"Do you want a receipt?"

Combating VAT and RST evasion with lottery tickets

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Governments both in developed and developing countries are facing the problem of value added tax (VAT) and retail sales tax (RST) evasion. This explains a growing interest in policies alternative to the traditional methods of deterrence. This paper describes the achievements resulting from a zero cost policy against VAT and RST evasion based on rewards. Customers are encouraged to request an invoice by changing the invoice into a lottery ticket, thereby making VAT and RST fraud and evasion more difficult for suppliers. Such a policy has, for example, been introduced in some Asian countries. After having characterized VAT and RST evasion as a special kind of public good situation, a theoretical explanation based on behavioral Economics models of the success empirically registered by this policy will be discussed. Given this theoretical framework, we then introduce an empirical test in order to verify the ex-ante applicability of the policy described in different socio-economic contexts. Finally we discuss the possible countervailing effects as well as the positive long-term side-effects of the introduction of the policy.

1. Introduction

'When I asked the decorator how much it would cost to paint my house, his answer was: "Do you want a receipt?".' This conversation, overheard during a Dutch birthday party, is an everyday example of an attempt to evade value added tax (VAT).[3] The decorator would probably ask for a lower fee for painting the house without an invoice as, in that case, he would not charge VAT. An invoice enables tax authorities to carry out controls. Invoices are, therefore, very important in preventing tax evasion and the illegal non-payment or under-payment of taxes. Most VAT and retail sales tax (RST) systems, therefore, include the obligation to issue an invoice.[4] However, this obligation is not always enough to ensure that invoices are actually issued, even if it is accompanied by sanctions in case of non-compliance.

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[3] In a column in a Dutch newspaper a similar conversation was published: ' "Do you need the receipt?" Everybody who hires odd-job companies knows this question. As I have just bought my own house, I was not that experienced and asked "The receipt…eh…well…why?" The decorator answered "Well, without one I can give you a good price".' Christiaan Weijts, Fraudeursdromen, NRC Handelsblad 23 October 2012.

[4] For example, article 220 of the Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax as amended later (hereinafter: VAT-Directive).

In addition to imposing sanctions on businesses that do not issue invoices, governments can give an incentive to customers to request an invoice and thus obliging suppliers to comply. In this paper we discuss a specific kind of reward complementary to sanctions and audits to combat evasion of RST and VAT: turning the invoice into a lottery ticket. In our discussion we use empirical Law and Economics research as this research field can give an insight into the effectiveness and efficiency of such a compliance strategy. This paper does not aim to discuss the whole issue of tax evasion and tax compliance: we focus on one specific strategy which is applied to increase RST and VAT compliance. For a general discussion on tax compliance we refer to the vast literature on this topic: Andreoni, Erard and Feinstein even speak of a 'tide of research on tax compliance'.[5]

The structure of this paper will be as follows. In section 2 we discuss the traditional way governments combat VAT and RST evasion, the alternative approach of providing incentives instead of sanctions and engaging consumers as 'unpaid auditors' in enforcing VAT and RST compliance by requiring businesses to issue invoices. Section 3 discusses why consumers in certain societies will not ask for invoices to combat tax evasion by comparing this to contributions to public goods, Section 4 discusses how consumers can be given an incentive to require an invoice, reports the results of the implementation of lottery ticket invoices in China and discusses the explanation J. Wan[6] gave for the success of this policy. As we are not convinced by this explanation we develop an alternative explanation in section 5 and suggest a model which can enable governments to decide on introducing lottery tickets or not. Furthermore, we discuss the possible unintended side-effects and some long-term benefits of this policy. The conclusion in section 6 summarizes our results.

2.   Combating evasion of VAT and RST

Slemrod noted that no government can announce a tax system and then rely on taxpayers' sense of duty to remit what is owed.[7] Andreoni, Erard and Feinstein observed that the problem of tax compliance is as old as taxes themselves.[8] Webley, Adams and Elffers state that VAT evasion is widespread and involves significant revenue losses.[9] Evasion of VAT and RST is not only a problem in developing countries or in countries in the south of Europe, but in northern European countries as well. In a report of May 2013 the European Commission gave an overview of the Actual VAT revenue in 2010 as

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[5] J. Andreoni, B. Erard and J. Feinstein. Tax compliance. *Journal of economic literature*, 36(2) 1998, p. 818-860, p. 819. Andreoni, Erard and Feinstein give a review of the major theoretical and empirical findings in the tax compliance literature. Amongst others, P. Webley, C. Adams and H. Elffers. Value Added Tax Compliance. In: E.J. MacCaffery and J.B. Slemrod (ed) *Behavioral public finance*, Russell Sage Foundation 2006, p. 175-205 and J. Alm. Tax Compliance and Administration. In: W. B. Hildreth and J. A. Richardson (ed) *Handbook on Taxation* Mercel Dekker 1999, p. 741–768 also give an overview of the literature on this topic.
[6] J. Wan. The incentive to declare taxes and tax revenue: the lottery receipt experiment in China. *Review of Development Economics*, 2010
[7] J.B. Slemrod. Cheating Ourselves: The Economics of Tax Evasion *Journal of Economic Perspectives* 21(1) 2007, p. 25-48, p. 25
[8] J. Andreoni, B. Erard and J. Feinstein. Tax compliance. *Journal of economic literature*, 36(2) 1998, p. 818.
[9] P. Webley, C. Adams and H. Elffers. Value Added Tax Compliance. In: E.J. MacCaffery and J.B. Slemrod (ed) *Behavioral public finance*, Russell Sage Foundation 2006, p. 175.

percentage of theoretical revenue at standard rates.[10] The Commission concluded that Member States are only collecting around one half of the VAT revenue available to them.[11] In the December 2012 Action Plan of the European Commission, VAT fraud and evasion was identified as an important field in which action was necessary. The European Commission shared this view with the EU Member States: "Member States also emphasized the need to adopt quickly the pending proposals in the Council and to pay particular attention to the fight against VAT fraud and evasion."[12] Such evasion not only erodes the income of governments; it also undermines the principles on which government expenditure is shared by citizens of a country and, as a consequence, the division of the tax burden.[13] Tax evaders are free riders: they benefit from government expenditures without contributing their share to the government income. If nobody would pay VAT or RST, everybody would be worse off as the government would not be able to meet its expenses. If a society is of the opinion that government expenses are too high, this should be resolved by reducing government spending in a democratic way, not by the decisions of individuals not to pay their share of democratically set taxes. Tax evasion is therefore undesirable both from an economic and a legal (fairness) point of view. It, therefore, makes sense that governments try to combat the evasion of all taxes, including VAT and RST.

2.1   Traditional methods: sanctions on tax evaders

Developing effective policies that promote tax compliance and combat tax evasion is a challenging task for authorities and policymakers. In the words of Andreoni, Erard and Feinstein: "How can an authority – with imperfect ability to monitor - design a taxation, audit, and punishment scheme to meet its revenue objectives?"[14] Academic research in the field of Law and Economics can give useful insights into this problem. Traditionally, contributions in Law and Economics focus on monitoring and sanctions to achieve

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[10] European Commission. *Combating tax fraud and evasion. Commission contribution to the European Council of 22 May 2013*, p. 8.

[11] Several reports have been published on this so called 'VAT gap', the difference between theoretical amount of VAT that should be due and actual VAT receipts, for example the report of Reckon LLP of 21 September 2009 for the European Commission http://ec.europa.eu/taxation_customs/resources/documents/taxation/tax_cooperation/combating_tax_fraud/reckon_report_sep2009.pdf (download 4 March 2013), which gives an overview of the VAT gaps in EU Member States in 2006 and Eurostat/European Commission *Taxation trends in the European Union*, 2013, p. 31 http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_structures/2013/report.pdf (download 17 May). In this report it was concluded that ten Member States collect less than 50 % of the theoretical amounts, another thirteen countries collect between 50 and 60 % and for only four countries - Bulgaria, Estonia, Cyprus and Luxemburg - the VRR is above 60 %..

