On the Measurement of Labour Tax Avoidance: Some Proposals Based on Tax-Avoidant Offending Firms

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Abstract

We develop novel proxies for labour tax avoidance (LTAV) using social security contributions (SOCs) reported in the income statements of a sample of 857,790 Spanish firm-years for the period 2001-2015. Subsequently, we test the validity of our proxies within a sample of 189 labour tax-avoidant offending firms (LTAOFs), accused of evading SOCs by public authorities.

Our results reveal that LTAOFs exhibit abnormally low SOCs as expenses, based on LTAV proxies specifically built to signal both conforming and non-conforming LTAV. Furthermore, we find that firm-specific financial variables as well as macroeconomic variables significantly influence LTAV. Our results are robust to adjustments of personnel costs to consider differences in firm efficiency, as well as to different matching procedures, including propensity score.

This study could foster further research on the efficacy of the LTAV proxies and on the drivers and implications of LTAV for firms and their stakeholders, in different socio-economic and institutional contexts. In addition, these proxies could integrate the other methods applied to estimate the undeclared work and its trends. Finally, they may assist tax authorities to direct their inspections, detect labour tax evasion, and then strengthen the social protection of the employees from employers' illegal exploitation practices, as well as reducing tax revenue shortfall and related sustainability concerns in the social security systems.

Keywords: labour tax avoidance; non-standard employment; social security contributions; undeclared work.

Abbreviations in the paper: ABSOCs (abnormal SOCs); BTD (book-tax differences); DEA (Data Envelopment Analysis); ESOCRs (effective SOCs rates); ITAV (income tax avoidance); LTAOFs (labour tax-avoidant offending firms); LTAV (labour tax avoidance); NSE (non-standard employment arrangements); NSOCs (normal SOCs); SOCs (social security contributions); UDW (undeclared work); VAT (value added tax).

1 Introduction

Prior research on tax avoidance, tax evasion and their determinants primarily deals with corporate income tax (Bame-Aldred, Cullen, Martin, & Parboteeah, 2013; Hanlon & Heitzman, 2010). In contrast, in this paper we examine labour tax, and specifically labour tax avoidance (LTAV), with the purpose of developing a measurement methodology and validating it empirically. In this regard, labour tax comprises social security contributions (SOCs) and other insurances, computed on gross salaries of all workers, that the employers are legally required to withhold and pay to tax authorities to support the social protection of their employees (Ravenda, Argilés-Bosch, & Valencia-Silva, 2015). Similar to income tax, practices to avoid or evade the payment of labour tax are widespread among firms worldwide in various legal and institutional contexts and they are often associated with labour exploitation (Arezzo, 2014; Buehn, 2012; Williams, Nadin, & Windebank, 2011). Furthermore, in the latest years these practices seem to have intensified due to the global economic crisis and the tougher competitive conditions within a globalized economy (Azmat & Haque, 2015; Schneider, Buehn, & Montenegro, 2010). Specifically, if employers underreport the real number of their employees or the hours truly worked or the position occupied to the social security authorities, they may succeed in avoiding or evading the payment of the legally due SOCs (Williams & Horodnic, 2017). In these scenarios, we expect underreporting of workforce and related costs to be somehow detectable in the financial statements of the employing firm.

Based on these premises and similar to previous definitions of tax avoidance (Hanlon & Heitzman, 2010; Ravenda et al., 2015), we broadly define LTAV as the reduction of firm's explicit labour tax liability through specific procedures. Hence, we include in our definition both legal and illegal LTAV practices, given that in some cases the legality of a procedure or transaction, sometimes associated with its economic substance, cannot be clearly assessed. In particular, LTAV may be within the law if it is, for example, performed by rearranging salaries of employed personnel with alternative kinds of compensation, which are not taxable under the legislation in force (e.g., expense reimbursement, fringe benefits, employee discount) (Feld & Schneider, 2010). In contrast, it is much more questionable the legality of LTAV achieved by abusing of subcontracted workforce or self-employed people, to circumvent the social security regulation, when the working relationship should be regulated as subordinate employment according to the labour law (e.g., false self-employment) (EC, 2014; Pfau-Effinger, 2009). Furthermore, to support job creation through the enhancement of the labour market flexibility, several European countries have recently adopted tax policies allowing reduction of the employers' labour tax burden for specific labour contracts and conditions. For example, in France the law decree n° 2014-1688 of December 29th, 2014 establishes a decrease in the employer's SOCs for wages below 1.6 times the legally defined minimum wage. On the other hand, in Spain the royal law decree n° 3/2014 of February 28th, 2014 grants a temporary reduction of the employer's social security burden through the establishment of a reduced flat rate of SOCs for new permanent contracts, on condition that the level of net employment is maintained for at least three years within the firm. Nonetheless, an abuse of these labour tax reliefs, in violation of the spirit of the law, represents a form of LTAV which may be considered legal, but it is almost never deemed ethical in the court of public opinion. Indeed, LTAV can be framed as a global sustainability problem as it entails significant negative effects on society by reducing the government tax revenue needed to finance public goods, services and pensions (Lanis & Richardson, 2012a). Specifically, LTAV may aggravate the difficulties of many European countries in sustaining their public pension systems that experience a significant reduction of contributions because of population ageing, changes in labour market structure, and financial globalization (French & Jones, 2012; Han, 2013). Moreover, LTAV carried out through undeclared work (UDW) may: attract workers away from the official economy, partly inhibit the creation of regular employment with full social protection, and create an unfair competition for official firms which do not engage in such a practice (Schneider & Enste, 2000; Williams & Nadin, 2014). Finally, LTAV, as a facet of the shadow economy, may lead policy makers to base their decisions on mistaken official macroeconomic indicators (Arezzo, 2014; Schneider & Enste, 2000).

