or overall low institutional quality may affect compliance. Nonetheless, some applications of these principles in a tax evasion context will be provided in section 2.4.

Within the subject of consumer behaviour, the idea of supervision is linked to that of discriminative stimuli. Discriminative stimuli are signals that communicate reinforcement or punishment for a given action, so that they affect the probability of the occurrence of an event.[10] An example of this is found on Bateson et al. (2006): in the canteen of the University of Newcastle there is a tea and coffee machine whose products can be paid via an honesty box. During the research period an instruction sign including price of tea, coffee and milk was added and this sign had a picture of either flowers or eyes alternated each week. At the end of each week the amount collected was compared with milk usage. The authors found that in the weeks in which the eye sign was displayed contribution was significantly larger as students felt that they were being observed. The eye picture, in this case, is a

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[10] For further information and example on discriminative stimuli please check:
https://www.sciencedirect.com/topics/medicine-and-dentistry/discriminative-stimulus

discriminative stimulus. A few years later, Ernest-Jones et al. (2011) replicated this experiment adding to the picture of flowers and eyes a text that could be congruent to the activity, namely taking the tray in the correct place in a canteen, and incongruent. Again, eye pictures lead to stronger response and even congruency contributed sharply. A similar feature was also experimented in the abovementioned study by Coricelli et al. (2010), where a picture of the respondent is displayed if they are caught evading. Clearly, the fact that a picture was displayed caused evasion to decrease.

Another relevant concept linked to discriminative stimuli is that of social norms, implicit rules regulating expected behaviour in social contexts.[11] In psychology their importance is often discussed, as some believe that they are fundamental to understand human behaviour and other claim they are too broad and relative. The truth most likely stays in the middle, as precise definitions are required for social norms to be effective. Norms can be injunctive (or prescriptive) and descriptive (or popular). The first define what the others believe is right to do, the second what other people do (Cialdrini et al., 1990). Some experiments to study the effect of social norms on society have been carried out. Two important ones are those by Cialdrini et al. (1990) and Keizer et al. (2008), that studied the effect of living in an already dirty environment on littering. Cialdrini et al. (1990) performed more than one experiment to rule out biases specific to those circumstances. For instance, in one of them they gave a handbill to people passing by in an amusement park and observed if and when they threw them to the ground depending on the number of handbills already on the floor. As far as the descriptive norm is concerned, they found that littering is indeed more frequent in already littered environments and, moreover, the more salient littering is, the more sharply it increases. This is true also for exceptionally clean environments, in which littering is rare. In other words, the individuals tend to keep track of the environment and conform to its norms. However, there may be some that observe the littering behaviour and distance themselves from it, thus refusing to litter. Thus, the two effects may oppose each other.

Similarly, injunctive norms were also evaluated. To do so, they prepared handbills with different prescriptions on them that were progressively distant from the prescribed behaviour. As predicted, the prescription (the injunctive norm) had a significant effect: flies with "Don't litter" written on top were littered 10% of the time, those with recycling indications 15%, those with energy saving suggestions 18% and those advertising a museum, the control, 25% of the time. Such injunctive norms seem to be the ones that change most extensively human behaviour. They also recognise a third kind

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[11] Info on norms here: https://simplysociology.com/social-norms-examples.html

of norm, that they call personal norm and is what a person thinks of his own behaviour, but applications are more limited (Cialdini et al., 1990). Overall, these results are also supported by the so-called "Broken Windows Theory" (BWT), that claims that if there is a broken window or any other sign of abandonment, such as graffiti, this leads to a sense of anarchy that creates more crime. In a sense, crime is an epidemic that spreads in function of the features of the environment (Gladwell, 2000). Further experiments on the subject were made by Keizer et al. (2008). They observed the behaviour of people in an alley in Groningen, in the Netherlands, that was used as a parking place for bicycles. In this alley there was a clearly visible red sign prescribing "no graffiti" that was seen by all participants to the experiment. The researchers put a generic "Happy holidays" fly from an invented sportswear shop in every bicycle and they counted how many people littered when the walls were clean and when graffiti were drawn on them. Consistently with predictions, there was a large and significant effect: 69% littered in the disorder condition, 33% in the normal one. The authors believe that, theoretically, this may be also due to the fact that in the antecedents of the littering decision one may be choosing between the immediate hedonic benefit of getting rid of the fly and the willingness to behave properly. The fact that in the same conditions other people littered may indicate that it is the right thing to do. Finally, in another experiment they found additional evidence that supports the effect of the specific environmental cues on behaviour: they put a visible £5 bill in a package hanging outside a mailbox. Whether the package had graffiti on it or not and whether litter was outside the mailbox influenced the percentage of people that decided to steal the package: 13% stole it in the basic condition, 25% in the littering one and 27% in the graffiti condition. Keizer et al. (2008) concluded that evidence of violated norms leads to tendency not to conform to other rules too. Because of this, policymakers should act timely to stop spreading of negative behaviour.

2.2.3 Tax morale

As developed so far, there is evidence of the influence of some individual non-monetary considerations on the decision to evade, such as guilt and anxiety before and after audits and supervision. Moreover, contributions such as Antoci et al. (2014) focus on the feature of a given social context as a whole, whose peculiar characteristics have an effect on the individual behaviour. For this reason, I am going to delve into the role of the social environment and country-level economic feature to study their impact on tax evasion. Lipatov (2014) studies the impact of social environment on unlawful actions in general and asserts that popularity of a behaviour is taken into account when considering the individual behaviour, which in a way further reinforces the popularity. In the case of infringements of traffic rules an individual may be aware of other citizens' compliance and maybe also of possible punishments and, based on this, they decide how much to evade. This is linked to the

idea of social learning, that consists in the fact that individuals may decide how to behave based on past experiences of other members of society.

