The effect of low corporate tax rate on payroll tax evasion

Boryana Madzharova *

Abstract

It is a commonly held view that the widespread policy of cutting the corporate income tax has a positive effect on taxable income through decreasing firms' incentive to hide profits. A neglected side of this policy, however, is its potential to trigger more evasion in another tax base, namely the social security base, especially if the corporate income tax is very low compared to the contribution rate. We develop a model in which employers and employees cooperate in declaring lower wages to the tax authorities in order to evade payroll contributions. Since wages and payroll taxes are a deductible expense, a lower reported wage translates into higher corporate profits on paper and hence, shifting of tax liability out of the social security into the corporate tax base. Using firm-level panel data for Bulgaria where the problem of contribution evasion is especially severe, we find that a 10% increase in the difference between the payroll rate and the corporate income tax will translate into 0.86% decrease in reported wages and a 0.6% rise in reported taxable income. The reported wage bill of big taxpayers appears to be more responsive to changes in the the difference between the payroll and the corporate income tax rates, but these firms do not tend to overpay corporate profit tax stemming from payroll evasion. Our results show that while wages paid by smaller taxable income firms are less sensitive to the tax gap, it is small businesses who mostly shift income between the bases.

JEL Classification: H25; H26; J31

*Center for Economic Research and Graduate Education - Economic Institute (CERGE-EI), Politickych veznu 7, 111 21 Praha 1, Czech Republic, E-mail: Boryana.Madzharova@cerge-ei.cz.

1 Introduction

The evasion of social security contributions has been a long-standing problem in the countries of Latin America and Central and Eastern Europe (CEE). Crude estimates for some Latin American countries in the early 1990s show that 50% to 60% of the contribution liability remained uncollected, with Brazil heading the list, while between 20% and 30% of total contribution income in CEE was evaded as estimated by the International Labour Office in the mid-1990s (Gillion et al. (2000)). In 2002, for example, according to a number of surveys, approximately 34% of all employed in Bulgaria understated their true wages and 25% worked without an official labour contract (Dimitrov et al. (2004)). Although pervasive in CEE and Latin America, payroll tax evasion is by no means limited to these regions. In fact, as Gillion et al. (2000) point out, this type of evasion poses a challenge even in the OECD countries, albeit on a smaller scale. In Turkey, however, the underreporting of earnings has reached such proportions that an earnings-related benefit system has turned into a virtually flat one (Bailey and Turner (2001)).

Not only does payroll tax evasion undermine the credibility and legitimacy of the social security system, but it also distorts labour markets by creating unfair competition and necessitating higher tax rates to generate required revenue (Pashev (2005)). Unlike tax evasion that affects the general functioning of government, contribution evasion directly impacts current pensioners' benefits and compliant contributors under the defined benefit (DB) scheme, reduces aggregate savings and output and may result in the introduction of a minimum pension paid from general revenue in defined contribution (DC) systems with low personal savings (Manchester (1999), Gillion et al. (2000)). When achieved through the underreporting of earnings, contribution evasion tends to flatten the benefits structure, erodes the personal income tax (PIT) base and, depending on strategy, spreads out to other tax bases as well.

There are various ways for an employer to evade the payment of contributions. The principal strategies include failing to register an employee or registering him as a contractor/temporary worker, not remitting contributions to the authorities, underpaying withheld contributions, or underreporting wage payments (McGillivray (2001), Bailey and Turner (2001)). Given that in many countries it is the employer's responsibility to file a tax return on behalf of his employees in the absence of other personal income but the labour contract, all of the above schemes can be executed with or without the collusion of the employee. Moreover, according to Gillion et al. (2000), even though methods for combatting evasion differ between DB and DC schemes, one system does not have a clear advantage over the other due to a significant overlap in the incentives for evasion. The most prominent examples are Chile and Uruguay who both switched from DB to DC with little effect on contribution evasion.

Studying evasion is especially difficult due to its illegality and hence, lack of consistent data. Nevertheless, various theoretical and empirical studies predominantly on personal income tax evasion have emerged, primarily after 1972 when Allingham and Sandmo positioned evasion in a specific theoretical framework. Contribution evasion, however, remains largely unexplored in the economic literature.

In this article, we consider contribution evasion in conjunction with tax evasion accom-

plished through massive underreporting of labour income in Bulgaria over the 1997-2002 period. Throughout this time, direct taxes have been steadily falling with the corporate income tax (CIT) going down from 42.4% to 23.5% for big companies and from 33.4% to 23.5% for smaller businesses. At the same time the heavy social security burden persisted from 44% in 1997 almost entirely covered by employers to 42.7% in 2002 divided between employers and workers in the ratio 75:25. Yet, the reduction in direct taxes in Bulgaria did not translate into narrower compliance gap, a fact largely attributed to the excessive burden of compulsory contributions (Pashev (2005)). The most widespread way of evading contributions was the understatement of workers' real earnings, which triggered evasion in the PIT base too (Dimitrov et al. (2004)). Since firms understated wages, they necessarily ended up reporting higher corporate profits as labour costs are a deductible expense. Thus, they faced a trade-off between overpaying CIT or paying full contributions. For the period 1997-2002, the shifting of tax liability out of the payroll tax base into the corporate base was profitable as the CIT rate was always lower than the payroll tax rate. Some firms, however, underreported sales thereby keeping profits at their true level, or reported zero profits (Pashev (2005)). In either case, the CIT cost of contribution evasion thus eliminated by making the shift of liability between the two bases unnecessary.

We develop a theoretical framework in which the employer and employees cooperate in underreporting actual wages for tax purposes. As a result, employers decrease their payroll tax payments, while employees receive higher net wages. The workers' decision to forego future pension benefits for current income and the employers' choice to evade are discussed in the context of Bulgaria and the specificities of its economy, but to a large extent such analysis is applicable to any country with a weak tax administration, significant payroll tax rates relative to the corporate burden and strong public mistrust in authorities. The declaration of lower wage payments than incurred in reality increases the firm's taxable income (TI) and hence, profit tax liability. The employer, therefore, can decide to decrease TI through the manipulation of sales or other means in order to bring profit down to its actual level or to overpay corporate income tax, fully or partially. We then derive the relationships between the magnitude of fraud, the payroll and the CIT rates.

To determine whether there is indeed shifting of tax liability out of the social security into the corporate tax base, we use firm-level panel data for Bulgaria from 1997 to 2002. In particular, we study the effect of the difference between the payroll tax rate and the CIT rate on reported wages and taxable incomes by firms. In the presence of income shifting the effect of the tax wedge on wages should be negative as an increase in the tax wedge makes income shifting more profitable and hence, drives reported wages down. Even if only a fraction of firms decide to overpay corporate profit tax as a result of their evasion activities in the social security base, the tax wedge should have a positive influence on reported taxable incomes in the corporate base. We exploit the progressivity of the CIT until 2002, the annual cuts in the CIT rates across and within CIT brackets, and the fact that different categories of labour are subject to different payroll contribution rates within and across years, as sources of variation for our identification strategy.

The paper is structured as follows: Section 2 summarizes past evidence on contribution evasion. Section 3 provides an overview of the Bulgarian social security system and the major reforms over the period of interest and sketches the main features of the CIT law. Section 4 outlines the major factors leading to widespread contribution evasion in Bulgaria, while the theoretical framework of analysis is developed in Section 5. In Section 6, I discuss the data, the empirical specification, and test the main hypotheses generated by the model. Section 7 concludes.

2 Literature on Evasion

The economic literature on contribution evasion is scant even though there has been a significant discussion on the reasons, consequences and the possible strategies for fighting payroll tax evasion (Gillion et al. (2000), McGillivray (2001), Bailey and Turner (2001), Manchester (1999)). Theoretically, the issue of wage underreporting has been tackled in considerable detail by Gideon Yaniv in a series of papers in the context of the personal income tax (Yaniv (1988) and Yaniv (1992)). Yaniv (1988) studies the advantages of withholding versus self-declaration for personal income taxation by exploring the possibilities of tax evasion in a withholding system, in which the employer remits employees' withheld PIT taxes to the authorities. The employer may choose not to comply by understating his total wage payments without the knowledge of his employees. Thus, the employer appropriates part of the personal income taxes of his employees, which he was supposed to transfer to the authorities. Yaniv assumes that the firm always overpays profit tax due to wage underreporting and if caught, will be either reimbursed or not. Therefore, the author imposes full shifting of tax liability from the personal to the corporate tax base, abstracting from other taxes, such as the payroll tax that are inevitably affected by this type of fraud mechanism. Yaniv goes on to derive the relationship between the level of wage understatement, the CIT rate and the personal income tax rate under alternative penalty schemes in a framework with a risk-averse employer maximizing his expected utility.

The collaborated employer-employee evasion is explored in Yaniv (1992) again in the context of the PIT. The mechanism of cooperation is the following: The employer understates his wage payments and as a consequence overpays profit tax. Because less PIT tax is withheld from employees, they agree to work for lower than the market wage in order to compensate their employer for the risk of being detected and the overstatement of his profit liability. Thus, savings for the employer stem from the payment of lower wages, while workers' tax savings due to wage underreporting outweigh net income losses.

While PIT evasion is incorporated into the model developed in the current paper, it only arises as a consequence of payroll tax evasion. We consider a mechanism, in which the market wage remains unchanged in reality, but is underreported for tax purposes. Accordingly, benefits to the employer and to workers accrue from lowering their payroll tax liability at the expense of the government, resulting in lower cost to the employer and higher net wages. Higher net wages for the worker further follow from the fact that lower wage stated in the labour contract translates into lower PIT payment.

Last but not least, Yaniv (1993) regards the hiring of workers without a labour contract, which is yet another possible channel for payroll tax evasion. In this case the choice variable is the number of employees declared rather than their wage level. In this article I will not take this option into account but will focus entirely on wage understatement.

