Game Theory Applied to Business Decision Making under Fiscalization in Croatia: Analysis, Equilibrium, and Policy Recommendations

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The Croatian Fiscalization Law implemented in Croatia in 2013 created dynamic interaction and significant consequences for business and the Government. We examine the influence of the Fiscalization Law on decision making of businesses and its consequences. The paper provides an overview and analysis of the implementation process, business decisions, interactions between business and Tax Administration, as well as the consequences. Financial benefits of tax evasion form a clear motivation for businesses, but noncompliance could lead to losses due to penalties. Given the decision-making under risk, the interaction between a business and Tax Administration should be formed as a game model enriched with empirical data. Given the empirical data, while businesses show tendency to deviate, Government generates gain. Hence, it is necessary to examine the equilibrium: how much deviation will the Government tolerate before raising penalties, and which amount of risk will business be willing to take in order to evade taxes.

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Introduction

There have been negative economic trends in Croatia for several years, caused by the global economic crisis. In the last few years, fiscal policy actions are aimed at fiscal consolidation of revenue, and the expenditure

side of the national budget. Activities on the revenue side relate to changes in tax regulations, reducing grey[1] economy and the more efficient charging of budget revenues (Republika Hrvatska 2014).

In a wider sense, grey economy includes all activities that occur outside the boundaries of the official economy, although it is very difficult to precisely define grey economy and to estimate its real size (Kesner-Škreb 1994). Tanzi (1983) defines grey economy as any earned income that is not reported to national authorities. Feige (1990) divides grey economy into four categories:

1. Illegal economy, which includes production and distribution of goods and services that are specifically prohibited by law, such as drug trafficking, prostitution, smuggling and organized crime;
2. Undeclared economy, which includes activities to avoid the compliance with the tax rules and activities to avoid paying taxes, for example not reporting the turnovers;
3. Unregistered economy, which includes activities that are not reported to official statistics and are not part of the national accounts;
4. Informal economy, which refers to activities by which a company reduces costs and violates administrative rules, such as unregistered workers.

There are numerous reasons for the existence of grey economy in Croatia. Škare (2001) sees those reasons as both external and internal. External reasons are the ones outside the economy domain, related to the consequences of war, alienation, insecurity, and weak regulations for law implementation. The internal factors include poor implementation of regulations and law corruption, bad administration, and bad allocation of public resources by the state.

According to the survey 'Grey Economy in Croatia' (Selectio 2006), the main reasons for participating in grey economy for both the employers and the businesses are high taxes, which burden the legal businesses; non-implementation of laws; weak sanctioning of law offenders; the 'untouchables,' i.e. privileged individuals; and the appetite for more money.[2]

This paper includes the category of grey economy which is related to non-compliance with tax rules; tax avoidance by not reporting the real amount of turnovers generated during the performance of activities; and not issuing the invoice to customers. According to Feige (1990), this is the category of undeclared economy.

The previous business tradition of not submitting all of the invoices

and financial benefits of tax evasion form a clear motivation for businesses. On the other hand, if revealed, noncompliance could lead to losses due to penalties for tax evasion. The business is observed as a decision-maker under risk, whose aim is to maximize the gain and minimize expected losses due to penalties. Given the decision-making under risk, the interaction between a business and Tax Administration should be formed as a game model enriched with empirical data. This enables the analysis of the previous course of interaction development, an assessment of deviation tendency and questioning the existence of long-term equilibrium.

The paper is structured as follows: the conceptual framework offers overview of the Fiscalization Law, its motivation, implementation, process and effects; methodology introduces modelling of business and Government decision-making framework, and sets a model for their interaction; the results and discussion section indicates possible outcomes of a business and Government interaction; while conclusion offers the summarization of the main points and indicates possible implications of the findings.

Conceptual Framework

FISCALIZATION

The Tax Administration presented the Suggestion for the Implementation of Cash Transactions Fiscalization (Vlada Republike Hrvatske 2012), which was a direct attack on tax evasion. This Suggestion explains the causes and reasons why taxpayers involve in tax evasion: unjust and complex tax regulations, the amount of penalty imposed for tax law violation, and the existence of opportunities for tax evasion. The Tax Administration conducted a detailed analysis of taxpayers' reported income and reached devastating results. The analysis led to the conclusion that the biggest tax evasion in cash transactions happens in the sectors of catering, retail trade and some service business. Not issuing the invoice – and by doing so, participating in tax evasion – has many negative consequences for the country. Tax offenders do not pay taxes on the part of the non-reported turnovers. This diminishes the basis for calculating the annual personal income tax or profit tax, which is not realistic given that it is calculated using only the reported income. Therefore, the first loss for the national budget is not calculating the real income and profit tax. Second, the national budget is diminished through the smaller amounts of reported Value Added Tax and Special Consumption Tax. Not issuing invoices creates an unfair competition by 'demolition of the price,' and in

TABLE 1 Phases in Fiscalization Implementation

Phase	Date of implement	Obligation for
I	1 January 2013	All taxpayers who are performing activities from the Area I through NCA: Activities such as providing accommodation and preparation and serving of food. All large and all medium-size companies by the Accounting Law.*
II	1 April 2013	All taxpayers who are performing activities from the Area G through NCA. Activities wholesale and retail, repair of motor vehicles and motorcycles. All taxpayers who are performing free professions activities.
III	1 July 2013	All the other taxpayers. Small fiscalization obligors.