[12] Communication from the Commission to the European Parliament and the Council, An Action Plan to strengthen the fight against tax fraud and tax evasion, Brussels, 6 December 2012, COM(2012) 722 final, p.3, http://ec.europa.eu/taxation_customs/resources/documents/taxation/tax_fraud_evasion/com_2012_722_en.pdf (download 4 March 2013).

[13] J.B. Slemrod. Cheating Ourselves: The Economics of Tax Evasion *Journal of Economic Perspectives* 21(1) 2007, p. 25-48, p. 41-42.

[14] J. Andreoni, B. Erard and J. Feinstein. Tax compliance. *Journal of economic literature*, 36(2) 1998, p. 819.

compliance.[15] Economic models predict that higher penalties and audit probabilities discourage non-compliance, the evidence suggests that higher audit probabilities probably have more impact than higher penalties.[16] However, Andreoni, Erard and Feinstein observed that econometric results suggest that the use of the 'stick' to enforce compliance with tax laws may not have any long-run impact.[17] Tax legislation focuses on sanctions as well, such as fines for businesses that do not pay the VAT due on their services and supplies. These traditional methods of combating tax evasion are based on deterrence, the use of sanctions and punishment as a threat to deter taxpayers from offending. However, enforcing the payment of indirect tax through deterrence methods can be costly for the government. Auditing businesses and imposing fines requires that the tax authorities have the means and sufficiently well equipped employees to perform these tasks. Indirect tax payments are based on the financial records of transactions. To establish whether supplies and services have been performed 'outside the books', the tax authorities have to do further research. Due to the information asymmetry between taxpayers (in economic terms: private agents) and the government, a revenue-maximizer taxpayer could be tempted to under report the tax amounts due unless a costly system of monitoring and sanctioning is in place. Sanctions are only effective if they pose a sufficient threat to deter taxpayers from tax evasion.

Efficiency reasoning would lead to setting the sanction at such a level that the marginal cost to the government of monitoring and sanctioning taxpayers would equal the marginal benefit of preventing tax evasion. Theoretically, Becker suggests that increasing sanctions would reduce tax evasion.[18] In fact, for a given probability of being detected, the expected profits from evasion are a decreasing function of the level of sanctions. However, there are practical arguments in favor of imposing a sanction ceiling, for example the necessity of preserving the marginal deterrence effect of sanctions and the credibility of the threat made by the sanctioning authority. If strong sanctions are combined with a low risk of tax fraud being discovered and of miscreants actually being fined, these will not be very successful in combating tax fraud. Hence, given the practical impossibility of raising the sanctions level over reasonable thresholds - a death penalty for tax fraud, would, for example, not be accepted in most democratic societies -, we could expect that high monitoring costs will be associated with high levels of tax evasion. Moreover, political constraints could prevent the implementation of sanctions. A legislator interested in maximizing his chances of being re-elected could be "captured" by interest groups benefiting from tax evasion and reduce the chances of effective policies being adopted to combat tax evasion.[19] An example seems to be the failure (unwillingness?) of previous Greek governments to act on the so-called "Lagarde

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[15] Seminal contributions include M.G. Allingham and A. Sandmo. Income tax evasion: A theoretical analysis. *Journal of Public Economics*, (1):323–338; 1972. and S. Yitzhaki. Income tax evasion: A theoretical analysis. *Journal of public economics*, 3(2):201–202, 1974. For a survey of the Economics and Law & Economics literature on tax evasion see J. Andreoni, B. Erard, and J. Feinstein. Tax compliance. *Journal of economic literature*, pages 818–860, 1998.

[16] P. Webley, C. Adams and H. Elffers. Value Added Tax Compliance. In: E.J. MacCaffery and J.B. Slemrod (ed) *Behavioral public finance*, Russell Sage Foundation 2006, p. 177.

[17] J. Andreoni, B. Erard and J. Feinstein. Tax compliance. *Journal of economic literature*, 36(2) 1998, p. 844.

[18] G. Becker. Crime and punishment: An economic approach. *Political Economy*, 169(177), 1968.

[19] G.J. Stigler. The theory of economic regulation. *The Bell journal of economics and management science*, pages 3–21, 1971.

list" of Greeks with overseas bank accounts.[20] Finally, in specific segments of the population tax evasion could be perceived as a morally justified behavior and pro-tax evasion social norms could develop.[21] The Dutch decorator apparently thought it very normal to offer to do a job with or without VAT. Tax evasion is so deeply rooted in some cultures that it could be considered endemic. For example, during the first half of 2012, in 38% of the tax audits in Italy (with peaks of over 50% in some provinces in the south) the issuance of invoices was found to be irregular.[22] These data are confirmed by a recent field experiment run on bakeries in Milan.[23] Within a time span of 12 minutes, two customers bought a loaf of bread in 108 bakeries. Only 73 (68%) bakeries were fully compliant and gave a receipt to both customers. This experiment was performed after much publicity was given to tax audits in shops in several towns, including Milan, and a strong awareness campaign in the mass media. Apparently these campaigns were not enough to completely change the attitude towards the issuing of invoices. In such situations, any coercive intervention by an external authority could be perceived as a violation of the established norm by the targeted population and could produce countervailing effects.[24] Indeed, empirical evidence suggests that, irrespective of the legal and socio-economic context and the effort put into combating indirect tax evasion, it is still a widespread problem.[25]

2.2   Stick and carrot?

The best way to reduce tax evasion would probably be to audit each and every tax payer. However, given the limited means of governments, this is not possible. Even though the traditional methods of deterrence could only mitigate the tax evasion problem, the tax compliance literature has traditionally been skeptical about the possibility of implementing alternative policies.[26] Nonetheless, some researchers have investigated the effect of implementing reward mechanisms instead of sanctions. Falkinger and Walther[27] show that a mix of sanctions and rewards would outperform a system with sanctions only without increasing expenditure for the government. Experimental Economics literature has also investigated the effect of rewards compared to sanctions in achieving compliance. For example, Torgler found in a field experiment among Costa Rican taxpayers that a monetary reward is the most effective way of increasing compliance.[28] In the report of May 2013 on combating tax fraud and evasion,

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[20] L. Thomas. In Greece, Taking Aim At Wealthy Tax Dodgers *New York Times* 11 November 2012.
[21] See section 4 for a detailed discussion on this point.
[22] La Repubblica, 31 July 2012.
[23] P. Battiston and S. Gamba. Social Pressure as a Determinant for Tax Compliance: a Field Experiment. *Working Paper,* 2012.
[24] E. Carbonara, F. Parisi, and G. Von Wangenheim. Unjust laws and illegal norms. *International Review of Law and Economics*, 2012.
[25] See F.A. Cowell. Tax sheltering and the cost of evasion. *Oxford Economic Papers*, pages 231–243, 1990. For a recent review of the literature see also J. Slemrod. Cheating ourselves: The economics of tax evasion. *The journal of economic perspectives*, 21 (1):25–48, 2007.
[26] For a discussion of this point see L.P. Feld, B.S. Frey, and B. Torgler. Rewarding honest taxpayers? Evidence on the impact of rewards from field experiments. *CREMA, Center of Research in Economics, Management and the Arts, Working Paper nr. 16*, 2006.
[27] J. Falkinger and H. Walther. Rewards versus penalties: on a new policy against tax evasion. *Public Finance Review*, 19(1):67–79, 1991.
[28] B. Torgler. Beyond punishment: A tax compliance experiment with taxpayers in Costa Rica. *Revista de Análisis Económico*, 18(1), 2003.

the European Commission also recommended the use of both sanctions and rewards to reduce the size of the shadow economy when it gave the following examples of measures to combat tax evasion: criminalizing the purchaser of undeclared work (sanction) and the use of monetary incentives to declare (reward).[29]

Other research outside the traditional tax policy literature seems to confirm the positive effects of rewards on motivating desired behavior. Both social Psychology[30] and Neuroscience[31] researchers have emphasized the role and effectiveness of rewards in achieving individuals' compliance. In particular, it seems that punishments and rewards have asymmetrical effects on human behavior,[32] hence making it possible to reinforce compliance through a combination of the two methods.

