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How to fight tax evasion: real progressivity

Combatendo a sonegação fiscal mediante uma progressividade efetiva

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Abstract: The objective of this article is to discuss the issue of tax evasion in the light of real progressivity, which is pointed out as an alternative solution to the problem. Inserted in this theme, the tax morale variable is introduced as a fundamental element to tax compliance. Therefore, it's analyzed the effects of a taxation progressivity on tax morale and on tax evasion. The paper updates, modifies, and extends the research by Doerrenberg and Peicchl (2013). Using data from Latin American countries in 2016, it's observed that when real progressivity in personal income

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taxation is not present, it causes low tax morale, low tax compliance and thus, more tax evasion.

Keywords: tax evasion; tax morale; progressivity; Latin America

Resumo: o objetivo deste trabalho é o de discutir a sonegação fiscal sob o escopo de uma efetiva progressividade tributária, muitas vezes apontada como uma alternativa para solucionar a questão. Nesse sentido, a moralidade tributária é introduzida como um elemento importante na determinação do cumprimento voluntário das normas tributárias. Busca-se, assim, verificar os efeitos da tributação progressiva na moralidade tributária e na sonegação fiscal. O artigo atualiza, modifica e amplia a pesquisa realizada por Doerrenberg e Peicchl (2013). Utilizando dados da América Latina de 2016, constata-se que a ausência de uma efetiva progressividade na tributação da renda é capaz de proporcionar uma queda na moralidade tributária e no cumprimento voluntário das normas tributárias, o que leva a uma maior sonegação fiscal.

Palavras-chave: sonegação fiscal; moralidade tributária; progressividade; América Latina

Introduction

In its 2017 Fiscal Panorama for Latin America and the Caribbean, the Economic Commission for Latin America and the Caribbean (ECLAC) emphasized that fiscal evasion remains a topic of great regional concern. The second chapter of the document, in brief, discusses recent developments of income tax, tax reforms and measures to face tax fraud in Latin America; and, in particular, it points out that statistical studies that systematically and periodically quantify tax evasion remain a gap to be filled in most countries.

The ECLAC report analyzed in depth the problem of tax evasion, noting that just few countries of that region have operational tools to conduct studies seeking estimations of tax avoidance and tax evasion in a systematic and periodic manner. In addition, when carried out, they are only applicable to VAT. With respect to noncompliance of other taxes, as a rule and unfortunately, no study is carried out for control and for statistical analysis, except for the income tax but, nevertheless, they correspond to old statistical calculations[3].

ECLAC reveals that, with respect to income tax, although they correspond to more distant periods, estimations on the evasion of this tax are significantly higher, reaching the average level of 47.5%. It is also pointed out that tax evasion rates on corporate income tax are usually higher than those for individuals (an average of 48.9% and 44.3%, respectively) [4].

Finally, the report also claims that, on average, tax fraud amounts to 2.4 percentage points of GDP in the case of VAT and 4.3 percentage points in the case of income tax[5].

In an international dimension, tax evasion has gained a prominent position in recent years, especially among developed OECD countries and G20 participants, which, in 2012, requested a detailed and in-depth study by the OECD Committee of Fiscal Affairs on solutions to the problem of the erosion of the tax base and the transfer of income / profits (Project Base Erosion and Profit Shifting - BEPS / OECD).

It should also be noted that these estimations are based on national accounts data, thus not taking into account losses arising from aggressive tax planning practices or transfer pricing that artificially reduce the level of production registered in an economy.

3 ECLAC, 2017, p. 43.

4 ECLAC, 2017, p. 44

5 ECLAC, 2017, p. 45.

The debate around these issues has been gaining more and more prominence among the governments of the region, which has provided the adoption of a set of concrete decisions and measures in favor of the strengthening of the tax administrations. In this sense, this work, when trying to investigate what is behind tax evasion, can prove to be extremely important in the indication of public policies for the region. All these countries face the challenge of securing sustainable resources for social development. The fight against evasion and tax avoidance is undoubtedly a path that points in this direction.

In this scope, this article aims to verify the link that can be established between tax compliance, tax morale and tax evasion, in a tax progressivity scene; and the investigation is geographically delimited to Latin America[6].

The paper is organised as follows. Chapter 1 provides a theoretical review of the main concepts inherent to the theme, based on authors and articles of recognized reference to the subject in question. Chapter 2 presents an econometric model and informs the variables chosen to analyze the correlations that can be established between tax evasion, tax progressivity and tax morale. Chapter 3 presents the analysis of the econometric results; and, the final chapter, the concluding remarks.

1 A theoretical incursion

The work of Allingham and Sandmo, Income Tax Evasion: A Theoretical Analysis[7], can be taken as a historic landmark and theoretical referential in relation to the study

6 On the relationship between equity in the tax system and tax morale see TOGLER, 2003 and RODRIGUEZ, 2017.

7 ALLINGHAM; SANDMO, 1972.

of tax evasion. These researchers proposed a model of analysis to study the connection between taxation and the risk of tax noncompliance, considering the effect of taxes on the portfolio of the citizen-taxpayer decision. In the study of the subject, the authors chose as the relevant variable of the research the problem of tax evasion. The specific objective of the article was to evaluate the individual taxpayer's decision on whether, and to what extent, taxpayers under-declared their income to avoid paying taxes.[8]

Technically, the standard model of tax evasion conceived in the work of Allingham and Sandmo, briefly, presents the idea that risk-averse taxpayers maximize the expected usefulness of income by choosing the amount of this that they must conceal. In this approach, the volume of unreported taxpayer income will be related to levels of risk aversion and real income, marginal tax rates, to the probability of detection, and to the quantum of fines that can be imposed on the taxpayer practicing evasion when caught. However, it should be mentioned that this model has over time received overwhelming criticism, the most relevant is that it confronts the empirical and experimental results, determining as a conclusion that there should be more tax evasion than that detected in the projections of the model.[9]

It is observed that literature on tax evasion has gone through two very clear lines of research[10]. The first highlights the subjective nature of the probability of detection. Many experimental research has been completed following this line of argument, whose assumption is that individual perceptions of being discovered by tax administration may be much greater than the objective probabilities of detection.

8 See DELL'ANNO, 2009, p. 988.

9 DELL'ANNO, 2009, p. 988.

10 See FELD; FREY, 2007.

The second considers the topic tax morale as the fundamental element to explain the greater degree of tax compliance in relation to the predictions exposed by Allingham and Sandmo[11].