That said, in this study we first develop several proxies for LTAV, based on the abnormal values of the ratio of SOCs paid to lagged total assets of 857,790 firm-years for the period 2001-2015 in various industries (e.g., construction and agriculture), which previous studies find to be most severely affected by LTAV practices (Buehn, 2012; Haigner, Jenewein, Schneider, & Wakolbinger, 2013; Williams et al., 2011). Subsequently, to validate our proxies, we assess whether they can signal the presence of LTAV, in the form of abnormally low SOCs, within a sample of 189 firms identified as labour tax-avoidant offending firms (LTAOFs), due to having been accused of evading social contribution obligations, following a labour inspection. It is noteworthy that the Spanish context is specifically suitable for this study given that, according to the most recent Eurobarometer survey (EC, 2014), during the economic crisis years the most notable increase in UDW, the extremely illegal LTAV, took place in Spain and Slovenia.

Although our measures for LTAV can reflect both legal and illegal tax reductions, we consider that, because of our research design, the illegal labour tax evasion related to the employment of UDW (conforming LTAV) may be the primary explanation of extreme abnormal values taken by our measures. Indeed, although legal LTAV is generally adoptable, the leeway in resorting to legal means to relieve labour tax is limited. On the other hand, UDW is the primary illegal means commonly used to avoid labour tax payment (Feld & Schneider, 2010; Williams & Nadin, 2012).

Overall, our results reveal that LTAOFs exhibit abnormally low SOCs as expenses, based on LTAV proxies specifically built to signal both non-conforming LTAV, carried out through the reduction of the relative magnitude of SOCs with respect to the reported personnel costs, and conforming LTAV arising from the underreporting of personnel costs, supposedly ascribable to the employment of UDW. In contrast, LTAV proxy built to exclusively signal non-conforming LTAV does not show any significant difference for LTAOFs, compared to the control sample of firms extracted from SABI database. These results may suggest that LTAOFs in our sample engage in conforming LTAV strategies alternatively, rather than simultaneously, to non-conforming LTAV strategies. Indeed, LTAOFs may avoid non-conforming LTAV strategies, more easily detectable, to legitimize themselves in front of the stakeholders (Duff, 2017; Lanis & Richardson, 2012a) and reduce the risk of tax authority inspections, which may unveil more illegal and punishable conforming LTAV strategies. Our results are robust to adjustments of personnel costs aiming to consider differences in firm efficiency, as well as to different matching procedures, including propensity score. Importantly, these results provide evidence of the effectiveness of our proxies to detect LTAV, considering that UDW may be the primary reason for the accusation of our 189 LTAOFs. In addition, in our final regression model we show that several factors influence LTAV, by including both firm-specific financial variables and macroeconomic variables.

It is noteworthy that Ravenda et al. (2015) first coin the term LTAV in the accounting realm and develop a proxy to detect it within a sample of Italian firms controlled by Mafia organizations. Relative to this, to our knowledge, unique prior accounting study on LTAV, our paper develops novel measures of LTAV aiming to signal both conforming and non-conforming LTAV and tests their efficacy within a sample of LTAOFs as well as their association with other firm-specific and macroeconomic variables. In contrast, in Ravenda et al.'s (2015) paper LTAV practices within Mafia-controlled firms are assumed based on previous case studies and the results may be driven by uncontrolled factors. Furthermore, in our study, as well as testing different alternative proxies, the average predictive power of the main model for the computation of abnormal SOCs (*ABSOCs*) is significantly higher than that of Ravenda et al.'s (2015) paper, due to a different estimation methodology. More importantly, our paper contributes to the literature as the novel LTAV proxies may foster additional research on their efficacy and on the reasons, determinants, and implications of LTAV for firms and their stakeholders, in different socio-economic and institutional contexts. Furthermore, these proxies could be the basis for the development of new direct methods to estimate UDW and its trends, based on accounting information, which could integrate the other procedures generally applied for this hard task. Finally, their ability to signal the presence of LTAV may enhance the performance of the risk-assessment models, currently used by tax authorities to direct their inspections for detecting labour tax evasion practices. Specifically, this latter result would allow to strengthen the social protection of the employees from employers' unsustainable exploitation practices as well as reducing tax revenue shortfall and consequent equity concerns in the social security systems.

The remainder of the paper proceeds as follows: section 2 reviews the literature and develops the main hypothesis; section 3 describes the research design and sample data; section 4 presents empirical results; section 5 includes concluding remarks.

2 Related Research and Hypothesis Development

Some prior research that can be related to LTAV consists of studies on UDW, mostly situated in public economics and labour relations areas, and studies on tax avoidance, mostly concentrated in finance and accounting areas and focused on income tax rather than labour tax. Hence, the examination of the measurement techniques and the related issues in these previous studies are particularly relevant to the development of our LTAV proxies.

2.1 Measuring UDW

The definition of UDW is controversial among researchers and it is ultimately determined by the research methods and objectives. In this setting, consistent with the tax avoidance focus of our study and based on previous research (EC, 2014; OECD, 2012; Williams, 2015; Williams & Nadin, 2012), we define UDW as income from legal and taxable economic activities involving labour as a production factor, on which income tax, SOCs, VAT or other taxes are not paid, because they are not reported to the public authorities according to the applicable regulatory system. Feld and Schneider (2010) suggest that these activities are not declared to public authorities not only to avoid taxes but also to avoid certain legal labour market standards (e.g., work permits, maximum working hours, minimum wages, safety regulations, etc.), commonly defined to protect the employees, and certain administrative obligations. It is noteworthy that if the activities are illegal or unremunerated, then they are part of the criminal or unpaid informal economy, respectively, rather than of the undeclared economy (Williams, 2010). Furthermore, based on the definition of informal employment developed by the International Conference of Labour Statisticians (ILO, 2012), our study can only deal with UDW in formal sector enterprises (legally registered entities) by excluding UDW in the informal sector enterprises.