However, simply rewarding businesses that comply with their tax obligations seems a bit odd from a legal point of view. The question is, therefore, whether it could be a solution to engage a third party who does not have a legal obligation regarding the tax: the customer in the transaction over which the VAT or RST is due.

2.3 Combating evasion by engaging customers: importance of the invoice

In many countries, the invoice is proof of the existence of a taxable transaction. Furthermore, it contains information on the amount of tax due. Once a company has issued the invoice, it becomes difficult, if not impossible, to hide information on the supply and RST or VAT due. Hence, a key strategy adopted by businesses in evading RST or VAT is not to issue an invoice. If customers demand an invoice, this kind of tax evasion is made more difficult. Customers, in a way, act as unpaid auditors for the state, enforcing compliance. In a VAT system, other businesses will ask for such an invoice, as this is necessary for reclaiming the VAT they have paid. However, asking for a receipt has virtually no benefits for individuals who are not taxable for VAT and RST. In fact, as will be discussed in more detail in the next paragraph, without any specific policy intervention, customers not only do not receive benefits, they could also face high social and moral costs when asking for an invoice if it is the social rule not to ask for a receipt.

3 Why customers do not ask for an invoice: framing the request for an invoice as a public goods situation

In economic terms, from the perspective of a consumer, asking for an invoice and thus preventing tax evasion can be compared with contributing to a public good. A public good has two characteristics: it is hard to exclude any person from benefiting from the good or the service even if this person does not pay for it (non-excludability) and the consumption of the good or the service does not prevent the consumption of it by others (non-rivalry). Common examples of such goods are the army and dikes. The non-

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[29] European Commission. *Combating tax fraud and evasion. Commission contribution to the European Council of 22 May 2013*, p. 3.

[30] J. Nuttin and A.G. Greenwald. Reward and punishment in human learning: Elements of a behavior theory. *Academic Press*, New York, 1968; see also L.D. Molm. Is punishment effective? Coercive strategies in social exchange. *Social Psychology Quarterly*, pages 75–94, 1994.

[31] J.A. Gray. A critique of Eysenck's theory of personality. *A model for personality*, pages 246–276, 1981; see also R.J. Larsen and T. Ketelaar. Personality and susceptibility to positive and negative emotional states. *Journal of personality and social psychology*, 61(1):132, 1991.

[32] H.P. Sims. Further thoughts on punishment in organizations. *Academy of Management Review*, 5(1):133–138, 1980.

excludability characteristic of these goods implies that it may be hard to get some individuals to voluntarily pay an adequate share of the costs of a public good, because they cannot be excluded from benefiting from it: the so called free rider problem. Therefore, absent external interventions, the free rider problem would lead to an under provision of the public good. In this section we will analyze whether having to request an invoice could be considered symmetrical to a public goods situation. Economic theory predicts that, because of the free rider effect, the supply of public goods will be at an inefficient level, below the social optimum. Hence, if the proposed parallel is correct, the enforcement of invoice issuance by customers remains suboptimal if the government does not provide incentives.[33]

In order to clarify the concept, consider the situation in which a consumer has to claim an invoice from a fraudulent seller. For our purposes, think of the buyer as a potential contributor to a specific public good, namely enforcement of tax payments. The rational buyer evaluates the private costs and benefits of asking for the invoice. For any transaction, the private benefit the individual buyer derives from asking for a receipt is almost zero. The customer hardly benefits himself from the tax the seller pays to the government. In economic terms: the benefit is not fully internalized by the customer. Instead, it is shared with the rest of the population. This is a consequence of the fact that goods financed through taxation are often public in nature and, by definition, non-excludible. The individual buyer and his fellow citizens share the benefit deriving from the tax paid in any transaction even if the latter are not directly involved in the specific transaction.

On the other hand, *not* asking for an invoice has an economic benefit if the customer can bargain for a discount as compensation for not obtaining a receipt, basically sharing the profit deriving from the tax evasion with the seller. Moreover, even in situations where bargaining is not feasible,[34] scholars report evidence of the existence of moral, ethical and social costs for buyers who ask sellers to comply with fiscal norms. McGee has collected two decades of scholars' contributions on the ethical aspects of tax evasion.[35] His book discusses philosophical and religious determinants of tax evasion, explaining the formation of pro-tax evasion behavioral norms. The authors argue that, if the social norm is positive towards tax evasion, individuals wanting to break these norms will face costs. Chang and Lai proposed a model incorporating social norms into a collaborative tax evasion agreement between a seller and his customer.[36] They found that this collusive practice tends to intensify the tax evasion problem and reduces the

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[33] There is extensive literature on public goods in social science: for a survey see J.O. Ledyard. Public goods: A survey of experimental research. s. 111–194 in: J.H. Kagel and A.E. Roth. *The Handbook of Experimental Economics*, 1995.

[34] It is often impossible or unprofitable to have a bargaining solution. For example, in transactions involving small amounts of money (such as the loaf of bread in the Milan bakery experiment discussed in section 2.1), the discount would be negligible or the opportunity cost of the time invested in bargaining would be higher than the discount itself. Moreover, in situations in which face-to-face bargaining is not feasible (e.g. other customers present in the shop, a crowded café, etc.) reputational concerns could prevent a customer from bargaining. Finally, in several countries, such as Japan, bargaining over prices is unusual and considered impolite, so customers would simply reject this approach; on this point see P. Berton. How unique is Japanese negotiating behavior? *Nichibunken Japan Review*, pages 151–161, 1998.

[35] R. McGee. The Ethics of Tax Evasion. *Dumont Inst for Public Policy*, 1998.

[36] J. Chang and C. Lai. Collaborative tax evasion and social norms: Why deterrence does not work. *Oxford Economic Papers*, 56(2):344–368, 2004.

effectiveness of tax enforcement. Kirchler also analyses the behavioral aspects of tax compliance and evasion, focusing on the psychological reasons that lead to customers colluding and accepting tax evasion.[37]

The research mentioned above suggests that in some cultures and societies costs are associated with not complying with the established norms favoring VAT and RST evasion. While the consumer bears the personal costs and sometimes misses the opportunity of a discount in expressly requesting an invoice, he basically gets no benefit from this enforcing operation. Even though requesting an invoice would be optimal from a social point of view, in the above mentioned social contexts free riding on the associated costs remains the individual dominant strategy. Asking for an invoice to prevent tax evasion can therefore be compared to contributing to a public good: government intervention is necessary, as otherwise 'prevention of tax evasion' will remain at a level below the social optimum (e.g. a high level of tax avoidance).

4   Giving customers an incentive to ask for an invoice: the Lottery Ticket Reward Policy

Given the findings in the previous section, the question is how to make customers ask for an invoice. In some countries, customers could face sanctions if they did not ask for an invoice. This was the case in Belgium and Italy. In Italy the obligation to issue an invoice was introduced in the 1980s. Originally, sanctions were imposed both on non-compliant business owners and customers. However, in practice it was problematic to impose sanctions on customers. The sanctions were strongly criticized by the population and the public opinion. The main reason was the high number of sanctions imposed on ignorant customers as a consequence of buyers' mistakes.[38] Moreover, customers had the troublesome duty of storing invoices for a period of time. These factors generated in the population a feeling of resentment against the monitoring authority and not only proved ineffective in fighting tax evasion, but seemed even to produce countervailing effects. As a consequence, in 2003 the Italian government abolished sanctions on customers.[39] Similarly, sanctions on buyers that did not request an invoice were in place in Belgium for a while but they were difficult to impose, were mainly symbolic and have been abolished as well.