NOTES * The way of company's categorization on micro, small, medium-size and large is shown in the article 5 of The Accounting Law (*Narodne novine,* 78/15, 134/15. ** A small fiscalization's obligor is each physical entity who is a liable by The Personal Income Tax Law (*Narodne novine,* 177/04, 73/08, 80/10, 114/11, 22/12, 144/12, 43/13, 120/13, 125/13, 148/13, 83/14, 143/14, 136/15) through performing free professional activities, excluding catering or trade, who has a yearly turnover not more than 149.500 Kn, whose income and tax income are calculating through flat rate by The Personal Income Tax Law and The Regulation of Flat Rate Taxing Free Professional Activities (*Narodne novine,* 143/06, 61/12, 160/13, 137/15).

that way a regular taxpayer can lose his or her turnovers, which leads again to a decrease in the national budget revenues.

THE INTRODUCTION OF FISCALIZATION

The obligation of fiscalization implementation had three phases. Dates of the implementation and the obligation for taxpayers from different National Classification of Activities (NCA) are given in table 1. The fiscalization obligors are taxpayers who meet the following criteria:

1. Physical entities are liable by The Personal Income Tax Law if performing free professional activities;[3]
2. Legal or physical entities are liable by The Profit Tax[4] if performing any business activity that creates the obligation of issuing invoices to customers for purchased goods or services provided.

All taxpayers who are fiscalization obligors have to adjust the content of the invoice; determine the method of coding the invoice's number; determine an internal act of the branches with the determination of coding rules; highlight a warning sticker about the obligation of issuing and tak-

ing the invoice. These actions should be performed for all business activities except for activities exempted from the obligation of fiscalization.[5] This paper includes an analysis only for those taxpayers who are fiscalization obligors and who charge their invoices in cash.

The period of enforced fiscalization was very short, but meeting the preliminary requirements necessary for fiscalization was conducted prior to it and it meant costs for the taxpayer. For taxpayers' convenience, Tax Administration issued a brochure (Republika Hrvatska 2016b) with instructions for conducting the process of invoice fiscalization.[6]

SUPERVISING THE IMPLEMENTATION OF FISCALIZATION

The Ministry of Finance – Tax Administration (www.porezna-uprava.hr) conducts supervision of the fiscalization implementation. The worst-case scenario enables the controller to prohibit further taxpayer's business activities until deficiencies are eliminated. The penalty for violating the Fiscalization Law can amount from 10.000 up to 500.000 HRK for issuing an invoice that does not contain all the required data. There is also:[7]

1. A penalty for the taxpayer or the taxpayer's responsible person in the amount from 1.000 to 50.000 HRK;
2. A penalty between 5.000 and 500.000 HRK for issuing an invoice that does not contain the exact invoice number, or for not highlighting a warning sticker (about the obligation of a business to issue and a customer to take the invoice) in a visible place inside the premises;
3. A penalty for the responsible person (business or taxpayer) that amounts from 1.000 to 40.000 HRK;
4. A penalty for the customer if he or she does not take the invoice after the purchase of goods or services, in the amount from 200 to 2.000 HRK.

The Government has also included citizens in the process of supervising the implementation of fiscalization, like a special form of 'inspectors.' Citizens can check every invoice with the Tax Administration within 30 days of invoice issuance, and are invited to report irregularities. Another way to motivate citizens to report irregularities are prize contests and rewards.[8]

THE EFFECTS OF FISCALIZATION

During the first period, the Tax Administration conducted 21.590 controls, during which it found 2.186 irregularities (roughly 10% of controlled

taxpayers), and imposed a penalty of temporary prohibition of work in 465 cases (roughly 2% of controlled taxpayers). During the second study period, the Tax Administration conducted 6.604 controls during which it found 2.002 irregularities (roughly 30% of controlled taxpayers), and for 388 of them (roughly 6% of controlled taxpayers) imposed a temporary prohibition of work. Thus, in the second reference period, the number of controls was drastically reduced, while the relative number of irregularities tripled. The Tax Administration explains that in 2013, the first year of fiscalization implementation, they tolerated irregularities due to taxpayers' adaptation. If true, this explains the number of controls, and such a small number of detected (or reported) irregularities. It is assumed there were much more irregularities, but the Tax Administration first issued a warning and pointed the irregularities, and if the irregularities were not removed by the second control to the same taxpayer, the taxpayers were punished.

At this point, the conclusion from these data is that the number of controls and the number of irregularities in 2014 indicated that the Tax Administration punished nearly every third controlled entity, which probably means that the Tax Administration started applying target controls. Were the customers' reports the reason for that? The citizens' involvement in the process of supervising the implementation of fiscalization, through reporting irregularities, made them act as an additional mechanism of control.

