Firm Level Determinants of Tax Evasion in Transition Economies

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**Abstract**

Business tax evasion is an important issue for governments. Yet, the factors that determine business tax evasion have not been sufficiently examined in the literature in general, and in transition contexts in particular. To address this gap, this study uses the WB/EBRD Business Environment and Enterprise Performance Survey (BEEPS) database with a sample of over 12,692 firms from 26 transition economies. Applying various modelling strategies, we argue that tax evasion is a function of firm level and institutional level variables. We contribute to the literature by providing robust evidence showing that the perceived tax burden has a positive impact on tax evasion. We also find that the tax evasive behaviour of firms is positively influenced by low trust in government and in the judicial system as well as by higher perceptions of corruption and by higher compliance costs. We find that smaller firms, individual businesses and firms in sectors that are less visible to the tax administration are more likely to get involved in evasive behaviour. Overall, institutional factors play an important role in determining firms’ tax evasion behaviour in transition economies. This finding has important policy implications.

JEL Classification: H25, H26, H32, P20

*Keywords:* Tax Compliance, Tax Evasion, Transition Economies, Institutions, Tax Rate, Corruption

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1. **Introduction**

Tax evasion is a global disease today; it imposes numerous economic costs on all societies. First, evasion is likely to slow down economic growth as the government’s ability to provide adequate public goods, market supporting institutions, infrastructure, human capital development, or research and development will be weakened (Johnson et al. 2000). Second, tax evasion diverts resources to unproductive activities such as establishing financial subsidiaries to cover-up evasion (Slemrod, 2007). Third, it causes inefficiencies in firms’ production as they tend to stay small and invisible to facilitate evasion and miss growth-enhancing opportunities in the formal economy (Nur-tegin, 2008). Fourth, tax evasion causes inequity between those that evade and those that comply, by moving the burden to the latter group and, thereby, creating an incentive for further evasion (Feinstein, 1991).

For Transition Economies (TEs) tax evasion is an especially important subject given that these countries face enormous institutional, behavioural and cultural changes during the transformation process (FES 2013). These changes, in turn, affect compliance levels and, hence, the tax revenues that constitute the main source of finance for the respective governments. In something of a vicious circle, restricted ability to raise tax revenue in these countries undermines the financial support for public institutions and deterrence mechanisms, the performance of which ultimately affect tax evasion. Moving to a market economy involves the accomplishment of numerous yet unique tasks in many areas of the economy as well as in the way of life. Centralised economies were characterized by a system where the state made decisions over production and consumption of goods and services. These economies provided social services and benefits (education, health, etc.) by using the resources generated by the profits and taxes of state-owned enterprises. The State’s full control of economic activities ensured that tax collection was not a problem. Moving towards a market economy was in general a challenging task, as TEs had to build new institutions from scratch, change the legal and the juridical system, regain trust in state institutions, and secure market mechanisms that support individual freedom. The need to provide social services and benefits remained while the available resources to finance these decreased continuously as the state itself was no longer the owner of enterprises and the controller of the market. Private owners kept the profits while tax collection was no longer guaranteed, as it was based largely on voluntary compliance, which understandably was low. Thus, understanding the factors affecting tax evasion has become crucial for these governments.

This paper is organized as follows. In Section 2, we provide a brief overview of the existing literature on tax evasion. In Section 3, we describe in detail the data used in the study and discuss the specification of our model in the light of previous studies. In Section 4, we focus on our approach to estimation and highlight the importance of diagnostic testing. Sections 5 and 6 report and discuss the empirical findings. The final section concludes.

1. **Literature Review**

Although tax evasion has been present ever since the first day of taxes and regardless of its devastating consequences across the world – especially in less developed and developing countries – only during the past forty years has it attracted the attention of researchers. At the beginning of the 1970s, taxation was a prominent area of interest amid theoretical economists. Inspired by suggestions of the Mirrlees (1971) work on taxation and risk taking, Michael G. Allingham and Agnar Sandmo considered the economics of tax evasion. In what later would become the *magnum opus* of tax evasion literature, their work combines studies in the economics of criminal activity (Becker, 1968; Tulkens and Jacquemin, 1971) with studies in optimal portfolio and insurance policies as well as in the economics of uncertainty (Mossin, 1968; Arrow, 1970) in order to develop a model of the decision of the taxpayer to comply. Their model assumes that the decision over the amount of income not disclosed for the purpose of taxation is made under uncertainty as to whether it would or would not provoke a reaction in the form of a penalty; depending on whether the decision maker is audited or not. Allingham and Sandmo (1972) also assume that the decision maker is a risk averse and rational taxpayer who makes the tax reporting decision like any other rational consumer choice, but is also inclined to dishonesty; that is, her decision is assumed to be isolated from environmental, community or state impact, or even regret, guilt or shame. However, such simplicity was later criticized and motivated further extensions. Under such assumptions, the level of income tax evasion is negatively related to the level of punishment imposed by law and the probability of audit by tax inspectors. However, when analysing the impact of tax rates on evasion, the model predicted an ambiguous effect with the occurrence of both an income effect (as tax rates rise, people become poorer and, in the presence of decreasing absolute risk aversion, they evade less) and a substitution effect (rising taxes means that the return from evasion is higher, thus the taxpayer prefers the risky choice to the safer one). Yitzhaki (1974) argued that the ambiguity was a result of an unrealistic assumption of the model that the penalty is imposed on the amount of income not reported; if, instead, it is imposed on the evaded tax the substitution effect disappears and thus – contrary to initial expectation – a tax rise will reduce evasion.

The Allingham and Sandmo (1972) model, known as the traditional model, was criticised for being too simplistic. Subsequent analysis has extended their model in a number of dimensions; mainly by the inclusion of numerous factors beyond the standard model that relate to institutions, individual characteristics, morality, ethics, culture and social stigma. These extensions tried to solve, as Torgler (2007) puts it, “*the puzzle of tax compliance*”; a condition where levels of tax compliance do not correspond to the levels of enforcement that the traditional model of Allingham and Sandmo (1972) would predict. As Torgler, (2011, p.12) argues, the issue of tackling tax evasion is *“not simply a matter of applying penalties and/or increasing the frequency of audits*”*.*

In one of the most prominent tax evasion reviews, Andreoni et al. (1998) argue that moral and social dynamics determinants should be included to enrich the traditional model. They group factors in three categories. The first group involves moral rules and sentiments that directly guide and impact decisions to comply or not. Morality in tax compliance has attracted the attention of tax researchers quite recently (for an extensive review see Torgler 2007). Torgler et al. (2010) also summarize a set of views that take into account an altruistic approach; the behaviour of an individual who is interested not only in her own welfare but also in the general welfare. Other views are related to a ‘Kantian’ morality approach, where they see taxpayers as having anxiety, guilt or even inferiority if their share of taxes paid is lower than what is defined as fair. Lago-Peñas and Lago-Peñas (2010) examine the determinants of tax morale in comparative perspective for several European countries. Based on the European Social Survey data for the years 2004 and 2005, they find that tax morale in European countries varies systematically with socio-demographic characteristics, personal financial experiences, political attitudes, on the one hand, and regional GDP and tax arrangements on the other hand.

Within the moral rules and sentiments, a few other studies have argued in favour of incorporating socio-cultural factors (Benjamini and Maital, 1985; Gordon, 1989; Myles and Naylor, 1996; Kim, 2003). Grasmick and Scott (1982) and Chau and Leung (2009) indicate that respondents with peers involved in unlawful activities are more likely to be non-compliant. Franzoni (1999) argues that when most people evade, the stigma effect is small and evasion is not in fact discouraged; however, when few people evade the stigma effect is great and evasion is discouraged. The change from one equilibrium to another takes the form of a “non-compliance epidemic” such that if more people start to cheat then the social stigma weakens and evasion spreads to an even larger fraction of the population. Cummings et al. (2005) and Chan et al. (2000) see peer influence as enforcing the cultural characteristics and norms of specific groups of individuals or nations.