Recent studies find that UDW prevails in developed as well as developing economies and is growing relative to declared work in almost all-global regions (Schneider, 2014; Williams, 2015). In this regard, Schneider (2015) finds that the southern European countries, including Spain, have considerably higher shadow economies than those of Central and Western Europe. Furthermore, he finds that in the two-year period 2014/2015 36 OECD countries register a decrease of the size and development of the shadow economy relative to two-year period 2008/2009. Indeed, the recovery of the official economy results in people having fewer incentives to undertake additional activities in the shadow economy and to earn extra “black” money (Schneider, 2015). Interestingly, UDW is mostly concentrated in sectors characterized by high labour intensity, little enterprise-specific worker qualification, high worker fluctuation levels, low levels of organizational rationalization and of production (Pfau-Effinger, 2009; Williams et al., 2011). These features are not compatible with jobs in primary labour market sectors and high-production enterprises that use highly developed technologies (Williams & Windebank, 2012). Hence, in our study include several sectors which substantially present these characteristics, namely: construction, agriculture, hotels, and restaurants, among others.

Regarding the socio-economic and spatial variations in UDW, two contrasting views prevail in the literature, namely the marginalization and reinforcement theses. The former dominant thesis holds that spatially and socio-economically marginalized groups (e.g., immigrants, unemployed people, women, etc.) are more likely to participate in UDW (Taiwo, 2013; Williams & Horodnic, 2015). In contrast, the emerging reinforcement thesis argues that participation in UDW is lower among marginalized populations, implying that undeclared economy enhances the inequalities produced by declared economy (Marcelli, Williams, & Joassart, 2010; Williams & Horodnic, 2015). In this regard, Williams and Nadin (2014) find that, in East-Central Europe and Western European nations, the marginalization and reinforcement perspectives co-exist given that the unemployed are more likely to participate in UDW but gain significantly less from it than those working undeclared who are in declared jobs.

Anagnostopoulos, Bitzenis, and Kontakos (2015) assert that labour-intensive enterprises in an increasingly competitive global market can survive by reducing labour costs. In this regard, according to the neo-liberal explanation theory, UDW is a rational economic decision which people and firms pursue in order to voluntarily exit the formal economy in order to avoid the costs, time and effort associated with the formal employment (Williams, 2015). In contrast, based on the structuralist theory, UDW is mainly due to an inadequate state intervention to protect workers from poverty within the context of the emerging de-regulated open world economy (Slavnic, 2010; Williams, 2015). In this respect, in a recent study focusing on the member states of the EU, Williams (2013) finds more evidence to support the structuralist theory rather than the neo-liberal perspective.

In addition, UDW includes heterogeneous types of employment relation which involves different degrees of social integration and arise from different motives and strategies of firms, workers and contractors, and their interplay (Pfau-Effinger, 2009). In this regard, Pfau-Effinger (2009) identifies three different types of UDW from a workers' motivational perspective. The *poverty escape type* is defined as UDW supplied by workers as their main source of income to avoid extreme poverty. It is particularly common in parts of the population that face restrictions on entering formal employment. From a demand side perspective, this type of UDW is employed by firms pursuing cost-saving strategy for tasks requiring low skills and by private households. The *moonlighting type* of UDW includes the second job of qualified craftsmen and professionals who are unregistered self-employed. Finally, the *solidarity orientated type* is UDW mostly motivated by the mutual support within social networks rather than by the monetary gain.

In order to develop effective policy measures to tackle UDW, it is essential to have accurate and comparable information about its extent, its structure, and its variation across regions and socio-economic groups (Anagnostopoulos et al., 2015; Schneider & Enste, 2000). However, accurate estimates of UDW are hardly achievable because the involved individuals prefer not being identified (Schneider et al., 2010). Nonetheless, prior studies adopt various direct and indirect methods to estimate UDW and improve the understanding of its dimensions and causes. Indirect methods seek to infer the size of the invisible UDW by measuring the observable traces it leaves in the official statistics. They are usually called indicator approaches and mainly employ macroeconomic data (e.g., electricity consumption, employment figures, cash transactions) collected for other purposes (Dell'Anno, Gómez-Antonio, & Pardo, 2007; Haigner et al., 2013; Schneider & Enste, 2000). It is noteworthy that most of indirect methods are criticized because they rely on questionable basic assumptions and unreliable macroeconomic estimates (Feige & Urban, 2008; Schneider & Enste, 2000).

Conversely, direct methods to estimate UDW are microeconomic approaches that directly collect information on UDW through contacts with or observations of individuals and/or firms (Dell'Anno et al., 2007). Specifically, they apply either surveys or tax auditing and other compliance methods (Schneider & Enste, 2000; Williams, 2006). The main benefit of the direct method of voluntary sample surveys is that not only the size, but also the structure of UDW, as well as the motives of the participants, can be measured. However, a drawback is that the reliability of the results greatly rests on the respondents' willingness to collaborate (Schneider & Enste, 2000), which is also linked to the social acceptability of UDW according to the local norms, values, and codes of conduct (Williams, 2015). Furthermore, previous studies argue that such direct surveys under-estimate the scale of UDW relative to indirect measurement methods (Franck & Olsson, 2014; OECD, 2012).

That said, our proposed LTAV measures, based on *ABSOCs*, could be conceived as the basis for developing a further direct method to estimate UDW, or its tax avoidance effects and their trends, within legally registered firms, based on accounting information. Relative to the other direct methods, the effectiveness of our LTAV proxies does not depend on the respondents' willingness to cooperate or the representativeness of the tax auditing sample. However, some concerns may arise from the reliability of the financial accounting information and especially the need to empirically define a threshold below which *ABSOCs* are likely to provide evidence of LTAV ascribable to UDW.