Recently, there have been a number of empirical papers on contribution evasion in Asia, and in particular, China. Nyland et al. (2006) make use of firm-level data of audited businesses in Shanghai who either payed their contributions in full, underpaid or overpaid. They set out to determine the characteristics of firms who tend to underpay contributions and find that firm size plays a role in evasion. Their results show that in Shanghai big companies tend to evade more contributions relative to smaller firms.

To our knowledge, the effects of contribution evasion on the revenue outcomes in other tax bases or on the incidence of the payroll tax have not been researched. In the presence of evasion, the incidence of social contributions can be very different from the current analysis in the literature. Gruber (1997), for example, studies the incidence of payroll taxation in Chile right after the privatization of the country's social security system and estimates that employers shift the incidence fully on wages. With contribution evasion, however, both the employer and the employee can illegally alleviate the burden of the tax at the expense of government revenue, which in turn affects everyone entitled to benefits.

Although not focusing on evasion, Gordon and Slemrod (2000) provide some empirical evidence on income shifting between the corporate and personal tax bases triggered by differences in the PIT and CIT rates. Using aggregated cross-sectional data, the authors estimate the effect of the difference in tax rates both on corporate rates of return and labour compensation of individuals. Their regressions yield a positive statistically significant relationship between the PIT rate and the corporate rates of return, while this relationship reverses for the CIT rate, signalling a strong case for income shifting. Due to time dummies, the tax effect is identified solely by the within-year variation in the tax rates difference.

If tax liability is shifted out of one base into another, then the decrease of income into the first base should be accompanied by an equal increase in income in the second base. Checking if this is indeed the case, Gordon and Slemrod (2000) find that one percentage point increase in the difference between the CIT and PIT rates leads to a 3.4% rise in reported labour income in a pooled 2SLS regression. Surprisingly, the effect of the tax variable on the top one percent of the population is found to be almost the same as for the rest of the population.

The present article considers the shifting of income from the social security system to the corporate tax base through the mechanism of wage underreporting. This shift may not be complete, in the sense that employers may choose not to report all sales and hence, avoid overpaying profit. Therefore, unlike Gordon and Slemrod (2000) , we do not account for the legal ways of taking advantage of tax differences.

3 Institutional background

3.1 Social Security System: Reform and Characteristics

The economic conditions in Bulgaria in the late 1990s were propitious for assessing the level of evasion and income shifting for the taxes under consideration. Until 1997 the social insurance system in Bulgaria was typical of any centrally planned economy: It was a standard pay-as-you-go (PAYGO) DB plan characterized with loose linkage between benefits and contributions, too liberal conditions for access to the pension system, and an insurance burden solely born by employers. While experts admit that a radical pension reform should have been undertaken as early as the beginning of the 1990s, by 1997 it became clear that this reform could no longer be postponed if the financial sustainability of the system was to be preserved (Shopov et al. (2005)). The chronic financial deficit, low collection compliance rate and high social burden on the working generation triggered an unanimous support for the reform, which was initiated in 1997 and implemented at the beginning of 2000 (Shopov et al. (2005)).

The changes led to the establishment of a three-pillar pension system known as the World Bank scheme, with the first pillar being the obligatory PAYGO. Some of the mandatory insurance contributions were redirected towards private occupational and eventually universal pension funds as well, which formed the basis of the second pillar, capital-based, with individual insurance accounts. The third pillar is a voluntary insurance system with people paying voluntary contributions into individual accounts. For couple of years after its establishment the 2nd pillar was restricted to workers from the so-called first and second labour categories who payed contributions at occupational funds for supplementary pension and early retirement. People in these two categories are employed in hazardous conditions, for instance, minors, underground geologists, hydrologists and others (see Appendix for detailed classification). Despite its fully funded structure, contributions to the second pillar are made only by employers. Later on everyone born after 1959 irrespective of labour category was able to contribute towards a universal pension fund under the second pillar.

Previous to 2000, the system did not distinguish between separate insurance risks (Table 1). Unemployment insurance was paid at a Pre-qualification and Unemployment Fund that was not part of the pension legislation, but which was subsequently integrated into pension insurance in 2002. From 2000 onwards differentiated amount of the insurance contributions for pension, sickness and maternity, and work injury were introduced, with the employer and the employee sharing the contributions in a given ratio (Table 2). Therefore, it was attempted to alleviate the insurance burden on employers, while increasing that on employees. However, the government encouraged employees by cuts in the PIT rate. The payroll contributions payable by employers in 1997 amounted to 42% of gross salary. In 2002, this percent was still very high– 32.2%. The combined employer-employee contribution rate decreased by only 1.3 percentage points for five years, from 44% in 1997 to 42.7% in 2002 (Table 1). Both the employer and the employee pay contributions to a maximum insured income equal to ten minimum wages. At the same time the personal pension for years of service and old age was restricted to no more than four social

pensions and no less than 115% of the old age social pension (Tafradjiyski et al. (2002)).

The reform resulted in a more efficient if more restrictive pension system. A new pension formula was adopted, which aimed at establishing a closer link between contributions and benefits. Before 1997, the amount of personal pension for length of service and old age was calculated on the average gross income on which contributions were paid for a period of three consecutive years, chosen by the person from the last 15 years of service before January 1st, 1997 (Tafradjiyski et al. (2002)). This provision provided no incentives for contribution compliance in the years other than the chosen three (Bailey and Turner (2001)). For a person retiring after 1997, the new formula calculated pensions on the income, on which contributions were made for the three selected years before 1997 and for the full period after this date until retirement and on length of service. For someone who has not worked before 1997, the pension is calculated on average monthly insurance income for the whole duration of insurance (Tafradjiyski et al. (2002)).

Simultaneously with changes in the formula, the legal retirement age was increased for both men and women from 60 and 55 years of age in 1997 to 61.5 and 56.5 years in 2002, respectively. This tendency continues in 2009. The retirement age for men is currently 63 years and for women it is 60 with a possibility for the equalization of the two in future.[1] The opportunity for an early retirement was also more limited after the reform. A major factor behind the rise in retirement age is the unfavorable dependency ratio over the years as shown in Table 2. Due to the very low replacement rate of the pension system, many pensioners keep on working well after retirement.

3.2 Corporate Income Tax

Unlike the persistently high payroll tax rates, the tax rate on profit in Bulgaria has been lowered substantially over the years from as high as 42.4% in 1997 to 23.5% in 2002 (Table 3). For the whole period 1997-2002 firms paid tax on profits for the republican budget and a tax on profit for municipalities–municipality tax. The tax base for the municipality tax was taxable income, while the tax base for the tax on profit was the taxable income reduced by the amount of the municipality tax. From 1997 to 2001 inclusive, the corporate income tax was progressive with firms above a legally stipulated threshold of TI paying higher CIT than firms below that threshold. Starting in 2002, a single rate was imposed irrespective of firms' TI. Table 3 summarizes the tax rates for the two income brackets and shows the effective rate taking into account the local CIT surcharge.

The decrease in the CIT rate, however, was not accompanied by an extensive expansion of the tax base to make the reform revenue-neutral. Depreciation rates and loss carry-forwards remained unchanged throughout the 1997-2002 period, although the different categories of assets subject to different rates of depreciation were described in more detail in the Corporate Income Tax Law of 1997 (Table 3). Initial investment, computers and software benefit from 50% depreciation rate. Most importantly, while the definition of taxable income changed, its core elements remained the same. Taxable income is formed based on the transformation of the

[1]For III labour category. People in I and II labour category retire earlier.

accounting financial result. The accounting financial result is the accounting value of the difference between revenues and expenses. Once this amount is determined it is adjusted upwards or downwards by certain provisions specified in the Corporate Income Tax Law for tax purposes in order to obtain TI. Therefore, any amendment in these provisions, alters the definition of TI.

Table 4 shows how the number of provisions varied over the period of interest. In particular it shows how many provisions were abolished, how many new ones were introduced and whether they increased or decreased TI. It is clear from Table 4 that the main change in the definition of TI occurred between 1997 and 1998 and since then the definition has mostly been altered with respect to the provisions that decrease TI. For example, in 1999 four new provisions were introduced allowing the subtraction of donations to cultural organizations or stipend funds for students in art schools from the accounting financial result. Expenditure for the acquisition of renewable energy equipment also became deductible. In 2000, these provisions were abolished. Furthermore, starting 1998-1999 tax relief was provided for firms that operated in regions with unemployment rate higher than the average for the country.

The fact that the corporate tax base was not expanded concurrently with slashes in CIT can be explained with Bulgaria's strong reliance on indirect taxation. Indirect taxes amount to 19.4% of GDP, which is the highest share among all EU member states (European Commission (2008)). Both VAT and excise duties contribute to this high level of indirect taxation.

[Another paragraph here: Table with revenue as percent GDP and comment on it, non decreasing revenue despite falling rates.]

4 Reasons for evasion

4.1 Employees

By agreeing to have their wage underreported, workers put more money in their pockets today, but forgo higher pensions in the future. If put in context, this otherwise myopic behaviour has its logic. First and foremost, the complexity of the Bulgarian pension system makes it almost impossible to obtain an estimate of the expected future pension. Worse, frequent changes in rules and the pension formula create a sense of uncertainty even in the most diligent taxpayer. Pension uncertainty aside, the average lifespan of the population is very close to the full retirement age, especially when it comes to men. For example, a Bulgarian man retiring in 2005 at the age of 63 is going to live six more years on average, in which he is going to receive a pension. This fact alone creates strong incentives for intertemporal shifting of income from the future to the present. The general low level of wages further enhances preferences for present consumption. Poor workers must meet pressing immediate needs and find it difficult to save for retirement.

Regarding healthcare, in a comprehensive survey conducted in 1997, Balabanova and McKee (2002) find that "under-the-counter" payments and various gifts before or after treatment have become entrenched into the health sector. People pay to ensure a better service and access to specialized facilities. The authors note that informal payments are "universal" for surgery, childbirth and any complicated medial procedure. In other words, the healthcare system has

long ceased to be "free" with people overcoming its deficiencies by out-of-pocket payments. It is not surprising, therefore that workers would prefer money at hand to contributions given their expectations to pay for quality treatment. Since free medical care is a public good, an increased uncertainty about the contributions of others to the public good is likely to lower an individual's own contributions as concluded by Sandler et al. (1987) and Alm et al. (1992). And when free-riders are not easily punished, people resort to evasion (in our model through their consent to jointly evade contributions with the employer).