An alternative to sanctioning customers is to give them a reward if they ask for a receipt. However, it might be rather costly and lead to heavy administrative burdens to give each customer a cash reward. Furthermore, if the reward is not high enough, customers will not be induced to ask for an invoice. For example, in the 1980s Bolivia tried to encourage people to require VAT receipts by introducing a complementary withholding tax of 10% on all income, which could be offset against the VAT paid as verified by invoices. However, according to Bird it was far from clear that this device boosted tax enforcement significantly, one of the reasons being that the stimulus to collect receipts

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[37] E. Kirchler. The economic psychology of tax behaviour. *Cambridge University Press*, 2007.
[38] Newspapers often emphasized cases where sanctioned buyers were children or where the sanction was the consequence of a accidental mistake (see for example *Corriere della Sera,* 18 March 1998).
[39] D.L. n. 269 (2nd October **2003**)

was weak given the alternative of making a deal with the entrepreneur not to pay the VAT and splitting the difference.[40]

Instead, countries can give customers who ask for an invoice a *chance* to obtain a large reward. This is not only cheaper, but Alm et al. show in a laboratory experiment that rewarding tax compliant behavior with participation in a lottery increases the rate of compliance more than rewarding all compliant individuals.[41] In order to implement this reward policy, the government starts a lottery. Each invoice issued becomes a lottery ticket by way of a serial number that is printed on every invoice. Hence, in order to participate in the lottery, customers have to request for an invoice and keep it until the final draw. The winning numbers are drawn from all serial numbers and the individuals owning the invoices with the winning serial numbers can claim a prize. If the costs of organizing the lottery and of paying out the prizes are smaller than the increase in tax revenue, the government increases its final tax revenue at zero cost. Furthermore, the lottery might have the effect that customers become so used to asking for a receipt that over time prizes may decrease in value or eventually be abolished. Thus it could be a means of strengthening tax morale in a country. This reward policy is also known as the Lottery Ticket Reward Policy (in short: LTRP). It is not just a theoretical approach to combating VAT and RST evasion, it has actually been implemented in several countries. In the next section we will look at the practical experience of this reward policy.

4.1   The effects of the Lottery Ticket Reward Policy: evidence from China

A few countries have introduced some kind of LTRP to mitigate VAT or RST evasion. Taiwan implemented such a reward policy in 1951 which is called the Uniform-Invoice Prize Winning Lottery. After the introduction of the uniform invoice system in Taiwan, it turned out that firms tended to underreport sales by not issuing an invoice at the time of sale. The tax authorities tried to induce customers to ask for invoices with every purchase. Most importantly, this kind of behavior was being induced by the uniform-invoice lottery giving customers the chance to win a large amount of money by obtaining an invoice at the time of purchase.[42] Every one of the roughly 11.5 billion receipts issued annually by Taiwanese shops comes with a unique lottery number, which enters a bi-monthly prize draw awarding prizes of up to $ 342,000.[43] Customers can check on line whether they have won a prize.[44] This policy is still in place, according to Giebe and Schweinzer because it proved so successful.[45] Some other countries that have applied the LTRP are the Philippines, Malaysia, Chile, Puerto Rico and Brazil. According to

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[40] R.M. Bird. Tax reform in Latin America: A Review of Some Recent Experiences. *Latin American research review* 27(1), 1992, p. 12-13.

[41] J. Alm, G.H. McClelland, and W.D. Schulze. Why do people pay taxes? *Journal of Public Economics*, 48 (1):21–38, 1992.

[42] C. Lin. An Appraisal of Business Tax Reform in Taiwan: The Case of Value-Added Taxation. In: T. Ito and A.O. Krueger (ed) *The Political Economy of Tax Reform* University of Chicago Press 1992, p. 144. In his paper (p. 137-155) Lin also discusses the problems with tax evasion in Taiwan under the old Business Tax and the VAT which was introduced in 1986.

[43] T. Giebe and P. Schweinzer. Consuming your way to efficiency: public goods provision through non-distortionary tax lotteries working paper, last version 23 April 2013, http://ssrn.com/abstract=177642, p. 1 and http://en.wikipedia.org/wiki/Uniform_Invoice_lottery.

[44] http://www.etax.nat.gov.tw/etwmain/front/ETW183W6?site=en.

[45] T. Giebe and P. Schweinzer. Consuming your way to efficiency: public goods provision through non-distortionary tax lotteries working paper, last version 23 April 2013, http://ssrn.com/abstract=177642, p. 1.

Giebe and Schweinzer these schemes have been highly successful in their intended purpose of reducing tax evasion.[46] Despite these practical experiences, until recent years there was nothing more than descriptive statistics and anecdotal evidence for these positive results. No systematic analysis was conducted on the impact of LTRP implementation. One of the reasons for this might be the technical difficulty in isolating the causal effect of a policy introduction. If a policy is adopted at a state level, it would be complicated to find a credible comparison. A suitable comparison could be another country that didn't implement the policy but that is otherwise similar to the country that did introduce it, but it is difficult to find comparable countries. Cross-country comparison results are often considered to be unreliable.

However, since 1998 a peculiar implementation of the LTRP in China makes it possible to isolate the causal effect of the policy. At that time, one of the turnover taxes levied in China was the so called business tax (BT), a turnover tax levied mainly on specific services. This tax was generally collected by local tax authorities. In order to reduce the negative effects of widespread BT evasion, the Chinese government started printing a lottery number on receipts registering business transactions. The invoice for restaurant or entertainment expenditures is at the same time a lottery scratch card. The idea is that customers will be incentivized to ask for an invoice and thus oblige the service provider to pay BT. Each lottery pays out a prize after some period of time. Once the receipt is issued, the seller cannot evade BT on that transaction. Thus, the buyer has a direct incentive to ask for the receipt and this indirectly obliges the seller to reveal information to the tax authorities. The peculiarity of the Chinese experience is the particular form in which the LTRP was implemented. The Chinese State Commission for Restructuring the Economic System,[47] a Chinese governmental agency, decided to introduce the LTRP only in some experimental districts in the period 1998 - 2003 in order to test its effects. At first, only some service industries, such as food service businesses, issued lottery tickets. As of 2002, the LTRP was applied to other service industries as well. Furthermore, the trial area was expanded to involve a growing number of districts. Because of this isolated implementation of the LTRP, it is possible to compare relatively similar districts with and without the LTRP. Therefore, the Chinese experience is a (quasi-) natural experiment.

To the best of our knowledge there has only been one study conducted by Wan that investigates the effects of this policy in China.[48] Wan estimated that the lottery reward policy increased revenues from BT by 17% in the experimental districts. He estimated that the ratio between lottery prizes paid by the government and increased tax revenue ranged between 1:30 and 1:40. This success induced the Chinese government to extend the LTRP area progressively from the initial trial area to the whole country.

Before proceeding, a word of caution on the implementation of the lottery policy in China is necessary. Some scattered data collected in China during the experimental period show that at the time of the lottery draft the Chinese government paid out only a

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[46] T. Giebe and P. Schweinzer. Consuming your way to efficiency: public goods provision through non-distortionary tax lotteries working paper, last version 23 April 2013, http://ssrn.com/abstract=177642, p. 29.

[47] See Note of Mainland China Government by State Commission for Restructuring the Economic System, 1989.