2.2 Measuring Income Tax Avoidance

Previous studies adopt several different proxies of income tax avoidance (ITAV), all of which are argued to have different properties and limitations. Specifically, most measures of ITAV only capture non-conforming ITAV, which is carried out through transactions accounted for differently for book and tax purposes that result in a decrease in taxable income, while leaving financial income unaffected. In contrast, conforming ITAV, based on the reduction of both financial accounting and taxable incomes through a tax strategy, cannot be captured by most measures (Hanlon & Heitzman, 2010; Lee, Dobiyanski, & Minton, 2015). The appropriateness of a measure of ITAV depends on the research objectives. In this regard, Hanlon and Heitzman (2010) list 12 measures of ITAV commonly used in the literature. In particular, the effective tax rate (ETR) measures are the most frequently employed in previous studies (Blouin, 2014; Duan, Ding, Hou, & Zhang, 2018; Lanis & Richardson, 2012b). They are calculated by dividing total tax expenses (GAAP ETR) or current tax expenses (current ETR) or tax paid (cash ETR) for one or more years by a measure of pre-tax income or cash flow for the same period. ETR measures can be compared with the statutory tax rate of reference to assess the magnitude of ITAV. It is noteworthy that the ETRs mostly reflect permanent and/or temporary differences between book and taxable incomes and cannot detect ITAV performed through a legal or illegal reduction of pre-tax accounting income and then taxable income (conforming ITAV). This latter tax strategy is more likely to be adopted by unlisted firms that do not face capital market constraints (Badertscher, Katz, Rego, & Wilson, 2017; Coppens & Peek, 2005).

In addition, prior research finds that the book-tax difference (BTD) measures (permanent and/or temporary differences between pre-tax income (also called "book income") and taxable income) may provide evidence of some element of non-conforming ITAV (Abdul Wahab & Holland, 2015; Desai & Dharmapala, 2009; Wilson, 2009). Based on that, several studies (Desai & Dharmapala, 2009; Kim & Zhang, 2016; Rego & Wilson, 2012) adopt abnormal BTD, computed as the residual of BTD regression on various predictor variables (e.g., total accruals), as a measure of ITAV. Another ITAV proxy previously used in the literature is based on the unrecognized tax benefits (Kim & Zhang, 2016; Rego & Wilson, 2012), namely the accounting reserve for future tax contingencies that publicly traded U.S. firms are required to present based on FASB interpretation No. 48 (FIN 48), effective in 2007. Finally, based on a sample of firms formally charged of tax shelter (tax avoiding transactions with no economic substance) and using a logistic regression, Wilson (2009) develops a probabilistic detection model of tax shelter participants which is used in several subsequent studies (Kim & Zhang, 2016).

Unlike the aforementioned studies primarily dealing with non-conforming ITAV, Badertscher et al. (2017) recently propose a conforming ITAV proxy based on the ratio of cash taxes paid to lagged total assets that captures by both conforming and non-conforming tax strategies. To remove the impact of non-conforming tax strategies from the ratio, Badertscher et al. (2017) consider as a proxy for conforming ITAV the residual of the by industry-year regression of the ratio on positive and negative total book-tax differences, as well as on other control variables, unrelated to ITAV, which may affect cash tax paid.

That said, by analogy to previously adopted ITAV measures, our objective is to develop some LTAV measures that may be able to provide evidence of non-conforming LTAV, through the reduction of SOCs relative to reported personnel costs, as well as of conforming LTAV, through the underreporting of personnel costs mostly ascribable to the employment of UDW. It is noteworthy that conforming LTAV in the form of UDW is a major concern in our research context for being the primary illegal means commonly used to avoid labour tax payment (Feld

& Schneider, 2010; Williams & Nadin, 2012). Indeed, conforming LTAV can be more easily disguised and gone undetected by labour tax authorities, than non-conforming LTAV.

2.3 Hypothesis Development on Abnormal SOCs

For the whole period of our study (2001-2015), a total statutory flat rate of about 30% of their employee gross remuneration (personnel costs) has been charged to the employing firms as SOCs. In Spain, SOCs are divided in four groups with different rates for the employer, namely: contributions for common contingencies (e.g., pension, disability and health insurance), having the higher rate (stable at 23.6% for the whole period), contributions for unemployment insurance, contributions FOGASA (insurance against insolvency of the employer), and contributions for occupational training. Nonetheless, the total statutory rate varies for temporary contracts (about 1% higher) and special worker categories. In addition, the social security tax base does not include some remuneration concepts such as specific fringe benefits, in kind remunerations, and refunds of travel expenses for workers moving outside their usual workplace. Lastly, the social security tax base is constrained between a minimum (legal minimum wage increased by one sixth) and a maximum base[1]. The portion of remuneration exceeding the maximum base is not subject to SOCs. In this regard, the Spanish government has increased the maximum base progressively from € 2.500 per month in 2001 to € 3.606 per month in 2015, to make taxable a larger portion of higher wages and then enhance the public collection of social security.