Historically, scientific research has pointed out that tax morale is greater if the relationship between the tax paid and the delivery of public goods and services to the collectivity by the rulers are equitable[12]; in the same direction, the trust deposited by citizens in government and in direct democracy correlates with greater tax morale[13]. In the same direction, the theme of equity or fiscal justice presents itself as a relevant topic within the scope of the discussion of tax morale. Murphy and Nagel[14] define equity (or fiscal equity) as the standard to assess differences in tax treatment of different individuals[15]. Fiscal equity, following Wenzel's[16] categorization, is theoretically subdivided into three types: a) perceived equity of results; b) the equity of procedures and treatment; c) the equity of penalties imposed. The first classification can be measured by the effectiveness of the behavior of those who decide to control certain economic and institutional variables; the latter two can be measured by the size of the informal economy as part of official GDP.

On equity or fiscal justice, many studies point to the existence of a concrete link of justice/injustice in political, fiscal institutional relations, or economic systems to the good/bad conscience of citizens. The literature emphasizes values[17],

11 See TORGLER; SCHNEIDER, 2007.

12 Verify TORGLER, 2003a, p. 137.

13 See TORGLER, 2003b.

14 MURPHY; NAGEL, 2002.

15 In this sense, verify also FOLLONI, 2014, p. 246.

16 WENZEL, 2005.

17 JÚNIOR; OLIVEIRA; MAGALHÃES, 2015, p. 244.

attitudes, norms, and compliance for laws that influence the decision of the taxpayer about the amount of income they do not want to declare. The first question that arises in this approach is about the harmonic definition of institutes that permeate literature, since experts use different denominations to express similar notions, for example: fiscal morality, fiscal ethics, moral rules, psychic cost, social stigma, social norms, cost of reputation, civic duty, etc.[18]

Feld and Frey[19] pacified the issue by adopting a definition anchored in the term "tax morale", even considering various social aspects and psychological motivations that lead citizens to pay taxes. The definition that was consecrated and accepted as a standard allowed to organize under a single expression a set of characteristics, about what a specialized literature accepted as the determinants of tax morale.

In the literature on tax moral two currents of thought[20] are highlited. The first considers the willingness of taxpayers to meet tax obligations, as an exogenous determinant of economic aspects. Therefore, tax morale would be a variable dependent on demographic, religious, historical, cultural and educational level of taxpayers. The second line of thought, conversely, regards tax morale as endogenous to economic factors. In this direction, Feld and Frey[21] point out three more relevant aspects that contribute to shape tax morale: a) the fiscal counterpart, where taxpayers obtain public services according to the amount of taxes they pay; b) the political environment that makes this counterpart effective; and c) the personal relationship between taxpayers and fiscal administrators".

18 On equity, fiscal justice and the variables that influence them see: DELL'ANNO, 2009, p. 989.

19 FELD; FREY, 2007.

20 See FELD; TORGLER; DONG, 2008.

21 FELD; FREY, 2007.

Torgler and Schneider[22] also presented studies exploring in greater depth factors that shape tax morale, which can be synthesized in three: moral rules and feelings; equity; and the quality of relationship between taxpayers and government. This categorization reveals the twofold nature of tax morale. On one hand, it is based on the subjective characteristics of taxpayers, that is, on their moral rules: one must take into account the psychological aspects of the taxpayers. On the other hand, it considers the social norms and the perception of equity of the system. Therefore, any analysis of citizen-taxpayer behavior trying not to pay taxes should consider a broader institutional environment, especially the place of residence of taxpayers.

In this context, the academic-scientific literature has for some time been studying the correlations that are established between tax evasion, progressive taxation and tax morale. This last expression, generically, was consecrated as being "the intrinsic motivation of the taxpayer to honestly pay tributes as contribution to the society". Of course, this spontaneous behavior is broadly understood as positive for a country since it contributes to lower the cost of financing public spending. However, one of the most relevant aspects for the understanding of moral behavior in tax field is precisely to identify the variables that influence the spontaneous conduct of the taxpayers to pay their tax due.

The present work updates, modifies and amplifies the research done by Doerrenberg and Peicchl[23], as it aims to investigate the link between tax compliance, tax morale and tax evasion in Latin America. For this purpose, the analysis is based on theoretical and on regression models developed by these authors.[24]

22 TORGLER; SCHNEIDER, 2007.

23 DOERRENBERG; PEICCHL, 2013.

24 DOERRENBERG; PEICCHL, 2013.

The models are slightly modified to capture the effects of the application of "real" progressivity of taxation on tax morale. There is supposed to have a strong between tax compliance and tax morale, and as progressive taxation can positively affect tax morale, this can help the fight against tax evasion.

Tax experts recommend, based on the results of empirical studies, that: 1) economists need to be interested in the determinants of tax morale because tax morale unequivocally affects tax compliance behavior and 2) policymakers can act against tax evasion through tax morale.[25]

It is worth mentioning that progressiveness of taxation can be fully associated to the idea of income redistribution, depending on the inclination that managers and policy makers impose on the management of the state budget. In addition, studies show that the impact of progressive taxes on individual tax morale depends on individual attitudes, which consider income redistribution in general and progressive taxation in particular.

In its turn, economic studies point out that progressive taxes increase tax morale of those who are financially better placed in the economic-social pyramid but, on the other hand, it lowers the tax morale of those who do not benefit when there is a linear tax system.

Alesina and Giuliano[26] presented a broad review of the existing literature and they seem to indicate that income is an unsatisfactory variable to explain support for redistribution. In the same direction, the literature on attitudes towards progressive taxation contains similar results. In Germany, studies by Heinemann and Hennighausen[27] show

25 See HALLA, 2010.

26 See ALESINA; GIULIANO, 2009.

27 HEINEMANN; HENNIGHAUSEN, 2010.

that personal income concerns are only partially capable of explaining support for progressive taxation.

Research results on attitudes towards redistribution and progressive taxation may indicate that individuals are not only concerned with their own well-being but also with those of other people. Thus, there is strong evidence that, in addition to the actual payment and fulfillment of the tax liability in general, individuals also attach importance to equitably fair distributions.

Understanding the determinants of tax morale is a relevant factor in explaining why people pay taxes. This understanding, simultaneously, can help combat tax evasion. In parallel, theoretical studies reveal an extremely important link between tax progressivity and tax morale.