During the first two seasons of the contest, citizens sent in 800.000 invoices altogether, while in the third season their response incredibly increased. By the end of the third round of the third season, the Tax Administration received 8.78 million invoices (1.8 million in the first, 3.5 million in the second and 3.5 million in the third round) (Republika Hrvatska 2016a).

Since Tax Administration has to check each received invoice, such control is conducted by a computer. Checking all of the received invoices equals to at least 10 million field inspections. This might be the answer to the question on whether or not tax inspectors are making target controls considering the previously found irregularities.

Methodology

The previous section provides a conceptual framework for the next step. Our goal is to examine the interaction between the Government and the businesses, the perception of motives and the possibility of long-term

equilibrium in tax evasion. Fiscalization is a regulation form, which does not introduce new taxes, but demands that every legal entity submits their invoices daily to Tax Administration, thus enforcing certain behaviour. Business and Government are two parties with different preferences over outcomes, which creates a conflict of interests. There are rules (enforced by the law), but the tendency for deviation is high. In order to analyse decision-making under risk, the dynamics of the interaction, the conflict of interests, the dependence of the outcome on the decisions of both parties, and the aim to examine interaction, motivation and possible equilibrium, an adequate model has to be applied. Given the features of the observed situation, the business and Tax Administration interaction should be formed as a game model enriched with empirical data. That enables the analysis of the previous course of interaction development, an assessment of deviation tendency, motivation and questioning the existence of long-term equilibrium. In order to define potential outcomes, as well as perceived Government motivation, we will apply game theory. Similar approach was suggested by Ordeshook (1986) while examining the interaction of the public and the Government in situations of public goods supply and demand using game theory and social choice theory. Laffont and Tirole (1986) use game theory to model regulation and efficient Government procurement, and introduce a moral hazard as a form of deviation from rational choices. The same authors, in 1993, extensively examine market regulation through firm and benevolent regulator interaction by changing conditions of the interaction (such as the number of firms on the market, regulator's motivation, introducing interest groups, incentives and incomplete information). While considering regulatory agency's position, they found that it has more complete information, and is inclined to increase its own payoff function, rather than social welfare pay-off. Such a finding points out the need for a proper incentive mechanism, which would ensure the efficiency of the regulation. Schmidt (1994) points out that regulator's beliefs and goals in Laffont and Tirole (1993) model are not observable prior to the action, which makes it hard to empirically test the predictions. This is not an aggravating circumstance for modelling the situation in this paper. The conceptual framework section contains the statements of motivation and goals publicly stated by the Government (Tax Administration) – the regulator. Thus, examination of the Government's decisions and underlying motivation will be the comparison of actions and outcomes (given the empirical data) to the claims of its motivation and goals. Rasmusen (2007) examines the application

of game theory in law and economy, showing that the application is possible in many areas, especially in the contract theory, as far as the use of the abstraction in modelling is correct and allows us to examine underlying principles regardless of the details. Corchon (1992) presents a partial equilibrium model of tax evasion, re-examining Nash, Stackelberg, maximin and Bayesian equilibrium, as well as cooperative game outcome. The author introduces the probability of tax evasion and probability of being monitored, and models tax evasion as a discrete variable. Similar approach will be used in this paper, regarding to probabilities and modelling tax evasion as a discrete variable. Corchon derives two conclusions: the evasion occurs due to imperfect information and high penalty for the evaders is socially desirable. Carfì and Musolino (2015) use game theory model to analyse the interaction between the state and relative taxpayer using realistic frequencies for probability and propose an honesty award. Antoci, Rusu, and Zarri (2014) model taxpayer situation using evolutionary game theory, considering three types of taxpayers: cheaters, honest citizens and punishers. They find that honest taxpayers who are willing to pay taxes play crucial role in a long-run equilibrium. Tan and Yim (2014) consider the effect of uncertainty on taxpayers' decisions and find that 'increasing the level of strategic uncertainty among taxpayers could be an effective device to deter tax evasion.' Tsebelis (1991) argues that a better approach to modelling probabilities is to derive them from maximization functions rather than assume them prior. He finds that lowering the penalties or law standards leads to a decrease in the frequency at which regulatory agency enforces the law. The author considers that this situation must be modelled as a game in order to explain the situation.

Given the previous research and recommendations on the subject, the situation observed in this paper will be described using dynamic game of complete information framework. In the first stage, business gets to choose to evade or not to evade taxes. At the second stage, the Government chooses to induce control over a business, or not to induce control. The game exceeds to the third stage only if control occurred at the second stage. At that stage, a business chooses between paying the penalty, not paying the penalty and closing the business.

BUSINESS DECISION-MAKING FRAMEWORK

Regularly, the business profit function is defined as revenues diminished by expenses. For the purpose of this paper, we will observe the part of this function related to the GDP and tax evasion. Therefore, it will be defined

by the revenue that contributes to production and taxes that contribute to GDP, parsed and corrected for tax evasion.