Within this legal framework, employers have a certain leeway to reduce the social security tax base below the reported gross remuneration of their employees as a form of non-conforming LTAV. For example, employers could avoid SOCs by, even fraudulently, replacing a part of the taxable basic salary of their employees with some remuneration concepts (e.g., expense reimbursement, fringe benefits) which are excluded from the social security tax base. A distinctive feature of SOCs, relative to the income tax expenses, is that they can be more specifically related to the sole personnel costs on which they are computed. Hence, a degree of variability of effective SOC rate (SOCs divided by personnel costs) within our sample may provide evidence of non-conforming LTAV strategies. However, to exclude variability factors related to the peculiarities of the industry, firm scale, capital intensity, year-specific macroeconomic and regulatory conditions, all of them possibly unrelated to LTAV, we consider

[1]The general regulation of social security contributions, their computation and settlement are included in the royal law decree n° 2064/1995 of December 22nd, 1995.

as our non-conforming LTAV proxy the residuals of a fixed-effect panel data regression of the ratio of SOCs paid to lagged total assets on actual personnel remuneration costs and year, estimated for each three-digit industry SIC code. This estimation methodology, based on regression residuals, is similar to that employed for some aforementioned ITAV proxies, such as abnormal book-tax differences (Desai & Dharmapala, 2009; Kim & Zhang, 2016; Rego & Wilson, 2012) and abnormal cash taxes paid to lagged total assets (Badertscher et al., 2017).

Nonetheless, this first LTAV proxy does not account for underreported personnel costs which may be attributable to the employment of UDW. In this respect, Seifert and Valente (2018) consider that the underreporting of labour input leading to overreported labour productivity in southern Italian vineyard farms, following the 2011 non-EU migrant wave in southern Italy, may be attributable to UDW displacing legal workforce. In the same vein, we assume that UDW may result in abnormally low reported personnel costs relative to sales, which is equivalent to higher reported labour productivity. Therefore, to produce a more comprehensive composite proxy, including conforming LTAV, we additionally compute *ABSOCs* by replacing in the above regression actual personnel costs with predicted personnel costs estimated by simultaneously regressing, for each three-digit industry SIC code, actual personnel costs on sale revenues, their annual change, finished product and work-in-process inventory annual changes, and year. Abnormally low values of this second LTAV proxy may be due to both non-conforming LTAV, arising from the strategic reduction of the tax base relative to the reported gross wages, and conforming LTAV, arising from the underreporting of the personnel costs. Finally, by subtracting the first non-conforming LTAV proxy from this second comprehensive LTAV proxy, we obtain a third proxy that should only signal the effect of conforming LTAV.

If these proxies are valid, they should score abnormally low values within tax-avoidant firms, especially for offending firms engaging in illegal LTAV. Indeed, these offending firms may engage in both conforming and non-conforming LTAV. However, conforming LTAV can be more easily concealed to tax authorities and other stakeholders than non-conforming LTAV. Therefore, we expect the former to be the favourite LTAV practice of most offending firms. In this regard, we can even envisage that LTAOFs may not exhibit, on average, any significant difference in terms of non-conforming LTAV from the other sample firms. Indeed, based on the legitimacy theory (Archel, Husillos, Larrinaga, & Spence, 2009; Lanis & Richardson, 2012b), LTAOFs may try to legitimize themselves in the eyes of the public of stakeholders and mitigate institutional pressures, by showing an apparent high level of compliance in terms of legally required SOC payments for the declared work. Specifically, this strategy may, among others, avoid raising tax authority suspicions about SOC obligation violations that are likely to trigger labour inspections, capable of unveiling disguised conforming LTAV practices linked to UDW. That said, the main hypothesis of our study is the following:

Hypothesis: LTAOFs exhibit abnormally low SOCs as expenses.

3 Research Design

3.1 Data and Sample Selection

To build our sample of firms used in our estimations, we first search for firms that have been accused of evading the payment of SOCs for their employees. Within the Aranzadi[2] database, we find 39 firms for which a Spanish high Court of Justice has handed down a sentence confirming the labour inspection assessment of their evasion of some due SOCs, during some specified fiscal years. In addition, we find other 150 offending firms by consulting, during the first 6 months of 2017, the virtual bulletin board of the Labour and Social Security Inspectorate[3] (available at: https://www.boe.es/tablon_edictal_unico/), which includes the notifications of the assessment, carried out by inspectors of Labour and Social Security Inspectorate, of the evasion of a certain amount of SOCs for some employees. These notifications are posted in the virtual bulletin board for twenty calendar days whenever, for some specified reasons, other established notification means are not practicable. In the notification the name and the fiscal code of the firm are both included. Nonetheless, the notification does not specify the exact amount of the evaded SOCs, nor the fiscal years to which they refer. Therefore, we consider as infraction periods the three years before the notification date, for which financial information is available in the SABI[4] database. Indeed, we subsequently download from SABI database the financial information of the LTAOFs and all the other available firms in the same two-digit industry SIC codes of the LTAOFs for the years 2000 through 2015. It is noteworthy that the fiscal year 2000 observations are lost in the analysis, given that the computation of several variables includes one year lagged data. Finally, after excluding observations with missing data to calculate our LTAV proxies, we are left with a sample of 178,054 firms (excluding LTAOFs), corresponding

[2]Aranzadi is the most comprehensive online legal information database on the market, managed by company Thomson Reuters, and including Spanish legislation, doctrine and jurisprudence.

[3]The bulletin board of the Labour and Social Security Inspectorate is governed by Ministry of Employment and Social Security Order ESS/1892/2013 of October 8th, 2013.

[4]SABI is a financial database, managed by company Bureau Van Dijk, containing financial statements, stock data and other legal structure information on companies in Spain and Portugal.

to 857,790 firm-year observations from 2001 through 2015, which we use for our estimations. Table 1 shows the distribution of the firms and firm-years included in our sample by two-digit industry SIC code.