The theoretical analysis shows that tax morale of an individual is greater, the more progressive is the taxation and that the impact of the progressivity scheme, in relation to tax morale, declines with the level of income. Therefore, the empirical test of these hypotheses reveals a positive (and declining) association between progressive taxation and tax morale, suggesting that tax evasion is lower in systems with high degrees of progressivity.[28]

On that account, in theory, progressive taxes contribute to a lower level of tax evasion and to greater equity and equality due to the possibility of income redistribution. That's why much of the academic and political debate centers on the impact of institutions and policies on tax morale and on ways to improve it.

Public policy makers are aware that their citizens have different levels of tax morale when establishing the tax burden. It is, therefore, necessary to determine how tax morale relates to tax burden that governments impose on different

28 DOERREMBERG; DUNCAN; FUEST; PEICHL, 2012.

groups of taxpayers. That is, taking the level of tax morale as given, the question is how it affects the tax burden that governments impose on different groups of taxpayers.

Many are the independent variables that, in an econometric model, should be considered as determinants of tax morale and tax evasion in an environment of tax progressivity. For that reason, it is carried out a theoretical review of these variables, based on specialized academic literature.

1.1 Variables tested in the model

a) Age

The literature, when analyzing the age factor, concludes that elderly people fulfill their tax obligations better among the others[29]. On this variable, it is also intuited that there will be, on older people, less fiscal effects of disincentives, in relation to property taxes, than on the younger ones, since in the transfer of property this obligation would fall on their heirs. In addition, older people are concerned about the possibility of receiving fiscal sanctions, not only in relation to the objective aspects of the fine and tax penalty, but also in terms of social acceptance, considering their image before the community in which they lived and they built their reputation and social status.[30]

b) Sex

The literature points out that women tend to fill their income tax returns more accurately than men, thus determining a lower level of tax evasion when compared to those.

29 See ALM; TORGLER, 2006; FREY; TORGLER, 2007 and TORGLER; SCHAFFNER, 2007.

30 See POMMEREHNE, WECK-HANNEMANN, 1996.

However, studies indicate that the coefficient is not significant and the marginal effects are very small.[31]

c) Education

The analysis of the education factor is interesting. Especially when it comes to higher education, since it has a positive influence on tax evasion. Studies show that an increase in educational level per capita increases the proportion of people who have made exaggerated deductions on their income tax returns[32]. The literature argues that taxpayers with a better level of formal education may have greater knowledge and understanding of tax legislation, and consequently about the possibility or not of committing excesses in their deductions or expenses[33].

Consequently, a good educational level makes it easier to understand the taxation theme and helps to visualize and understand the connection between taxes and benefits. A better educated taxpayers will naturally be more prepared to assimilate tax law and, therefore, better to evaluate the degree of risk of tax noncompliance.[34]

d) Social class

The social class factor is a variable that is linked to an economic aspect (level of income of the taxpayer)[35], however, its analysis gains a high degree of complexity, since, in parallel with the mentioned aspect, that are others directly linked to the first, for example, the educational level. Em-

31 See DOERRENBERG, PEICHL, 2011 and TORGLER; SCHAFFNER, 2007.

32 TORGLER, 2003a.

33 TORGLER; SCHAFFNER, 2007 and RODRIGUEZ-JUSTICIA; THEILENB, 2016.

34 TORGLER, 2003c.

35 DOERRENBERG, PEICHL, 2011.

pirical research shows a tendency that low-income groups have higher tax morale than groups with better economic conditions[36].

e) Religiosity

Empirical research that considers the variable religiosity as a factor influencing the behavior of taxpayers reveals that tax evasion and religious belief are negatively related variables. Torgler[37] states in his research that there is a strong cause-and-effect relationship between religiosity and tax evasion, with tax morale as a moderating factor. The results are confirmed by Torgler[38] for Latin America.

f) Ideology

Ideology is a term that can be analyzed under two conceptions: the neutral and the critical. In the first sense it means a set of ideas, thoughts, doctrines or world views of an individual or a group, that drive their social actions and, mainly, their political ones. In the second conception, ideology can be considered as an instrument of domination that acts by convincing and alienating human consciousness and masking reality.

In the tax field, the ideology factor is very much linked to the identification of the political regime established in the state (democratic, authoritarian, autocratic) and in the conception of governmental management and how the public policies are implemented.

However, in modern times, it is worth considering that inserted in the ideology theme, the "right versus left" debate has gained a new physiognomy. Nowadays, this distinction

36 TORGLER, 2003c.

37 TORGLER, 2006.

38 TORGLER, 2006.

is no longer anchored in the concepts of freedom or the promotion of well-being as a function of economic development; but in aspects related to values such as order, justice and protection of the environment. In this understanding, right--wing political forces, notably in a capitalist and democratic country, struggle especially to ensure order as a priority. Left-wing political groups, on the other hand, choose the promotion of justice as their primary objective, even though this may jeopardize order; and in this direction simultaneously give the State a role as an active agent in reducing social inequality and in promoting the ideals of justice.

According to the doctrine of Bobbio, equality should be considered as the central theme of the Left and should not be seen as a utopia where all are equal in everything in society, but as a dual tendency, in which: on the one hand, it emphasizes more aspects which makes men equal, than those who make them unequal; and, on the other hand, the search for policies that tends to drop inequality, that is, policies aim in practice to make more equal the inequals. Moreover, this last conception of the left reinforces the idea that the search for equality goes hand in hand with the ideals of social justice.

In practice, it is observed that the process of recent democratization in Latin America has shown signs of favoring the redistribution of income through the redirection of public spending, promoting a social recovery precisely of low-income sectors.

As a consequence, it would be natural to understand that states governed by political sectors with leftist ideologies, which direct public expenditure to social recovery, encourage the citizen-taxpayer to be more obedient. Conversely, governments with right-wing ideologies, concerned only with maintaining order, negatively influence tax compliance.

g) Level of autocracy

The position of the formulators of both proposals and political decisions also has a direct influence on the willingness of taxpayers to comply with their tax obligations. Notably, the theory that views taxes as the object of a psychological contract, argues that when the elaboration of tax laws is considered fair and the litigation is decided on the basis of constitutional precepts, taxpayers generally feel more inclined to consider public policies as a counterpart; and, as a consequence, they are inclined more spontaneously to comply with the tax obligation[39].

From the foregoing, it is easy to perceive the difficulty of taxpayers complying with the tax obligation in autocratic regimes, which do not consider the democratic participation of the population in the processes of public policy formulation.