Undoubtedly tax system parameters like tax rates, penalties and government's enforcement capacity influence taxpayers' behaviour. There is, however, one factor, which is difficult to measure but invariably affects tax compliance–tax morale. The research on this topic has surged in recent years with particular emphasis on how different social norms, values and attitudes lead to various willingness to pay taxes across countries (e.g. Torgler (2002); Alm and Torgler (2006); Cummings et al. (2005)). We argue that the tax morale in Bulgaria is low because of perceptions of widespread corruption in the government and the tax administration. A 2004 survey by Coalition 2000 showed that 64.3% of people believed that almost all or most politicians and political party leaders are involved in corruption. Only in 2008 and the beginning of 2009 the media has covered at least three major scandals that, if anything, entrenched perceptions of pervasive corruption.[2] Ignoring people's impression of how their taxes are used and how they regard the officials who make use of them, would mean neglecting a major driver of tax compliance.

It is worthwhile mentioning that payroll and healthcare contributions by employees are relatively new phenomena in the Bulgarian tax system as both were introduced as late as 2000. Before that year, payroll contributions were paid in full by the employer, while healthcare was financed by the state. It is likely, therefore, that the relative novelty of these contributions can to some extent explain Bulgarian employees' still limited willingness to pay taxes.

4.2 Employers

Currently, there is no theoretical framework comparing the costs and benefits of the welfare state to firms. In particular, what benefits, if any, do firms derive from social policies? One of the few answers offered in the literature is by Isabela Mares who argues that at least in coordinated market economies, such as Germany and Scandinavia, in which product market and innovation depend on collaboration with organized labour, employers do support policies of social protection as a means of inducing workers to acquire non-transferable, firm-specific skills that make workers more dependent on a given employer. Hence, firms mitigate risk exposure due to a narrow skill specialization by providing adequate insurance(Mares (2003)). Conversely, Mares claims, businesses in liberal market economies, oppose policies of social protection.

[2]Some of these scandals are the European Union's temporary suspension of millions of euro under the pre-accession programs PHARE and SAPARD because of "mismanagement" and "inadequate control" of funds. In July a report by the European Commission's anti-fraud office implicating major government officials in having ties to organized crime, leaked to the media causing anger and frustration among the public. And in the beginning of 2009, the general director of the National Revenue Agency responsible for the collection of VAT, social security and CIT among others, quit after allegations of syphoning millions of VAT.

The presence of widespread contribution evasion, however, can turn even compliant employers in coordinated or liberal economies into evaders as they face high costs of unfair competition (Pashev (2005)). Thus, the cost advantage of evading firms over their competitors forces other firms into the practice of evasion until such practice is "acceptable" because of its prevalence (Gillion et al. (2000)).

5 The Model

5.1 Government able to prove contribution evasion

We develop a model in which the firm underreports its wage bill having the consent of its employees and shares the benefits of evasion with them. The firm simultaneously decides whether to overpay corporate profits, only part of the increase in profit, or none of it. For now we assume that the government has the capacity to detect and punish contribution evasion. Later on, we relax this assumption.

Let the true profit of the firm be $\pi^{real} = Y(L) - w^R L - w^R L t_s$, where w^R is the gross wage paid to the employee in the absence of fraud, L is the number of workers and t_s is the payroll tax rate on the employer. The value of output $Y(L)$ is produced by labour input only, where $Y'(L) > 0$ and $Y''(L) < 0$. Denote t_e to be the payroll rate on workers and t_p the personal income tax rate. A non-evading firm pays $w^R(1 + t_s)$ per employee, while a worker's after-tax earnings are $(1 - t_p)(1 - t_e)w^R$. If the firm underreports w^R by an amount u, the gross wage for tax purposes becomes $w^R - u$.

This type of evasion generates benefits from three different sources: Contributions payable by the firm decrease by ut_sL, ut_eL is the fall in employees' contributions and finally, PIT revenue goes down by $t_p(1 - t_e)uL$. According to the law, if a worker derives his income solely from employment, he is not obliged to file a tax return. It is the employer's responsibility to withhold the personal income tax and remit it to the tax collecting agency. Due to the progressivity of the PIT, wage understatement will move some workers to a lower tax bracket. At minimum, no PIT is remitted. This happens when $w^R - u = w_{min}$. Until 2007 when Bulgaria introduced a flat tax PIT, w_{min} was not taxed.

An important question is how these gains are redistributed between the employer and the employee as contribution evasion becomes difficult without the cooperation of workers. Before a person is hired, he needs to sign an employment contract stipulating his exact gross remuneration to be $w^R - u$, with the mutual understanding that he will actually receive w^R with u given under the table. The worker's net wage increases by $t_p u + t_e uL(1 - t_p)$, i.e. we assume that the savings realized due to evaded employee's contributions go back to the employee in the form of higher compensation. Since what the worker gets is not enforced by contract, he takes a risk–trusting the employer to deliver on their non-official agreement. We presume that the employee is neither compensated for this risk, nor for expected lower pension in the future. The diagram below summarizes the benefits from evasion to both parties:

$$\text{No evasion: } \underbrace{w^R(t_s+1)}_{\text{cost to employer}} \longleftarrow w^R \longrightarrow \underbrace{(1-t_p)(1-t_e)w^R}_{\text{no-evasion net wage}}$$

Evasion (What is seen by authorities):

$$\underbrace{(w^R-u)(1+t_s)}_{\text{cost to employer}} \longleftarrow \underbrace{w^R-u}_{\text{authorities}} \longrightarrow \underbrace{(1-t_p)(1-t_e)(w^R-u)}_{\text{official net wage}}$$

Evasion (What happens in reality):

$$\underbrace{w^R+(w^R-u)t_s}_{\text{cost to employer}} \longleftarrow \underbrace{w^R}_{\text{real}} \longrightarrow \underbrace{w^R-(w^R-u)(t_e-t_p(1-t_e))}_{\text{true net wage}}$$

As the firm cannot expense its true wage bill, the profit that it declares to the authorities is $\pi^{reported} = Y(L) - (w^R-u)L - (w^R-u)Lt_s$. The real profit as a result of contribution evasion increases to

$$\pi^{real,evasion} = Y(L) - w^R L - (w^R-u)Lt_s > \pi^{real} \tag{1}$$

The difference $\pi^{reported} - \pi^{real} = (1+t_s)uL$ constitutes an evasion-driven increase in profit that is taxed at the corporate tax rate t_c. It is at this point that social security evasion creates incentives for further evasion in the corporate income tax base. In particular, knowing by how much its profit rises on paper, a firm can choose to hide part of its sales or choose another strategy in order not to pay corporate income tax in excess of its true liability.[3] Suppose that the firm subtracts a fraction $\phi uL(1+t_s)$ from its taxable income. Thus, if $\phi = 0$, there is no attempt to bring profit down to its true level and part of the losses in social security revenue are mitigated by more collections in the corporate tax base. In that case, one can easily conclude that higher corporate revenue results from lower CIT rate and less evasion, whereas in reality this rise will be at least partly driven by more evasion in another tax base. Second, if $\phi > 0$ ($\phi = 1$), the cost of contribution evasion is partially (entirely) eliminated. We do not consider the case when $\phi > 1$. In other words, we restrict the firm to not evade corporate tax for its own sake but only in conjunction with social security.[4] As long as the firm engages in fraud in both bases, the total amount evaded is:

$$E = \underbrace{(t_s + t_e + t_p(1-t_e))uL}_{\text{PIT+ total social security}} + \underbrace{t_c\phi(uL + t_s uL)}_{\text{corporate tax}}. \tag{2}$$

The firm's behavior is constrained by probability of audit and severe penalties that make evasion costly. Let the probability of audit be $\bar{p} = p_1(\phi(uL + t_s uL)) + p_2(\frac{u}{w^R})$. p_1 is the probability of being caught for cheating at the corporate tax base. We follow Slemrod and Yitzhaki (2000) and assume an endogenous probability of detection that is an increasing convex function of evaded income in the corporate tax base. p_2, on the other hand, is a function of the

[3] An accountant we consulted extensively for this paper noted that some firms may deliberately decide to overpay CIT in a given year, especially if they have understated taxable income in previous years in expectation of the lower rate. Regarding strategies for reducing sales, the most common one is not issuing an invoice, which makes a cash transaction untraceable.