The second group of factors proposed by Andreoni et al. (1998) relates to the fairness of the tax system, the enforcement of which affects individuals’ willingness to comply (Cowell, 1990; Bordignon, 1993; and Falkinger 1995). Jackson and Milliron (1986, p.137) argue that tax fairness consists of at least two different dimensions: “*One dimension appears to involve the equity of the trade - the benefits received for the tax dollars given ...”*, as defined by effectiveness; *“... the other dimension appears to involve the equity of the taxpayers’ burden in reference to that of other individuals*”.

Finally, the third group of factors relates to taxpayers’ perception of government performance and behaviour (corrupt or transparent), which in turn affects the trust in government and institutions. Tyler (1997) argues that the way people are treated by the authorities affects their evaluations of authorities and their willingness to co-operate. Frey and Feld (2002) recognize the importance of transparency and treatment of citizens by fiscal authorities. If individuals feel as partners then their honesty will be higher compared to when they are made to feel inferior. Alm et al. (2006) examine Russian attitudes toward paying taxes. A special feature of their work is that they study tax morale – or the intrinsic motivation to pay taxes – at three different points in time, in 1991 before transition and in 1995 and 1999 during transition, using data from the World Values Survey (WVS) and the European Values Survey (EWS). They find that all trust proxies have a positive and a statistically significant impact on tax morale. An increase in trust in government and in the legal system has considerable marginal effects on tax morale. On the relationship between taxpayers and institutions, Torgler (2007) argues that those governments that pre-commit themselves with direct democratic rules impose restraints on their own power and thus send a signal that taxpayers are seen as responsible persons. These signals may create a social capital stock since the citizens understand their role in society and their influence on government through votes. Hanousek and Palda (2004) saw tax evasion as a form of legitimate discontent of citizens towards their respective governments; perceptions towards which were negative. Tirole (1996) explains that when taxpayers see their government as corrupt and irresponsible, evasion is seen as a “vote of dissent” on the government. Table 1 summarises the theoretical predictions from the literature reviewed on the determinants of tax evasion.

**Table 1.** Summary of theoretical predictions on the determinants of tax evasion

|  |  |  |
| --- | --- | --- |
| **Traditional Determinants** | | |
| Tax Rate | *Ambiguous* | Allingham and Sandmo (1972), Yitzhaki (1974) |
| Audit Rate | *Negative* |
| Fine Rate | *Negative* |
| **Non-traditional Determinants** | | |
| Morality | *Negative* | Andreoni et al. (1998), Torgler (2007), Torgler (2011), Lago-Peñas and Lago-Peñas (2010) |
| Socio-Cultural | *Ambiguous* | Benjamini and Maital (1985), Gordon (1989), Myles and Naylor (1996), Franzoni (1999), Kim (2003), Grasmick and Scott (1982), Chan et al. (2000), Cummings et al. (2005), Chau and Leung (2009) |
| Fairness | *Negative* | Cowell (1990), Jackson and Milliron (1986), Bordignon (1993), (Falkinger 1995), Hibbs and Piculescu (2010) |
| Trust | Negative | Tirole (1996), Tyler (1997), Frey and Feld (2002), Hanousek and Palda (2004), Alm et al. (2006), Torgler (2007), |
| Compliance Costs | *Positive* | Franzoni (1999) |
| Firm Characteristics | *Ambiguous* | Marelli (1984), Marelli and Martina (1988); Virmani, (1989), Sandmo (2004), Crocker and Slemrod (2005) |

*Source: Literature Review*

Although the literature on tax evasion is well developed, it mostly relates to individuals. Recently, however, the focus has shifted to evasion by businesses. As Torgler (2011) argues, *“... business tax evasion in general, has received very little attention. Work in this area is therefore highly relevant (p.6)”.* Business modelling has given rise to comparative static analysis similar to that of the individual traditional model; namely, the firm evades less with higher probability of detection and larger fines, while the impact of tax rates is ambiguous (see Marelli, 1984; Marelli and Martina, 1988; Virmani, 1989; Sandmo, 2004; Crocker and Slemrod, 2005). Likewise following developments in the modelling of individual behaviour, Hibbs and Piculescu (2010) argue that tax evasion and underground economy occur when a large number of businesses perceive taxes as not worth paying; that is, when they are left without much need for formal institutional services. Big firms, on the other hand, take great productive benefit from formal institutions and their services which, in turn, increases their incentives and efforts to pay taxes and sustain present institutions.[[1]](#footnote-1) The relative lack of research on tax evasion by businesses is unfortunate, especially given the fact that in most countries the bulk of taxes is paid by firms and firms account for the bulk of tax evasion too (McCaffery and Slemrod, 2004; Crocker and Slemrod, 2005; Chang and Lai, 2004; Nur-tegin, 2008).

The aim of this paper is to provide empirical research to address the paucity of literature on the determinants of business tax evasion for TEs. The starting assumption in our work is similar to the assumption generally made in the current literature on the tax behaviour of businesses; namely, that the tax behaviour of businesses is similar to the tax behaviour of individuals, and that – as a corollary – the determinants of business tax evasion may be similar, at least qualitatively, to the determinants of tax evasion by individuals or households. As Slemrod (2007, p.36) points out, the literature on business tax evasion "*adapts the theory of tax evasion, which for the most part concerns individual decision makers, to the tax compliance decisions made by businesses*”.

The lack of data for TEs has considerably limited the scope of work for researchers interested in exploring empirically the nature of business tax evasion in these countries. However, the EBRD’s Business Environment and Enterprise Performance Survey (BEEPS) questionnaire provides reasonable measures of our variables of interest. Given the availability of this data, our research builds on the only two, to our knowledge, works on the micro determinants of business tax compliance for TEs; namely, Nur-tegin (2008) and Joulfaian (2009), who both make use of the BEEPS 2002 dataset. However, when investigating one of the most important determinants of tax evasion – tax burden – they reach contradictory conclusions: Nur-tegin (2008) finds that tax rates have a negative impact on tax evasion; while Joulfaian (2009) finds that tax rates have a positive impact on tax evasion. These opposing results may arise from the omission of important variables in their respective model specifications and/or their respective choice of variables to represent the tax burden. We consider both in turn, the better to highlight our contribution.

First, we improve the model specification. Joulfaian (2009) omits compliance costs and trust variables, and Nur-tegin (2008) omits firm characteristics such as sector of activity and legal status.[[2]](#footnote-2) These studies, although providing the platform for future work, including ours, are built on misspecified models because of omitting important independent variables. Accordingly, some of their results are likely to be impaired by omitted variables bias (Wooldridge 2003, p.89). Our work corrects for the model specification by including all relevant determinants of tax evasion in one model. We also control for both “truthfulness” and “missingness” of observations of the dependent variable; and, hence, are able to provide more reliable estimates. Better model specification and addressing the issue of omitted variable bias is our first contribution.

Second, we investigate the relationship between the tax burden and tax evasion. The previously contradictory estimates may be the result of, together with model misspecification, an incorrect proxy for tax burden. The statutory taxes (Corporate Tax, Value Added Tax, and Social Security Contributions) used by Joulfaian (2009) and Nur-tegin (2008) (mainly due to lack of other tax rate data) do not adequately represent the actual tax burden faced by businesses in transition countries. First, Value Added Tax (VAT) is an indirect tax imposed on the final consumer and hardly represents a real tax burden on businesses. According to a study by PricewaterhouseCoopers (PWC)[[3]](#footnote-3), the burden of VAT on business arises from the procedures for its collection rather than from its rate. The procedure, time and other costs are related to “compliance costs” – a variable which is controlled and estimated in our model separately. Furthermore, small companies, which constitute the majority of companies in the sample, are not subject to VAT. Second, Corporate Income Tax (CIT), as denoted by the name, is a tax imposed mainly on corporations. Most of the business respondents in BEEPS (about 75%) are not defined as corporations and therefore not subject to CIT. We also note that tax systems in different transition economies apply different tax rates to different businesses, depending on their legal status, turnover or even the sectors in which they operate. The lack of data on various taxes for different countries makes it impossible to assess the real tax rate/burden that each interviewed business (each with different characteristics) faces. In addition, we argue that applying a general tax, the country average, would be an appropriate approach if the data were to be aggregated at country level for a cross-country investigation of tax evasion (see Richardson 2006). In firm-level study, we employ the indicator ‘tax burden’ as a more valid alternative to ‘tax rates’ and avoid the problems associated with tax rates. Individual respondents declare their perception of the extent of *tax burden* on their businesses and its impact on tax evasion. Having in mind the diversity of taxes imposed on businesses with different characteristics, their perception of the tax burden, we argue, best captures the impact of different taxes on each business – and, most importantly, the impact of the tax burden on the decision to evade or not.[[4]](#footnote-4) This proxy has been recently used by Alm and McClellan (2012) – two prominent authors in the field of tax evasion. Our results show that, throughout all estimations and all model specifications, the perception of the tax burden is positively related to tax evasion – at the 1% level of significance.