Political participation is a component that has beneficial effects. Strengthening democracy gives citizens the opportunity to express their preferences. A more active role of taxpayers competes to monitor and to better control the politicians and thus it reduces the asymmetry of information between them and their agents (government), which reduces discretionary power. This situation has an influence on tax morale. A stronger pro-democracy political environment presents a significant positive result on tax morale[40].

h) People's trust in each other

Some researches indicate that, usually, in societies where people have confidence in each other, it is because they maintain a closer level of interaction, which can be

39 FONG, 2001.

40 TORGLER, 2005.

decisive for a positive attitude concerning paying taxes[41]. The literature indicates that this factor is related to the level of social capital. A high level of social capital is an inductive instrument and facilitator to determine a better level of government and public management[42].

i) Confidence in congress and judiciary

The theme of tax morale establishes a direct relation with the confidence that the citizen places in the spheres of state power. Therefore, the literature indicates that the greater the degree of credibility citizens have in state institutions, the greater the degree of tax morale and, in the same direction, that of tax compliance, as well.[43]

In Latin America, however, it is worth noting that, in many countries, the trust that the citizen places, both in the Legislative and in the Judiciary, is a cause for concern; because countries characterized by authoritarian or undemocratic regimes and that normally do not develop public management in a transparent way make it difficult to stimulate the moral behavior of citizens in tax field. Besides, the lack of confidence in these Sate powers is an instrument that acts negatively in relation to tax morale and, in the same direction, to tax compliance, which means that it serves to stimulate the level of tax evasion.

Additionally, in many countries in Latin America both political offices are filled by an economic elite and members of the Judiciary usually belong to the more affluent sections of society. Thus, politicians and members of the Judiciary reproduce the ideology of the ruling elite and perpetuate a

41 TORGLER; SCHAFFNER, 2007 and DOERREMBERG; DUNCAN; FUEST; PEICHL, 2012.

42 FONG, 2001 and HEINEMANN; HENNIGHAUSEN, 2010.

43 TORGLER 2003a and TORGLER; SCHAFFNER, 2007.

model that does not serve the community fairly and equitably. Thus, unfortunately, the lower the trust in powers, the lower the degree of tax morale and fiscal compliance.

The coherence of the activities performed by the members of the Judiciary, reflected in the speed and quality of the judicial service affects positively the taxpayers to comply with their tax obligations. Hence, a judiciary recognized as effective and fair represents an instrument that contributes positively to tax morale and consequently to tax compliance.

j) Employment status

Studies show that there is no relevant difference between categories of employees, but except for a higher level of tax evasion among part time employees, the unemployed and the retired, when compared to employees working in full-time.[44]

On the other hand, surveys considering macroeconomic indicators reveal that, in periods of economic crisis, determinants of unemployment increase in the short term, have a negative and significant impact on the tax morale, indicating that it reduces in times of crisis.

k) Perception of Corruption

The corruption factor affects in many ways and very negatively the tax morale of the taxpayers, determining a real frustration on taxpayers. Some papers indicate that in Latin America taxpayers do evade taxes because there is corruption[45]. Ecuador, Mexico and El Salvador have the highest rates, Argentina, Chile and Peru, the lowest.

Corruption can reach a great number of social actors involved in taxation. Moreover, when this is manifested in

44 DOERRENBERG; PEICHL, 2011.

45 TORGLER, 2003a and TORGLER; SCHAFFNER, 2007.

the sphere of the tax administration, it decisively represents a real negative effect on the behavior of taxpayers[46].

The literature of fiscal compliance indicates that in public management, the discretionary power over resource allocation may induce reprehensible corruption behavior. This is especially true in developing countries, where public agents are in the context of a political elite, who holds relevant positions in the hierarchy of public administration as well as in legislative houses. Over-regulation, on the one hand, and the lack of transparent and democratic procedures, on the other, often provides good scope for illicit activities.

In this plan, corruption reduces the efficiency of the allocation of public resources, mostly financed through tax revenue. In some countries, the wages of tax agents have been increased to reduce the incentive for them to engage in corruption.

The issue of corruption manifests itself in the most varied social strata, even if for different reasons, but in all situations represents a component that negatively influences tax morale and tax compliance.

2 An empirical assessment

2.1 The model

This article seeks to evaluate the propensity of a Latin American to evade paying taxes using the latest data available from Latinobarómetro, 2016. In this round, 20.204 people were interviewed in Latin America. This survey, designed to represent a sample of the voting age population, embraces a great quantity of topics, from issues related to satisfaction

46 TORGLER, 2003a and RODRIGUEZ, 2015.

with the social situation of respondents to various interests in politics, conventional or not.

It is crucial to point out that in cross-section[47] studies the modeling for more than two possible scores (polytomous responses) is adjusted in a multinomial logistic regression, also known as generalized logistic model, in case the categorical responses are nominal ones[48]. Among them, the cumulative logit model[49] is the most used. Known as a proportional odds model[50], it assumes that there is approximately linear growth of odds ratios for the regression coefficients. The odds ratio is a statistic that measures the chances of a particular result happens if a particular factor is present. This is a measure that tells us how much more likely a person exposed to a certain factor under study presents a certain behavior compared to another person that is not exposed. It is used to compare the probabilities of occurrence of some outcomes (evade taxation, for example), considering the different perceptions of the structures of political opportunities or different socioeconomic conditions.

47 Cross-sectional studies make comparisons at a single point in time, whereas longitudinal studies make comparisons over time.

48 A nominal variable is one that has two or more categories, but there is no intrinsic ordering to the categories. For example, gender is a categorical variable having two categories (male and female) and there is no intrinsic ordering to the categories.

49 The name cumulative link models is adopted from AGRESTI (2002), but the models are also known as ordinal regression models although that term is sometimes also used for other regression models for ordinal responses such as continuation ratio models.

50 Everything begins with the concept of probability. Assuming that the probability of success of any event is 0.8, the probability of failure is 1- 0.8 = 0.2. The odds ratio are defined as the ratio of the probability of success in relation to the likelihood of failure. In our example, the odds ratio are 0.8 / 0.2 = 4. This means that the chances of success are 4 to 1. When OR=1 exposure does not affect odds of outcome; if OR>1 exposure associated with higher odds of outcome and if OR<1 exposure associated with lower odds of outcome.

The proportional odds model, however, has been used in the literature without a basic and important finding about its assumptions. Described initially by McCullagh[51], it assumes that the coefficients, for each explanatory variable, are the same for all logits. Often, however, this assumption may not be verified, which allows non-proportionality for a subset of covariates that violate proportionality and non-proportional odds when proportionality is abandoned.