Hence, the business function is defined as

$$B_i = (R_i, R_{Ei}, T_i, T_{Ei}), \tag{1}$$

where i denotes the observed business, respectively, $i = 1, \ldots, n$; R_i denotes regular business income; R_{Ei} denotes unreported business income; T_i denotes taxes paid for the regular income and T_{Ei} denotes unpaid taxes for unreported income.

The parsed function takes the following form,

$$B_i = R_i + (-1)^c ebrcR_{Ei} - T_i + (-1)^c ebrcT_{Ei} + (-1)^c ebrcK(1 + p), \tag{2}$$

where c denotes occurrences of the control, $c = 0, 1$ and gains the value 1 if control occurred for the observed business, otherwise gains value 0; business tax evasion decision is denoted as $e = 0, 1$ and gains value 1 if business evades taxes and 0 if it does not; the penalty value is $K = 0, 300000$ measured in HRK by the Law; the sum of all occurred controls is $C = \sum_{k=1}^{n} c_k$ assumed to be evenly distributed over the set of the businesses; r denotes the probability of control occurrence for a business, respectively,

$$r = \frac{\binom{n}{1}\binom{n-1}{C-1}}{\binom{n}{C}},$$

and b stands for business belief of probability of getting a penalty if they chose to evade taxes.

The business motivation is to maximize the gain and minimize the loss. It seems that tax evasion can contribute to gain maximization, but the accompanying uncertainty and penalties can contribute to higher loss.

There are also businesses, which will obey the law regardless of the possibility for evasion or penalties. However, this paper targets primarily those, which tend to deviate from obeying the law. This subset of businesses will always choose to obey the law and for the purpose of this paper, they will be treated among the set of businesses whose belief on being caught is equal to one.

The businesses have to make decisions under the uncertainty of tax control. Given the motivation, there are two constraints:

1. $\max_{R_i, R_{Ei}} B_i$ and

2. $\min_{T_{Ei},K} B_i$.

In order to satisfy the first constraint, the first order condition has to be satisfied:

$$(-1)^c rceb = 0.$$

There are two possible outcomes, which empower possible business decisions.

If the business perceives the probability of control to be $r \neq 0$, hence $rcb \neq 0$ it can decide that e should be equal to zero, in order to fulfil the first order condition without the decision under the risk.

If the business perceives the probability of control to be $r = 0$, it can allow e to be equal to 1, and respectively $c = 0$. Given the empirical data provided on the number of controls, $r \neq 0$, rational decision would be to dismiss this option.

However, there is also the third possibility, which is not foreseen by previous condition, where business perceives r to be close to zero, and makes decision under the risk about the e. In this case, r denotes the perceived risk of control. In addition, it is important to take in consideration another reason for this outcome, based on the belief in the probability of getting caught, b. It is related to the dynamics of business interaction with their customers and it is based on trust. If the business chooses to evade invoice report in rare situations only with loyal customers, it can form a belief that if the control occurs, the business will be perceived as $e = 0$ and will not receive penalty.

Second, the first order condition requires:

$$R_i - T_i = -(-1)^c rceb(R_{Ei} + T_{Ei} + K(1 + p)). \tag{3}$$

In order to solve this, it is necessary to notice that the business gain would be largest if the right side of the equation was equal to zero, which leads to solving this equation for r, c, b and e, and that has already been done in the first of the two first order conditions.

The second constraint leads to solving the first order conditions:

$$(-1)^c rceb = 0 \tag{4}$$

$$(-1)^c rcb(1 + p) = 0 \tag{5}$$

$$R_i - T_i = -(-1)^c rceb(R_{Ei} + T_{Ei} + K(1 + p)) \tag{6}$$

If we look at the second constraint conditions, it can be noticed that if e has been previously chosen to be $e = 1$, the only way to minimize the penalty cost is to minimize r, c, b or bring them all to zero. However, that

is not in the domain of the business to decide. The bottom line is, these conditions also show that the outcome depends on the business choice of e, which will depend on the perceived value of r and b.

Hence, possibilities for business decisions are: (1) obey the law, where $e = 0$, and (2) decision under the risk, tax evasion, where $e = 1$, and $r = [0, 1], b = [0, 1]$.

GOVERNMENT DECISION-MAKING FRAMEWORK

The Government function will be composed of the aggregated and parsed business contribution to the GDP.

$$\Delta Y = (T_r, T_E, I_r, I_E), \tag{7}$$

where T_r denotes Government income from regularly paid taxes, respectively $T_r = \sum_{i=1}^{n} T_i$; T_E denotes unpaid taxes (opportunity cost), $T_E = \sum_{i=1}^{n} T_{Ei}$; I_r denotes regular business income (production), $I_r = \sum_{i=1}^{n} R_i$, and I_E denotes unreported income (opportunity cost), $I_E = \sum_{i=1}^{n} R_{Ei}$.

Parsed form of the function is:

$$\Delta Y = T_r - (C-k)ET_E + I_r - (C-k)EI_E + k(K(1+p) - K_y) - (C-k)K_y, \tag{8}$$

where C denotes sum of occurred controls, $C = \sum_{k=1}^{n} c_k$; E is a sum of tax evasion occurrences, $E = \sum_{i=1}^{n} e_i$; k is a set of occurred controls which found tax evasion, $k = C \cap E = C \cdot E$; and K_y is the expense for each tax control.