[4] If a firm reports zero taxable income, then it completely removes the cost of social security evasion and the corporate income tax, although it faces higher probability of audit.

ratio of the amount of wage underreported to the total wage and is increasing and convex as well. A firm that is paying contributions on minimum wages is more likely to attract attention than a firm paying the average wage for the economy. If $u = 0$, then $p_1 = p_2 = 0$, which captures our previous assumption that there will be no corporate tax evasion without contribution evasion. The firm is risk-neutral. Its after-tax profit if not detected is:

$$\pi^{nd} = Y(L) - w^R L - (w^R - u)t_s L - t_c[Y(L) - (w^R - u)L(1 + t_s) - \phi u L(1 + t_s)] \quad (3)$$

The penalty scheme in this model environment is complicated. First of all, since we have allowed for the possibility of detection of payroll tax evasion, we further assume that an audit performed for corporate tax evasion will expose wage understatement and vice versa. We explore the consequences of authorities' inability to expose contribution evasion later on. An important question in this context is whether the firm will be reimbursed for its overpayment of profit (if any), not reimbursed, or penalized for engaging in evasion in general (Yaniv (1988)). In the first two cases–full or partial reimbursement and no reimbursement at all–the firm faces no penalty for manipulating profits provided that it is triggered by contribution evasion. Therefore, it pays off to set $\phi = 1$. If not detected, the firm will have eliminated the cost of its contribution fraud partially or fully. If detected, it will be punished for payroll and personal income tax evasion, but not corporate profit understatement. Thus, even though the profit tax is overpaid, it makes sense not to reimburse the firm, but to punish it with a fraction of the tax "evaded". In a sense this would be a punishment for not overpaying CIT completely because if this was the case, then no CIT "evasion" would have taken place. The penalty under these conditions becomes:

$$P = \lambda_1(t_s + t_e + t_p(1 - t_e))uL + \lambda_2 t_c \phi(uL + t_s uL) \quad (4)$$

where $\lambda_1 > 1$ and $\lambda_2 < 1$.[5] In the event of detection, the firm's profit changes to:

$$\begin{aligned} \pi^d &= Y(L) - w^R L - (w^R - u)t_s L \\ &- t_c[Y(L) - (w^R - u)L(1 + t_s)] - \lambda_1(t_s + t_e + t_p(1 - t_e))uL \\ &- \lambda_2 t_c \phi(uL + t_s uL) \\ &= \pi^{nd} - P \end{aligned} \quad (5)$$

An employer then chooses L^*, ϕ^*, and u^* to maximize expected profit:

$$E[\pi] = (1 - \bar{p})\pi^{nd} + \bar{p}\pi^d, \quad (6)$$

[5] An additional assumption behind this penalty structure is that the firm bears full responsibility for evaded employees' contributions. This possibility is not accounted for by the law, so for now we will ignore the fact that workers cooperate willingly.

The first order conditions for this problem are:

$$\frac{\partial E[\pi]}{\partial \phi} = t_c - p_1' P - (p_1 + p_2)\lambda_2 t_c = 0 \tag{7}$$

$$\frac{\partial E[\pi]}{\partial u} = t_s - t_c(1 + t_s) - (p_1 + p_2)A - p_2' \frac{1}{w^R}\frac{P}{L} = 0 \tag{8}$$

$$\frac{\partial E[\pi]}{\partial L} = (1 - t_c)(Y'(L) - (w^R - u)(1 + t_s)) - u(1 + (p_1 + p_2)A) = 0, \tag{9}$$

where $A = \lambda_1(t_s + t_e + t_p(1 - t_e))$. It can be seen from (8) that the marginal benefit of underreporting wage by one euro, t_s, equals the marginal cost of overreporting profit at the corporate tax base plus the expected penalty. I thus obtain the necessary condition for contribution evasion to be

$$t_s > t_c(1 + t_s), \tag{10}$$

which requires that the CIT is markedly below the payroll rate. An interesting and empirically testable implication of this condition is that firms facing lower CIT rate have a bigger incentive to engage in social security fraud than firms for which the CIT rate is close to their contribution rate. $(p_1 + p_2)A$ is the expected penalty per euro of understated wage and depends on the probability of detection for both social security and corporate tax evasion because the higher the u, the more sales need to be manipulated. The same logic applies to the expected penalty in eq.(7). The additional term, $p_2' \frac{1}{w^R}\frac{P}{L}$ captures the fact that an audit for social security fraud can uncover corporate profit interference. On the other hand, the marginal benefit of sheltering some of the increased profit, $t_c \phi L(1 + t_s)$ cancels out after we plug in (7) into the second FOC to obtain (8). Concerning the optimal number of workers, wage underreporting does distort the choice upwards as demonstrated in (9) since the firm is able to decrease the marginal cost per worker by $t_s - (p_1 + p_2)A > 0$.[6]

Particularly interesting is the relationship between the amount of wage understated u and the CIT rate t_c. Using (8) we obtain:

$$\frac{du}{dt_c} = -\frac{(1 + t_s)(1 + p_2' \frac{1}{w^R}\lambda_2 \phi u)}{(p_1' \phi L(1 + t_s) + p_2' \frac{1}{w^R})A + p_2'' \frac{1}{(w^R)^2}\frac{P}{uL}} < 0 \tag{11}$$

The above equation shows that a decrease in t_c stimulates contribution evasion by decreasing both the marginal cost of reporting more profit and the expected penalty so that $\frac{d(w^R - u)}{dt_c} > 0$. Thus, cutting the CIT rate can rise taxable income in the economy through two separate channels: First, smaller rate translates into less corporate tax evasion; second, lower rate triggers more social security evasion through the underreporting of wages with at least some firms overreporting corporate profits. Therefore, unless a way is found to decrease the contribution rates, the policy of lowering the corporate tax burden may backfire through more evasion in

[6] The positive sign is clear from (8).

another base.

As expected $w^R - u$ is decreasing with the payroll rate again pointing to the fact that increasing the contribution burden will cause more wage underreporting:[7]

$$\frac{du}{dt_s} = \frac{1 - t_c - (p_1 + p_2)\lambda_1 - p_1'\phi uLA - p_2'\frac{u}{w^R}(\lambda_1 + \lambda_2 t_c \phi)}{(p_1'\phi L(1+t_s) + p_2'\frac{1}{w^R})A + p_2''\frac{1}{(w^R)^2}\frac{P}{uL}} > 0 \tag{12}$$

The relationships between the tax rates and ϕ and L are derived below:

$$\frac{d\phi}{dt_c} = \frac{1 - p_1'\lambda_2\phi uL(1+t_s) - \bar{p}\lambda_2}{uL(1+t_s)(p_1''P + 2p_1'\lambda_2 t_c)} > 0 \tag{13}$$

$$\frac{d\phi}{dt_s} = -\frac{p_1''P\phi + p_1'\lambda_1 + 2p_1'\lambda_2 t_c \phi}{(1+t_s)(p_1''P + 2p_1'\lambda_2 t_c)} < 0 \tag{14}$$

$$\frac{dL}{dt_c} = \frac{Y'(L) - (w^R - u)(1+t_s)}{Y''(L)(1-t_c) - Ap_1'\phi u^2(1+t_s)} < 0 \tag{15}$$

$$\frac{dL}{dt_s} = \frac{(w^R - u)(1-t_c) + \bar{p}u\lambda_1 + p_1'u^2A\phi L}{Y''(L)(1-t_c) - Ap_1'\phi u^2(1+t_s)} < 0 \tag{16}$$

A decrease in t_c leads to lower ϕ and more workers, while a fall in t_s rises ϕ and again, increases the number of employees. Since p_1, the probability of being caught for payroll tax evasion, depends on t_s and at the same time p_1 can result in uncovering profit manipulation, a fall in t_s decreases the expected penalty of cheating, and hence, ϕ goes up.

We next turn to exploring the effect of tax rates on taxable income. The TI that is going to be taxed at the corporate base is:

$$TI = Y(L) - (w^R - u)L(1+t_s) - \phi uL(1+t_s) \tag{17}$$

We ignore proceeds to the government from fines as we are interested only in changes in revenue stemming from changes in taxable income.

$$\frac{dTI}{dt_c} = \underbrace{\frac{\partial TI}{\partial L}}_{+}\underbrace{\frac{dL}{dt_c}}_{-} + \underbrace{\frac{\partial TI}{\partial \phi}}_{-}\underbrace{\frac{d\phi}{dt_c}}_{+} + \underbrace{\frac{\partial TI}{\partial u}}_{+}\underbrace{\frac{du}{dt_c}}_{-} < 0 \tag{18}$$

Keeping all else constant, a lower CIT rate increases TI because more labour is hired, ϕ goes down and it is more profitable for the firm to overpay CIT, which leads to higher u. Note that there will be a further effect–bigger incentive for honest reporting of profits unrelated to payroll tax evasion–which is not captured by the above formulation. The sign of $\frac{dTI}{dt_s}$, however, is ambiguous. On the one hand, decreasing t_s rises taxable income because less payroll tax expense is deducted and more labor is employed. On the other hand, ϕ increases, while u goes

[7] We have plugged (7) and (8) into the numerator to show that it is positive.

down, both shifting TI downwards.

$$\frac{dTI}{dt_s} = \underbrace{\frac{\partial TI}{\partial t_s}}_{-} + \underbrace{\frac{\partial TI}{\partial L}}_{+}\underbrace{\frac{dL}{dt_s}}_{-} + \underbrace{\frac{\partial TI}{\partial \phi}}_{-}\underbrace{\frac{d\phi}{dt_s}}_{-} + \underbrace{\frac{\partial TI}{\partial u}}_{+}\underbrace{\frac{du}{dt_s}}_{+} \tag{19}$$

5.2 Government unable to prove contribution evasion

The above model relies on the assumption that social security evasion can in fact be detected and punished. In practice, tax authorities have limited capacity for the conduct of audits, especially if evasion is widespread. Furthermore, when the incentives of the employer and his workers are aligned so that they cooperate, it is extremely difficult to prove underpayment of contributions. In what follows, we consider the case when the government is unable to adequately enforce social security compliance.

What can be ascertained by an audit of a firm suspected in payroll evasion? As already mentioned, the labor contract signed by the worker states $w^R - u$ as the true gross wage. Besides, once employed, a worker has to sign monthly payslips, which again list the amount of the salary to be $w^R - u$. As a consequence, a person who is not willing to participate in an evasion scheme, will simply not find employment with a company that underpays its workers' social security. Provided that an employee decided to become a whistle-blower after being hired, his signature on the contract and the payslips will officially invalidate his claim. In other words, in the presence of collaborative payroll tax evasion an auditor cannot go much further than establishing that the employees of a given company work for lower wages (usually the minimum wage) than the market wages for their respective professions.