Therefore, this assumption must be tested before the setting for the model. With this objective, the test of score proposed by Corrar et al. (2007) is used:

$$S = U'(\theta_0)[-\theta_0)]^{-1}U(\theta_0),$$

in which $U(\theta_0)$ is the scoring function $U(\theta_0) = \partial \log L(\theta) / \partial\theta$ evaluated in θ_0, $[-F(\theta_0)] - 1$ is the inverse of $-F(\theta_0)$, the matrix of variances and observed covariates of $U(\theta)$, also evaluated in θ0 and $U'(\theta_0)$ represents the derivative of the scoring function. This statistic follows asymptotically a chi-square distribution[52] with $p = K(J - 2)$ degrees of freedom, K being the number of explanatory variables and J the number of variable responses present in the model. For large samples, the hypothesis H_0 that the model has proportional odds is rejected at a level α of significance and p degrees of freedom if $S > \chi 2(1-\alpha, p)$. A non-significant test indicates evidence that the model to be adjusted is that of proportional odds.

With regard to the ordinal model of proportional odds, the strategy to be pursued is the dichotomization of the

51 McCULLAGH, 1980.

52 The chi-squared distribution is a squared standard normal random variable, so it takes only nonnegative values and tends to be right-skewed. The extent of its skewness depends on the degrees of freedom or number of observations. The higher the degrees of freedom (more observations), the less skewed (more symmetrical) the chi-squared distribution.

categories of the response variable[53]. Data analysis occurs in a manner analogous to a dichotomous variable and it is performed by combining two of the response categories at a time. That is, an accumulated probability is made such that:

$$\theta_{h\,i\,j\,k\,1} = \Pi_{h\,i\,j\,k\,1}$$

$$\theta_{hijk2} = \Pi_{hijk1} + \Pi_{hijk2}$$

It is easy to see that, thus, $\Pi_{hijk3} = 1 - \theta\, \Pi_{hijk2}$

For each subpopulation, for an ordinal response with L> 2 categories, L - 1 cumulative logits are considered, based on accumulated probabilities. For three categories of the response variable, it shows:

$$\text{logit}_1(\theta_{h\,i\,j\,k\,1}) = \ln \quad \text{e logit}_2(\theta_{h\,i\,j\,k\,2}) = \ln$$

$$\text{or logit}_1(\theta_{h\,i\,j\,k\,1}) = \beta_{01} + \beta' X_{hijk} \text{ e logit}_2(\theta_{h\,i\,j\,k\,2}) = \beta_{02} + \beta'_L X_{hijk}$$

It can be seen that the proportional odds model that takes both odds into account simultaneously, for each combination of the explanatory variables of the model is:

$\text{logit}\ (\theta_{hijkL}) = \beta_{0L} + \beta'_L\ X_{hijk}$ where L indexes the two logits.

The parameter β_{01} represents the intercept of the first cumulative logit and the parameter β_{02} represents the intercept of the second cumulative logit. $\beta_{L'}$ is a vector of effects parameters for the explanatory variables. X_{hijk} is a representative vector of explanatory variables. There are L-1 values estimated for the intercepts and only one value for each

53 Thus, considering a multinomial polymorphic model with three responses to be predicted by four variables h, i, j and k, the individual probabilities of each response are given by Hosmer; Lemeshow (2002): Π hijk1 = P (Y = 1 IX 1 = x h, X 2 = x i, X 3 = x j, X 4 = x k) =; Π hijk2 = P (Y = 2 IX 1 = xh, X 2 = xi, X 3 = xj, X 4 = xk) = Π hijk3 = P (Y = 3 IX 1 = xh, X 2 = xi, X 3 = xj, X 4 = xk).

explanatory variable of the model, being this value used in all logits.

Another alternative for rejecting the proportional odds assumption is to adjust the non-proportional odds model. While in the proportional odds model it is estimated several intercepts and a single parameter for each independent variable, which is admitted as valid in all logits, in this model several intercepts are estimated as well as several parameters for each predictor variable in a respective logit (HOSMER; LEMESHOW, 2002). As for the models for the L-th and M-th logits adjusted for the explanatory variables X_h ,X_i , X_j and X_k, they would be:

$$\text{logit}(\theta_{hijkL}) = \beta_{0L} + \beta_{1LXh} + \beta_{2LXi} + \beta_{3LXj} + \beta_{4LXk} \text{ and}$$

$$\text{logit}(\theta_{hijkM}) = \beta_{0M} + \beta_{1MXh} + \beta_{2MXi} + \beta_{3MXj} + \beta_{4MXk}$$

Since the explanatory variables are not proportional, a model is fitted for the generalized logits and not for the cumulative logits where each generalized logit is formed with the probability of each response category on the reference response category, chosen according to the researcher's interest. Thus, in an experiment with two independent variables h and i and four categories of response variables, with

Π_{hi1} = Probability of the response occurring in the first category of the variable given the conditions h and i.

Π_{hi2} = Probability of the response occurring in the second category of the variable given the conditions h and i.

Π_{hi3} = Probability of the response to occur in the third category of the variable given the conditions h and i.

Π_{hi4} = Probability of the response to occur in the fourth category of the variable given the conditions h and i.

Three generalized logits will be formed. Note that if there are L categories of response variable, L-1 generalized logits will be formed.

Taking the first response variable as a reference, it shows

$\text{logit}_{hi1} = \log$, $\text{logit}_{hi2} = \log$, $\text{logit}_{hi3} = \log$

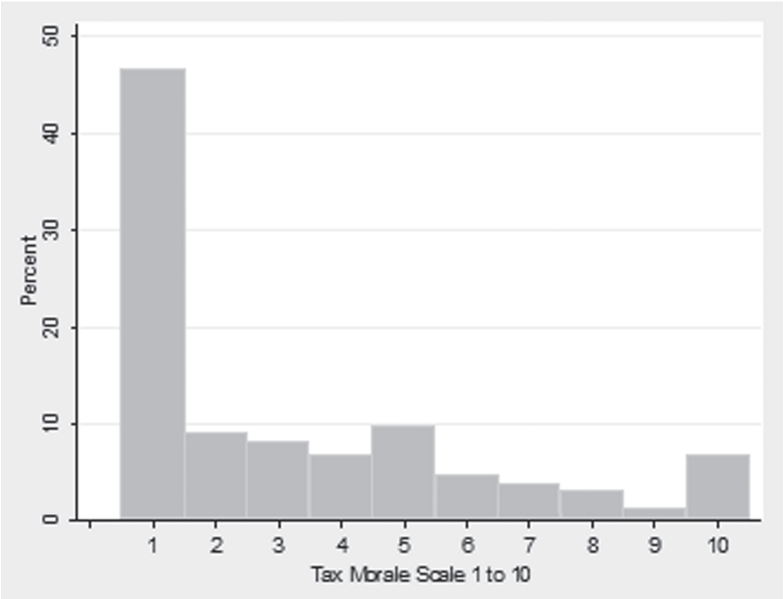
Thus, the model to be adjusted for the generalized logits is expressed by:

$\text{logit}_{hik} = \beta_{0k} + \beta_{k'Xhi,}$ where k indexes the 3 logits.