Third, with regard to trust – another important determinant of tax evasion – we distinguish between trust in government and trust in the judicial system. We follow the suggestion in one of the seminal works on tax evasion, Andreoni et al. (1998), who argue in favour of a separation between the role and impact of various institutions. They argue that, in reality, government is not a single entity controlling all policies. In practice, it is more likely that there is a very clear distinction between governmental agencies responsible for tax rates, audit and fine rates. For instance, as they argue, tax rates and the frequency of audits are set by central government and the tax administration agency, while fine rates are set by courts. Therefore, it is necessary to measure and control for the perception of businesses towards each institution separately. A similar distinction is urged by Cowell (1990), in one of the most comprehensive reviews of tax evasion. Our results show that both “trust in government” and “trust in courts” are statistically significant across most model specifications.

Fourth, by including the 2005 round of BEEPS, we double the sample size.[[5]](#footnote-5) This enables us to a) look at the impact of time on tax evasion; and b) have more confidence in the estimated results. The year dummies are important not only as additional control variables but also to ensure adequate statistical specification of the model. There are two reasons (and hence advantages) for their inclusion: they minimize the effect of cross-group – time specific – common shocks; and they provide information on how the evasive behaviour by firms has changed across the years. Further research with larger sample sizes and over several years as well as using better model specifications provides valuable information and further contribution to the literature.

1. **Data**

In order to assess the level of tax evasion, we use the Business Environment and Enterprise Performance Survey (BEEPS) database for the years 2002 and 2005, produced jointly by the European Bank for Reconstruction and Development (EBRD) and the World Bank, which provides firm-level data on a broad range of variables related to the business environment and performance of firms. Although there were two other rounds of BEEPS in 1999 and 2008, these were not used in this study, because the former did not include some of the important independent variables and the latter lacked the all important tax evasion variable. Our final pooled cross-sectional sample consists of 12,692 firms from 26 transition economies.[[6]](#footnote-6) We drop public enterprises and cooperatives, in order to focus only on private sector companies. We also drop companies that took part in both survey rounds in order to ensure independence of observations from each other.

The question of interest for the present study is as follows: **Q.58** (2002 survey) and **Q.43a** (2005 survey) *– Recognising the difficulties that many firms face in fully complying with taxes and regulations, what per cent of total annual sales would you estimate the typical firm in your area of business reports for tax purposes?*

The respondents were asked to provide a single answer, in percent, on the level of reporting. The survey does not provide a direct question on compliance, although indirect measures of compliance (and other unlawful activities) are common in studies using survey data.[[7]](#footnote-7) We transform the question from a measure of compliance into a measure of evasion by subtracting the percentage of sales reported for tax purposes from 100. Under this transformation, 60% of observations have 0% values. The distribution of our dependent variable is thus roughly continuous over strictly positive values but zero for a nontrivial fraction of the sample – i.e., we have a censored sample (Gujarati, 2002; Wooldridge, 2003). Table 2 provides descriptive statistics for the pooled cross sectional sample. A detailed description of each variable together with the corresponding survey questions and units of measurement is provided in Table 3.

**Table 2** Descriptive Statistics for Pooled Cross Sectional Sample

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Obs.** | **Mean** | **Std. Dev.** | **Max** | **Min** |
| Tax Evasion | 11796 | 13.09 | 21.39 | 99 | 0 |
| Perceived Tax Burdena | 12498 | 2.79 | 1.10 | 4 | 1 |
| Trust in Government | 12412 | 3.89 | 1.46 | 6 | 1 |
| Trust in Judicial System | 11990 | 3.45 | 1.38 | 6 | 1 |
| General Corruption | 11435 | 2.55 | 1.49 | 6 | 1 |
| Compliance Costs | 12214 | 5.89 | 10.66 | 95 | 0 |
| Foreign | 12692 | 0.13 | 0.34 | 1 | 0 |
| Medium | 12692 | 0.18 | 0.38 | 1 | 0 |
| Large | 12692 | 0.08 | 0.28 | 1 | 0 |
| Individual | 12692 | 0.29 | 0.46 | 1 | 0 |
| Partnership | 12692 | 0.29 | 0.45 | 1 | 0 |
| Mining | 12692 | 0.01 | 0.10 | 1 | 0 |
| Construction | 12692 | 0.11 | 0.31 | 1 | 0 |
| Manufacturing | 12692 | 0.35 | 0.48 | 1 | 0 |
| Transportation | 12692 | 0.06 | 0.24 | 1 | 0 |
| Wholesale and Retail | 12692 | 0.28 | 0.45 | 1 | 0 |
| Real Estate | 12692 | 0.09 | 0.29 | 1 | 0 |
| Hotels and Restaurants | 12692 | 0.06 | 0.23 | 1 | 0 |
| Dummy Year | 12692 | 0.63 | 0.48 | 1 | 0 |

a We thank an anonymous reviewer for the suggestion on labeling this variable.

Source: BEEPS 2002 and 2005

|  |  |  |  |
| --- | --- | --- | --- |
| Table 3. Description of variables | | | |
| **Variable** | **Description** | **Question** | **Unit of measurement** |
| **Tax Evasion** | measure of the fraction of sales concealed | *Q.58 and Q.43a – Recognizing the difficulties that many firms face in fully complying with taxes and regulations, what per cent of total annual sales would you estimate the typical firm in your area of business reports for tax purposes?* | In Percentage (%) |
| **Tax Rate** | measure of tax burden as perceived by businesses | *Q.80g and Q.54h “Can you tell me how problematic are these different factors for the operation and growth of your business… Tax Rates”* | 1) no obstacle, (2) minor obstacle, (3) moderate obstacle, and (4) major obstacle |
| **Trust in Government** | measure of sharing information by central government | *Q.46a and Q.34a: “To what degree do you agree with the following statements? ... Information on the laws & regulations affecting my firm is easy to obtain”* | 1) strongly disagree, (2) disagree in most cases, (3) tend to disagree, (4) tend to agree, (5) agree in most cases, and (6) strongly agree. |
| **Trust in Legal System** | measure of perception of businesses towards effectiveness of courts in solving various business disputes | *Q.42 and Q.28: “To what degree do you agree with this statement? “I am confident that the legal system will uphold my contract and property rights in business disputes”.* | 1) strongly dis  agree, (2) disagree in most cases, (3) tend to disagree, (4) tend to agree, (5) agree in most cases, and (6) strongly agree |

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Description** | **Question** | **Unit of measurement** |
| **General Corruption** | measure of business’ perception towards corruption | *Q.51 and Q.35c “It is common for firms in my line of business to have to pay some irregular “additional payments/gifts” to get things done ” with regard to customs, taxes, licenses, regulations, services etc”* | (1) never, (2) seldom, (3) sometimes, (4) frequently, (5) usually, and (6) always. |
| **Compliance Costs** | measure of amount of time that senior management spends dealing with various legal requirements | *Q.50 and Q.35a “What percent of senior management’s time in 2001 was spent in dealing with public officials about the application and interpretation of laws and regulations and to get or to maintain access to public services?”* | In Percentage (%) |
| **Industrial Classification** | measure of firm’s major output in specific operating sector | *Q.2 and Q.2 “What percentage of your sales comes from the following sectors in which your establishment operates?”* | Dummy for: 1) mining and quarrying, 2) construction, 3) manufacturing, 4) transport storage and communication, 5) wholesale, retail, repairs, 6) real estate, renting and business services, 7) hotel and restaurants, and 8) other (base dummy) |
| **Size** | number of employees | *S.4 “How many full-time employees work for this company?”* | Dummy for: Small 2-49 (base dummy); Medium 50-249; and Large 250 – 9999 |
| **Ownership** | origin of main investor | *S.4c and S.5 “What percentage of your firm is owned by:”* | Dummy for: Domestic (base dummy) and Foreign |
| **Legal Status** | legal organization | *S.2 “What is the legal organization of this company?”* | Dummy for: Single Proprietorship, Partnership and corporations (base dummy) |
|  |  |  |  |

Note: The question numbers refer to BEEPS 2002 and 2005 respectively.