The Government motivation is to generate more income, which is possible either through the income maximization, or loss and expenses minimization. Given the Government's awareness of tax evasion, they use instrument of control in order to maximize the effectiveness of the tax control. It is assumed that the Government makes rational decision and maximizes the function value through the income and taxes, and not by paid penalties. Respectively, it minimizes the loss regarding the opportunity cost of tax evasion and the cost of induced controls. Hence, Government decisions will be driven by minimization of the negative effects to the budget. The motivation creates constraint, which forms first order conditions for solving the Government's problem:

$$\min_{E, K_y} \Delta Y.$$

That leads to solving

$$E(T_E + I_E) = 0 \text{ and} \tag{9}$$

$$(C - k)(I_E - T_E) = 0. \tag{10}$$

The first condition clearly shows that the best outcome for the Government would be if there were no tax evasion. That could happen if no one chooses to evade taxes, $E = 0$. The other possibility is that the sum of tax evasion and unreported income equals zero. However, none of these decisions is in the domain of Government decision making.

The second condition points out factors relevant for Government decision making, $C - k = 0$ where $C = k$. In that situation, every control results in charging a penalty. That points out to optimal Government decision to conduct controls only in the set of tax evaders. Despite the rationality behind this solution, the implementation could be questionable. In fact, the purpose of the control is to determine whether the observed business evades taxes or not, so they can have the complete information only after the observation. However, they can obtain extensive information before the control in order to diminish uncertainty and enhance the success rate. Unfortunately, there is also another possibility for inspectors to achieve $C = k$ and that is to charge a penalty within every control for every irregularity regardless how small the penalty is.[9]

Inference leads to optimal situation for the Government: either no one evades taxes, or the control finds all those who evade taxes.

However, the outcome depends neither solely on the business nor on the Government decision. The previously shown optimizations from business and Government perspectives point out preferred outcomes, which will serve as a framework for the Government – business interaction.

BUSINESS AND GOVERNMENT INTERACTION

The environment of the observed situation is defined by fiscalization. Given the decision-making under risk, the business and Tax Administration interaction should be formed as a game. That enables the analysis of the previous course of interaction development, the assessment of deviation tendency and questioning the existence of long-term equilibrium.

The game theory decision tree shows the possible choices and related outcomes. So, let us play a game.

Given the game environment, the business makes the first move and decides whether to obey the law or to evade taxes. At this point, if the business decides to evade taxes, it is decision under the risk regarding to their belief on r and b. Next, the Government is on the move and it can decide to induce control over the observed business or not. If the Government controls were not randomly distributed, they would depend on

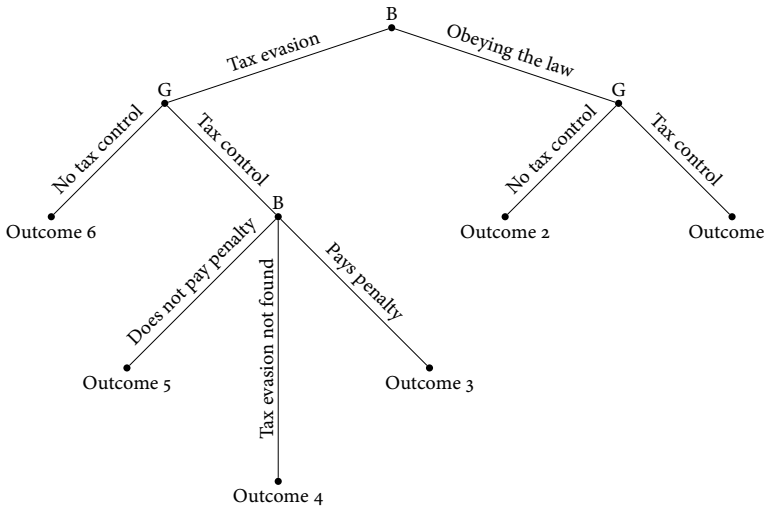

FIGURE 1 Decision Tree Game Representation (B – business, G – government)

their belief on the business's choice of *e*. If the control finds irregularities, the business will have to pay penalty. At that decision node, the business has to decide to pay or not to pay the penalty. If the total cost of penalty exceeds the regular income diminished by regular tax on income, the business will not be able to pay for it; hence, it will probably shut down the business. The described decisions and their interconnection lead to six possible outcomes. The first outcome shows that the business decided to obey the law and the Government induced the control. No irregularities were found and no penalty has been paid. The second outcome describes a situation where business decides to obey the law and the Government decides not to control this business. The third outcome describes the decision path where the business decides to evade taxes, the Government decides to conduct control and the business pays the penalty. The fourth outcome describes the business's decision to evade taxes, after which the Government conducts control but does not find irregularities. The fifth outcome occurs if the business decides to evade taxes, the Government conducts control and the result is closing the business due to the impossibility of paying the penalty. The sixth outcome denotes the decision path of the business's choice of tax evasion, the absence of Government control, and the lack of the penalty. The possible outcomes reveal the existence of cheaters and honest taxpayers, which can be related to Antoci, Russu, and Zarri's (2014) research.