(Insert Table 1 here)

Pearson Chi-squared test of independence indicates that the percentage distribution of other SABI firms in the various two-digit SIC codes significantly differs from that of LTAOFs ($\chi2(25) = 850.31$; $p<0.01$). More specifically, relative to the other SABI firms, LTAOFs are particularly more abundant in the Construction sectors (SIC codes 15, 16, 17), cumulatively representing 28.04% of LTAOFs, followed by Business Services (SIC code 73), representing 13.76% of LTAOFs. It is noteworthy that these sectors, especially Construction, are among those sectors that previous studies find to be most severely affected by LTAV practices (Buehn, 2012; Haigner et al., 2013; Williams et al., 2011).

3.2 LTAV Proxies

As previously stated in the hypothesis development section, our LTAV proxies are based on the ratio of SOCs paid to lagged total assets. We use SOCs reported in the income statement by nature, which all Spanish private and public companies must file with the public company register, as part of the legally required financial statements. It is noteworthy that reported SOCs can be mostly considered fully paid, considering that Spanish social security regulation (royal law decree n° 2064/1995 of December 22nd, 1995) establishes strict payment due dates within the following month of the wage accrual period.

Therefore, our first LTAV proxy is the abnormal level of the ratio SOCs to lagged assets (*AbSOC_Tot*), computed as the residuals of the Eq. (2) model, simultaneously estimated with Eq. (1) model for each of the 138 three-digit industry SIC codes[5], using a two-stage least square procedure for panel-data models with firm fixed effects (Baltagi, 2013). Specifically, the fitted dependent variable of the Eq. (1) is included as covariate in Eq. (2).

It is noteworthy that Eq. (1) model is similar to that employed by previous studies for the calculation of normal and abnormal production costs and discretionary expenses (e.g., Ding, Li, & Wu, 2018; Ge & Kim, 2014; Hong & Andersen, 2011).

$$\frac{PERS_{i,t}}{ln(TA_{i,t-1})}=\beta_0+\beta_1\frac{1}{ln(TA_{i,t-1})}+\beta_2\frac{S_{i,t}}{ln(TA_{i,t-1})}+\beta_3\frac{\Delta S_{i,t}}{ln(TA_{i,t-1})}+\beta_4\frac{\Delta I_{i,t}}{ln(TA_{i,t-1})}+FirmFE+YearFE+\varepsilon_{i,t} \quad (1)$$

[5]In untabulated robustness tests, we simultaneously re-estimate the models cross-sectionally for each industry-year combination and the results are qualitatively analogous to those presented.

$$\frac{SOC_{i,t}}{ln(TA_{i,t-1})} = \beta_0 + \beta_1 \frac{1}{ln(TA_{i,t-1})} + \beta_2 \left[\frac{\widehat{PERS}_{i,t}}{ln(TA_{i,t-1})}\right] + FirmFE + YearFE + \varepsilon_{i,t} \quad (2)$$

Where $SOC_{i,t}$ is the social contribution expenses in year t; $ln(TA_{i,t-1})$ is the natural logarithm of total assets in year t-1[6]; $S_{i,t}$ is the net sales in year t; $\Delta S_{i,t}$ is the change in net sales from year t-1 to t ($S_{i,t} - S_{i,t-1}$); $\Delta I_{i,t}$ is change in finished product and work-in-process inventories from year t-1 to t[7]; and $PERS_{i,t}$ is total personnel costs in year t, excluding SOCs; *FirmFE* is firm fixed effects; *YearFE* is year fixed effects. Therefore, *AbSOC_Tot* is the difference between actual SOC_t (deflated by $ln(TA_{t-1})$) and normal SOCs (NSOCs) estimated by the fitted values of Eq. (2). Importantly, lower and negative values of *AbSOC_Tot* suggest higher probability of firm engagement in LTAV and vice versa. Furthermore, *AbSOC_Tot* can be defined as a composite measure of LTAV given that it captures both conforming LTAV and non-conforming LTAV. Indeed, low *AbSOC_Tot* may arise from visible low rates of SOCs on reported personnel costs because of non-conforming LTAV strategies. However, higher predicted personnel costs with respect to actual costs arising from Eq. (1) and signalling their possible underreporting, also influence lower *AbSOC_Tot* attributable to conforming LTAV.

Our second LTAV proxy is the abnormal level of the ratio SOCs to lagged assets (*AbSOC_NConf*), computed as the residuals of the Eq. (3) panel data model individually estimated for each of the 138 three-digit industry SIC codes.

$$\frac{SOC_{i,t}}{ln(TA_{i,t-1})} = \beta_0 + \beta_1 \frac{1}{ln(TA_{i,t-1})} + \beta_2 \frac{PERS_{i,t}}{ln(TA_{i,t-1})} + FirmFE + YearFE + \varepsilon_{i,t} \quad (3)$$

Proxy *AbSOC_NConf* only captures non-conforming LTAV strategies, given that the Eq. (3) only considers reported personnel costs. Hence, unpaid SOCs due to personnel cost underreporting cannot influence *AbSOC_NConf*.

Finally, we compute a third LTAV proxy by subtracting proxy *AbSOC_NConf* from composite proxy *AbSOC_Tot*:

[6]We deflate all variables by natural logarithm of lagged total assets to address the nonlinearity of the model. An untabulated analysis of residuals shows that this expedient achieves its aim and significantly improves the explanatory power of the model.

[7]We add this variable to exclude these inventory adjustments from the possible causes of the regression residuals ultimately affecting our LTAV proxies.

$$AbSOC\_Conf = AbSOC\_Tot - AbSOC\_NConf \tag{4}$$

AbSOC_Conf may only capture conforming LTAV mostly linked to strategies aiming to avoid SOCs payment through the underreporting of personnel costs. Although the employment of UDW may be a plausible explanation for low negative values of *AbSOC_Conf*, we cannot rule out that more efficient firms, with high labour productivity, may also score significantly low in this proxy as well as in *AbSOC_Tot* proxy. Furthermore, differences in degree of operating leverage (proportion of fixed costs relative to variables costs) and capacity utilization, unrelated to LTAV, may also affect the values of our proxies. In this regard, we partially address these concerns in an additional analysis following the presentation of the main regression results.