1. **Basic Regression Model**

To investigate the micro determinants of business tax evasion in transition economies, we estimate the following model:

**(1)**

Index *i* refers to observations 1,...,12,692. **TE**i stands for the level of tax evasion inferred for observation *i*; is the perceived level of the tax burden; trust in government; trust in courts and the legal system; business perception about the level of corruption; represents firms’ compliance costs; is firms’ ownership type (1 for foreign and 0 domestic); is a dummy variable, 1 for medium sized firms and 0 otherwise; is a dummy variable, 1 for large sized firms and 0 otherwise; is a dummy variable, 1 for sole proprietorships and 0 otherwise; is a dummy variable, 1 for partnerships and 0 otherwise; ***mining*** is a dummy variable, 1 for firms activity in mining and 0 otherwise; is a dummy variable, 1 for firms activity in construction and 0 otherwise; is a dummy variable, 1 for firms activity in manufacturing and 0 otherwise; is a dummy variable, 1 for firms activity in transportation and 0 otherwise; is a dummy variable, 1 for firms activity in wholesale and retail and 0 otherwise; is a dummy variable, 1 for firms activity in real estate and 0 otherwise; is a dummy variable, 1 for firms activity in hotels and restaurants and 0 otherwise; is year dummy (1 for 2005 and 0 for 2002); ***countryi***is country level dummy for 26 transition countries (Serbia and Montenegro as the base or omitted dummy); and**ε*i***is the usual error term. The next section elaborates on various econometric issues related to the estimation of our model.

1. **Developing the basic model**

The dependent variable in our study deals with a sensitive issue, that of tax evasion. This might restrict respondents’ willingness to provide either a truthful or indeed any answer. Hence, two sources of potential sample bias may arise: first, nonresponse may be endogeneous to firm behaviour, therefore the exclusion of missing values might bias estimates (Joulfaian, 2009); and, second, since the dependent variable captures firms’ perceptions of the level of evasion by other firms, full compliance responses may be false in order to cover a common pattern of evasion by firms (Nur-tegin, 2008). The latter does not deal with “missingness” as such. Rather, some of the provided answers are treated as subject to varying degrees of truthfulness, which cannot be observed but which can be proxied by the estimated probability of external review (assumed to be positively related with truthfulness). Sample selection was addressed in both Nur-tegin (2008) when treating “truthfulness” (missing values were dropped), and in Joulfaian (2009) when treating “missingness”. In this paper we address both sources of sample selection bias.

The selection bias problem was first acknowledged by Tobin (1958), who argued that if this sample selection problem is not accounted for in the estimation procedure, an ordinary least squares estimation (OLS) will produce biased parameter estimates. Later on, Heckman (1979) introduced a two-step statistical approach known as Heckit, which offers a means of correcting for non-randomly selected samples and provides consistent, asymptotically efficient estimates for all parameters in the model. Both Tobit and Heckit address those cases where the impact of independent variables can affect either the incidence (or intensity) and propensity of an event; in our case, tax evasion. Tobit assumes that there is a similar effect of independent variables on both intensity and propensity.

Heckman, on the other hand, relaxes this assumption by offering a two-step approach. The first step (selection equation) is the estimation of a Probit model to measure the impact of independent variables on the propensity. This generates a new variable known as the Inverse Mills Ratio (IMR) – which is a measure of the propensity (in our case propensity to evade). In the second step, Heckman introduces the IMR into the primary regression; hence measuring the intensity (in our case of tax evasion) conditional on propensity (to evade).

The standard Heckit procedure starts from a linear regression model (main equation):

**(2)**

where *Y*i is the dependent variable, tax evasion; *Xi* the observed variables relating to the ith observations; and is the error term. The next step in the Heckman method is to create the selection model, which must be estimated using a Probit estimator. The Probit model assumes that the error term follows a standard normal distribution (Heckman 1979). The selection equation is:

**(3)**

where is a vector of exogenous variables determining the selection process or the outcome Wi\* only when, in the selection equation, Wi\*, crosses a specific threshold. Wi\* is a dichotomous variable with the property that:

**(4)**

When controlling for “missingness”, we investigate whether nonresponse is endogenous to firm behaviour determinants, by generating a dummy from the responsiveness of the dependent variable. Not controlling for missing values may bias the estimates in Equation (1) (Joulfaian, 2009). Hence, Equations (3) and (4) become:

**(5)**

where is a dummy variable with values 1 if respondents have answered and 0 otherwise. Conditional upon positive responses we estimate Equation (1).

When controlling for “truthfulness”, we are interested in the degree of openness by firms, hence we investigate whether the firm had its annual financial statements reviewed by external auditors.[[8]](#footnote-8) In other words, if a firm was subject to review of its statements, then it has fewer reasons to underreport tax evasion. In this vein, one can argue that its zero evasion responses may be honest as well. The selection bias becomes an issue when misrepresentation by dishonest firms of their views is systematic in creating too many full compliance answers (Nur-tegin 2008). If, however, the misperception is random then selection bias is not present (Breen, 1996). Hence, Equations (3) and (4) become:

**(6)**

where is a dummy variable with values 1 if respondents have declared that their businesses had external auditors of their financial statements and 0 otherwise. Conditional upon positive responses we estimate equation (1).

Wooldridge (2003) argues that Xi should be a strict subset of Zi. This has two implications. First, any element that appears as an explanatory variable in the main equation should also be an explanatory variable in the selection equation. Second, there must be at least one element of Zi that is not also in Xi; i.e. at least one variable that affects selection but does not have a partial effect on Y in the main Equation (2).[[9]](#footnote-9)

Accordingly, we consider two exclusion restriction variables, one each for the sample selection sources that we address. For “missingness”, in the selection Equation (5) we use a variable with values 1 if the respondent was an owner and 0 otherwise. The assumption here is that such a proxy serves well in measuring firms’ readiness to answer sensitive questions, such as the one related to tax evasion. Unlike managers and other groups of respondents, owners are more likely to hide common evasive behaviour (if present) by refusing to answer. Conversely, whether respondents are owners or managers, or whether they share/do not share information, is unrelated to tax evasion. Consequently, we argue on theoretical grounds that this exclusion restriction variable should not appear in the main regression. The expected sign of the dummy variable for owner in the Probit selection equation is *negative.*

For “truthfulness”, as an exclusion restriction variable in the selection Equation (6) we use a dummy variable with values 1 if the firm applies International Accounting Standards (IAS) and 0 otherwise. By doing so we assume that application of IAS has a considerable impact on the firms’ decision to have external reviewers, but not on the level of tax reporting. Here the expected the sign of the IAS dummy in the Probit selection equation to be *positive.*

An alternative to the Heckman Two-Step Probit-OLS approach is the Heckman Maximum Likelihood.[[10]](#footnote-10) Joulfaian (2009) applies an extended Heckman ML procedure to the estimates of a Tobit equation conditional upon a positive response to a Probit equation (note that the standard Heckman Two-Step estimates OLS conditional upon Probit). Given that around 60% of respondents in our sample have declared full compliance, i.e. no evasion, the dependent variable has a distribution that spreads over values that are positive; but most of which are zero. Under these circumstances, the extended Heckman ML procedure with Tobit estimation conditional upon a positive response in the Probit selection equation is appealing. Under the extended Heckman ML procedure, the correlation of the error terms across the two equations is corr(ε,u) = . If = 0, then there is sufficient evidence to assume that there is no sample selection bias. Note that in the second-stage Tobit estimation, there is no **λ** variable included, since the estimator is not least squares. This sample selection model is estimated by maximum likelihood, hence there is no selection “correction” variable as in the standard Heckit procedure.