Finally, as anticipated in section 2.1 when discussing Doerrenberg and Peichl (2013), also inequality affects tax evasion decisions and can be introduced within the area of tax morale. People decide whether and how much to evade considering their perception of the fairness of the State, evaluating both the use the State makes of tax revenue and the equality between classes of taxpayers (Argentiero et al., 2021). Moreover, taxpayers also consider whether they receive back less than what they pay, the so-called *exchange inequality* (Bloomquist, 2003). Secondly, horizontal and vertical inequality both have an impact. Horizontal inequality arises when two taxpayers with equal characteristics pay different amounts, while vertical inequality concerns the fact that wealthier individuals should pay a larger amount. In addition, Deszo et al. (2022) find another element that links inequality and the behavioural effects that will be soon discussed. They studied the effect of wage inequality on tax evasion and found that when an individual loses part of its wage due to random processes it does not affect compliance. However, when one is victim of deliberate wrongdoings of another entity that cause wage to decrease, then tax evasion sharply increases.

2.2.4 Framing and mental accounting within tax evasion

The last part of this section will be devoted to the effect that two behavioural theories have on tax evasion, namely framing and mental accounting, that were extensively discussed in section 1.5. Fochmann and Wolf (2019) carried out a lab experiment to evaluate whether framing can influence tax evasion by facing respondents with two decisions, one in which they must declare the income they earned and pay taxes accordingly and one in which they declare expenses and get the corresponding tax refund. The researchers found that evasion is more pronounced when individuals declare a positive income rather than when they declare expenses, credits, or losses. They explain this with the idea that individuals see the negative and the positive cases as two distinct scenarios that abide to different rules. In the case of positive income, individuals feel that they are giving away some money that they have already earned. On the other hand, when declaring a deduction, they perceive the declaration as something that gives them extra money, making them more prone to accept to gain only what they are supposed to. Thus, according to these results deductions would be an instrument less subject to evasion with respect to more classical declarations of income. This could be considered when designing tax policy. Moreover, these results are consistent with prospect theory (Kahneman and Tversky, 1979), that prescribes that people are more risk averse in the case of gains rather than of losses. In this context, the deduction situation is seen as a gain as it provides an additional money

flow, whereas the payment of a tax takes away some wealth that was already earned. More specifically, although this view is not explicitly portrayed by Fochmann and Wolf (2019), this behaviour can be explained by the *endowment effect*. The endowment effect derives from the reference-dependent approach brought by prospect theory. It derives from the idea that people tend to give larger value to products they already own than to an identical good they do not own yet or, analogously, they evaluate more income they earned through work or sacrifice than money they received without any effort (Achtypi et al., 2021). The endowment effect is also linked to mental accounting, as it consists in mentally adding income in two different accounts depending on how they were earned. A recent study by Dhami et al. (2023) delved into the role of the endowment effect and mental accounting in tax evasion with an experiment. They made two contrasting hypotheses about the way in which endowments are transmitted to tax evasion: they propose larger loss aversion for earned income and they believe that evasion of earned income implies lower moral costs. Clearly, the two effects are conflicting. Dhami et al. (2023) could not get sound results on this issue due to conflicting interactions between risk preferences in the case of source-dependent income, but they observed the importance of mental accounting in tax evasion-related questions.

2.3 Fiscal policies to fight tax evasion.

Until now, I have introduced a range of experimental results from TEGs including both monetary and behavioural considerations. Insights on how such elements can affect tax evasion have been provided, but it is still important to look into the literature to find some possible solutions that take into account some of these considerations. Some, namely those concerning fiscal policy and optimality of the variables of the model, will be discussed in this section. Others, those more oriented towards behavioural components and experiments will be left to section 2.4.

In section 2.1 the results of the meta-analysis by Alm and Malézieux (2021) helped in identifying some key insights into tax behaviour that went beyond the theorical considerations of the standard model. Not every finding can be transformed into policy in a straightforward way since in most cases a trade-off is involved, for instance between improvements only in the extensive or intensive margin. Still, they identify three variables that seemingly have a clear reinforcing effect on tax evasion, which are the tax rate t, tax amnesty and a flat tax system. Tax amnesty affects the evasion decision as the perspective of not being punished after being caught is an incentive to evasion. On the other hand, a flat tax system hinders equality and ultimately tax morale, thus decreasing compliance. Moreover, the tax rate t should be optimally established since an excessive burden makes more people evade,

although no net effect was found on overall compliance. Arguably, policymakers should pay attention to such findings to develop more efficient policies.

Overall, policymakers should encompass information to find optimal policies that deliver the maximum tax revenues, while keeping costs for the government into account (ie. Audit costs). A possible policy in this sense is that of imposing very low auditing probability p, to minimise costs, and impose extremely high fines. This, however, may likely backfire and negatively affect the intensive margin, as anticipated in section 2.1. Such approach is also seemingly unfeasible since it is politically unsustainable, and it would also create hostility between taxpayers and tax collectors. Kirchler (2007) delves into this issue and argues that this can have a crucial influence on compliance and tax morale. Indeed, he claims that it would be beneficial to overcome a "cops and robbers" approach in favour of a more cooperative "service and client" scenario. This would provide an incentive for citizens to voluntarily comply and allow the government to better communicate the scope and the reasoning behind the policies they implement. The possible validity of such idea is indirectly corroborated by a study by Adriaenssens and Hendrickx (2015). They used data from the European Social Survey,[12] organised by the European Commission, that includes a self-reported tax evasion survey in all EU countries. They found that the trust between citizens and the government indeed weakens tax evasion behaviour, consistently with theory and previous research.