3.3 Base Regression Model on LTAV Determinants

To test our hypothesis and the significance of possible LTAV determinants, we regress our estimated LTAV proxies on the hypothesis-related independent variable *LTAV_FY*, taking value of 1 for LTAOFs in the years of the infraction and 0 otherwise. Furthermore, we add other control variables, defined in detail in the Appendix A, that may be determinants of LTAV, based on findings of previous research on ITAV (Lanis & Richardson, 2015; Moore, Suh, & Werner, 2017) as well as of Ravenda et al.'s (2015) study on LTAV in Italy. Indeed, we assume that, in some circumstances, motivations and incentives to engage in ITAV may also lead to engage in LTAV, and some analogies may be found between the Italian and the Spanish context. Furthermore, opportunities to engage in LTAV may be associated with those to engage in ITAV, given that LTAV increases taxable income through the reduction of SOCs and personnel expenses.

Specifically, we include a variable for firm size (*SIZE*) in our model, that we expect to be positively associated with LTAV. Indeed, larger firms may need more flexible and lower cost workforce. Furthermore, because of a wider separation of ownership and control, they may be less risk averse than smaller firms, which may deem LTAV as a risky activity imposing significant costs on a firm (Lanis & Richardson, 2015). Finally, the greater economic and political power of larger firms may grant them more leeway to reduce their labour tax burden (Lanis & Richardson, 2015). We also add a variable for capital intensity (*CAPINT*), measured as the proportion of fixed assets, that we expect to be negatively associated with LTAV, consistent with previous studies documenting a higher presence of LTAV practices (e.g., UDW) in sectors with high labour intensity and low technology and workforce qualification

(Anagnostopoulos et al., 2015; Pfau-Effinger, 2009). In addition, we include a variable for sales growth (*GROWTH*) that may be negatively associated with LTAV, due to the wider availability of financial resources in growing firms, which may discourage the reduction of personnel costs through LTAV practices (Ravenda et al., 2015). Previous studies show a positive association between ITAV and income-decreasing discretionary accruals (*DAC*) in listed companies, providing evidence that some ITAV is carried out by managing accruals (Wilson, 2009). Hence, we include variable *DAC* and expect it to be negatively related to LTAV, given that firms may try to offset lower SOCs (higher LTAV), having a taxable income-increasing effect, with more negative *DAC*, having a taxable income-decreasing effect. In particular, earnings management for ITAV purposes is even more likely in a country like Spain, characterized by a strong alignment of financial and tax accounting (Coppens & Peek, 2005). We also consider the relation between LTAV and management of real transactions affecting cash flow. More specifically, we focus on material costs, including both raw materials and merchandise, and service costs, which may be manipulated to avoid taxes. Hence, we estimate the abnormal level of material costs (*AbMAT*) and service costs (*AbSERV*), using a model similar to that adopted by prior studies for abnormal production costs (Ge & Kim, 2014; Hong & Andersen, 2011), and include them as control variables. We expect a positive association between LTAV and *AbMAT*, given that firms engaging more in LTAV may simultaneously over-report material expenses, to reduce taxable income. Furthermore, undeclared sales, which may be used to finance UDW, may result in higher *AbMAT* computed with respect to sales. On the other hand, LTAV may also be achieved by abusing of subcontracted workforce or self-employed people, when the working relationship should be regulated as subordinate employment according to the labour law (e.g., false self-employment) (EC, 2014; Pfau-Effinger, 2009). In these cases, personnel costs may be reported as service costs by resulting in higher *AbSERV*. Next, we include a variable to control for firm's cash level (*CASH*), that we expect to be positively associated with LTAV. Indeed, cash-intensive businesses may have more opportunities to generate undeclared cash and pay black salaries without bearing the related SOCs. We believe that motivations and the incentives to engage in ITAV may be similar to those to engage in LTAV. Therefore, we predict a positive relation between LTAV and a proxy of ITAV (*AbETR*), that we include in the model. Previous studies find that greater volatility in profitability (*Std_ROA*) may impact a firm's tax-planning strategies (Kim & Zhang, 2016; Rego & Wilson, 2012). More specifically, higher uncertainty linked to higher profitability volatility may lead firms to increase the flexibility of their workforce, by abusing of more flexible employment contracts with lower labour tax burden or by resorting to UDW. Hence, we predict a positive association between *Std_ROA* and LTAV. We additionally include other variables to control for age, indebtedness and performance of the firms, for which we do not make any prediction on their association with LTAV.

Finally, to ensure that variation in economic and demographic factors at regional level does not influence our results, we include some macroeconomic control variables such as: unemployment (*UNEMPL*), population (*POPUL*), GDP per capita (*GDP_PC*), GDP growth (*Δ%GDP*), and hourly labour cost (*HLBRC*). In this regard, we expect unemployment to be positively related to LTAV. Indeed, previous studies document a positive association between UDW, the most aggressive form of LTAV, and unemployment even in Mediterranean countries such as France, Spain and Greece (Buehn, 2012; Dell'Anno et al., 2007; Haigner et al., 2013).