Under the assumption that *missingness* and *truthfulness* in the dependent variable are random and present, respectively, that is they do not cause any sample selection bias, our final approach should address the issue of data censoring. We do that by using the Tobit Corner Solution. In the next section, we report and discuss the empirical findings.

1. **Estimation Results**

Our results show that all estimated effects are in accordance with theory and the previous empirical literature. Moreover, the signs of coefficients remain unchanged across all three specifications: selection “missingness”; selection “truthfulness”; and Tobit corner solution. Differences in the SEs are minor in almost all cases. This is encouraging given the need for robustness checks; in particular, given its theoretical ambiguity, for the relationship between the tax rate and compliance. Tables 4 and 5 provide sample selection results for both “missingness” and truthfulness”. Column 1 in both tables presents Full Information Maximum Likelihood (FIML) results of the extended two stage Heckman Selection procedure (Probit in the first stage, Tobit in the second) while Column 2 in both tables presents standard Two-Step Heckman Selection results (Probit in the first stage, OLS in the second). As argued, given that the dependent variable is censored, the final equation requires a Tobit estimation (hence FIML: Probit-Tobit); while the Two-Step Heckman Selection (Probit-OLS) is implemented mainly as a robustness check both for sample selection and variable significance. In addition, Table 6 presents standard Tobit results, which will serve as our preferred model should our data not suffer from sample selection bias.

In Table 4, when checking for sample selection bias from “missingness”, the indicator of interest is rho () – the correlation of the error terms across the two equations. Its statistical insignificance shows that, under the assumption of having good identifying variables, there is a high chance of making type one error by rejecting Ho: there is zero correlation between error terms; that is, the problem of sample selectivity arising from truthfulness is not present in the given data set. Although the significance of rho () is rejected in both Tables 4 and 5, lambda (λ), or the coefficient on the inverse Mills ratio, is significant at the 5% level in our robust (Two-Step Heckman Probit-OLS) estimation in Table 4.

In Table 4, our exclusion restriction variable (“respondent is owner”) appears to be significant at the 5% level in the Two-Step Heckman Selection model; and has a negative sign. This result is encouraging as it validates our inclusion of this particular variable in the selection equation on theoretical grounds. The results from Heckman FIML, however, show that the exclusion restrictions have lost their significance. Note, however, the Probit estimates are identical in both Two-Step Heckman (estimated by STATA) and FIML Heckman (estimated by LIMDEP). Yet we do not know (and unfortunately no explanation is given in the manual) how the SEs are calculated in LIMDEP or, therefore, what is the difference between the LIMDEP SEs and those estimated by STATA. Regardless of that, given the results, we conclude that potential sample selection bias caused by “missingness” has been addressed.

Our next step is to check for potential sample selection bias from “truthfulness”. Table 5 shows the Heckman results. Our preferred model is Heckman FIML, because the dependent variable is censored. Moreover, the Heckman Two-Step model is provided as a robustness check, in particular of the adequacy of the identifying variable in the selection equation (suggested by the significance of the exclusion variable in the Probit selection equation). Given this robustness check, it is reasonable to assume that any selection bias is controlled for in the Heckman FIML estimates and that the relatively large SE on rho() does not reflect inadequate – weak – identification of the Probit selection equation.