2.4 Non-fiscal instruments to fight tax evasion.

The last section of chapter Two will be devoted to some experiments and concepts that could be exploited to increase compliance, mostly using behavioural concepts. Some instruments can be implicitly drawn from considerations in previous sections, but in those cases no literature that applies them to real life experiments was found. However, the experiments that were indeed conducted bring many useful insights. The main ones are field experiments conducted in the UK by Hallsworth et al. (2017) in partnership with two government agencies: the British Tax Collection Authority (HMRC) and the UK cabinet office's Behavioural Insight Team. Contrary to most of research on tax evasion, this one focuses on timely payment instead of declarations. In this case, data for the research is already implied in the outstanding tax amount that must be paid, in the timing of the letter and receipt in the case the payment is made.

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[12] More information on the ESS can be found here: The European Social Survey | CROS (europa.eu)

The two reasons that may cause a taxpayer not to pay taxes on time are liquidity constraints and procrastination, the focus of this analysis being the taxpayers in the latter condition, as liquidity constrained individuals cannot react to the messages in any way. The research will try to nudge individuals into paying taxes rapidly by increasing moral costs by means of norms and public-good messages. In the first of the two experiments 100,000 taxpayers were randomly given one out of five messages, namely:

1) "Nine out of ten people pay their tax on time" **(basic norm)**

2) "Nine out of ten people in the UK pay their tax on time" **(country norm)**

3) "Nine out of ten people in the UK pay their tax on time. You are currently in the very small minority of people who have not paid us yet" **(minority norm)**

4) "Paying tax means we all gain from vital public services like the NHS, roads, and schools" **(gain)**

5) "Not paying tax means we all lose out on vital public services like the NHS, roads, and schools" **(loss)**

1, 2, and 3 are different variants of the norm, while 4 and 5 are public-good messages that also evaluate the prospect theory previously discussed. In the case of the control approximately 35% of the recipients paid taxes within the 23 days considered in the experiment. Other values are to be interpreted as percentage increases with the respect to the control, the simple reminder letter. Moreover, results of this phase show that the basic norm increases payments in 23 days by 1.3% and the country norm by 2.1%, with the minority norm yielding a substantial increase in payments (5.1%). Both public-good norms lead to a 1.6%, so losses and gains framing may have no effect. Notwithstanding that, another kind of framing appears to be decisive here. Looking at 2 and 3 there is a large gap in the experiment results, but the only difference is the identification of the taxpayer within the small minority that did not pay it. This is because such mistake of the taxpayer is explicitly noted and then they perceive it closer to them. This can be explained using the construal-level theory by Trope and Liberman (2010), that claims that people construct hypothesis on the unknown, such as other people's feeling or the future, to predict what is going to happen. This process is, however, mediated using oneself as the reference point and the degree of proximity with the circumstances is key. Going back to the experiment, this means that the more the individual feels attached to the message, the more they will be likely to act and pay (Hallsworth et al., 2017). Thanks to the experiment, the authors estimated that £3 million were raised within the sample in 23 days and if the minority norm was applied to every letter a further £11 million would have been raised.

Following the success of this experiment the same entities made another research together one year later to expand findings from experiment One, involving 119,527 people. This experiment also included descriptive and injunctive norms, as well as financial messages expressing additional information (i.e., the possible means of payment). To set up a truthful injunctive norm the researchers carried out a survey asking to 1,200 British citizens whether they agreed that people should pay their taxes on time and eighty-eight percent responded that they should.

In this second experiment thirteen different messages were sent, which can be grouped in three categories: six testing the psychological distance from the norm, five testing injunctive norms and two with financial information. By design, some would receive the letters before the others. The norms testing psychological distance varied in geography and debt amount.

1) "The great majority of people in the UK pay their tax on time." (Adaptation of the basic norm from experiment One, General descriptive)
2) "The great majority of people in your local area pay their tax on time." (Local descriptive)
3) "Most people with a debt like yours have paid it by now." (Debt descriptive)
4) "The great majority of people in your local area pay their tax on time. Most people with a debt like yours have paid it by now." (Geography and debt specific)
5) "You are currently in the very small minority of people who have not paid us yet" (Minority status)
6) "Nine out of ten people in the UK pay their tax on time. You are currently in the very small minority of people who have not paid us yet." (Minority norm from experiment One)
7) "Everyone in the UK should pay their tax on time." (Moral duty)
8) "The great majority of people agree that everyone in the UK should pay their tax on time." (General injunctive norm)
9) "Nine out of ten people agree that everyone in the UK should pay their tax on time." (Fraction injunctive norm)
10) "88% of people agree that everyone in the UK should pay their tax on time." (Percentage injunctive norm)
11) "Nine out of ten people agree that everyone in the UK should pay their tax on time. And nine out of ten people do pay on time." (Injunctive and descriptive norm)
12) "You can pay by debit card, credit card, or Direct Debit. You can also pay using internet and telephone banking. For more information on how to pay, go to

www.hmrc.gov.uk/payinghmrc. If you don't believe that this payment is overdue, please contact us on the number above. " (Additional information)[13]

13)"We are charging you interest on this amount" (Interests)