2.2 Looking for the variables

From the discussions in the introduction, the dependent variable, tax morale, is the answer to the question made in the Latinobarómetro survey (2016): "On a scale of 1 to 10, where 1 means "not at all justifiable" and 10 means "totally justifiable", how justifiable do you believe it is to evade paying taxes? The distribution of this variable could be seen in Figure 1:

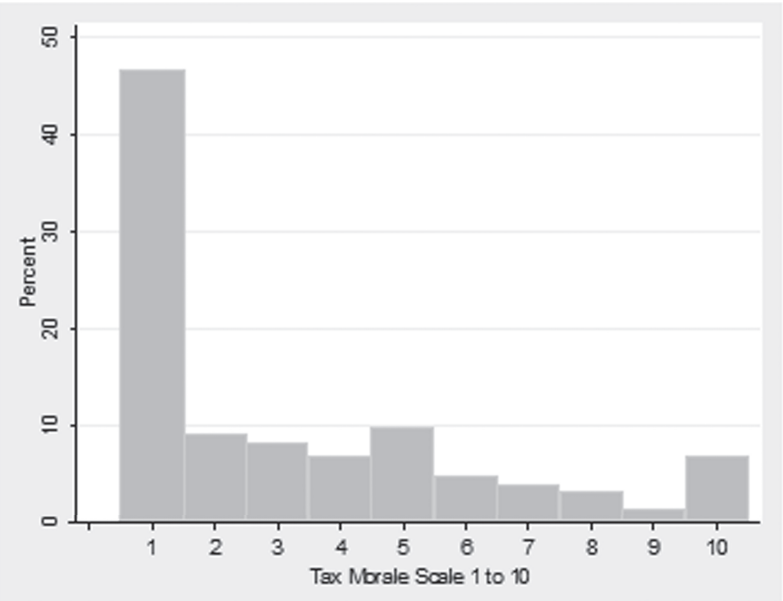
Figure 1: Distribution of tax morale, 1 to 10



Source: Latinobarómetro (2016), own elaboration

The dependent variable is condensed in a three response variable, where "0" takes the scale 1, never justifiable to evade paying taxes, the scale "1" takes the answer 2 to 6, meaning that it's sometimes justifiable to evade and the scale "2", where a high propensity to evade is considered (Figure 2). One level of the dependent variable is chosen as the reference category. This is typically the most common or the most frequent category.

Figure 2: Distribution of tax morale, 0 to 2



Source: Latinobarómetro (2016), own elaboration

For the independent variables, the article considers[54]: age, sex (male), education, social class, religiosity, ideology, autocracy level, level of people's trust in one another, confi-

54 Respectively in Latinobrómetro (2016): edad, sexo, S13, S22, S8.A, P17ST, P10ST, P12ST, P13ST.D, P13ST.F, S18.A, P10TI

dence in the Congress, confidence in the judiciary, employment situation and corruption perception. The assumptions are that the explanatory variables are able to increase or decrease tax morale.

2.3 How to measure tax progressivity?

Many methods of measuring tax progression have been proposed such as tax elasticity and residual income elasticity. These first ones relate only to the tax schedule and do not care about the income distribution in which the tax applies. Musgrave and Thin (1948) were the first ones to propose global measures of tax progression as a kind of inequality measures of pre- and post-tax incomes, or weighted deviations between taxation and a revenue-neutral hypothetical proportional taxation.

They presented, though, a great shortcoming: tax schedules which have for some income intervals declining average tax rates, may be categorized as more progressive than tax schedules with increasing average tax rates throughout. Meanwhile, development of global tax progression based on dominance relations of Lorenz curves followed the discussions. The Lorenz curves prevailed afterwards due to single-crossing conditions[55] (Hemming; Keen, 1983), or domination of elasticity over the whole income support[56] (Jakobsson, 1976; Kakwani, 1977). Notwithstanding, measures of global tax progression are restricted as they can only compare tax schedules if the same income distribution applies to all tax schedules to be compared.

Realistic evaluations of tax progression ask for comparisons of different tax schedules associated with different

55 HEMMING; KEEN, 1983.

56 JAKOBSSON, 1976 and KAKWANI, 1977.

income distributions. However, tax equity implies the delimitation of a citizen's tax morale insofar, as the latter perceives that a tax system is fair or unfair, leading to a subjective consideration of the question of equity. In this respect, this paper uses a proxy for tax progressivity in LA. It is taken into account the extent to which income inequality could be also considered a result of tax policies. In Latinobaromtro (2016) the variable number P21ST ("How fair do you think income distribution is in your country") is thus considered.

It's observed that fiscal policy can help reduce income inequality through various channels. First, progressive direct taxes and transfers can reduce disposable income inequality (inequality of income after taxes and transfers) so that it is less than market income inequality (inequality of income before taxes and transfers). Second, it can affect "real" disposable income inequality via consumption taxes. Third, through in-kind transfer spending (such as on education and health), it can reduce the inequality of "full income" (disposable income adjusted for in-kind transfers). In-kind transfers such as those for education and health also affect market income inequality over time by changing the distribution of human capital, including across generations by promoting social mobility. The extent of fiscal redistribution will depend on both the magnitude of taxes and transfers and their progressivity.

Since the progressiveness of a country's tax system can make a great difference in reducing inequality in the distribution of final income, the more the income is perceived to be concentrated, the unfairest the taxation system is considered. This is particularly relevant when one does not have a large share of progressive taxes in the total tax burden, as is the case in most Latin American countries, making the sense of inequity in income distribution more perceived.

These countries rely more heavily on indirect taxes as a source of revenue. Overall, indirect taxes in these countries tend to be either slightly progressive or slightly regressive and therefore have only a small impact on income inequality[57]. The low level of direct transfers also limits the extent of fiscal redistribution that can be achieved on the spending side of the budget.