In the case of Bulgaria, this fraudulent behavior is so endemic that in 2003 the government introduced so-called "minimum social security thresholds" for each industry and type of occupation, on which employers are obliged to pay social security. Since their implementation, thresholds have been raised annually with the increase reflecting the authorities' perception of what the true salaries in the economy are (Slavova et al., 2007). This policy strongly suggests that the tax administration cannot sufficiently combat or prevent payroll tax evasion and has attempted to mechanically control contributions instead of relying on agents' discretion. Thus, the government compensates for the very low probability of detecting evasion by managing $w^R - u$. Despite bringing in more revenue from non-compliant taxpayers, this policy can introduce substantial distortions due to the ad-hoc setting of wages, which may not be optimal for many businesses. A survey of the structure of wages performed by the Bulgarian National Statistical Institute in 2006 showed that out of 2.2 million labor force, 20% earned the minimum monthly untaxable income, while 50% of all employed worked for twice the minimum wage or less. In an attempt to prove contribution evasion, authorities sometime monitor the expenditures of individuals who report minimum wages, but have made major purchases like a car or a home.

If the government cannot enforce social security compliance, the probability of detection reduces to $p(\phi u L(1 + t_s))$. Thus, if a firm is caught cheating, it will be for the overpayment

of corporate tax, but from an auditor's perspective, there is profit tax evasion since it will be difficult to find proof that profit manipulation was a result of contribution evasion. The penalty decreases too:[8]

$$t_c \lambda \phi u L(1 + t_s), \tag{20}$$

where this time $\lambda > 1$ ($\lambda_2 < 1$ under perfect enforcement).

The penalty structure assumed here, while corresponding to the penalties specified by law, may not reflect the practice.[9] In particular, in the event that a firm is caught cheating, the auditor who prepares the penalty report may be induced to accept a bribe, which is usually less than the amount of the punishment itself. If the auditor is not susceptible to bribery, the firm can appeal his decision in a court of law and succeed in paying off the judge, although this scenario is much more complicated and risky. An evading company certainly takes these possibilities into consideration when evaluating the risks it is exposed to.

According to a survey conducted by Vitosha Research (2004), 43% of the general public and 51% of businesses believed that tax officers are involved in corrupt activities. In a different survey, the public ranked judges higher than tax officers in terms of corruptibility (Coalition 2000, 2005). Even if public perceptions are incorrect, businesses act upon them. While we will not account for these prospects in our model, it is important to bear in mind that even a draconian penalty structure may not provide the right incentives to prevent tax fraud and that the problem of evasion is manyfold. Chander (1992), for instance, develops a game theoretic model with corrupt tax administration showing that an increase in the tax rate can lead to more bribing of auditors and hence, less revenue collected. The tax system's parameters, therefore, are not entirely exogenous from a taxpayer's point of view, as given corruption in the tax administration, these parameters can be manipulated to the taxpayer's (and auditor's) advantage.

Given that the firm assumes it takes no risk when understating wages, its decision will be entirely based upon whether $t_s > t_c(1 + t_s)$ holds or not. If the condition is satisfied, it pays off to set $w_R - u = w_{min}(w_{minthreshold})$.[10] An auditor can only verify $\pi^{reported}$ but not $\pi^{real,evasion}$. As a consequence, π^d becomes:

$$\begin{aligned} \pi_1^d &= Y(L) - w^R L - w_{min} t_s L \\ &- t_c[Y(L) - w_{min} L(1 + t_s)] - (\lambda - \phi) t_c u L(1 + t_s) \end{aligned} \tag{21}$$

[8] We do not consider the effect of the social security thresholds. In any case, the conclusion that if facing no probability of detection for contribution evasion, the firm will set $w^R - u = w_{min}$ will hold for the thresholds as well.

[9] In the case of an intentional evasion of taxes, a firm owes the evaded tax, interest on it as well as a fixed fine. This type of evasion is also considered a criminal offense. If evasion is unintentional, however, only the tax and the interest are payable.

[10] To explain why there are enterprises that pay contributions on true wages, we will have to include tax morale in the form of cost (disutility) of evading taxes that will serve as a deterrent to full evasion.

The firm is then choosing L and ϕ to maximize expected profit:

$$E(\pi)_1 = p(V)\pi_1^d + (1 - p(V))\pi^{nd}, \tag{22}$$

where $V = \phi u L(1 + t_s)$. Below, we derive the first order conditions:

$$\frac{\partial E(\pi)_1}{\partial \phi} = 1 - \lambda[p'(V)V + p(V)] = 0 \tag{23}$$

$$\frac{\partial E(\pi)_1}{\partial L} = (1 - t_c)(Y'(L) - w^R - w_{min}(t_s - t_c(1 + t_s)) = 0 \tag{24}$$

Because $(1 - t_c)(1 + t_s)w^R > w^R + w_{min}(t_s - t_c(1 + t_s))$, again, more labor is hired compared to the no-evasion optimum. A decrease of t_c in this case will not have any effect on u as the firm has already set it at its maximum possible value but it will lead to a higher ϕ since the expected penalty for corporate evasion goes down.

6 Empirical analysis

6.1 Data description

We use firm-level data for Bulgaria from the AMADEUS dataset provided by Bureau Van Dijk, a European electronic publishing firm. The data is an unbalanced panel of firms' main financial statement variables and contains more than 800,000 firm-year observations for the period 1997-2006. Two thirds of these firms have missing values for almost all entries in their income statement. Firm coverage is especially good from 1999 to 2004, with fewer firms observed for 1997-1998. The period under consideration, however, is restricted to 1997-2002 due to the introduction of the minimum social security thresholds in 2003 that legally stipulate the minimum level on which contributions are payable for every type of profession. The main variables of interest are the firm's total cost of employment, which includes salaries and social security expenses, taxes paid according to which we will assign each firm into its respective tax bracket and calculate TI, and the number of employees. Other characteristics of interest are firm size, measured by number of employees, tangible fixed assets and total assets, degree of indebtedness, which we capture by the amount of current liabilities, the number of internal auditors and earnings before interest and tax among others. Only firms that file a report at the end of the year are included in the panel and firms that are in liquidation, dissolution, or bankruptcy have been excluded from the analysis. Since sole traders are subject to special taxation, which is not part of the Corporate Law, they are not considered either.

We need to differentiate between firms based on their taxable income and the type of industry they operate in. For that purpose, we first recover TI from the data. To allocate firms within brackets, we multiply the taxable income threshold stipulated by law with the lower CIT rate for a given year and assign firms that pay less than that amount in tax to the low tax bracket, while those paying more go into the high bracket. Once companies calculate their book profit, they have to add and deduct all items specified by law in order to obtain their taxable income.

As a consequence, the data contains many firms that have zero or negative book profit but have paid positive tax. The converse is also true– some firms with positive profits for a given year, pay no tax. Therefore, book profit can neither be used in place of TI, nor is it a good indicator of it. One peculiarity and major advantage of the Bulgarian tax code is that the tax liability stated on the firm's financial statement is the same as in the firm's tax return, which is not publicly available.[11] We am, therefore, able to recover TI by dividing the tax liability by the respective tax rate. We do not have information on carryforwards, however, so taxable income is very likely to have been adjusted downwards for some firms that have sustained losses in previous years.[12] The firms with zero TI in 1997 are 20% of the sample, but they grow to about 60% by 2002. 20% to 30% are companies in the low tax bracket, with businesses in the high bracket having the lowest share of 10% to 20%.

Social security rates are assigned to each firm depending on its type of industry. The Appendix lists the industries that fall within the first and second labour category and are, therefore, liable to pay higher payroll contributions. On average within a given year, the share of firms in the first labour category is only 1% of the sample, while firms in the second labour category constitute 10% of the sample. The AMADEUS database provides firms' total cost of employment *coste*, which is the sum of wages and payroll tax. We divide *coste* by $1 + t_s$ and the number of employees in order to obtain the average wage bill per employee, $w^R - u$. To ensure results are not driven by changes in the minimum wage, we include minimum wage as an explanatory variable in all regression specifications.

Table 5 provides summery statistics for the two dependent variables–the logarithm of taxable income and the logarithm of the average reported wage per employee excluding payroll contributions–by corporate tax bracket and labour category. As expected, the wages of the workers in the first labour category, irrespective of whether the firm is in the low, high or zero corporate tax bracket, are higher on average than those of the workers in the second and third labour categories. Similarly, second labour category employees earn slightly higher wages on average compared to the majority of workers in the third category. Considering the corporate tax bracket dimension, wages of the big taxpaying firms are always considerably above wages paid in the low tax bracket firms, while this pattern is not so clear concerning the wages of the zero TI firms and the low tax bracket. All in all, wages remain rather rigid in the period that we consider. When it comes to taxable income, the second part of Table 5 shows that there is a steady increase in reported taxable income of companies belonging to the low tax bracket in all labour categories despite falling corporate tax rates. TI of the big taxpayers fluctuates and does not exhibit a particular trend.

6.2 Empirical Specification

In order to find out if there is shifting of income out of the social security into the corporate tax base as a result of faster decreasing corporate tax rate than payroll rates, we employ the

[11] This information was kindly provided by Harazos Chetinyan from Chetinyan Accountants Ltd.

[12] Hanlon (2003) provides an excellent analysis of the caveats in inferring taxable income from firms' financial statements.

following basic specifications:

$$ln\left[\frac{(w^R-u)_{it}}{(w^R-u)_{it-1}}\right] = \alpha_0+\alpha_1 ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)+\alpha_2 ln\left(\frac{t_{sit}}{t_{sit-1}}\right)+\epsilon_{it} \quad (25)$$

$$ln\left[\frac{TI_{it}}{TI_{it-1}}\right] = \beta_0+\beta_1 ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)+\beta_2 ln\left(\frac{t_{cit}}{t_{cit-1}}\right)+\delta_{it}, \quad (26)$$

where $ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$ is the log of the change in the difference between social security and corporate tax rates, $ln\left(\frac{t_{sit}}{t_{sit-1}}\right)$ is the log of the change in the payroll rates and $ln\left(\frac{t_{cit}}{t_{cit-1}}\right)$ is the log of the change in the corporate tax rates. According to eq.(25), when a firm decides what wage to report, it takes into consideration both the amount of payroll contributions it needs to pay and the difference between the payroll and the corporate tax rate, which will matter if the wage is underreported due to the artificial increase in taxable corporate income. In eq.(26), apart from the rates difference, TI is further determined by the corporate income tax. If there is shifting of income between the two bases, then reported wage should decrease as the difference between the payroll rate and CIT increases, which translates into α_1 having a negative sign. Provided that the increase in TI that stems from payroll tax evasion is completely overpaid in the corporate income tax, we should observe a $\beta_1 > 0$ and similar in absolute value to α_1. In our model we have allowed for firms to cook the books and choose not to overpay CIT, which is very likely to be happening in reality. Therefore, we expect that $ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$ will have a smaller effect on TI than on wages.