As in the first experiment control letters without any message are sent. They lead to a 11.8% increase in payments after 8 days and 33.6% after 23 days. As far as the injunctive norms are concerned, the general injunctive norm (8) has very low effect whereas moral duty (7) 2.2%. Interestingly, the fraction injunctive norm (9) has a 1.7% effect, that is significantly lower than the 3.4% of the percentage injunctive norm (10). This may be explained by the idea that precise numbers indicate higher precision and knowledge of the matter, whereas a more general phrasing can be perceived as cluelessness (Backus et al., 2015). In the case of descriptive norms, (1) and (2) imply respectively a 1.4% and 2.2% increase but their difference is not significant. (3) yields a 3% increase whereas (4), the sum of the local and debt norm, by 5%, as if (2) and (3) summed their effects. On the other hand, (5) and (6) cause a 4.2% and 4.7% effect. Finally, the financial messages (12) and (13) cause respectively a 3.2% and 3.9% increase. From this, one can infer that financial norms increase payments, as also the injunctive and descriptive norms do. The latter has a larger effect than the injunctive ones, which is the opposite of what Cialdini et al. (1990) claimed.
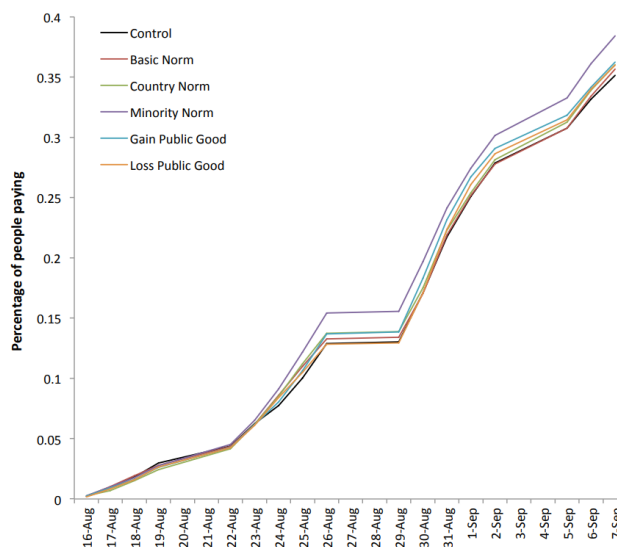
Figure 2.4a: Percentage of people paying after having received the letter in the various groups.
Source: Hallsworth et al. (2014)

A few years later a similar experiment was carried out in Norway by Kristina et al. (2020). In April the Norwegian Tax Administration (NTA) sends a precompiled tax form about taxes of the previous

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[13] Hallesworth et al. (2014) claim that 12 and 13 have been introduced considering the "service and client" approach mentioned in section 2.2 and put forward by Kirchler (2007).

fiscal year (2011 in this case). Then, citizens must input other information if something is missing within the end of April. If information is already correct no further action is needed. Usually, all domestic information is already included but, historically, foreign incomes are not. However, in recent years foreign authorities have increasingly started to share information about Norwegian citizens, so NTA could compare self-reported values with actual ones. In 2012 they found that among the 40,000 declarations received 18,000 had a declared amount inferior to the actual one by a sum between $350 and $35,000. Thus, full compliance was approximately 55%.

All 15,000 members of the sampled received the usual form in Week 14 of 2013 and those in the treatment groups received a letter on how to declare foreign income one week later. They estimated that letters were read by 65% of the sample population. Citizens had to report their income by the end of week 18. They were randomly put in either the control group, that received no letter, or one of the three treatment groups. The base group received a letter claiming that the tax system is becoming more international, that citizens are required to pay taxes also on foreign income and explaining how to declare such income. The moral group could receive either a fairness treatment ("The great majority report information about their income and assets in Norway correctly and completely. In order to treat all taxpayers fairly, it is therefore important that foreign income and foreign assets are reported in the same manner.") and a societal benefit treatment ("Your tax payment contributes to the funding of publicly financed services in education, health and other important sectors of society."). The first one is based on the fact that in Norway most income is declared via third-party reporting and 70% of taxpayers does not modify the precompiled form. The second one was aimed at eliciting a feeling of reciprocity and closeness to the norm. Other two treatments focused on this public-good approach by demonstrating possible uses for taxes, such as education or healthcare and were coupled with either the base letter or the social benefit letter. Finally, in the detection letter the first sentence of the base letter "The Norwegian economy is becoming more internationalised, and an increasing number of Norwegian taxpayers receive income and have assets abroad," is substituted with "The tax administration has received information that you have had income and/or assets abroad in previous years.". The goal of this letter is making the taxpayer perceive a higher likelihood of being audited, but a significant effect is not obvious, as one may believe that NTA does not know of all income or that it is just a baseless treat.

Treatment	Description
No letter	Did not receive a letter
Base	General information letter
Fairness	Base letter + the following sentence added to the first paragraph: "The great majority report information about their income and assets in Norway correctly and completely. In order to treat all taxpayers fairly, it is therefore important that foreign income and foreign assets are reported in the same manner."
Societal benefits	Base letter + the following sentence added to the first paragraph: "Your tax payment contributes to the funding of publicly financed services in education, health and other important sectors of society." Two additional treatments included an attachment visualizing public services financed through taxes (without the base letter/in combination with the base letter).
Detection	Base letter, but the first sentence ("The Norwegian economy is becoming more internationalized and an increasing number of Norwegian taxpayers receive income and have assets abroad") is replaced by the following sentence: "The tax administration has received information that you in previous years have had income and/or assets abroad."

Figure 2.4b: Description of the possible treatments received.