Again, the indicators of interest are rho (), the correlation of the error terms across the two equations, and lambda (λ), the coefficient on the inverse Mills ratio. Results from both these indicators show that even under the assumption of having good identifying variables, there is a high chance of making type one error by rejecting *Ho: there is zero correlation between error terms*; that is, sample selectivity problem arising from dishonest answers is not present in the given data set. The results show that our exclusion restriction variable (“having external reviewer/auditor”) is significant at the 1% level across both estimations. Moreover, the sign is positive, supporting our theoretical hypothesis that firms applying International Accounting Standards are more likely to have independent external reviewers/auditors. This result is encouraging as it validates our inclusion on theoretical grounds of this particular variable in the selection equation.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 4 Sample Selection Bias from 'Missingness' | | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
|  |  | **HECKMAN FIML** | | | | | | **HECKMAN TWO STEP** | | | | | |
|  |  | **Main** | | | **Selection** | | | **Main** | | | **Selection** | | |
|  |  | TOBIT | | | PROBIT | | | OLS | | | PROBIT | | |
| Dependent Variable: |  | **Tax Evasion** | | | **Response** | | | **Tax Evasion** | | | **Response** | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
|  |  | Coeff | | S.E | Coeff | | S.E | Coeff | | S.E | Coeff | | S.E |
| **Perceived Tax Burden** |  | 2.61 | \*\*\* | 0.49 | 0.06 | \* | 0.03 | 0.89 | \*\*\* | 0.23 | 0.06 | \* | 0.02 | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| **Trust** |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| Trust in Government |  | -0.74 | \*\* | 0.32 | 0.22 |  | 0.27 | -0.34 | \*\* | 0.15 | 0.22 |  | 0.22 | |
| Trust in Judicial System |  | -1.24 | \*\*\* | 0.36 | 0.28 |  | 0.29 | -0.53 | \*\*\* | 0.17 | 0.28 | \* | 0.02 | |
| **General Corruption** |  | 7.11 | \*\*\* | 0.36 | 0.38 |  | 0.29 | 2.90 | \*\*\* | 0.16 | 0.38 |  | 0.02 | |
| **Compliance Costs** |  | 0.13 | \*\*\* | 0.40 | 0.00 |  | 0.00 | 0.08 | \*\*\* | 0.02 | 0.00 |  | 0.00 | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| **Ownership** |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| Foreign Firm |  | -6.37 | \*\*\* | 1.42 | 0.00 |  | 0.11 | -2.51 | \*\*\* | 0.65 | 0.00 |  | 0.06 | |
| **Size** |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| Medium |  | -7.65 | \*\*\* | 1.30 | -0.13 |  | 0.10 | -3.21 | \*\*\* | 0.60 | -0.13 | \* | 0.05 | |
| Large |  | -10.3 | \*\*\* | 1.78 | -0.11 |  | 0.13 | -3.97 | \*\*\* | 0.81 | -0.11 |  | 0.07 | |
| **Legal Status** |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| Individual |  | 7.01 | \*\*\* | 1.32 | -0.04 |  | 0.10 | 2.84 | \*\*\* | 0.62 | -0.04 |  | 0.06 | |
| Partnership |  | 2.87 | \*\* | 1.44 | -0.08 |  | 0.12 | 0.90 |  | 0.67 | -0.08 |  | 0.06 | |
| **Industry Sector** |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| Mining |  | -9.3 | \* | 5.49 | 0.06 |  | 0.46 | -4.17 | \* | 2.34 | 0.06 |  | 0.24 | |
| Construction |  | -3.14 |  | 2.44 | -0.06 |  | 0.21 | -1.67 |  | 1.17 | -0.06 |  | 0.11 | |
| Manufacturing |  | -2.87 |  | 2.21 | -0.04 |  | 0.19 | -1.71 |  | 1.06 | -0.04 |  | 0.10 | |
| Transportation |  | -7.29 | \*\*\* | 2.79 | -0.16 |  | 0.22 | -3.53 | \*\*\* | 1.32 | -0.16 |  | 0.12 | |
| Wholesale and Retail |  | -3.38 |  | 2.19 | -0.02 |  | 0.19 | -1.65 |  | 1.06 | -0.02 |  | 0.10 | |
| Real Estate |  | -3.04 |  | 2.52 | -0.16 |  | 0.20 | -1.44 |  | 1.23 | -0.16 |  | 0.11 | |
| Hotels and Restaurants |  | 4.54 |  | 2.89 | -0.15 |  | 0.22 | 1.77 |  | 1.37 | -0.15 |  | 0.12 | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| **Exclusion Restriction Variable** |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| Respondent is Owner |  |  |  |  | -0.13 |  | 0.09 |  |  |  | -0.13 | \*\* | 0.05 | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| **Constant** |  | -14.1 | \*\* | 6.18 | 0.88 | \*\* | 0.36 | 10.1 | \*\*\* | 3.03 | 0.88 | \*\*\* |  | |
| **Year Dummy** |  | -10.0 | \*\*\* | 2.09 | 0.58 | \*\*\* | 0.08 | -2.95 | \*\*\* | 1.05 | 0.58 | \*\*\* |  | |
| **Country Level Dummies** |  | Yes |  |  | Yes |  |  | Yes |  |  |  |  |  | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| **Rho** |  | 0.12 |  | 0.45 |  |  |  |  |  |  |  |  |  | |
| **Lambda (λ)** |  |  |  |  |  |  |  | 18.2 | \*\* | 0.19 |  |  |  | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| Number of observations |  | 10303 | | | | | | 10303 | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| \*\*\* at 1% level of significance; \*\* at 5% level of significance; \* at 10% level of significance; | | | | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 5 Sample Selection Bias from 'Truthfulness' | | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | **HECKMAN FIML** | | | | | | **HECKMAN TWO STEP** | | | | | |
|  |  | **Main** | | | **Selection** | | | **Main** | | | **Selection** | | |
|  |  | TOBIT | | | PROBIT | | | OLS | | | PROBIT | | |
| Dependent Variable: |  | **Tax Evasion** | | | External | | | **Tax Evasion** | | | External | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | Coeff | | S.E | Coeff | | S.E | Coeff | | S.E | Coeff | | S.E |
| **Perceived Tax Burden** |  | 3.22 | \*\*\* | 0.74 | -0.02 | \* | 0.01 | 0.80 | \*\*\* | 0.29 | -0.02 | \* | 0.01 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Trust** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Trust in Government |  | -1.81 | \*\*\* | 0.51 | 0.02 | \*\*\* | 0.01 | -0.96 | \*\*\* | 0.21 | 0.02 | \*\*\* | 0.01 |
| Trust in Judicial System |  | -1.47 | \*\* | 0.57 | 0.00 |  | 0.01 | -0.69 | \*\*\* | 0.23 | 0.00 |  | 0.01 |
| **General Corruption** |  | 6.65 | \*\*\* | 0.55 | 0.01 |  | 0.01 | 2.30 | \*\*\* | 0.21 | 0.01 |  | 0.01 |
| **Compliance Costs** |  | 0.12 | \* | 0.06 | 0.00 | \*\*\* | 0.00 | 0.07 | \*\*\* | 0.02 | 0.00 | \*\*\* | 0.00 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Ownership** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Foreign Firm |  | -6.99 | \*\*\* | 2.14 | 0.40 | \*\*\* | 0.05 | -2.55 | \*\*\* | 0.88 | 0.40 | \*\*\* | 0.04 |
| **Size** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Medium |  | -8.63 | \*\*\* | 2.47 | 0.60 | \*\*\* | 0.04 | -3.27 | \*\*\* | 1.00 | 0.60 | \*\*\* | 0.04 |
| Large |  | -11.1 | \*\*\* | 3.23 | 0.95 | \*\*\* | 0.07 | -3.45 | \*\* | 1.33 | 0.95 | \*\*\* | 0.06 |
| **Legal Status** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Individual |  | 7.25 | \*\*\* | 2.50 | -0.40 | \*\*\* | 0.04 | 3.26 | \*\*\* | 1.00 | 0.40 | \*\*\* | -0.40 |
| Partnership |  | 3.87 | \* | 2.20 | -0.17 | \*\*\* | 0.04 | 1.77 | \*\* | 0.88 | 0.17 | \*\*\* | -0.17 |
| **Industry Sector** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mining |  | -1.20 |  | 8.71 | 0.19 |  | 0.17 | -1.60 |  | 3.12 | 0.19 |  | 0.19 |
| Construction |  | 2.15 |  | 4.42 | 0.13 | \* | 0.07 | 0.50 |  | 1.84 | 0.13 |  | 0.13 |
| Manufacturing |  | -0.31 |  | 4.11 | 0.19 | \*\*\* | 0.06 | -0.75 |  | 1.71 | 0.19 | \*\* | 0.19 |
| Transportation |  | -8.21 | \* | 4.88 | 0.15 | \* | 0.08 | -3.67 | \* | 1.99 | 0.15 | \* | 0.15 |
| Wholesale and Retail |  | -2.82 |  | 4.10 | 0.11 | \* | 0.06 | -1.51 |  | 1.71 | 0.11 |  | 0.11 |
| Real Estate |  | 2.62 |  | 4.57 | 0.00 |  | 0.07 | 0.88 |  | 1.91 | 0.00 |  | 0.00 |
| Hotels and Restaurants |  | 11.2 | \*\* | 5.06 | 0.00 |  | 0.08 | 4.35 | \*\* | 2.11 | 0.00 |  | 0.00 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Exclusion Restriction Var.** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| International Accounting Standards |  |  |  |  | 0.58 | \*\*\* | 0.04 |  |  |  | 0.58 | \*\*\* | 0.03 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Constant** |  | -15.3 | \* | 8.31 | -0.77 | \*\*\* | 0.13 | 15.8 | \*\*\* | 3.65 | -0.77 | \*\*\* | 0.14 |
| **Year Dummy** |  | -9.70 | \*\*\* | 1.57 | 0.07 | \*\* | 0.03 | -4.30 | \*\*\* | 0.64 | 0.75 | \*\* | 0.03 |
| **Country Level Dummies** |  | Yes |  |  | Yes |  |  | Yes |  |  | Yes |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Rho** |  | 0.02 |  | 0.12 |  |  |  |  |  |  |  |  |  |
| **Lambda (λ)** |  |  |  |  |  |  |  | 0.37 |  | 0.84 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Number of observations |  | 8818 | | | | | | 8818 | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| \*\*\* at 1% level of significance; \*\* at 5% level of significance; \* at 10% level of significance | | | | | | | | | | | | | |

We also note that in terms of the signs of coefficients in Tables 4 and 5, there is no obvious difference between FIML Probit-Tobit estimation and Two-Step Probit-OLS estimation; the majority of variables yield the same signs and similar statistical significance, suggesting robustness.

As already argued, under the alternative assumption of the non-existence of sample selection bias, our final choice is the Tobit Corner Solution model, given the censored nature of the dependent variable. Tobit results presented in Table 6, with Column 1 representing standard Tobit estimations (left censored dependent variable). In order to evaluate whether the Tobit model is appropriate, we estimate a Probit model with the dependent variable a dummy for tax evasion (1 if evasion occurs and zero otherwise). We then divide the Tobit coefficients by sigma (from Tobit) and obtain νj=βj/σ (the ratio of the Tobit coefficient βj to the Tobit estimated standard deviation of the residual σ). As can be seen from Column 2, the relative-to-sigma νj coefficients are very close (almost identical) to Probit, suggesting that the choice of using Tobit is legitimate Wooldridge (2003). For many models, including Tobit, the pseudo-R2 has no real meaning (STATA 2011). Wooldridge (2003, p.529) argues that:

*… we should remember that the Tobit estimates are not chosen to maximize an R-squared — they maximize the log-likelihood function — whereas the OLS estimates are the values that do produce the highest R-squared.*

The Tobit results are almost identical to the converged FIML Heckman estimations. This is of no surprise as the second stage in FIML Heckman is run using Tobit. These similarities serve as a strong robustness check that sample selection bias is *not* present in our data (under the presence of severe sample selection bias the Heckman results would be substantially different). For this reason, we interpret our Tobit estimates without further reference to the very similar FIML results. As argued previously, we cannot interpret straightforwardly the *β* coefficients as the effect of Xi on Yi, as one would do with a linear regression model. Instead, it should be interpreted as the combination of (1) the change in Yi of those observations above the limit, weighted by the probability of being above the limit; and (2) the change in the probability of being above the limit, weighted by the expected value of Yi if above. Hence, we derive two marginal effects: conditional (Column 3); and unconditional (Column 4).