[48] J Wan. The incentive to declare taxes and tax revenue: the lottery receipt experiment in China. *Review of Development Economics*, 2010.

relatively small fraction of the announced prizes. For example, while the Beijing Local Tax Bureau announced that prizes would amount to thirteen million Yuan in 2002,[49] *ex-post* payments are on average less than 17% of the prizes previously announced. Such inconsistent behavior maximizes revenue in one period but, needless to say, would kill any possibility of collecting revenues in succeeding periods as soon as customers find out that prizes are not actually paid. Given the lack of comprehensive data on this issue and the relatively short experimental period, future research should test whether the success of the policy in the first years decreased over time. In this paper, we will focus on the explanations for the success of the lottery policy in the initial stages, in which consumers expected prizes to match those previously announced.

Understanding the determinants of the successful results of the LTRP is not merely a theoretical exercise but a key element in effectively replicating the policy in different contexts. After having decided to implement LTRP, a government has to commit to pay a lottery prize to the winner of the lottery. If the *ex post* increase in tax revenue is smaller than the prize, the government incurs a loss. A theoretical model that captures and explains the key factors involved in the LTRP mechanism would provide an indicator of the likelihood of success in a specific socio-economic and institutional environment. That would limit the probability of unsuccessful implementation of the policy and possibly prevent monetary losses for the government.

4.2   Wan´s explanation for the LTRP's success: saving transaction costs of cheating

In an early unpublished version of his work presented at the International Conference on Econometrics and the World Economy 2009, Wan tries to explain the success of the lottery policy in increasing tax collection through the saving of transaction costs caused by cheating associated with a high level equilibrium of tax evasion.[50] In the literature on tax evasion, a standard assumption is that there are additional costs for a firm that evades tax besides the expected costs associated with being discovered and punished. Examples of such 'transaction costs of cheating' are hiring lawyers and bribing tax officials and law administrators.[51]

Consumers in a standard setting would choose to buy from a tax-evading firm since in a competitive market it can offer lower prices than the honest firm. However, Wan suggests it is possible to introduce a lottery having an expected value smaller than the gain derived from increased tax collection but greater than the difference between tax paid by honest firms and the sum of tax of evading firms plus the transaction costs of cheating. Such an expected gain associated with lottery participation represents a sort of subsidy sufficient to provoke a consumer shift toward honest firms, driving out of the market the evading firms. In his analysis, Wan concludes that there is a social gain associated with the introduction of the lottery policy which could be achieved only if the transaction costs of cheating are higher than the individual costs of asking for the invoice.

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[49] See Beijing Local Tax Bureau announcement on July 17th 2002.
[50] J. Wan. A solution to tax evasion. *Center for Advanced Economic Study Fukuoka University, Working Paper WP-2009-09*, 2009.
[51] See, for example, Allingham and Sandmo (1972).

Despite the empirical results being convincing and the econometric techniques applied appearing to be robust, the theoretical model proposed by Wan doesn't seem to be able to explain the challenging success reported.[52] First, from a micro-perspective Wan's introduction of the transaction costs of cheating excludes virtually every level of business - mostly small enterprises and independent workers - for which accountability standards are reduced or so simplified that the transaction costs for eventual cheating are zero anyway. The example of China, where introduction of a lottery policy achieved positive results involving only small service businesses, seems to clash with the assumption of high transaction costs of cheating.

Moreover, from a macro-perspective, if the lottery policy could only be successfully implemented in the presence of substantial transaction costs of cheating, it would confine and limit its applicability to a handful of cases. In particular, it would exclude developing countries or countries where institutions and the rule of law are weak and where unlawful behavior is widespread and socially accepted. In those countries where evading tax is simply the rule, no or very few transaction costs are borne by the evading firms. Paradoxically, this is precisely those very countries which would be the most in need of innovative policies that would have immediate effect without the need for additional public expenditure. Wan recognizes that in some of the provinces involved in the lottery experiment evading taxes was actually the predominant behavior adopted by almost all of the business population: it doesn't seem reasonable to assume that firms were sustaining high transaction costs to conceal a behavior that was so widespread.

While Wan correctly assumes that there is a general fixed cost for consumers to ask for a business receipt (that could be thought as a moral cost as well as a cost in terms of time or missed discounts) there is evidence that social interactions strongly influence consumer behavior in this situation. In a laboratory experiment Falk and Fischbacher showed that the level of criminal behavior by individuals is positively correlated with the level of criminal activity perceived in the social group they belong to.[53] Furthermore, Anderlini and Terlizzese show that adding a social interaction component to the characterization of individual behavior in trust decisions (e.g. the higher my perception of the average trust level in the population, the more I trust others) could account for the rising of a multiplicity of different equilibria that capture different trust rates in different societies.[54]

The afore-mentioned studies report evidence that social influence, namely the perception of the behavior of other members of the population, affects individual behavior. In situations where evading taxes is widespread and socially acceptable the cost of asking for a receipt for the individual consumer would be comparatively higher than in a place with a lower level of tax evasion. Hence, in contradiction of Wan's assumptions, it follows that the higher the level of unlawful behavior in the population, the smaller the impact of the introduction of a lottery reward policy. This result is counter-intuitive and fails to explain the success of the LTRP in China, where high levels of tax evasion as well as widespread social norms fostering this behavior are in place.

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[52] Actually the only published version of Wan's contributions (Wan, 2010) contains just the empirical estimations and has no theoretical explanations.
[53] A. Falk and U. Fischbacher. "Crime" in the lab-detecting social interaction. *European Economic Review,* 46 (4):859–869, 2002.
[54] L. Anderlini and D. Terlizzese. Equilibrium trust. Technical report, *Einaudi Institute for Economic and Finance (EIEF)*, 2009.

It seems therefore that the success of the LTRP should be investigated from the standpoint of different micro-foundations. In the next paragraph we will present an informal[55] model that evaluates the results of the LTRP from an alternative perspective which takes into account a taste for gambling and overestimation of the utility derived from a possible lottery prize.

5   Cumulative Prospect Theory and the Lottery Ticket Reward Policy success: a model

In section 4 we emphasized that the situation faced by a customer having to ask for an RST or VAT receipt could be analyzed within the theoretical framework of a public good situation. A number of recent studies have examined, both theoretically and empirically via laboratory experiments, the performance of lotteries (or raffles) in the private provision of public goods. The theoretical contributions by Morgan[56] and Lange et al.[57] show that, under specific assumptions on the form of agents' utility function,[58] lotteries outperform voluntary contribution mechanisms in the private provision of public goods Empirical results from laboratory experiments[59] confirm these theoretical predictions.
In this section we present an informal model that, without imposing any restrictive assumption on agents' utility function form, could explain the success of the LTRP in combating VAT and RST evasion. This model departs from the neo-classical framework of rationality. In order to explain the success of the LTRP, we will look at the way people make decisions. The theoretical benchmark for this is Tversky and Kahneman's Cumulative Prospect Theory (onward CPT).[60] CPT is a theory of individual decision-making under risk and uncertainty that is recognized and well-established in the social sciences, in particular Economics.[61] It has been developed to capture regularities empirically observed in human behavior such as the framing effect, loss aversion and the overweight (underweight) of unlikely (average) events that cannot be explained by

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[55] For a technical version of the model presented in the next section see M. Fabbri, Shaping Tax Norms through Lotteries, RILE Working *Paper Series 2012/02,* 2012. Available at SSRN: http://ssrn.com/abstract=2202189.

[56] J. Morgan. Financing public goods by means of lotteries. *Review of Economic Studies*, 2000.

[57] A. Lange, J.A. List, M.K. Price. Using Lotteries to Finance Public Goods: Theory and Experimental Evidences. *International Economic Review*, 2007.

[58] Specifically, these studies assume that agents have a quasilinear utility function. This utility function has the peculiarity of being linear in only one argument, generally the numeraire. Quasilinear utility functions are sometimes used in economic literature because they combine desirable technical properties with mathematical tractability. For a detailed discussion of quasilinear utility functions see A. Mas-Colell, M. Whinston, and J. Green. *Microeconomic Theory*. New York. Oxford University Press, 1995, chapter 3, page 45.