Source: Kristina et al. (2020)
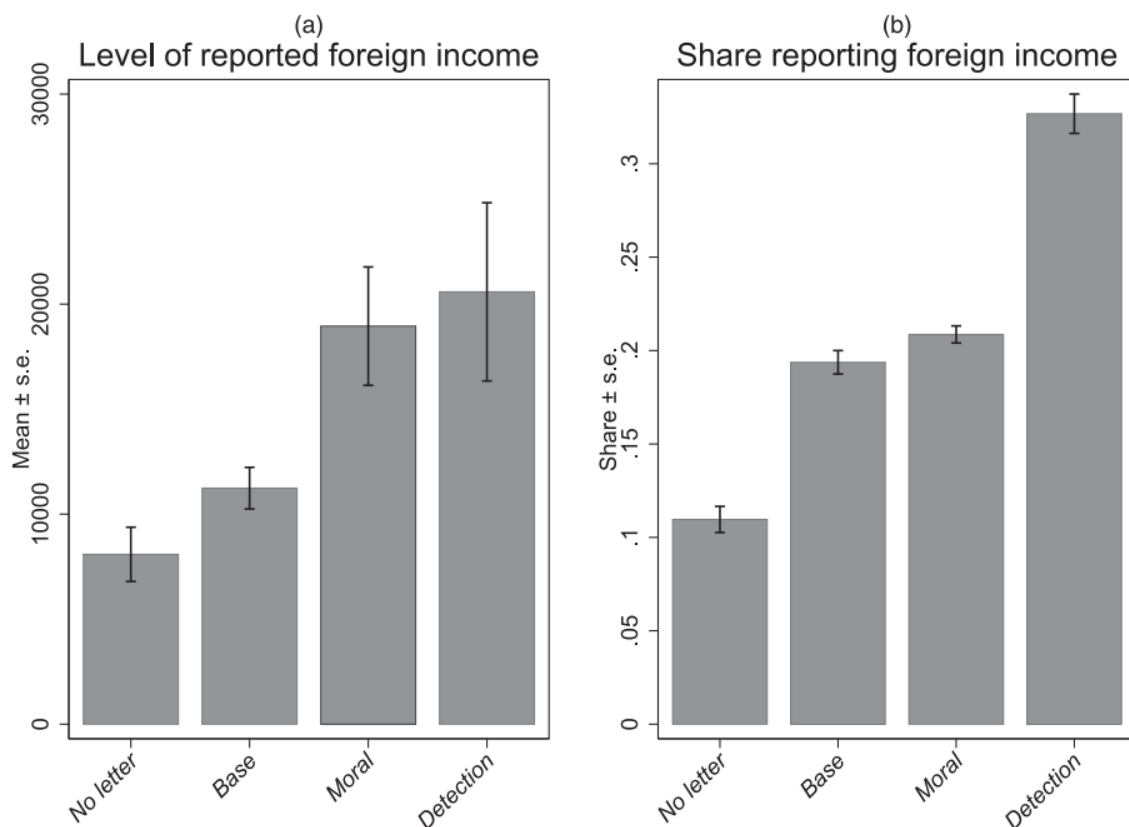
Figure 2.4c: On the left, mean amount declared in NOK (1000 NOK=$ 122 as of 14/07/2017)

On the right, data from the extensive margin.

Source: Kristina et al. (2020)

The results from this experiment are that receiving the letter has a positive but non-significant (p-value = 0.113) effect on declarations. Secondly, all treatments have a positive and significant effect, the stronger being the detection treatment. Moral treatments are expected to have such a large effect because Norway has a strong norm on taxes, but results would likely be less positive in other countries. Moreover, the letters have different effects on the extensive margin: the detection ones have a large and significant effect, whereas the moral ones have no effect, and this is true both in the

short and in the long run. On the contrary, moral ones only affect the intensive margin, but only in the short run. Since the moral and detection have different effects, the authors argue that it would be interesting for future research to study the interaction of the two approaches.[14] Overall, this experiment, as well as the one by Hallsworth et al. (2017), show that there is a great potential in using similar instruments to nudge individuals into being more compliant, both by means of a more truthful declaration and more timely payments. The strength of such approaches is that their cost is virtually zero and their efficacy quite sound. In the Norwegian case, the experiment allowed for an extra $21 million to be collected, in the British one $12 million, but the cost of the is measure extremely low.

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[14] All the information about the Norwegian experiment is taken from Kristina et al. (2020)

Chapter Three: Further topics and policy applications

3.1 Evasion of other taxes

Until now, this thesis has focused on the study of tax evasion relative to the income tax. However, clearly there many other taxes that can be evaded, such as payroll taxes and Value Added Taxes (VAT), that will be the focus of this section.

VAT evasion can take multiple forms. For instance, business may be avoiding making receipts and keeping transactions in two different books, one for themselves and one for the tax authority. Alternatively, one can declare larger deductions than the real value or engage in the so-called Carousel fraud (Schenk et al., 2015). Moreover, some may also fictionally import a good from another state to receive a deduction (Hangáčová and Strémy, 2018).

Among the VAT frauds the most famous one is the Carousel fraud, or Missing Trader Intra-Community (MTIC) fraud. This costs European tax revenue authorities 50 billion Euros per year. It makes use of the fact that intra-EU transactions are VAT free, as the VAT must only be paid by the final seller in that given Member state. However, in some Carousel fraud cases the final seller asks for the tax value to the intermediate one but does not declare the transaction to tax authorities. This fraud happens frequently in high-value sectors, such as electronics (Europol).[15] This scheme requires some conditions: "the supplied goods have to be taxable, the transport of goods has to be completed at the Country of the destination, the supply and purchase of goods have to be performed as a part of economic activity and the buyer and the seller have to be registered as taxable persons." (Hangáčová and Strémy, 2018. Pp. 3). This is how the scheme works: there is company 1 in country A selling a good to company 2 in country B. Company 2 should pay VAT in country 2, but they wait the tax declaration submission deadline to pay the tax. Then, company 2 sells the good, that includes VAT, within country B to company 3 and then company 2 disappears. At this point, company 3 sells the good to country C and company 3 has the right to get a deduction. At the end, 3 sells the good back to company 1 and the cycle starts again. This resulted in the fact that company 1 asked a deduction to State A, 2 had to pay VAT to country B but then disappeared, 3 asked for a VAT deduction to State B. State B had to reimburse VAT without ever getting it and A granted the deduction, losing a possible revenue. All of this can even happen without any physical good being supplied. Sometimes an empty truck is sent just to demonstrate that shipping happened, or sometimes goods transported have virtually zero value. This activity gives a good reward as the entities get the deductions from the

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[15] More information at this link: https://www.europol.europa.eu/crime-areas-and-statistics/crime-areas/economic-crime/mtic-missing-trader-intra-community-fraud#:~:text=In%20simple%20MTIC%20cases%2C%20fraudsters,typically%20known%20as%20carousel%20frauds.