It is evident that the tax system can play an important role in reducing income disparities. The decisions to be made about taxation - how much is to be raised and by what means – affect much more than just finding the revenue for the provision of public services. In this sense, it is argued that increasing inequality is a problem, and that it is not inevitable. In that context, a good government depends on, among other things, tax settings that are genuinely progressive, and which are seen to be both fair and efficient.

The paper, therefore, has the following variables:

Table 1 – The model's variables

Variable	Description	Values
Y	How justifiable do you believe it is to evade paying taxes?	0 – Never(1)
		1 - Low (? 6)
		2 - High (>6)
X1	Age	From 16 till 96
X2	Sex	1 if male, 0 if female
X3	Respondent Years/Type of education	1 Without education
		2 One year of education
		3 Two years of education
		3 Four year of education
		4 Five years of education
		...
		13 Twelve years of education
		14 Incomplete university
		15 Completed university
		16 High school academies Incomplete techni
		17 High school academies complete techni

57 CHU; DAVOODI; GUPTA, 2000.

X4	Perception of socioeconomic status	1 Very good
		2 Good
		3 Not Bad
		4 Bad
		5 Very bad
X5	Religiosity	1 Very practicing
		2 Practicing
		3 Not very practicing
		4 Not practicing at all or no religion
X6	Ideology	From 1 to 11, where 1 is left and 11 is right
X7	Autocracy level	0 Country governed for a powerful group
		1 For the good of all
X8	People's trust in one another	0 One can trust most
		1 One can never be too careful
X9	Confidence in the judiciary	From 1, a lot, to 4, None
X10	Confidence in the Congress	From 1, a lot, to 4, None
X11	Employment Situation	1 Self Employed
		2 Public agent
		3 Salaried
		4 Temporarily out work
		5 Retired
		6 Student
X12	Corruption perception	1 Increased a lot
		2 Increased some
		3 Stayed the same
		4 Decreased some
		5 Decreased a lot
X13	Tax progressivity (how fair the income distribution is)	1 Very fair
		2 Fair
		3 Unfair
		4 Very unfair

Source: Latinobarómetro (2016), own elaboration

3 The results

Once the explanatory variables of the model were selected, the score test was performed with the purpose of evaluating the assumption of proportional odds for the model. Table 1 presents the results for this model. The statistic of this test was 432.15 with a p-value <0.0001 and 13 degrees of freedom, thus indicating the rejection of the hypothesis of proportionality. Thus, alternatives to adjustment are the models of partial proportional odds or non-proportional odds.

Table 2 - Estimations of the proportional odds model

Parameter	DF	Estimation	SD	Wald (χ2)	P Value
Intercept 1	1	3,42	0,3184	177,05	<0,0001
Intercept 2	1	0,34	0,2124	2,83	0,0937
X1	1	-1,17	0,20	23,05	<0,021
X2	1	-2,11	0,21	82,42	<0,0054
X3	1	-3,72	0,23	116,04	<0,003
X4	1	-3,43	0,98	197,41	<0,0001
X5	1	1,82	0,78	97,13	<0,002
X6	1	0,07	0,81	51,55	<0,043
X7	1	5,42	1,40	432,7	<0,0034
X8	1	0,42	0,3	65,01	<0,032
X9	1	-0,12	0,02	15,4	<0,005
X10	1	-4,37	1,41	187,3	<0,004
X11	1	-5,21	0,08	215,87	<0,0001
X12	1	0,4	0,05	9,48	<0,003
X13	1	2,13	0,98	56,13	<0,0001
Score Test	11			432,15	<0,0001

Source: Latinobarómetro (2016), own elaboration

After the rejection of the proportionality hypothesis, the parameters were estimated for the non-proportional odds model. In this model several parameters for the intercept were estimated, as well as for the covariates in the two logits (k -1, where k = 3 response categories). In the logit 1, of equation:

Logit 1 = Inter 01 + $(Age_{11}).X_1$ + $(Sex_{21}).X_2$ + $(Educ_{31}).X_3$ + $(Econ_{41}).X_4$ + $(Rel_{51})X_5$ + $(Ideol_{61})X_6$ + $(Auto_{71})X_7$ + $(Trust_{81})X_8$ + $(Jud_{91})X_9$ + $(Cong_{101})X_{10}$ + $(Emp_{111})X_{11}$ + $(Corr_{121})X_{12}$ + $(Prog_{131})X_{13.}$ There are people with a low tendency to evade taxation versus there is not.

In the logit 2, of equation: Logit 2 = Inter 02 + $(Age_{12}).X_1$ + $(Sex_{22}).X_2$ + $(Educ_{32}).X_3$ + $(Econ_{42}).X_4$ + $(Rel_{52})X_5$ + $(Ideol_{62})$

X_6 + $(Auto_{72})X_7$ + $(Trust_{82})X_8$ + $(Jud_{92})X_9$ + $(Cong_{102})X_{10}$ + $(Emp_{112})X_{11}$ + $(Corr_{122})X_{12}$ + $(Prog_{132})X_{13}$ represents: There are a number of people highly predisposed to evade taxes versus there is not.

All variables were significant ($p < 0.05$)[58]. Therefore, it was necessary to adjust the non-proportional odds model under the likelihood ratio test (722.8 <0.001) as well as the estimation of coefficients and odds ratios having the response variable Y = 0 as reference.

Table 3 – Determinants of Tax Morale

Parameter	DF	Estimation	SD	P Value	OR
Intercept 1	19112	4,84	2,48	-	-
Age_{11}	19112	0,38	0,64	<0.0001	1,08
Sex_{21}	19112	0,29	0,17	<0,0021	1,34
$Educ_{31}$	19112	0,02	0,81	<0.0032	1,02
$Econ_{41}$	19112	-1,33	0,16	<0.32	0,26
$Relig_{51}$	19112	3,75	0,82	<0,45	42,50
$Ideo_{61}$	19112	4,72	0,78	<0,33	112,11
$Autoc_{71}$	19112	0,25	0,48	<0,0031	0,81
Trust81	19112	-7,45	0,48	<0,51	0,0006
Jud_{91}	19112	0,45	0,92	<0,0045	1,56
$Cong_{10\,1}$	19112	-0,45	1,14	<0,4	0,63
$Emp_{11\,1}$	19112	0,90	0,5	<0,32	2,45
$Corrup_{12\,1}$	19112	0,14	1,13	<0,0003	1,15
$Tax_{13\,1}$	19112	0,19	0,33	<0,0001	1,21
Intercept 2	19112	3,12	2,31	-	-

58 In almost all research, the investigator hopes to reject the null hypothesis, because the null hypothesis usually it is not the same as the other. When a researcher can reject the null hypothesis (and the conventional criterion for the decision to reject is p <.05, but that is totally arbitrary), the researcher interprets that rejection the evidence that the variables ARE related to each other, and that is what researchers usually hope to show.