[59] J. Morgan, M. Sefton. Funding public goods with lotteries: experimental evidence. *The Review of Economic Studies,* 2000; J.K. Goeree, E. Maasland, S. Onderstal, J. L. Turner. How (not) to raise money. *Journal of Political Economy*, 2005; A.J.H.C. Schram, S. Onderstal. Bidding to give: an experimental comparison of auctions for charity. *International Economic Review*, 2009; L. Corazzini, M. Faravelli, L. Stanca. A Prize To Give For: An Experiment on Public Good Funding Mechanisms. *The economic journal*, 2010.

[60] A. Tversky and D. Kahneman. Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4):297–323, 1992.

[61] Kahneman was awarded the Alfred Nobel Memorial prize in Economics in 2002 (unfortunately Tversky had died before) for his contribution to behavioral studies, despite the fact that he and Tversky were both psychologists without formal education in economic science.

the Von Neumann-Morgenstern Expected Utility Theory[62] (EUT) traditionally applied in mainstream Economics. In short, the EUT hypothesis is that agents making decisions on a probabilistic prospect maximize its expected value discounted by risk aversion. A fundamental feature of the EUT is that probabilities are linearly weighted. Hence, according to the EUT, a rational agent who prefers $800 as a certainty over the prospect of $2000 at a probability of 50% will also decline the prospect of $100,000 at a probability of 10%, since the two probabilistic prospects have the same expected value of $1,000.

Despite its fascinating theoretical architecture, there is empirical evidence that the EUT fails to capture certain regularities in agents' decision making processes.[63] Camerer and Loewenstein give a thorough explanation of the importance and limitations of the Expected Utility Theory: "Expected Utility hypothesis is like Newtonian mechanics [...]. Linear probability weighting in Expected Utility works reasonably well except when outcome probabilities are very low or high. But low-probability events are important in the economy, in the form of gambles with positive skewness (lottery tickets, and also risky business ventures in biotech and pharmaceuticals), and catastrophic events that require large insurance industries. [...] People are typically averse to risky spreading of possible money gains".[64]

CPT is important for this paper, because it explains by way of a formal theory the empirical evidence that individuals adopt a non-linear evaluation of a probabilistic outcome: they overweight the possibility of extreme events and remain relatively unaffected by changes close to the average of the probability range. Hence, without imposing additional assumptions on the form of individuals' utility functions, CPT can explain why risk-averse subjects would in some cases accept gambles – such as a lottery – with a strictly negative expected value. Recalling the examples above and contrary to EUT predictions, the empirical evidence suggests that a consistent percentage of the population systematically prefers the certainty of $800 to a 50% chance of obtaining $2,000 (showing risk-aversion) but at the same time would "irrationally" also prefer the prospect of winning $10,000,000 at a 0.001% probability in preference to the certainty of $800 (hence showing risk-seeking, since the expected value of the probabilistic prospect in the latter case is smaller than $800).

Now consider the choice faced by a consumer who has to ask for an invoice. Recall that the individual benefit from the payment of the tax on the invoice is negligible and that costs are associated with the request for an invoice. Consider a government that implements the LTRP and announces a lottery prize. Fabbri (2012) shows that, for any

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[62] J. Von Neumann and O. Morgenstern. Theory of games and economic behavior. *Princeton Univ. Press,* 1944.

[63] For the purposes of this paper the problem of preference reversal over uncertain outcomes is of particular interest. See Lichtenstein, S.; P. Slovic. Reversals of preference between bids and choices in gambling decisions. *Journal of Experimental Psychology* 89 (1): 46–55, 1971; Grether, David M.; Plott, Charles R. Economic Theory of Choice and the Preference Reversal Phenomenon. *American Economic Review* 69 (4): 623–638, 1979; Holt, Charles. "Preference Reversals and the Independence Axiom". American Economic Review 76 (3): 508–515, 1986.

[64] C. F. Camerer, G. Loewenstein, and M. Rabin. Advances in behavioral economics. *Princeton University Press*, 2003.

feasible prize amount[65] offered by the government, the individual dominant strategy for a Von Neumann-Morgenstern Expected Utility maximize agent with any non-negative degree of risk aversion, remains not to request an invoice. Individuals rationally (in mainstream economic sense) evaluating the probabilities of winning the lottery prize multiplied by the prize amount will always find that the expected gain deriving from the lottery is smaller than the cost of asking for the receipt. Hence, if individuals behave as a Von Neumann-Morgenstern utility maximizer, the LTRP would result in a failure unless it is unrealistically assumed that individuals are risk-lovers. Therefore, in light of the evidence of the success of the LTRP presented in section 4, it seems that Expected Utility Theory is not the appropriate theoretical background to analyze or explain individual decision making in the context of the LTRP. The reason is that the LTRP introduces a probabilistic situation in which individuals choose over extreme elements: extremely low probability of winning a substantial prize. For this kind of situation the linearity in probability weighting implied by Expected Utility Theory seems unable to capture the correct decision-making process.

Therefore, it seems that CPT represents a more suitable theoretical background to analyze the LTRP. Fabbri (2012) assumes the coexistence of heterogeneous types of individual in a population: some are expected utility maximizes and others evaluate probabilistic prospects through CPT. The author shows that, for a certain range of the parameter values describing risk preferences in the CPT model,[66] asking for an invoice becomes the dominant strategy of CPT-type individuals. The result derives from the non-linearity implied by CPT. In practice, even holding constant the expected value of the lottery prize, in CPT the effects of increases in the prize amount and of reductions in the probability of winning a prize do not completely offset each other. An offsetting change in prize amount and probabilities would have no effect on the expected value of the gamble for an expected utility maximize type. However, for a CPT-type, the low probabilities-high prize gamble is more attractive.

Implementing the theoretical framework of CPT allows for making *ex-ante* predictions on the successful implementation of the LTRP. In particular, once some specific information on the population of interest has been collected, a policymaker could determine what is the minimum number of individuals required to establish a lottery prize sufficiently large to persuade CPT-type individuals to contribute.

To proceed with this calculation it is necessary to acquire information on the gambling and risk preferences of the population. In practice, it is necessary to generate a quantitative description of the agents' average behavior when facing decisions under risk. To be technically precise, it is necessary to calibrate the parameter values of the model adopted in describing individuals' behavior under risk and uncertainty. The successful implementation of the LTRP in China does not guarantee that the same policy would achieve equal results in a different environment, since it is well known that individuals' risk-preferences greatly vary across societies. Given that many observable (such as income per capita or average saving rates) and unobservable (such as culture and social norms) factors are correlated with the taste for gambling of a population,

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[65] In order to be a zero cost policy, the lottery prize must be smaller than the increase in RST revenue arising from the introduction of the lottery. Hence the prize amount cannot exceed the sum of additional individuals' contributions.

[66] Following Tversky and Kahneman, Fabbri assumes that the value function has polynomial form; however, the results hold for any continuous and quasi-concave utility function.

establishing the possibility of a successful implementation of the LTRP in a specific environment requires a careful empirical investigation of the characteristics of a population. The verification whether a country with a higher level of income per capita and different ethical norms than China shares a taste for gambling sufficiently developed to implement the LTRP is an empirical issue. In order to clarify how this estimation of population's gambling behavior works in practice, consider the situation in which a government wishes to apply LTRP. Before announcing the lottery prize, the government will want to check if the policy described in an abstract context will work in this specific country. As a first step, a quantitative characterization of the risk preferences of the population has to be estimated. Statistical procedures and econometric techniques may fulfill this task. While a detailed discussion of these methodologies lies outside the scope of the present paper, it is useful to provide some examples. Survey results and field data relative to lottery tickets sold could be used to estimate the average part of income spent on lotteries and on gambling. Alternatively, it may be possible to directly elicit the risk-taking preferences of representative random samples of individuals through interviews or small incentivized acts of gambling. A detailed discussion of this last procedure, commonly used in experimental social sciences, is reported in Holt and Laury.[67]

Once a quantitative characterization of the population's risk preferences is obtained, it would be sufficient to incorporate those values into the general model specification as reported in Fabbri (2012). Then it can be established whether, given the estimated risk preferences, the population of the specific country is large enough to attempt a successful implementation of the LTRP.