States and is hard to detect, as it is quite complex, and it takes an extensive period to complete. To make detection harder, they may involve more Member States. Moreover, sometimes even legitimate businesses take part in it without knowing it (Hangáčová and Strémy, 2018).

The VAT gap, the difference between the VAT amount that should have been collected if every activity was properly taxed (VTTL) and the real revenue, is studied yearly by the European Commission in a publication that discuss its evolution in recent times. The last available estimate, that for the year 2020, is of €91 billion or 9.1% of VTTL. However, this value likely suffers from some bias due to the decrease of VAT rates in some countries due to the Covid-19 pandemic and the fact that some aids provided during the pandemic were conditional on having paid taxes. In comparison, in 2019 it was of €132 billion or 11% of VTTL (European Commission, 2022). However, consistently with what happens with tax evasion in general, this value is also inconsistent between countries. At the EU level, there are some countries that have a low gap: Sweden (3.3%), Finland (3.6%) The Netherlands (6.9%), Hungary (9.8%), Portugal (8.2%), Latvia (7.2%), Germany (9%), Cyprus (5.9%). Conversely, others have very high values: Lithuania (20.8%), Italy (21.8%), Malta (26%), Romania (35.5%). This lost revenue implies a loss of enormous quantity of public funds (i.e., €31 billion for Italy, €14 billion for France). (Source: European Commission, 2022. Data is for 2019).

On the other hand, payroll tax evasion involves mixed, formal, and informal employment and the choice between part-time and full-time work (Commander et al., 2013). Unfortunately, elaborating a thorough discussion on the matter has proven to be difficult due to scarce publications on the matter. Still, there is the possibility to make some considerations.

Commander et al. (2013) developed a model on this topic. In the model there are three firms: the private informal firms that pay no tax but can be fined with probability p, State-owned or recently liberalised firms and, formal privately owned firms. Firms may also give benefits in addition to the wage. Workers can work either part-time and full-time and combine formal and informal jobs, thus there is also a mixed sector. State-owned firms aim at maximising both wages and employment but are no-profit, whereas private ones maximise profits. The fact that companies also offer benefits implies that a worker may decide to keep working in a company although he would get a higher wage in a mixed scenario or, alternatively, they may prefer multiple jobs to acquire the different benefits offered by each employer. Importantly, a large flow of people from the formal sector to the mixed one involves a decrease in employment in the informal sector and damages the informal workers. On the other hand, also social benefits and shifts in aggregate demand change equilibrium. Finally, an increase in detection probability p increases formal work and full-time employment in public firms.

Results they got from a panel with 6,000 individuals are usually consistent with the model. As hinted before, non-monetary benefits increase likelihood that a person may have multiple jobs, but this requires the wages to be high enough overall. Moreover, subsidies tend to increase formal employment and higher formal wage increase both formal and informal employment, but strongly affects the mixed one. Notwithstanding that, it must be highlighted that data is relative to Ukraine in 2003 and 2004 and their validity in other contexts must not be taken for granted (Commander et al., 2013).

		Proportion of government-subsidized social benefits	Number of government-subsidized social benefits	Total employment in state-owned firms	Rate of payroll tax	Probability of detecting non-payment of payroll tax	Output price, for state-owned firms
Employment is in terms of number of workers		S	b	M	τ	φ	p
Full-time employment in state-owned firms	N_f^S	+	−	+	−	+	+
Full-time employment in the informal sector	N_f^I	+	−	−	+	−	+
Part-time employment in the informal sector	N_p^I	−	+	+	+	−	−
Full-time employment in private formal firms	N_f^F	+	−	−	−	+	+
Part-time employment in private formal firms	N_p^F	−	+	+	−	+	−

Figure 3.1: Signs of the relationship between variables.
Source: Commander et al. (2013)

3.2 The role of electronic payments in VAT evasion.

As discussed in section 3.1, VAT evasion is a costly problem in many EU countries and especially in Italy. For this reason, the Italian government often introduces measures to tackle this phenomenon, although they change quickly depending on the political groups in charge. For instance, they frequently alter the maximum amount that can be paid in cash in a transaction between two different entities. On the January 1st, 2023, it was modified for the tenth time in 23 years and was set to €5,000 instead of the €2,000 previously in place, that was bound to become €1,000 if this new law was not enacted. The stricter limit has been that of €1,000 from December 6th, 2011, to December 31st, 2015. Above that amount one must pay with traceable methods, such as electronic payments. Fines are enforced on both the seller and the buyer. Only other 11 EU countries have such measure, with variable amounts, such as €500 of Greece, €1,000 of Spain, Sweden, and Finland or €10,000 of Malta and Czech Republic and €15,000 of Croatia (Confcommercio, (2022); Il Sole 24 Ore, (2022)).[16]

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[16] Source: https://www.ilsole24ore.com/art/tetto-contante-5mila-euro-come-pagare-evitare-sanzioni-AEQ3W9RC?refresh_ce ; https://www.confcommercio.it/-/tetto-contante

According to an analysis about the decision to increase the threshold in 2016 made by Giammatteo et al. (2022), such measure is effective in decreasing VAT evasion. Specifically, they estimated this 2016 increase to have led to 0.5% higher VAT evasion. Moreover, they also estimated that using cash on 1% more transactions increases VAT evasion by a value between 0.8% and 1.8%.