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 6 TOBIT estimation results | | | | | | | | | | | | |
|  |  |  | | | | |  | | |  | | |
|  |  | TOBIT | | | Probit | βj/σ | Conditional Marginal Effects | | | Unconditional Marginal Effects | | |
|  |  | **1** | | | **2** | | **3** | | | **4** | | |
| Dependent: **Tax Evasion** |  | Coeff | | Robust S.E | Coeff | | Coeff | | S.E | Coeff | | S.E |
|  |  |  | | |  |  |  | | |  | | |
| **Perceived Tax Burden** |  | 2.55 | \*\*\* | 0.73 | 0.08 | 0.07 | 0.81 | \*\*\* | 0.22 | 1.06 | \*\*\* | 0.29 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Trust** |  |  |  |  |  |  |  |  |  |  |  |  |
| Trust in Government |  | -0.76 | \* | 0.39 | -0.02 | -0.02 | -0.24 | \*\* | 0.12 | -0.32 | \*\* | 0.16 |
| Trust in Judicial System |  | -1.27 | \*\* | 0.52 | -0.03 | -0.03 | -0.40 | \*\* | 0.16 | -0.52 | \*\* | 0.21 |
| **General Corruption** |  | 7.08 | \*\*\* | 0.46 | 0.21 | 0.19 | 2.26 | \*\*\* | 0.13 | 2.95 | \*\*\* | 0.17 |
| **Compliance Costs** |  | 0.13 | \*\*\* | 0.04 | 0.00 | 0.00 | 0.04 | \*\*\* | 0.01 | 0.05 | \*\*\* | 0.01 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Ownership** |  |  |  |  |  |  |  |  |  |  |  |  |
| Foreign Firm |  | -6.39 | \*\*\* | 1.55 | -0.16 | -0.17 | -1.97 | \*\*\* | 0.46 | -2.51 | \*\*\* | 0.57 |
| **Size** |  |  |  |  |  |  |  |  |  |  |  |  |
| Medium |  | -7.57 | \*\*\* | 1.34 | -0.21 | -0.20 | -2.33 | \*\*\* | 0.40 | -2.96 | \*\*\* | 0.51 |
| Large |  | -10.3 | \*\*\* | 2.05 | -0.28 | -0.27 | -3.08 | \*\*\* | 0.57 | -3.85 | \*\*\* | 0.69 |
| **Legal Status** |  |  |  |  |  |  |  |  |  |  |  |  |
| Individual |  | 7.07 | \*\*\* | 2.06 | 0.19 | 0.19 | 2.28 | \*\*\* | 0.67 | 2.99 | \*\*\* | 0.88 |
| Partnership |  | 2.95 |  | 2.16 | 0.09 | 0.08 | 0.95 |  | 0.70 | 1.24 |  | 0.93 |
| **Industry Sector** |  |  |  |  |  |  |  |  |  |  |  |  |
| Mining |  | -10.0 | \*\* | 4.23 | -0.21 | -0.27 | -2.96 | \*\*\* | 1.14 | -3.68 | \*\*\* | 1.33 |
| Construction |  | -3.09 |  | 1.96 | -0.08 | -0.08 | -0.97 |  | 0.59 | -1.25 | \* | 0.75 |
| Manufacturing |  | -2.82 | \*\* | 1.38 | -0.07 | -0.08 | -0.89 | \*\* | 0.43 | -1.16 | \*\* | 0.55 |
| Transportation |  | -7.16 | \*\*\* | 2.15 | -0.20 | -0.19 | -2.18 | \*\*\* | 0.61 | -2.75 | \*\*\* | 0.74 |
| Wholesale and Retail |  | -3.36 | \*\* | 1.57 | -0.10 | -0.09 | -1.06 | \*\* | 0.49 | -1.37 | \*\* | 0.63 |
| Real Estate |  | -2.91 |  | 1.88 | -0.14 | -0.08 | -0.91 |  | 0.57 | -1.17 |  | 0.73 |
| Hotels and Restaurants |  | 4.68 | \*\* | 2.29 | 0.11 | 0.12 | 1.55 | \*\* | 0.79 | 2.05 | \* | 1.06 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Constant** |  | -12.8 | \*\*\* | 4.53 | -0.62 | -0.34 |  |  |  |  |  |  |
| **Year Dummy** |  | -10.50 | \*\*\* | 2.92 | -0.25 | -0.28 | -3.45 | \*\*\* | 0.96 | -4.55 | \*\*\* | 1.26 |
| **Country Level Dummies** |  | Yes |  |  | Yes |  | Yes |  |  | Yes |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pseudo R2 |  | 0.03 |  |  |  |  |  |  |  |  |  |  |
| Sigma |  | 37.6 |  |  |  |  |  |  |  |  |  |  |
| Number of observations |  | 9705 |  |  |  |  |  |  |  |  |  |  |
| Left-Censored Observations |  | 5642 |  |  |  |  |  |  |  |  |  |  |
| Uncensored Observations |  | 4063 |  |  |  |  |  |  |  |  |  |  |
| Right-Censored Observations |  | 0 |  |  |  | |  | | |  | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| \*\*\* at 1% level of significance; \*\* at 5% level of significance; \* at 10% level of significance | | | | | | | | | | | | |

There is no straightforward preference for using one of the effects; but since their sizes are similar across the variables, and since the unconditional effects apply to the whole sample, we have chosen to interpret the unconditional (Column 4) rather than the conditional effects.

The results show that there is a positive relationship between perceived tax burden and tax evasion at the 1% level of significance. Increasing the perceived tax burden by one category increases tax evasion by 1.06 percentage points, if all other factors are held constant. The relationship between c*orruption* and tax evasion is also positive and statistically significant at the 1% level. All other things held constant, a rise in the perception of corruption by tax officials by one level increases tax evasion by 2.95 percentage points*.* A positive relationship is observed also between *Compliance costs* and tax evasion, at the 1% level of significance, although the impact seems to be quite small.

As expected, *Trust* variables are negatively related to evasive behaviour by firms. *Trust in government* is statistically significant at the 5% level. An increase in transparency by one level, reduces tax evasion by 0.32 percentage points. *Trust in judicial system* is also statistically significant at the 5% level and is negatively related to tax evasion; for every positive change in trust by one category, tax evasion reduces by almost 0.52 percentage points.

Firm related determinants, *ownership, size* and *legal status* have the highest coefficients while their statistical significance is strong (at the 1% level).[[11]](#footnote-11) Evasion drops by around 2.51 percentage points if the firm is owned by *foreign* entrepreneurs, compared with domestic owners. Compared to s*mall* firms, less evasion is reported by *medium* and large *businesses*. All other factors held constant, *medium* firms are more compliant than are *small* firms by 2.96 percentage points, while this gap is extended (in absolute terms) by *large* firms to 3.85 percentage points, who evade around 1 percentage point less than do the *medium*. The estimates also point to higher levels of evasion if the firm is an *individual* or a *partnership* as compared to *corporate*. The estimated coefficient is 2.99 for individual, followed by an estimate of 1.24 for partnerships.

Firms in various sectors tend to have different compliance behaviour. Compared to ‘*Other’* (the base category), firms operating in *‘Hotels and restaurants’* appear to be most evasive (coefficient of 2.05 and statistically significant at the 10% level), followed by firms in *‘Manufacturing’* (-1.16 and statistically significant at the 5% level), ‘*Real estate, renting and business services’* (-1.17), *‘Construction’* sector (-1.25 and statistically significant at the 10% level), *‘Wholesale, retail and repairs*’ (-1.37 and statistically significant at the 5% level), and *‘Transport storage and communication’* (-2.75, and statistically significant at the 1% level). Firms operating in *‘Mining and quarrying’* have the lowest evasive behaviour. Ceteris paribus, firms in this sector evade by 3.68 percentage points less than ‘Other’.

Last, the period dummy suggests that, at the 1% level of significance, compared to the base year (2002), tax evasion fell in 2005 by 4.55 percentage points. Results for the country level dummies can be provided upon request.

1. **Conclusion and Policy Recommendations**

The standard economic model of tax evasion (Allingham and Sandmo, 1972) suggests two counteracting effects on the relationship between the tax rate and evasion. Yet, business modelling showed that the theoretical predictions on this relationship are very sensitive to the assumptions made, with most studies suggesting ambiguity. The empirical evidence on the impact of tax rates is likewise inconclusive. Even studies of TEs using the same datasets (BEEPS 2002) produced opposing results. While Nur-tegin (2008) finds a negative relationship between the tax rate and evasion, Joulfaian (2009) finds a positive relationship. In our study, the impact of the perceived tax burden (used as a proxy for the tax rate) on tax evasion is positive and this result remains robust regardless of differences in the models estimated. These results suggest that increasing the tax burden on businesses in transition economies leads to higher levels of tax evasion.