Results and Discussion

This section deals with model implementation, as well discussion, and interpretation of results. It attempts to answer the research questions: is it possible to use the model for analysis of the previous course of interaction development, is it possible to assess deviation tendency and can it determine the existence of long-term equilibrium. In order to determine the equilibrium, two questions will be answered: how much deviation will Government tolerate before raising penalties or increase the amount of control, and which amount of risk will business be willing to take in order to evade taxes.

First, we will analyse the game implementing the functions, which underline players' motivation, which is shown in figure 1.

In the first stage of the game, the business is on the first decision node and gets to choose between obeying the law and tax evasion. At the very beginning, their motivation function is perceived as:

$$B_i = R_i - rebR_{Ei} - T_i - rebT_{Ei} - rebK(1+p), \tag{11}$$

given the belief b.

The decision on tax evasion is determined with the previous belief in the probability of being caught in tax evasion, and probability of control occurrence and the penalty cost. The business makes decision on e, based on the available information and perception of r and/or b. In order to consider r, business had to have previous belief on b to be equal or close to zero. If the business maximizes the gain and minimizes the loss regarding to probability of r, then it achieves higher perceived gain if r is smaller, respectively

$$r \leq \frac{R_i - T}{K(1+p) + (R_{Ei} + T_{Ei})}. \tag{12}$$

That relation reveals underlying motivation $R_{Ei}+T_{Ei} > R_i-T_i-K(1+p)$, which shows that the rb will be small enough and tax evasion profitable in every outcome, if and only if possible overall gain from tax evasion is bigger than regular business profit diminished for the penalty. Based on this relation, each business should decide on their e, tax evasion decision parameter.

Hence, the motivation function for the business, which chooses to obey the law in the first stage, looks like this:

$$B_i = R_i - T_i, \tag{13}$$

and for the business which decided for tax evasion:

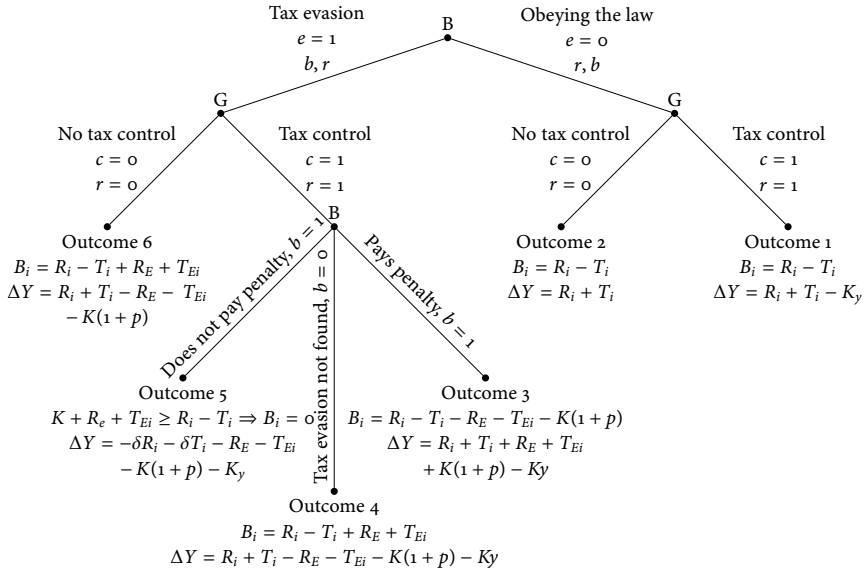

FIGURE 2 Decision Tree Game with Probabilities and Outcome Functions

$$B_i = R_i + (-1)^c cR_{Ei}e - T_i + (-1)^c cT_{Ei}e + (-1)^c cK(1 + p), \tag{14}$$

with risk probability r, and belief in not getting caught b, which become exogenous parameters after the decision has been made.

Given this finding, the game has been enhanced and represented in figure 2.

If a business decides to obey the law, and makes decision based on belief b and risk probability r, then it is true that $e = 0$. If control occurs, the probability of control takes the value of 1, hence control occurrence parameter takes the value of $c = 1$. The outcome for the business is equal to regular business income diminished by taxes, while the Government has the loss of conducting control. If control does not occur, $r = 0$, hence $c = 0$, the second outcome is equal to regular business and Government operations (there is no control expense, so there is no loss for the Government).

If a business has a belief b close to zero and perceives risk probability also to be close to zero, it will choose $e = 1$. If control occurs, $r = 1$, and $c = 1$. In the third outcome, the values regarding tax evasion become the loss for the business and the gain for the Government. The fourth outcome occurs when a business's belief b proves to be true, and control does not find irregularities. The outcome shows gain from tax evasion for

TABLE 2 Conducted Controls in Croatia

Year	Conducted controls	Found irregularities	Temporary closed businesses	Total number of businesses
2013	21590	2186	465	144356
2014	6604	2002	388	171046

a business, and loss for the Government formed from the control expense and opportunity cost of tax evasion values.