5.1   Possible Counter-arguments

The empirical evidence discussed in previous sections and the theoretical results of the model presented in paragraph 4 suggest that the LTRP could be an effective tool for policymakers to achieve socially efficient outcomes. Nevertheless, a possible counter-argument is that the policy requires a government at time zero to commit to paying an *ex-ante* announced high monetary premium. However, the effective increase in tax revenue only occurs later on. The prize amount initially offered could be seen as an investment that can only partially guarantee future returns as it is made under conditions of uncertainty. While the policy is founded on a theoretical argument supported by experimental and empirical evidence, the practical implementation and design of such a reward mechanism in real-life environments could be extremely complex and subject to failure.

Moreover, in some cultures there might be a moral aversion to lotteries, which will make it politically difficult to implement the policy. When the Belgian Minister of Finance only hinted at a lottery system for restaurant and bar invoices in December 2009, it was immediately criticized by a Member of Parliament. She seemed to fear that it might lead to a gambling addiction.[68]

Furthermore, the mechanism rests on the assumption that people's taste for gambling will not decrease over time. It should be tested if individuals' willingness to ask for

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[67] C.A. Holt and S.K. Laury (2002). Risk aversion and incentive effects, *American Economic Review* 92, 1644-1655.
[68] Réponse du vice-premier ministre et ministre des Finances et des Réformes institutionnelles du 08 mars 2010, à la question n° 270 de madame la députée Valérie Déom du 07 janvier 2010, DO 2009201013743, QRVA 52 97, p. 82-83.

invoices boosted by the excitement about the new gambling opportunity in the periods immediately after the reward policy has been implemented are followed by a progressive decline in interest (and in the request for invoices) over time. Sustainability of the lottery ticket policy in the long-run depends crucially on this factor.[69] Bird is skeptical about what he calls 'tax gimmicks' as the LTRP. In his view the real secret of success lies not in such gimmicks but in the more mundane task of establishing a more credible and effective tax administration.[70] Bird acknowledges that if tax administration is improved, then 'gimmicks' intended primarily to increase the flow of information to the administration may provide some extra benefit, but in his view these cannot take the place of improved administrative effort.[71] We agree with Bird that improving the tax administration is extremely important to improve compliance. However, for countries that do not have the means and knowledge for bringing their tax administration up to the highest standard, policies such as the LTRP might be of help.

Also, when developing an LTRP, mechanics must be introduced to reduce fraud with invoices, such as falsified invoices. In Taiwan new systems of e-invoices which are being proposed include the special function of automatically checking whether the invoice number matches the Uniform-Invoice Prize Winning Numbers announced by the Ministry of Finance.[72] Such systems will also help to reduce falsification of VAT receipts. Another problem with the Taiwanese system was the fact that as the lottery numbers come per invoice and not per amount spent, there is an incentive for customers to pay for every single item separately in order to get more receipts.[73] A possible solution for this specific problem would be paying a lottery prize that is proportional to the invoice value. This solution would drop customers' incentives to pay for each item separately, since the increase in probability of winning the lottery due to the fact that the buyer collected multiple invoices is offset by the diminished value of the lottery prize.

Furthermore, it has been suggested that targeted rewards may be more effective than scattergun rewards. Giving the chance to win lottery prizes to all customers may not seem as effective as rewards to specific customers, such as customers who report painters who offer them a discount for cash with no invoice. While it is true that this mechanism could potentially increase the lottery efficiency compared to LTRP, nevertheless, the practical implementation may also bring additional problems. A system that rewards only customers who actively report irregular transactions implies that the individual reporting the illegal action has to reveal personal data. This could potentially restrain customers who want to remain anonymous when reporting illegal actions of sellers. For example, in Italy customers can report to the Guardia di Finanza, the official monitoring authority, irregularities in the issuance of invoices (in 2012 there have been more than 600.000 notifications). On the basis of this information, the authority may

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[69] As noted above, data on the results of the natural experiment occurring in China are available only for a relative short period of time.

[70] R.M. Bird. Tax reform in Latin America: A Review of Some Recent Experiences. *Latin American research review* 27(1), 1992, p. 31.

[71] R.M. Bird. Tax reform in Latin America: A Review of Some Recent Experiences. *Latin American research review* 27(1), 1992, p. 31-32.

[72] C-J Chang, H-C Kuo, C-Y Chen, T-H Chen and P-Y Chung. Ergonomic Techniques for a Mobile E-Invoice System: operational Requirements of an Information Management System. *Human Factors and Ergonomics in Manufacturing & Service Industries 2012, p. 4.*

[73] T. Giebe and P. Schweinzer. Consuming your way to efficiency: public goods provision through non-distortionary tax lotteries working paper, last version 23 April 2013, http://ssrn.com/abstract=177642, p. 1.

decide to impose an audit on the targeted business. While before 2012 notifications were strictly anonymous, starting from April 2012 the Italian government required personal data from the customer reporting the irregularity. This decision of the Italian legislator provoked criticism since customers reporting irregularities could be identified and have often been subject to material and moral retaliations. It is still difficult to empirically assess the effects of the government policy. However, anecdotic evidence suggests that because of it many customers reporting irregularities in the issuance of invoices switch from the official Guardia di Finanza signaling system to an unofficial website (www.evasori.info) created by a private citizen in order to report tax evasion anonymously.

Finally, a special word of caution should be spent on the crowding-out effect of voluntary requests for invoices. In some countries, a consistent percentage of the population considers it to be an individual duty to enforce the issuance of invoices, even without specific laws or monetary incentives. Unfortunately, those customers who regularly request invoices may not carry on doing so after LTRP is introduced. There is a growing body of literature both in Psychology and Economics focusing on the direct and indirect detrimental effects of monetary incentives.[74] Those studies suggest that monetary incentives directly crowd out individuals' willingness to behave pro-socially. Furthermore, these studies suggest that these incentives indirectly affect the proper functioning of a norm enforcing mechanism, increasing inefficiency. Quoting Ariely: "money, as it turns out, is the most expensive way to motivate people. Social norms are not only cheaper, but often more effective as well".[75]

Investigating this issue, Fuster and Meier set up a laboratory experiment in order to verify the presence of the negative indirect effect of monetary incentives.[76] In each period, participants could allocate a fraction of their private endowment to a public account. Money on the public account generated interest that was distributed at the end of each period. However, interest and capital on the public account were equally shared among all participants, independent of their individual contribution. This scenario mimics a public goods situation: while it would be socially efficient for participants to allocate the full private endowment to the public account, the individual dominant strategy consists in free-riding on others' contribution. As previously discussed, it is well known that without any external intervention, the level of resources allocated to the public account remains sub-optimal. However, despite the theoretical prediction of zero contribution, it has been shown that a proportion of participants always adopt the socially efficient strategy, irrespective of what the other players are doing. A 2001 cross-country studies report evidences that the percentage of "altruistic" individuals varies greatly across societies.[77]

The objective of Fuster and Meier's experiment is to verify the effect of a monetary reward on the behavior of these altruistic participants. When monetary incentives for

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[74] B.S. Frey and R Jegen. Motivation crowding theory. *Journal of economic surveys*, 2001; J. Le Grand; Motivation, Agency and Public Policy: of Knights and Knaves, Pawns and Queens. *Oxford University Press*, Oxford 2003; R Benabou, J Tirole. Intrinsic and extrinsic motivation. *The Review of Economic Studies*, 2003.

[75] Recalling Dan Ariely's *Irrational Predictability* (2008).