Similarly, in the last few years it was made mandatory for shops to accept electronic payments when a customer explicitly claims that he wants to pay by card. Starting from 30th June 2022, this was mandatory for any amount, but then the current government claimed that wanted to establish that acceptance was mandatory only above €60. At the moment the rule is that acceptance is mandatory for any amount and the fine is of €30 plus the 4% of the transaction value. (Confcommercio, 2022).[17]

Electronic payments, being traceable, are potentially a good instrument. Indeed, there is a negative correlation between VAT evasion and payments made by card. However, the extent at which cards are available is not the key factor, as the existence of cards also fosters the use of ATMs, that make evasion easier, as they are used to withdraw cash. Thus, a solution may be that of providing incentives on card transactions, but they also propose the indirect solution of improving broadband connection to make e-commerce more accessible (Immordino and Russo, 2018). Others also suggest that, as in the case of income tax evasion, tax morale may affect compliance. For this reason, they claim that also trust in the government plays a role in VAT evasion, as customers are enforcers of the law since they can request for a receipt and for the transaction to be registered. Moreover, VAT evasion may be accepted or even desired by the consumer as the seller may offer them a discount if the payment is in cash, especially in the case of small businesses. (Kim et al., 2022). Some scholars also studied whether trends in VAT evasion can be explained by consumer preferences for cash or card.

Traditionally, money is considered a mean of payment, an accounting unit, and a storage of value. The last scope is particularly important in this sense, as some believe that people may keep money as a protection from crises or bank failures and this may explain why people may prefer cash. Moreover, some studies suggest that using cards involves different behavioural consequences than cash (Bruno and Faggini, 2022). For instance, spending money is linked to a mental representation of banknotes. When an electronic payment is made the act of paying is decoupled from the purchase and this makes the person feel as if they spent less (Soman, 1998). Overall, it can be argued that increasing electronic payments may be a powerful instrument against VAT evasion. For this reason, some measures have been introduced recently in Italy, but also in other countries: receipt lotteries and cashback.

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[17] https://www.confcommercio.it/-/pos-obbligatorio

Receipt lotteries have been recently used in many countries to counter VAT evasion. The reasoning behind them is that such initiative may be provide an incentive for the individual to demand the receipt, making him an enforcement agent (Wilks et al., 2019). They have been implemented in China starting from 2012 and Wan (2021) argues that their effect has been positive as they incentive voluntary declaration. Similar projects were carried out also in Malta in 1997 (the first country in Europe), Romania and Slovakia, among others, but also in South America. Some countries, such as Peru and Mexico implemented similar measures using respectively tax rebates and coupons for electronic appliances (Giarrizzo, 2012). Moreover, they have been implemented also in Italy and Portugal.

Wilks et al. (2019) discuss the Portuguese case. During the financial crisis of 2009 Portugal, following Greece and Ireland, was bailed out. The government needed to raise taxes and imposed an increase of 3.5% on income taxes and of 2% on VAT. In the meantime, policies aimed at reinforcing compliance were introduced: at first, they imposed the communication of a personal number while receiving the receipt, but this was opposed by the citizens, that started protesting and mockingly provided the numbers of government members. In 2014 the receipt lottery was introduced: citizens would need to provide a personal number when making a transaction and this would create an amount of lottery tickets proportional to the expense made. This entailed weekly broadcasted lotteries that first entailed winning a car and after a few years a monetary prize of €35,000 extracted once a week and €50,000 prize every six months. This led to a 36% increase in receipts transmitted to tax authorities in one year and of 52% in two years. Likewise, starting from January 2020 in Italy a similar mechanism was introduced and is still in place now. Its costs are low and most likely recouped by the higher tax revenue generated (Banfi, 2019). However, Banfi (2019) notes that from a rational point of view the individual would still be worse off by non-evading and asking for the receipt, as the minimum point that would make them indifferent is where they get approximately the taxes they pay back.

Furthermore, the Italian government also introduced another measure, that of the Cashback. The Cashback was introduced on December 8th 2020 and was supposed to last three semesters, until June 30th 2022. However, it was cancelled one year before, after only one semester of operations. The Cashback consisted in the possibility of receiving back 10% of the expenses made with electronic payments with a maximum of €15 cashback for transactions of €150 or more, with a personal maximum of €150 cashback per semester, plus further €150 in the December 2020 trial period.

Moreover, it also involved a €1,500 prize for the top 100,000 users that made the most transactions during each semester, the so-called "Super Cashback".[18] Overall, this measure was frequently opposed by many scholars and entities on many grounds and the Super Cashback was subject to fraud due to people purposefully making small transactions to obtain a better ranking position. One of the reasons for this, is that the measure was in place also for transactions made in supermarkets, that always give customer their receipt. This also allowed a cash-oriented person to always pay with electronic methods in large shops and continue using cash in local ones, maybe also continuing the evasion behaviour (Ingrao and Lupi, 2021). Notwithstanding that, some also argue that the Cashback could be an incentive to use the local shops instead of online platforms (Pistone, 2021). Moreover, the Cashback is also very costly. Ingrao and Lupi (2021) estimate €1,5 billion per semester with 10 million Italians participating. Another consideration made, one that is more subtle and somewhat ethical, is that paying taxes should be considered a civil duty for citizens. The fact that the government itself provides some kind of incentive to encourage compliance shifts tax payments from a duty to a more material exchange (Wilks, 2019).