The fifth outcome is the worst possible outcome for both the Government and the business. If the penalty amount is so high that the business cannot pay for it, it will have to shut down. This situation is slightly worse for the Government. First, it will not reimburse tax evasion, neither will it charge the penalty, but it will also lose all future possible incomes from that business (and indirectly, it will cost the Government additionally through the social expenses for newly unemployed workers). Therefore, this outcome provides a recommendation for the upper bound in defining penalties. The significance of the penalty is to educate/indoctrinate businesses and make sure they will obey the law, and not to enable them to do business. Given that, penalties should be defined individually for a business, respectfully

$$K \leq \frac{1}{1+p}[R_i - T_i - R_{Ei} - T_{Ei}], \tag{15}$$

assuming that the unreported income will be determinate and related taxes charged (as shown in the right part of the inequality). The findings are contrary to Corchon's (1992) conclusion that high penalties for evaders are socially desirable.

The sixth outcome derives from the business's decision to evade and the absence of Government control. Tax evasion is a business's profit and the Government's opportunity loss.

So far, it is clear that if the Government wants to minimize tax evasion, it has to influence important factors for business decision-making: perceived risk of control r and the belief of not getting caught b, and to make any of them, or both close or equal to zero. Unreasonably high penalties are not a rational choice. However, the number of tax controls defines perceived risk of control (yearly), and the belief of not being caught is based on a business's relations with the customers. The Government can, and as will be shown, already has used this influential factor in order to reduce tax evasion.

We will now consider presented model as a repeated game, which has been played in Croatia. We will insert the available empirical data and examine the effectiveness of induced changes over the years (table 2). Given the stated parameters, it is possible to calculate the probability of control occurrence for each year,

$$r_{2013} = \frac{\begin{pmatrix} 21590 \\ 1 \end{pmatrix}\begin{pmatrix} 122766 \\ 215589 \end{pmatrix}}{\begin{pmatrix} 144356 \\ 21590 \end{pmatrix}}, \text{ and } r_{2014} = \frac{\begin{pmatrix} 6604 \\ 1 \end{pmatrix}\begin{pmatrix} 164442 \\ 6603 \end{pmatrix}}{\begin{pmatrix} 171046 \\ 6604 \end{pmatrix}},$$

as well as the belief of paying the penalty if control occurred,

$$b_{2013}\frac{2186}{21590} = 0.10125 \text{ and } b_{2014} = \frac{2002}{6604} = 0.3031496.$$

Regarding the probabilities and beliefs, the situation significantly changes if we include 'recruited inspectors' – citizens that enrolled in invoice collecting game. The information on the annual amount of collected invoices is not available, but in over three years, 27.640.000 invoices were submitted altogether. Unfortunately, the information on how many businesses have been covered by submitted invoices is not available. If that information was available, each of them could be included in the model as a control occurrence.

So, what does it mean for the business and Government payoff functions? If the business observes only inspector control, the risk of control occurrence is quite small and it diminishes the expected penalty. This creates a motivation for evasion. Given that the number of the businesses covered by submitting invoices for prize competition is not available, a business can assume that some of its customers are invoice collectors and choose to evade taxes only when providing service or selling to familiar and loyal customers. Given the decision making criteria has been defined before,

$$r \leq \frac{R_i - T_i}{K(1+p) + (R_{Ei} + T_{Ei})},$$

it can be noticed that companies with higher profit have higher tendency for deviation. However, the decision-making is crucial for the businesses which balance with covering their expenses, and that is even more emphasized for small businesses. A choice to evade taxes can provisionally seem to be a good solution if the business is not going well and owner's

existence is violated, but it can also lead to shutting down the business if the penalty occurs.

From the Government's perspective, their motivation is to increase success rate in charging penalties when control occurs, which is aligned with the Laffont and Tirole (1993) conclusions. That uncovers the underlying motivation for collecting penalties. In addition, data shows that only 0.3% of all active businesses have been closed by inspector's decision in 2013 and 0.23% in 2014. That can be demonstrated through another conclusion,

$$K \leq \frac{1}{1+p}[R_i - T_i - R_{Ei}T_{-Ei}],$$

involving the amount of the penalties. If the inspectors charge penalty higher than other yearly revenue from controlled business, it is more profitable for the Government. In other words, if business's revenues are small, in a short run it is more profitable for the Government to induce higher penalty, charging it and causing the closing of a business. However, seriously, is that the point of this law?

However, in a long run, the rational choice for Tax Administration is to adjust the penalty given the previous equation, otherwise it will not compensate tax evasion and charge the penalty, but it will also lose all possible future incomes from that business. In addition, shutting down a business indirectly costs the Government through the social expenses for newly unemployed workers. Given the results, the right way to fight evasion is to increase the business's perceived risk of control and belief of being caught, through an increase in the number of controls. That is only partially inclined with Tan and Yim (2014), who claim that increasing the strategic level of uncertainty could negatively affect tax evasion. Our findings suggest that it is necessary to increase perception of the certainty of being caught.