A problem with eq. (26) is the endogeneity of t_{cit}. While the CIT influences the amount of TI reported, it is TI that determines, which bracket the firm is in and hence the corporate tax rate. The solution of reverse causality in similar specifications has been the introduction of an instrument (IV), which is correlated with the endogenous variable, but exogenous to the error term (Gruber and Rauh, 2007; Gruber and Saez, 2002). We follow the literature and construct such an IV by keeping a firm's TI in year t the same as in year $t-1$ and use only the changes in the tax law between the two years for identification. TI in year t is also adjusted by growth rates, which are exogenous to the firm's behaviour and therefore, show how TI would have grown in the absence of any interference by the company.

The growth rates were calculated in the following way: First, firms within each NACE2 industry were separated into eight income intervals starting from zero with the last interval being firms with TI over 100 million USD. This was done for Bulgaria, Poland, the Czech Republic, Hungary and Romania. The growth rate of TI for each income interval within a given NACE2 industry was calculated for Poland, the Czech Republic, Hungary and Romania, averaged out, and then applied to the firms in the same industry and income interval in the Bulgarian data. It is possible that the four countries we use may have had shocks affecting their industries differently, however, they were still in transition in the period we consider and coming out of a similar political and to some extent economic background as Bulgaria, albeit the

Czech Republic and Hungary being much stronger and bigger economies. The instrument for $ln\left(\frac{t_{cit}}{t_{cit-1}}\right)$ is thus $ln\left(\frac{t_p}{t_{cit-1}}\right)$, which is the log of the predicted change in CIT. The same logic applies for $ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$, which is instrumented with $ln\left(\frac{t_{sit}-t_p}{t_{sit-1}-t_{cit-1}}\right)$. $ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$ is instrumented in the wage equation as well, because supposing that a common evasion mechanism determines what TI and wage are reported, it is possible that a shock affecting the CIT will affect the mechanism too, and hence wage and TI. It is for this reason that we estimate eq. (27) both with and without an IV.

The instruments above are constructed as a function of income in the previous period $t-1$. Thus, if TI_{it-1} is correlated with δ_{it},running the regression with the IVs will still produce biased results. The two sources of endogeneity in this framework, as described by Gruber and Saez (2002), are mean reversion and changes in the income distribution. Mean reversion occurs when there are fluctuations in taxable or labour income, which are transitory. For example, a firm that is exceptionally successful in year $t-1$ is likely to revert to its normal performance in year t. The same applies for individual income, especially at the top of the income distribution. Widening of income inequality or external shocks that make some firms more profitable than others for reasons unrelated to changes in tax rates change the income distribution, which, if uncontrolled for, will bias estimation. Therefore, we include a lagged log of wage and TI in eq. (25) and eq. (26), respectively.

Further, we follow Gruber and Saez (2002) and include even richer specification of lagged income to account for the possibility of a non-linear interaction between mean reversion and changes in the income distribution. In particular, we add a 10-piece spline of lagged income in our regressions. Such rich specifications are justified by the numerous tax reforms in the period 1997-2002, in which the CIT rate has been cut on a yearly basis for the high bracket firms and twice for the low bracket companies providing good over time variation, within and across groups. The payroll rate has also been falling annually, although not as radically as the corporate tax.

Our regression framework thus becomes:

$$\begin{aligned} ln\left[\frac{(w^R-u)_{it}}{(w^R-u)_{it-1}}\right] &= \alpha_0+\alpha_1 ln\left(\frac{t_{sit}-t_{cp}}{t_{sit-1}-t_{cit-1}}\right)+\alpha_2 ln\left(\frac{t_{sit}}{t_{sit-1}}\right)+\sum_j \alpha_{3j} YEAR_j \\ &+ \alpha_4 ln((w-u)_{it-1})+\sum_{k=1}^{10}\alpha_{5k} SPLINE_k((w-u)_{it-1})+X'\Gamma+\epsilon_{it} \quad (27) \\ ln\left[\frac{TI_{it}}{TI_{it-1}}\right] &= \beta_0+\beta_1 ln\left(\frac{t_{sit}-t_{cp}}{t_{sit-1}-t_{cit-1}}\right)+\beta_2 ln\left(\frac{t_{cp}}{t_{cit-1}}\right)+\sum_l \beta_{3l} YEAR_l \\ &+ \beta_4 ln(TI_{it-1})+\sum_{m=1}^{10}\beta_{5m} SPLINE_m(TI_{it-1})+X'\Delta+\delta_{it}, \quad (28) \end{aligned}$$

where YEAR are year dummies and X includes the log of total assets, fixed assets, minimum

wage, earnings before interest and tax, profit before tax, turnover and cash and cash equivalents.

7 Results

The results of estimating eq. (27) are presented in Table 6. All regressions in this and subsequent tables include year fixed effects and all the variables in X. When a regression does not include IV estimation, standard errors are clustered by firm. In Table 6 eq.(27) is estimated with and without an instrumental variable leading to very similar results, which indicates that it is likely that $ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$ is not endogenous in the wage equation. Column1 shows that a 10% increase in $t_{sit} - t_{cit}$ will lead to 0.86% decrease in reported wages. This estimate is a bit lower for the no IV case. The regressions in columns 1 and 2 include no lagged wage income and no spline. Lagged income is added in columns 3 and 4, in which the estimates of wage elasticity with respect to the difference in the tax rates fall substantially to 0.35% and 0.45% for the IV and no IV estimation, respectively. The lagged wage income has very significant negative effect on reported wages in both the IV and non-IV cases. Adding a 10-piece spline of wage income in columns 5 and 6 does not seem to change the results from our estimation when only lagged income is included and the estimation is robust to even richer splines. The minimum wage has a very strong positive influence on reported wages with a coefficient of 0.33 in almost all estimations. The payroll tax by itself has a negative and significant effect on reported wages.

Table 7 shows estimates of the same equation, but this time we are interested in the heterogenous effect of $t_{sit} - t_{cit}$ on firms in the different corporate tax brackets. All specifications include lagged wage and a 10-piece spline. Since the corporate income tax is the same for all firms within a bracket, the identification of the estimates in Table 7 comes from the variation in the payroll rate only. Overall, it appears that the big taxpayers are more sensitive to the difference in tax rates than their low income counterparts. Thus, big firms' elasticity is 0.05 for the IV case and 0.069 for the no-IV case, whereas for firms in the low income bracket the elasticities are 0.042 and 0.045 for the IV and no-IV specifications, respectively. The higher responsiveness of big taxpayers is not surprising, since it is them who are likely to have the accounting ability and resources to engage in income shifting behaviour through double book-keeping. In fact, the companies that report zero taxable income are the least responsive to the $t_{sit} - t_{cit}$ difference as they simply do not face the trade-off of overreporting profits if they underdeclare wages. It is possibly for the same reason that these firms are most responsive to changes in the payroll tax itself as compared to firms in the high and low brackets.

If there is indeed shifting of income out of the social security base due to payroll evasion, then to some extent part of this income should reappear as an increased taxable revenue. In Table 8 we turn to exploring what happens in the corporate tax base and TI as a result of payroll evasion. In column 1 we have included no controls for lagged income, and hence we do not account for mean reversion and changes in the income distributions. The results, although significant, have the opposite sign of what we expected. These results change dramatically, however, once lagged income is added in column 2, which demonstrates the sensitivity of the

results to controlling for income. Then the effect of $ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$ on TI becomes positive and significant, which is a strong evidence for the presence of income shifting. Thus, 10% change in the $t_{sit}-t_{cit}$ difference leads to 0.61% rise in reported taxable income. The effect of the CIT rate also has the correct sign, but the estimate is not significant in this specification. The coefficient of the lag is close to -1 and significant, suggesting that on average mean reversion dominates income dispersion in the sample period. Once the 10-piece spline is added to the specification, column 3 shows that the elasticity remains almost unchanged at 0.63%. The coefficients of the spline exhibit non-linearities, being negative for the lower income firms, then turning positive towards the higher end of the income distribution.

In Table 9 we explore if TI of firms in the different brackets responds differently to changes in the difference between the payroll rate and CIT. Again, identification comes solely from variation in the payroll rates. The elasticity for the high income bracket is close to zero and insignificant. This result is not inconsistent with our finding that it is the high bracket firms who are most responsive to $t_{sit}-t_{cit}$ in terms of wages. An elasticity of zero with respect to taxable income would mean that these firms do not tend to overpay CIT by managing somehow to eliminate the artificial increase in their profits. The elasticity remains positive but insignificant for the low bracket firms, suggesting that most of the shifting of income between the two bases will come from those companies that are less skilled in manipulating profits.

8 Tax Policy Implications

In the last decade many developing economies have resorted to cutting their CIT rates in order to attract foreign direct investment and stimulate domestic business. Developed countries have followed the trend in an attempt to prevent major outflows of capital due to intensified competition. While such policy clearly generates incentives towards the honest disclosure of corporate profits, it would be hasty to consider its effects in isolation of other tax bases within the economy. The main goal of our paper is to point out the risk that a too low CIT can exacerbate payroll tax evasion if the contribution burden on employers is significant and payroll tax evasion is prevalent. With the collaboration of employees, such fraudulent behaviour becomes virtually undetectable and as a consequence it may be more beneficial for a firm to overpay profit tax than to pay its full contributions expense. Thus, unless the government is able to somehow balance the corporate and social security burden, such possibility certainly exists and should not be neglected. Given Europe's rapidly aging population and significant reliance on defined benefit pension schemes, it is unlikely that we will witness a decrease of the social security burden on employers. It is, therefore, important to carefully consider not only the advantages of a low CIT rate, but also its potential side-effects through its interaction with other tax bases.