[76] A. Fuster and S. Meier. Another hidden cost of incentives: The detrimental effect on norm enforcement. *Management Science*, 56(1):57–70, 2010.

[77] J. Henrich, R. Boyd, S. Bowles, C. Camerer, E. Fehr, H. Gintis and R. McElreath. In search of homo economicus: behavioral experiments in 15 small-scale societies. *American Economic Review,* 2001.

adopting socially efficient behavior are introduced, altruistic agents did not always carry on behaving consistently. Instead, while a number of free-riders started behaving pro-socially because of the incentives, some of the altruistic agents stopped allocating resources to the public account. In the end, the combination of these effects leaves the net amount collected on the public account unchanged in the situation with or without the private incentives scheme. The possible explanation for this counter-intuitive and inefficient result suggested by the authors is the destruction of intrinsic motivation by extrinsic incentives and the framing effect of shifting from a social to a monetary context.

Fuster and Meier's results are important for the LTRP. These suggest that LTRP could be effective and self-sustaining, leading to a stable, efficient, equilibrium, only if a series of fundamental accessory conditions are present. Specifically, it seems that the possible crowding out effect of monetary incentives on norm enforcement would not be a problem in the case of widespread and inefficient socially accepted behavior, such as tax evasion and not asking for an invoice. In situations with established inefficient social norms little altruistic enforcing of the issuance of invoices is to be expected without government intervention. Thus, a well specified system of incentives could achieve a higher contribution level without leading to negative indirect effects.

5.2.   Positive long-term effects

Despite the concerns emerging from possible side-effects, there are also positive externalities connected to the lottery policy. First of all, imagine the LTRP is introduced in a society where tax evasion, in the form of not issuing invoices, is widespread and that this behavior is socially accepted or tolerated. If the LTRP is adopted, it is reasonable to assume that some consumers will now react to private incentives and will start enforcing the issuance of invoices even from suppliers that were used to systematically evade taxes. The negative aspects of the social costs of asking for a receipt are outweighed by the chance of winning a prize.

Through the historical records of VAT or RST reported by companies, the tax authorities can identify those businesses that have an abnormal peak in the period in which the lottery policy is implemented. For example, it would be straightforward to implement an algorithm that, after controlling for seasonality and business cycles, automatically identifies the suppliers reporting a statistically significant increase in supplies and tax. Hence, it would become possible to separate such businesses from those that present continuous payments of VAT or RST. This signal could be used as an indicator to direct monitoring resources towards businesses that report discontinuous trends. Thus, the LTRP could be of help in focusing auditing efforts. Businesses that were used to evade taxes might even anticipate the increased probability of an audit and will review their behavior and increase their VAT or RST payments permanently. As discussed before, it is possible that LTRP will turn out to be unsustainable because the increased payments of VAT and RST are not sufficient to pay the promised prize. If this happens the government will have to incur a momentary loss. However, the benefits of higher contribution levels deriving from more efficient screening and auditing and a more effective sanctioning system will also produce a revenue increase in subsequent periods when the lottery reward option has been abolished.

Moreover, the LTRP may not only be effective in combating VAT and RST evasion, but also in tackling the evasion of taxation of business profits. As invoices give an indication

of retail sales, these can be used to establish whether the reported taxable profit is consistent with such retail sales.

Finally, an additional long-term possible benefit deriving from LTRP introduction is the so called equilibria shift in a *no pain no gain* situation. Following Parisi,[78] we could interpret the apparently irrational presence of Pareto-inefficient social norms (consumers accepting the evasion of tax by their suppliers) as a point of local optimum that requires an initial loss of utility to shift toward the global optimum. To clarify this point, consider as an example the release of more efficient software. This new software is not essential to perform fundamental operations, but individuals using the old software are slower in performing certain minor tasks. Hence, while individuals are not obliged to use the new software, sticking to the old one they experience small disutilities that could be potentially eliminated, resulting in a Pareto improvement (the "gain"). However, utilizing the new software requires a training period during which it is not possible to conduct work activities and an initial effort to learn the new code (the "pain"). If individuals are not sufficiently forward looking (technically, are characterized by a high time discount factor) or don't have information about the benefits of adopting the new software (are rationally bounded), they will refuse to incur the once-and-for-all switching cost to the new software and lose the chance of a permanent improvement.

Similarly, a society as a whole could experience a permanent Pareto improvement if tax revenue increases and the state can provide better services. The change of a social norm fostering tax evasion would be perceived only as a cost in the short run, since less cash would circulate in the economy and less competitive businesses would be likely to fail. Permanent benefits from a change in the *status quo* will be experienced only in the medium and long run, after the new equilibrium is reached. For example, if the increase in tax revenue is used to finance new infrastructure, only after the project is completed will individuals experience an increase in utility. The introduction of a lottery reward could work as a sort of compensation for the initial "pain" that customers have to experience. Once the new, Pareto superior equilibrium is reached, individuals will perceive the enforcement of the issuance of invoices as the welfare-maximizing strategy, even if the LTRP is suspended.

Moreover, the external shock could lead to more consumers adopting socially efficient behavior (asking for invoices) and thus initiate a process of changing the norm. The mechanism of social norm creation is often characterized by the so called "snowball effect": an initial group of individuals adopting socially efficient behavior because the external incentives might prompt the rest of the population to ask for invoices as well.[79] Even if, after the first prize is assigned, the government cannot repeat the lottery, it is still possible that consumers will have already reached the new, Pareto-efficient equilibrium and will, therefore, continue to ask for invoices. Asking for an invoice will thus have become the social norm. While it is possible that the initial investment and incentives mechanism will last for only for a limited amount of time, the positive externalities may continue to spread into the future.

6. Conclusion

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[78] F. Parisi, *Spontaneous emergence of law: customary law*. Encyclopedia of Law and Economics. United Kingdom: Edward Elgar Publishing, 2000.
[79] A. Aviram. The paradox of spontaneous formation of private legal systems. *Yale Law & Policy Review*, 22: 1, 2004.

The implementation of the LTRP in China increased RST revenue by giving customers an incentive to request invoices, thus reducing RST evasion by businesses. In this paper we have tried to explain this result and to provide for a model which might help governments in deciding whether or not to implement such a policy to combat RST evasion. Risk preferences, social norms and population size have been discussed as important factors.

A major concern is the level at which lottery prizes must be set. A well specified reward option must elicit a taste for gambling by consumers and induce them to ask for an invoice even though this is not an efficient strategy for a rational utility maximize individual. Given the peculiar situation introduced by the LTRP (low probability of a possible high gain), in order to describe a situation in which agents have to make a decision under risk a generalized theoretical framework based on Cumulative Prospect Theory has been proposed. This general theoretical framework allows for the testing of the applicability of the LTRP in specific contexts. A key element from a practical point of view would be the correct estimation of risk-preferences of the specific population. We underlined the importance of this empirical task in order to successfully implement the LTRP, since it is well known that risk-preferences vary across populations and depend on individual wealth and other factors. Moreover, we have discussed the possible positive and negative side-effects. In order to limit the risk of crowding out virtuous behavior, we suggest that the lottery only be introduced in countries with high levels of VAT and RST evasion by businesses and a social norm of consumers not asking for invoices or only in sectors with relatively high rates of tax evasion, in countries which have an otherwise compliant norm. For example, where the LTRP might be effective on a more general scale in Italy, it might be best for the Netherlands to limit it to certain sectors, such as those involving decorators and the carrying out of other odd-jobs for private individuals.

Regarding the positive long-term side-effects, we have pointed out how, in some settings, the LTRP could help in deciding which businesses should be audited and that it could result in asking for invoices becoming the social norm, even if the policy is implemented for a limited time only. The side effect of slightly increased waiting times at Milanese bakeries because every customer demands a receipt and less juicy conversations during Dutch birthday parties about decorators, will be outweighed by such benefits.