3.3 A natural experiment on electoral response to policies against tax evasion.

So far, this thesis has tried to illustrate some insights and policies to fight tax evasion, considering both the manipulation of model variables and behavioural instruments. Nonetheless, the responsibility for their implementation lies on the policymakers and, as tax evasion is often a politically charged topic, their role is non negligible. The creation of such policies is a complex matter and requires the joint interest of many political entities and institutions. For this reason, I decided to include a study on this matter that was carried out in Italy by Casaburi and Troiano (2016). Specifically, they study the impact of anti-evasion programs on re-election possibilities, that are a factor of interest for political policymakers.

The study focuses on the effects of the *Ghost Buildings program* that aimed at discovering unregistered buildings in Italy using technology. Often, policies against tax evasion are desired by the large part of the population but opposed by tax evaders, that are usually the minority. This is because, clearly, compliers benefit from similar policies. However, the punishment evaders face is larger than the benefit for compliers, which creates an asymmetric setting that contributes to make the stance of policymakers unclear.

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[18] Further information on Cashback: https://io.italia.it/cashback/guida/

The program was introduced in 2007 with the aim of discovering buildings absent from the land registry and consequently not taxed. The program relied on the comparison between aerial pictures and land registry maps and a later redaction of a list of all the ghost buildings. In the aftermaths of the program, 40% of the buildings have been registered by 2011, yielding more than €450 million in taxes per year, that were in large part received by the local government (65%). This is, on average, €530 per year per owner of ghost buildings. One standard deviation in ghost buildings enforcement leads to 3% more tax revenue. They found many interesting results. Firstly, towns with wide diffusion of ghost buildings appear to be less politically competitive (e.g., there less candidates running for elections and electoral results tend to be less close). Secondly, the overall impact of the program is larger in areas in which tax evasion is less accepted. Finally, the towns in which citizens receive more public goods in return for their taxes have a stronger electoral response.

The theoretical framework used involves heterogenous taxpayers that have different motivations on whether to evade or not. Evaders tend to pay taxes only if detection is sufficiently likely and the likelihood is influenced by the policies enacted by the government, but this is not always observable by the taxpayer. The policies influence welfare in two opposite ways: evaders lose income due to enforcement and society in general derives benefit from larger availability of public funds. This affects evaders as they may still get some benefit from stricter policies, but also non-evaders, that are better off thanks to strict policies. Furthermore, non-evaders get also an intrinsic non-monetary benefit from evasion detection, similarly to the case of punishers in Antoci et al. (2014) discussed in section 2.2. Other results are that in less densely populated areas ghost buildings are more frequent, likely because it is easier to hide them. In cities where the mayor is young, male, educated, and is born in that town more people tend to register the building. This is consistent with data that claims that better policymakers, assuming that more educated politicians are better, tend to be stricter on tax evasion, that citizens react more to male politicians and that when the mayor is born in that city, they can enforce rules better as they have more information on inhabitants and their relatives would be badly affected by negative policies.

As far as the electoral results are concerned, an interesting finding is that before the ghost building there was no correlation between tax evasion and electoral trends, but then it becomes positive. Secondly, a standard deviation increase in enforcement is linked to a 1.8% decrease in the candidate number, to a 4.1% increase in probability of running for an additional term, to a 3.4% increase in the lead gap, and reduces risk of a second ballot by 18%, in the towns with population larger than 15,000.

Moreover, re-election probability improves by 11.3% as result of a standard deviation increase in building registration.

Nonetheless, the authors also provide some alternative explanation to consider. First, many buildings were old and almost all of them were built before the current term. Thus, non-evaders were the only ones that were not aware of evasion. Finally, they warn that external validity of the results may not be granted in the case of other countries or taxes.[19]

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[19] The entire section 3.3 is based on Casaburi and Troiano (2016).

Concluding remarks

In this thesis, I have looked at the academic literature to find some determinants of tax evasion behaviour and some instruments to fight it. Tax evasion is complex and most of the determinants are associated with some uncertainty concerning their magnitude and direction. This is even more true when comparing the theoretical perspective and the results from lab experiment, although even studies sometimes contradict one another. In this sense, the meta-analysis by Alm and Malézieux (2021) has been a very useful instrument to sum up what the effects appear to be on average. Sometimes, difficulties arise also because behavioural insights often rely on medicine and psychology rather than on economics.

Nonetheless, it was still possible to find some consistent and powerful insight. First, it is clear that tax evasion is sharply shaped by considerations that are distant from rational economic reasoning. Taxpayers are influenced by framing, by mental constructs such as mental accounting, and by society and its norms. Tax compliance also depends on the composition of society and on the interaction between its members, as a large share of punishers and whistle blowers is seemingly needed to bring society towards compliance. Moreover, the use that the government makes of tax revenue and the compliance of other citizens affects tax morale and ultimately their desire to comply. Notwithstanding these behavioural arguments, that are central to this paper, the economic variables are also important. In this sense, the audit probability p and the fine rate F both seem to be positively linked to compliance, although the former has a stronger effect. Moreover, tax amnesties and a flat tax rate both seem to significantly strengthen tax evasion behaviour. Other issues, such as the tax rate t and endogenous audit rules, most likely need to be analysed more closely to overcome any form of uncertainty.

The other aim of this thesis, that of finding instruments that can be used to fight tax evasion, also provided some interesting suggestions. Most came from the behavioural side rather than from the most traditional one. For instance, the experiment by Hallsworth et al. (2017), as well as that by Kristina et al. (2020), provided a very useful example of the impact that simple and inexpensive policies can have and experiments could be easily replicated by other policymakers too. Furthermore, in section 2.2 some behavioural topics such as discriminative stimuli and social norms were discussed and, if applied to tax evasion, they could likely be the basis for effective policies. In this sense, it seems that there is plenty of room for further studies to be carried out, especially in the behavioural domain and its applications to policies against tax evasion.

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