References

Allingham, M., Sandmo, A., 1972. Income tax evasion: A theoretical analysis. Journal of Public Economics 1, 323–338.

Alm, J., Jackson, B., McKee, M., 1992. Institutional Uncertainty and Taxpayer Compliance. The American Economic Review 82 (4), 1018–1026.

Alm, J., Torgler, B., 2006. Culture differences and tax morale in the United States and in Europe. Journal of Economic Psychology 27 (2), 224–246.

Bailey, C., Turner, J., 2001. Strategies to reduce contribution evasion in social security financing. World Development 29 (2), 385–393.

Balabanova, D., McKee, M., 2002. Understanding informal payments for healthcare: the example of Bulgaria. Health Policy (62), 243–273.

Chander, P., 1992. Corruption in tax administration. Journal of Public Economics 49, 333–349.

Coalition 2000, 2005. Anticorruption reforms in Bulgaria. Report, Coalition 2000.

Cummings, R. G., Martinez-Vazquez, J., McKee, M., Torgler, B., 2005. Effects of tax morale on tax compliance: Experimental and Survey Evidence. CREMA Working Paper 2005-29, Center for Research in Economics, Management and the Arts.

Dimitrov, L., Gancheva, A., Pashev, K., 2004. The hidden economy in Bulgaria: Characteristics, structure and size. In: Iliev, P. (Ed.), The hidden economy in Bulgaria. Report, The Center for the Study of Democracy.

European Commission, 2008. Taxation trends in the European Union. Data for the EU member states and Norway . Eurostat statistical books, European Commission.

Gillion, C., Turner, J., Bailey, C., Latulippe, D. (Eds.), 2000. Social security pensions. Development and reform. International Labour Office, Geneva.

Gordon, R., Slemrod, J., 2000. Are "real" responses to taxes simply income shifting between corporate and personal tax bases? In: Slemrod, J. (Ed.), Does Atlas shrug? The economic consequences of taxing the rich. Harvard University Press, pp. 240–280.

Gruber, J., 1997. The incidence of payroll taxation: Evidence from Chile. Journal of Labor Economics 15 (3), S72–S101.

Gruber, J., Rauh, J., 2007. How elastic is the corporate income tax base? In: Auerbach, A., Hines, J., Slemrod, J. (Eds.), Taxing Corporate Income in the 21st Century. Cambridge University Press, pp. 140–163.

Gruber, J., Saez, E., 2002. The elasticity of taxable income: evidence and implications. Journal of Public Economics 84, 1–32.

Hanlon, M., 2003. What can we infer about a firm's taxable income from its financial statements? National Tax Journal 56 (4), 831–864.

Kim, B., Maddala, G., 1992. Estimation and Specification Analysis of Models of Dividend Behavior Based on Censored Panel Data. Empirical Economics 17, 111–124.

Manchester, J., 1999. Compliance in social security systems around the world. In: Mitchell, O., Myers, R., Young, H. (Eds.), Prospects for social security reform. University of Pennsylvania Press, pp. 295–312.

Mares, I., 2003. The sources of business interest in social insurance: Sectoral versus national differences. World Politics 55 (2), 229–258.

McGillivray, W., 2001. Contribution evasion: Implications for social security pension schemes. International Social Security Review 54 (4), 3–22.

Nyland, C., Smyth, R., Zhu, C. J., 2006. What determines the extent to which employers will comply with their social security obligations? Evidence from Chinese firm-level data. Social Policy and Administration 40 (2), 196–214.

Pashev, K., 2005. Corruption and tax compliance. Challenges to tax policy and administration. Report no.16, Center for the Study of Democracy.

Sandler, T., Sterbenz, F., Posnett, J., 1987. Free Riding and Uncertainty. European Economic Review 31, 1605–1617.

Shopov, G., Noncheva, T., Tafradjiyski, B., 2005. The pension reform in Bulgaria: Bridging social policy research and policy making. Report, Club "Economika 2000".

Shum, P. M., 1996. Taxes and Corporate Debt Policy in Canada: An Empirical Investigation. The Canadian Journal of Economics 29 (3), 556–572.

Slavova, Z., Shisheva, M., Zlatanov, S., 2007. Social Security in Bulgaria in 2007. Annual report, National Social Security Institute.

Slemrod, J., Yitzhaki, S., 2000. Tax avoidance, evasion, and administration. NBER Working Paper W7473, National Bureau of Economic Research.

Tafradjiyski, B., Loukanova, P., Shopov, G., Staykova, D., 2002. Payroll tax evasion. An international workshop population, labor market, pension and quality of life in transitional countries, The pension reform in Bulgaria–Two years after the start.

Torgler, B., 2002. Speaking to theorists and searching for facts: Tax morale and tax compliance in experiments. Journal of Economic Surveys 16, 657–683.

Vitosha Research, 2004. Corruption monitoring system (business sector). Report, Vitosha Research.

Yaniv, G., 1988. Withholding and non-withheld tax evasion. Journal of Public Economics 35, 183–204.

Yaniv, G., 1992. Collaborated employee-employer tax evasion. Public Finance/ Finances Publiques 47, 312–321.

Yaniv, G., 1993. Payroll tax evasion. Discussion Paper 51, National Insurance Institute.

9 Appendix: Classification of Firms into Labour Categories

Firms are assigned into labour categories in accordance with the Decree for the Categorization of Labour upon Retirement enacted at the end of 1997. The Decree stipulates the types of labour in the first, second and third labour categories, which pay different payroll contributions as described in Table 1. The following type of labour falls within the First Labour Category:

Casting of metals
Metallurgy
Manufacture of petroleum products and nuclear fuel
Mining
Quarrying

The following type of labour falls within the Second Labour Category:

Air, coastal, railway transport
Construction of ships, motorways, airfields, water projects, civil engineering works
Collection and treatment of sewage
Industrial dyeing (furs); Manufacture of pigments
Manufacture of glassware, plastics, rubber, ceramics, cement, explosives, weapons, fertilizers, glass fiber

The type of labour not specified under the first and second categories falls within the Third Labour Category

Table 1
Social Insurance Financing in Bulgaria

	1997		1998		1999		2000		2001		2002	
	Employer	Employee	Employer	Employee	Employer	Employee	Employer	Employee	Employer	Employee	Employer	Employee
III Labour Category												
Pension	37	2	37	2	35.85	1.5	25.6	6.4	23.2	5.8	20.25	6.75
Sickness/Maternity							2.4	0.6	2.4	0.6	2.25	0.75
Work Injury							0.7	0	0.7	0	0.7	0
Unemployment	5	0	3.8	0.95	3.55	0.7	3.2	0.8	3.2	0.8	3	1
Health Insurance					3	3	4.8	1.2	4.8	1.2	4.5	1.5
2nd Pillar Universal fund											1.5	0.5
Total	42	2	40.8	2.95	42.4	5.2	36.7	9	34.3	8.4	32.2	10.5
II Labour Category												
Pension	47	2	47	2	45.85	1.5	28.6	6.4	26.2	5.8	23.25	6.75
Sickness/Maternity							2.4	0.6	2.4	0.6	2.25	0.75
Work Injury							0.7	0	0.7	0	0.7	0
Unemployment	5	0	3.8	0.95	3.55	0.7	3.2	0.8	3.2	0.8	3	1
Health Insurance					3	3	4.8	1.2	4.8	1.2	4.5	1.5
2nd Pillar Occupational fund							7	0	7	0	7	0
2nd Pillar Universal fund											1.5	0.5
Total	52	2	50.8	2.95	52.4	5.2	46.7	9	44.3	8.4	42.2	10.5
I Labour Category												
Pension	52	2	52	2	50.85	1.5	28.6	6.4	26.2	5.8	23.25	6.75
Sickness/Maternity							2.4	0.6	2.4	0.6	2.25	0.75
Work Injury							0.7	0	0.7	0	0.7	0
Unemployment	5	0	3.8	0.95	3.55	0.7	3.2	0.8	3.2	0.8	3	1
Health Insurance					3	3	4.8	1.2	4.8	1.2	4.5	1.5
2nd Pillar Occupational fund							12	0	12	0	12	0
2nd Pillar Universal fund											1.5	0.5
Total	57	2	55.8	2.95	57.4	5.2	51.7	9	49.3	8.4	47.2	10.5

SOURCE.-- Law for the Social Security for various years; Bulletins of the National Social Security Institute for various years

NOTE.-- Figures are percentage of payroll.