Conclusions

The paper provides short overview of the Fiscalization Law implementation, which was used as a situational framework for designing a game theory model. Given the business and Government decision making framework a model of their interaction was modelled.

The results show that there are six possible outcomes for the business and Government interaction considering tax evasion.

The implications of the results show that the optimal strategy for a business which chooses tax evasion, is not to issue an invoice only to

loyal customers, which diminishes the possibility of being reported and diminishes the business's perceived risk of control and the belief of being caught. The optimal strategy for the Government is to increase the business's perceived risk of control and the belief of being caught, through an increase in the number of controls. In the long run, that is a better strategy than charging high penalties. High penalties increase the Government pay-off function in a short run, but diminish possible future incomes as discussed for the sixth outcome. Hence, the penalties should be individually tailored for each business in order to enable future business activities.

The paper provides theoretical game theory model for the analysis of decision making under the Fiscalization Law in Croatia enriched with empirical data. Findings point out to consistency with Laffont and Tirole's (1993) results, but show discrepancy to Corchón's (1992) in the long run equilibrium. The model provides practical recommendations for professionals and policy makers.

Because the Fiscalization Law was enforced in 2013, and not all the data is available, the collected empirical data considered in this paper refer to 2013 and 2014. In addition, the overall scientific literature regarding economic perspective of the Fiscalization Law in Croatia is scarce. This represents a limitation of the research, but it also suggests possibilities for further research when more data is available.

Only the following elements are considered in the model: business and Government pay-off functions, occurrences of the control, business tax evasion decision, the penalty amount, the sum of all occurred, the probability of control occurrence for a business, business's belief of the probability of getting a penalty if they choose to evade taxes, the sum of tax evasion occurrences, set of occurred controls which found tax evasion, and the expense for each tax control. That is a limitation of this paper, but it also reveals the possibility for enriching the game with other situational or behavioural variables in further research.

Notes

1 Except for the term 'grey economy,' other terms are used in literature as well, such as: underground economy, informal economy, parallel economy, working on black.

2 A very interesting fact this survey showed is the evidence of employers' ignorance about the existence of a law framework, which disables them to work legally. The survey pointed out a very high level of ignorance regard-

ing law regulations by taxpayers, customers, and citizens in general. Therefore, the Government's activities, besides the repression of grey economy, should be focused on informing the public about law regulations and tax obligations.

3 Free professional activities are stated in the article 18 of The Personal Income Tax Law (*Narodne novine,* 177/04, 73/08, 80/10, 114/11, 22/12, 144/12, 43/13, 120/13, 125/13, 148/13, 83/14, 143/14, 136/15).

4 Article 2 of the Profit Tax Law (*Narodne novine,* 177/04, 90/05, 57/06, 146/08, 80/10, 22/12, 148/13, 143/14) defines the profit tax obligor.

5 The activities that are exempted from the fiscalization are stated in the article 5 of The Cash Transactions Fiscalization Law (*Narodne novine,* 133/12).

6 Taxpayers are obligated by the Financial Agency to provide the certificate for electronic signature of the elements in the invoice, because it is required for identification during electronic data exchange with the Tax Administration.

7 According to the General Tax Law, a taxpayer is obliged to issue an invoice to a customer for any purchased goods or services performed. The case of non-issuance of invoices represents the heaviest form of tax violation for which the taxpayer could get a penalty in the amount from 20.000 to 500.000 HRK (HRK is official acronym for Croatian currency, Kuna), while the taxpayer's responsible person could be penalized in the amount from 5.000 to 40.000 HRK. The Tax Administration may prohibit further work to the taxpayer due to non-issuance of invoices, and this prohibition can last from 15 days to 6 months. In addition, the taxpayer is also obligated to issue invoices by the Value Added Tax Law, the Personal Income Tax Law and the Profit Tax Law.

8 The first season of the prize contest took place in the period from February to December 2013 through 4 rounds, with the total prize of 180.000 HRK. The second prize contest lasted from August 2014 to April 2015, and through 3 rounds rewarded citizens with the total prize of 480.000 HRK. The third season began in August 2015 and lasted until April 2016 under the new slogan 'Search invoices and catch Kunas,' through 4 rounds and the total prize of 290.000 HRK. In order to achieve even greater effects of fiscalization in fighting tax evasion, the Government turned to tourists visiting the country, and prepared two different prize contests specifically for them. The first one was conducted under the slogan 'And where is the invoice!?' intended for Czech tourists, and the other under the slogan 'The invoice, please!' intended for all the other tourists. As a reward, the winners got a holiday in Croatia in the value of 15.000 HRK (see http://www.porezna-uprava.hr/HR_Fiskalizacija/Stranice/UzmiteRacunBezRacunaSeNeRacuna.aspx).

9 This behavior is questionable because there are reported situations that it sometimes occurs, even though it is contrary to the purpose and declarative goals.

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