Evasive behaviour becomes more understandable once institutional variables are included. Firms’ decisions are largely driven by the treatment they receive from their governments and courts. As expected, trust in government and courts remains negatively related with tax evasion. These findings are in line with both the Nur-tegin (2008) and the Joulfaian (2009) results, suggesting that for TEs establishing trust is a means of fighting tax evasion. In addition, our findings show that corruption, as expected, is positively related to tax evasion. This relationship has been confirmed robustly in all our estimations.

Compliance costs are an important theoretical factor in the literature. However, in our estimations, although significant at 1% and positively related to tax evasion in all estimations, the impact of this variable is small.

One of the most important findings of this study is that a firm’s characteristics largely determine its tax evasion. Our results show that a firm’s size matters; the larger the firm the smaller the evasion. A general reflection can be drawn from the fact that in the majority of TEs, tax inspectorates are more concerned with large businesses than with small ones. Given the deficiencies in tax administrations, the allocation of human resources requires a strategy that optimizes revenue collection. Hence, large firms, due to their higher turnovers (and so potential returns from detection of evasion), are more attractive targets, thus leaving small firms less observed. In addition, foreign firms are generally more compliant. This is understandable, as foreign investors tend to be more risk averse given the unfamiliarity of a foreign business environment. Similarly, corporations and partnerships are more compliant than are individual firms. This result suggests that involvement of more people in decision-making reduces unlawful activities; activities such as tax evasion are more likely in the cases of full discretion by lone decision makers.

Several interesting results are derived from industry differences amongst firms in TEs. A general impression from our estimations is that sectors that involve higher cash transactions and/or activities less visible to tax administration are more evasive. In this regards, hotels and restaurants record the highest evasion. Similarly, firms in construction, real estate or wholesale and retail are more evasive compared to others. The lowest evasive behaviour is observed in mining and transportation. These results indicate the need for more presence of tax inspectors in high cash transaction businesses. In cases where human resources are insufficient, tax incentives for buyers (such as tax deductions for all invoice collections by consumers) could be adequate. Further, several TEs have practiced tax incentives for non-cash transactions.

Last, positive, large and highly significant period effects for Year 2005 relative to Year 2002 suggests that tax evasion may be falling over time. This again is consistent with the importance of transitional reforms, in particular improvements in law enforcement and other institutions in these countries.

The results and main findings of this study have a number of policy implications for combatting tax evasion in transition countries. First, countries with weak collection mechanisms should work on reducing the levels of the tax burden in order to increase both voluntary compliance and general tax revenues. Second, stronger deterrence mechanisms will reduce opportunities for tax evasion, thereby strengthening principles of fair market competition by reducing unfair advantage to evaders. Third, countries should make significant efforts to improve the relationship between taxpayers and institutions, which will also build trust. Fourth, reduced tax evasion will improve public finances and enable government to increase the supply of public goods, which may also strengthen trust in government. A better relationship between taxpayers and tax spenders will create a synergy of compliance. Over the long term, reduced evasive behaviour may be transformed into social norms or common practices, further reforming behaviours and perceptions.

This paper has several limitations. These are related to the data used in the research. First, the most important limitation relates to the qualitative nature of the self-reported independent variable of tax evasion. Lack of accurate and actual tax reporting data for transition economies, similar to tax measurement programmes available in the US, forces this work to rely entirely on perceptions; some of which, as is the case with every other survey, may be subjective and prone to bias. Surveys of tax evasion are even more complicated, because tax evasion is unlawful and socially undesirable, thus making individuals reluctant to admit such behaviour. In addition, there is a fear of penalties and other sanctions, which induce individuals to either provide untruthful answers about their compliance behaviour or refuse to answer at all. Although we control for sample selection bias in this research, the use of actual tax and audit databases might have increased confidence in the validity of our estimates. Second, the absence of any tax measurement and audit programmes in TEs precludes control for the impact of the audit and fine rate on tax evasion (though, in this study, national variations are controlled by country dummy variables). A better estimation of the effect of the audit rate would have also been possible with either tax measurement programmes or actual audited tax returns as evidence. Third, data for a longer time span would have increased the precision of our estimates as well as providing more information on time shocks or other time-related effects on observed tax evasion levels during transition. Moreover, the lack of recent data for transition economies did not allow us to investigate the effect of institutional change on compliance. Last, the inability to differentiate amongst types of taxes and the impact of each tax rate on business tax evasion also limits the findings of this study. At least theoretically, the investigation of different types of taxes with respect to compliance could provide tax-specific rather than generic policy recommendations.

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1. We thank the anonymous referee for bringing this paper to our attention. [↑](#footnote-ref-1)
2. In addition to these works, Alon and Hageman (2013) also make use of BEEPS data. Their important work deals with the impact of corruption and general trust on business tax evasion, while controlling for other important variables. Yet, traditional variables such as tax rate and compliance costs are not included in the analysis. Alon and Hageman (2013) while investigating business tax evasion in transition economies of the former Soviet Bloc (using the 2005 round of BEEPS) find that tax compliance is lower among firms with higher levels of tax-related unofficial payments and higher levels of particularized trust. They also find that, in the case of higher generalized trust, the relationship between corruption and tax compliance becomes weaker. [↑](#footnote-ref-2)
3. https://www.pwc.com/gx/en/tax/pdf/impact-of-vat.pdf [↑](#footnote-ref-3)
4. In support of our claim, we compared several country level CIT and VAT tax rates with the perceived tax burden by businesses covered in BEEPS. We found no correlation between the two measures. We interpret this as an indicator that currently available data on tax rates, specifically those of CIT and VAT, may not be a good measure of the tax burden when assessing the impact of the tax burden on business tax evasion. As already mentioned, tax burden derived from tax rates can be best measured by the independent perceptions of individual businesses. [↑](#footnote-ref-4)
5. Nur-tegin (2008) works on a sample of 4,538 – while dropping missing values; while Joulfaian (2009) works with 5,740 respondents. Our sample – see below – includes 12,692 firms. [↑](#footnote-ref-5)
6. These countries are: Albania, Armenia, Azerbaijan, Belarus, Bosnia, Bulgaria, Croatia, Czech Republic, Estonia, Serbia and Montenegro, FYR Macedonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, Tajikistan, Ukraine and Uzbekistan. We do not include Turkey as we want to focus only on post-communist countries i.e. transition economies, and we also drop Turkmenistan given the lack data for the most important questions related to tax evasion. [↑](#footnote-ref-6)
7. For more on how to conduct evasion questions see Hanousek and Palda (2004) and Gerxhani (2006). [↑](#footnote-ref-7)
8. The question reflecting openness is: *Q.74 (2002 survey) and Q.49 (2005 survey) -* *Does your establishment have its annual financial statement reviewed by an external auditor?* [↑](#footnote-ref-8)
9. In the absence of such an *exclusion restriction variable,* the results will usually be less than convincing. According to Wooldridge (2003) the reason for this is that while the inverse Mills ratio is a nonlinear function of Zi, it is often well-approximated by a linear function. If Zi equals Xi, thencan be highly correlated with the elements of Xi. Such multicollinearity can lead to very high standard errors for the . Furthermore, in the absence of a variable that affects selection but not Y, it is extremely difficult, if not impossible, to distinguish sample selection from a misspecified functional form in the main equation. [↑](#footnote-ref-9)
10. A notable issue in the Heckman Two-Step approach relates to standard errors, which remain problematic for three reasons. As Lin (2007) argues: first, the additional variance that results from the generated regressor - namely the inverse Mills ratio term - must be taken into account. Second, if there is indeed selection, then there is heteroskedasticity. Third, spatial dependence is induced by the fact that a common *β* is used to construct the estimated inverse Mills ratio for all of the observations. Heckman (1979) includes a consistent variance estimator that deals with all of these problems (for more, see Greene 2002 p.785). STATA produces the corrected standard errors by default. [↑](#footnote-ref-10)
11. Apart from the *partnership* which is not statistically significant in Table 6, although it is in Tables 4 and 5. [↑](#footnote-ref-11)