Age_{12}	19112	0,31	0,61	<0.02	1,09
Sex_{22}	19112	0,11	0,19	<0.0001	1,12
$Educ_{32}$	19112	0,04	0,77	<0,029	0,41
$Econ_{42}$	19112	0,33	0,13	<0.045	1,39
$Relig_{52}$	19112	1,75	0,74	<0,09	5,75
$Ideol_{62}$	19112	0,07	0,78	<0,03	1,04
$Autoc_{72}$	19112	2,78	0,45	<0,47	16,11
$Trust_{82}$	19112	-1,45	0,51	<0,11	0,23
Jud_{92}	19112	-0,10	0,84	<0,037	1,90
$Cong_{102}$	19112	-0,48	1,11	<0,4	0,62
Emp_{112}	19112	0,54	0,6	<0,51	1,71
$Corrup_{122}$	19112	3,13	1,11	<0,002	1,37
Tax_{132}	19112	0,45	0,35	<0,027	1,56

Source: Latinobarómetro (2016), own elaboration

Thus, the non-proportional odds model adjusted for the two logits is:

Logit1 = $4{,}84 + 0{,}38.Age_{11} + 0{,}29.Sex_{21} + 0{,}02.Educ_{31} - 1{,}33.Econ_{41} + 3{,}75.Relig_{51} + 4{,}72.Ideo_{61} + 0{,}25.Autoc_{71} - 7{,}45.Trust_{81} + 0{,}45.Jud_{91} - 0{,}45.Cong_{101} + 0{,}90.Emp_{111} + 0{,}14.Corrup_{121} + 0{,}19.Tax_{131}$

Logit2 = $3{,}12 + 0{,}31.Age_{12} + 0{,}11.Sex_{22} + 0{,}04.Educ_{32} + 0{,}33.Econ_{42} + 1{,}75.Relig_{52} + 0{,}07.Ideo_{62} + 2{,}78.Autoc_{72} - 1{,}45.Trust_{82} - 0{,}10.Jud_{92} - 0{,}48.Cong_{102} + 0{,}54.Emp_{112} + 3{,}13.Corrup_{122} + 0{,}45.Tax_{132}$

3.1 Relevant interpretations

The results confirm partially the hypotheses about the impact of the socioeconomic variables and the motivatio-

nal ones. In the logistic regression 1 the significant results - p-value smaller or equal to 0.05, are: age, sex, education, autocracy level, confidence in the judiciary, corruption perception and tax progressivity. In the case of the second logistic regression, the determinants statistically significant are: age, sex, education, social-economic class, confidence in the judiciary, ideology, corruption perception, and tax progressivity.

Finally, in none of the specifications, the variables concerning religiosity, trust in others, confidence in the Congress, and employment situation have reasonable effects on the results, i.e., they are statistically indistinguishable in relation to other variables.

Some of the proxies related to the functioning of the institutions have a significant effect on the estimated probability of tax evasion. This is because, in statistical terms, the p-values of the variables autocracy level, confidence in the judiciary, corruption perception and tax progressivity have proved to be smaller or equal to 0.05. In other words, the hypotheses that such factors affects the propensity to evade taxation is true and, therefore, they do not result from a random situation. In this sense, logit 1 notes that when Latin Americans perceived that they are governed for the good of all and not for a powerful group, the enhancement of democracy could bring down the chances to evade by up to 19%.

To interpret the odds ratio of confidence in the judiciary, it is worth mentioning that the results of the survey were tabulated between 1 and 4: 1, for those with strong confidence; 2, trust greatly; 3, trust a little, and 4, do not trust. In other words, the greater the value, the greater the mistrust. Returning to the table 2, it is observed that the more mistrust with the judiciary, the more chances of cheating the tax administration at 56 and 90%, respectively. Once such

skepticism in Latin America is higher than the average of the other countries, this variable is an important predictor for tax cheating.

What about the chances of tax evasion in accordance with corruption perception? Here the statistics indicate also that the greater perception, the greater chances of not paying all the taxes due. However, the data from Latinobarómetro revealed a great increase in this perception comparing 2016 with the precedent years, as many judicial investigations took place in the region and many politicians were arrested in Argentina, Brazil and Mexico. In this way, the interaction of this variable makes the propensity of individuals to try to evade taxation at 15 and 37% respectively.

As for the tax progressivity, measured in our model as a way to turn the society less unequal, the findings corroborate the arguments raised before. In particular, the unfairer the income distribution is, or the more progressive the tax system is, the more probability to evade taxation. In the first equation, this probability is 21% higher and in the second, 56% more.

The results also indicate that the older the Latin Americans, the more propensity to evade and men do much more than women. Remarkable is the fact that the more educated the Latin American, the greater propensity to evade taxation, but very slightly, at 8 and 9% more.

Interestingly, ideology presented a significant effect on the propensity of Latin Americans to try to evade taxation in the second equation. By the way she was measured in the survey, the results indicate that further to the right is the citizen, the greater propensity to cheat, but at a very little difference of 4%.

It follows from the foregoing that the presented results corroborate our expectations that the political context, its

structure and its perception are important predictors of tax evasion.

Concluding remarks

There is great evidence that observed tax compliance behavior cannot be explained entirely with the traditional economic analysis that focuses mainly on deterrence components. Instead, there are several other factors that help explain why many people are compliant, especially the notion of ''tax morale''. The literature that followed focused on the link between tax morale and compliance behavior and it reported a positive correlation of the two elements. There are some evidence that countries with a high degree of tax morale promote high degree of tax compliance and even a low informal economy.

Tax morale, or ''the intrinsic motivation to pay taxes'', might help explain the puzzle of why so many individuals pay their taxes. Interestingly, this has been discussed as a residual explanation without investigating factors that shape tax morale. By analyzing tax morale as a dependent variable and trying to search for determinants, many interesting results are found. In this way, governments might be called to carry out several policy changes in order to foster tax compliance levels, such as simplifying taxpaying procedure; making believe for the taxpayers that paying taxes is the right thing to do; developing fairer tax systems and promoting cooperative rather than deterrent tax policies.

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