Table 2
Social Insurance: Main Characteristics

	1997	1998	1999	2000	2001	2002
Dependency ratio						
(pensioners to insured persons)	69.17%	71.84%	83.26%	103.19%	107.59%	108.02%
Replacement ratio						
(avg. pension to avg. insurable income)	32.20%	36.95%	36.79%	39.80%	38.02%	39.38%
Legal retirement age*						
Men		60	60	60.5	61	61.5
Women		55	55	55.5	56	56.5
Contributions share ratio	-	-	-	80:20	80:20	75:25

SOURCE.-- Bulletins of the National Social Security Institute for various years; National Statistical Institute

NOTE.--* Data for III labour category. Workers in the I and II labour category have the right to retire earlier

Table 3
Corporate Income Tax Financing and Characteristics

	1997	1998	1999	2000	2001	2002
CIT rate central budget						
TI>Treshhold* (high bracket)	36	30	27	25	20	15
TI<Treshhold (low bracket)	26	20	20	20	15	-
CIT rate municipalities	6.5	10	10	10	10	10
Total CIT (high bracket)	42.4	37	34.3	32.5	28	23.5
Total CIT (low bracket)	33.4	28	28	28	23.5	-
Depreciation rates						
I asset category	4	4	4	4	4	4
II asset category	20	20	20	20	20	20
III asset category	8	8	8	8	8	8
IV asset category	15	15	15	15	15	15
Loss carryforward (years)	5	5	5	5	5	5

SOURCE.-- Law for the Corporate Income Tax for various years

Table 4
Changes in the Definition of Taxable Income

	1997	1998	1999	2000	2001	2002
No. of Provisions in CIT Law						
Increasing the financial result	22	23	23	24	23	24
Decreasing the financial result	11	10	15	13	14	17
No. of Abolished provisions						
Increasing the financial result		3	0	0	1	0
Decreasing the financial result		2	0	4	0	2
No. of Newly stipulated provisions						
Increasing the financial result		4	0	1	0	1
Decreasing the financial result		2	5	2	1	5

SOURCE.-- Law for the Corporate Income Tax for various years

Table 5

Time-Series Data on Taxable Income and Wages

	1997		1998		1999		2000		2001		2002	
	N	log(wage/empl)	N	log(wage/empl)	N	log(wage/empl)	N	log(wage/empl)	N	log(wage/empl)	N	log(wage/emp
Firms in first labour category												
In high tax bracket	33	-3.81 (.541)	26	-3.05 (1.25)	30	-3.30 (.482)	25	-3.28 (.502)	37	-3.35 (.535)	-	-
In Low tax Bracket	27	-4.61 (.448)	50	-4.03 (.679)	35	-4.26 (.631)	42	-4.14 (.730)	50	-4.01 (.730)	43	-3.65 (.545)
With zero taxable income	13	-4.69 (.560)	45	-4.08 (1.03)	79	-4.09 (.770)	94	-3.89 (.661)	97	-3.95 (.755)	43	-3.81 (.717)
Firms in Second labour category												
In high tax bracket	242	-4.16 (.658)	244	-3.71 (.620)	248	-3.72 (.701)	299	-3.49 (.834)	426	-3.56 (.666)	-	-
In Low tax Bracket	559	-4.83 (.713)	1201	-4.19 (.782)	890	-4.39 (.696)	1013	-4.30 (.712)	1090	-4.25(.647)	759	-3.84 (.777)
With zero taxable income	211	-4.90 (1.55)	582	-4.03 (1.01)	1332	-4.47 (.836)	1560	-4.33 (.759)	1922	-4.29(.742)	686	-4.10 (.868)
Firms in Third labour category												
In high tax bracket	1676	-4.21 (.736)	1497	-3.66 (.757)	1502	-3.69 (.791)	1742	-3.54 (.786)	2470	-3.63 (.767)	-	
In Low tax Bracket	5433	-4.88 (1.16)	12328	-4.44 (.930)	8456	-4.38 (.756)	10105	-4.27 (.734)	11738	-4.22 (.712)	8241	-3.92 (.861)
With zero taxable income	2273	-4.94 (1.52)	7081	-4.34 (.928)	16155	-4.49 (.754)	19792	-4.39 (.731)	24366	-4.35 (.708)	9856	-4.22 (.811)

	1997		1998		1999		2000		2001		2002	
	SS-CIT	log(TI)	SS-CIT	log(TI)	SS-CIT	log(TI)	SS-CIT	log(TI)	SS-CIT	log(TI)	SS-CIT	log(TI)
Firms in first labour category												
In high tax bracket	14.6	1.81 (2.03)	18.8	1.05 (1.33)	23.1	.97 (1.21)	19.2	1.35 (1.80)	21.3	1.04 (1.45)	23.7	-
In Low tax Bracket	23.6	-3.14 (1.49)	27.8	-2.96 (1.55)	29.4	-2.25 (.829)	23.7	-2.13 (.866)	25.8	-1.96 (.776)	23.7	-.421 (1.87)
With zero taxable income	57	0	55.8	0	57.4	0	51.7	0	49.3	0	47.2	0
Firms in Second labour category												
In high tax bracket	9.6	.77 (1.60)	13.8	.92 (1.34)	18.1	.81 (1.24)	14.2	.86 (1.29)	16.3	.75 (1.40)	18.7	-
In Low tax Bracket	18.6	-3.55 (1.80)	22.8	-3.35 (1.67)	24.4	-2.36 (.858)	18.7	-2.37 (.847)	20.8	-2.19 (.807)	18.7	-1.22 (1.76)
With zero taxable income	52	0	50.8	0	52.4	0	46.7	0	44.3	0	42.2	0
Firms in Third labour category												
In high tax bracket	-0.4	.309 (1.32)	3.8	.617 (1.19)	8.1	.559 (1.12)	4.2	.499 (1.06)	6.3	.411 (1.03)	8.7	-
In Low tax Bracket	8.6	-3.59 (1.82)	12.8	-3.57 (1.70)	14.4	-2.44 (.846)	8.7	-2.44(.847)	10.8	-2.29 (.816)	8.7	-1.58 (1.50)
With zero taxable income	42	0	40.8	0	42.4	0	36.7	0	34.3	0	32.2	0

NOTE.--SS-CIT is the percentage point difference between the payroll contribution rate and the corporate income tax. Log(wage/empl) is the logarithm of wage per employer excluding social security. Log(TI) is the logarithm of taxable income.

Table 6

Effect of difference of payroll and corporate tax rates on reported wage w-u

	Pooled IV	No IV	Pooled IV	No IV	Pooled IV	No IV
			Lagged wage		Lagged wage and SPLINE	
$ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$	-0.086	-0.071	-0.035	-0.045	-0.030	-0.046
	[0.01]	[0.005]	[0.008]	[0.004]	[0.008]	[0.004]
Ln(MinWage)	0.363	0.362	0.334	0.322	0.332	0.319
	[0.005]	[0.010]	[0.004]	[0.008]	[0.004]	[0.008]
$ln\left(\frac{t_{sit}}{t_{sit-1}}\right)$	-0.948	-0.995	-0.33	-0.48	-0.417	-0.48
	[0.192]	[0.224]	[0.169]	[0.182]	[0.165]	[0.176]
Ln (Turnover)	0.022	0.021	0.043	0.029	0.042	0.031
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
$ln((w-u)_{it-1})$			-0.506	-0.385	-0.938	-0.837
			[0.003]	[0.007]	[0.021]	[0.067]
No. observations	38,431		38,431		38,431	

NOTE.-- Columns 1,3 and 5 2SLS estimates. Columns 2,4 and 6 OLS with clustered standard errors. Year fixed effects present in all regressions

Table 7

Effect of difference of payroll and corporate tax rates on reported wage w-u by corporate tax bracket

	Pooled IV	No IV	Pooled IV	No IV	Pooled IV	No IV
	High CIT Bracket		Low CIT Bracket		Zero Taxable Income Firms	
$ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$	-0.050 [0.011]	-0.069 [0.011]	-0.042 [0.005]	-0.045 [0.005]	-0.024 [0.010]	-0.020 [0.009]
Ln(MinWage)	0.346 [0.011]	0.326 [0.026]	0.348 [0.005]	0.322 [0.011]	0.310 [0.007]	0.297 [0.012]
$ln\left(\frac{t_{sit}}{t_{sit-1}}\right)$	-0.048 [0.476]	-0.037 [0.519]	-0.291 [0.224]	-0.345 [0.254]	-0.741 [0.278]	-0.804 [0.267]
Ln (Turnover)	0.016 [0.007]	0.008 [0.006]	0.038 [0.003]	0.030 [0.003]	0.042 [0.004]	0.037 [0.005]
$ln((w-u)_{it-1})$	-0.89 [0.039]	-0.831 [0.125]	-0.846 [0.030]	-0.790 [0.084]	-1.07 [0.054]	-0.999 [0.114]
No. observations	5,149		22,847		10,456	

NOTE.-- 2 SLS estimates. All regressions include 10-piece spline of wage income

Table 8

Effect of difference of payroll and corporate tax rates on reported TI

Income Controls	None	Lagged Income	Lagged Income & 10-piece spline
$ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$	-0.567 [0.050]	0.061 [0.026]	0.063 [0.027]
$ln\left(\frac{t_{cit}}{t_{cit-1}}\right)$	0.555 [0.211]	-0.040 [0.111]	-0.057 [0.122]
$ln(TI_{it-1})$		-0.994 [0.005]	-0.946 [0.022]
Spline 1st			-0.343 [1.34]
Spline 2nd			-1.43 [0.463]
Spline 3rd			-0.572 [0.268]
Spline 4th			-0.121 [0.107]
Spline 5th			-0.211 [0.083]
Spline 6th			0.323 [0.190]
Spline 7th			-0.046 [0.051]
Spline 8th			-0.007 [0.016]
Spline 9th			0.003 [0.011]
Spline 10th			0.0001 [0.0001]
No. observations			23,781

Table 9

Effect of difference of payroll and corporate tax rates on reported TI by corporate tax brackets

	Hight CIT Bracket	Low CIT Bracket
$ln\left(\frac{t_{sit}-t_{cit}}{t_{sit-1}-t_{cit-1}}\right)$	-0.0006 [0.043]	0.040 [0.060]
$ln\left(\frac{t_{cit}}{t_{cit-1}}\right)$	-0.464 [0.363]	-1.78 [0.284]
$ln(TI_{it-1})$	-1.08 [0.049]	-0.949 [0.029]
Spline 1st	4.62 [4.67]	-0.559 [1.54]
Spline 2nd	2.48 [2.58]	-1.96 [0.477]
Spline 3rd	0.586 [0.952]	-0.315 [0.301]
Spline 4th	0.201 [0.324]	-0.554 [0.134]
Spline 5th	0.051 [0.131]	-0.438 [0.169]
Spline 6th	-0.060 [0.221]	0.266 [0.458]
Spline 7th	0.059 [0.064]	0.338 [0.154]
Spline 8th	0.031 [0.021]	-0.004 [0.066]
Spline 9th	0.003 [0.014]	0.289 [0.174]
Spline 10th	0.0006 [0.0005]	-0.341 [0.322]
No. observations	4,296	19,485