In summary, to test our hypothesis we estimate the following base regression model for our LTAV proxies, whose variables are defined in the Appendix A:

$$LTAV\_PROXY_{i,t}=\beta_0+\beta_1 LTAV\_FY_{i,t}+\sum\beta_k CONTROLS_{k,i,t}+FirmFE+YearFE+\varepsilon_{i,t} \quad (5)$$

4 Results and Discussions

4.1 Estimation of Normal and Abnormal SOCs

Table 2 displays the regression results of Eq. (2) model used to estimate NSOCs and whose residuals represent our composite LTAV proxy *AbSOC_Tot*. Results are presented following the Fama and MacBeth's (1973) procedure. More specifically, the reported coefficients and R^2 are mean values of panel data fixed effect estimations across 138 three-digit SIC-industries. Hence, the significance levels of coefficients are computed based on the standard errors of the coefficients across industries. Furthermore, to mitigate the influence of outliers, all variables of Eq. (2) model are winsorized at the top and bottom 1 percent of their distributions, before running the estimations.

(Insert Table 2 here)

It is noteworthy that all the estimated regressions are significant at the 0.01 level according to the Wald χ^2 tests. Furthermore, the average coefficient on variable [$PERS_{i,t}/ln(TA_{i,t-1})$], the predicted value of Eq. (1) model, is positive and significant ($p<0.01$), as expected. More importantly, the fit of the model is on average very satisfactory. More precisely, untabulated values of R^2, across the 138 estimations, range from a minimum of 0.633 for SIC code 024 (Dairy Farms) to a maximum of 0.993 for SIC code 565 (Family Clothing Stores), with an average of 0.945 showed in the table. This represents a significant improvement in comparison with Ravenda et al.'s (2015) estimation model of *ABSOCs*, whose average R^2 is only 0.29, and with regression models aiming to estimate ITAV through abnormal book-tax differences (Desai & Dharmapala, 2009; Kim & Zhang, 2016; Rego & Wilson, 2012) and abnormal cash taxes paid to lagged total assets (Badertscher et al., 2017), whose R^2 coefficients also stay below 0.30.

4.2 Descriptive Statistics and Univariate Analysis

Table 3 reports descriptive statistics for the variables included in our base regression model and comparison tests between LTAOF-year observations and the other SABI firm-year observations. All continuous variables, except *UNEMPL, POPUL, GDP_PC, Δ%GDP,* and *HLBRC*, are winsorized at the top and bottom 1 percent of their distributions to avoid the influence of outliers. Furthermore, they are standardized by industry-year to enhance the comparability across industries and years.

(Insert Table 3 here)

As expected, the means and the medians of variables *AbSOC_Tot* and *AbSOC_Conf* are negative and significantly ($p<0.01$) lower for LTAOF-years relative to the other SABI firm-years. These results provide a first support for our hypothesis on abnormally lower SOCs exhibited by LTAOFs as well as a first validation of the effectiveness of our LTAV proxies. On the other hand, the results are more conflicting for variable *AbSOC_NConf*, given that its mean for LTAOF-years is positive and significantly ($p<0.01$) higher, relative to the other SABI firm-years, whereas its median is negative and significantly ($p<0.01$) lower as for the previous two proxies. In this regard, the Wilcoxon median test may be more reliable than the mean t-test, because of the rejection of the hypothesis of normality for *AbSOC_NConf*, based on the untabulated Shapiro-Wilk test. However, as an advance of the next multivariate regression results, we could envisage that conforming LTAV, proxied by *AbSOC_Tot* and *AbSOC_Conf*, may be prevalent over non-conforming LTAV, proxied by *AbSOC_NConf*, within our LATOFs sample.

Turning to control variables, it is noteworthy that LTAOFs are on average significantly ($p<0.01$) larger (*SIZE*), older (*AGE*), more leveraged (*LEVTOT*), and exhibit higher abnormal service costs (*AbSERV*) than the other firms. In contrast, they are significantly ($p<0.01$) less capital intensive (*CAPINT*), profitable (*ROA*), and cash intensive (*CASH*). In particular, the low capital intensity of LTAOFs is consistent with previous research showing a larger diffusion of LTAV practices such as UDW in sectors characterized by low capital investments in technology and high labour intensity (Anagnostopoulos et al., 2015; Pfau-Effinger, 2009). Furthermore, higher service costs in LTAOFs may indicate a higher resort to subcontracted workforce or an abuse of self-employed people as a means to avoid SOCs (EC, 2014; Pfau-Effinger, 2009).

As regards the macroeconomic variables, LTAOFs are significantly more concentrated in regions and years with higher unemployment (*UNEMPL*), population (*POPUL*), hourly labour cost (*HLBRC*), and GDP per capita (*GDP_PC*), but lower GDP growth (*Δ%GDP*). Assuming a certain representativeness of our sample, these results are mostly consistent with some previous studies on the determinants of the shadow economy in Mediterranean countries such as France, Spain and Greece (Dell'Anno et al., 2007; Schneider, 2015).

Finally, Table 4 shows that Pearson correlations between control variables of the base regression model in Eq. (5) are mostly low (below 0.47), providing evidence that collinearity is unlikely to affect our estimations.

(Insert Table 4 here)

4.3 Regression Results and Discussion

Table 5 shows the estimations of the Eq. (5) base regression model for the three LTAV proxies.

(Insert Table 5 here)

Initially, it is noteworthy that the estimated regressions are significant at the 0.01 level according to the F tests. Importantly, the coefficient on the hypothesis-related variable *LTAV_FY* is negative and significant ($p<0.01$) both in *AbSOC_Tot* and *AbSOC_Conf* regressions, providing support for our hypothesis on lower *ABSOCs* exhibited by LTAOFs. Conversely, the coefficient on independent variable *LTAV_FY* is not significant at conventional levels in *AbSOC_NConf* regression, contrasting with our hypothesis. Overall, these results suggest that lower *ABSOCs* within LTAOFs are mostly due to conforming LTAV strategies rather than non-conforming LTAV strategies. Hence, LTAOFs in our sample may, for some reasons, prefer the former strategies.

As regards the control variable, all their coefficients are mostly significant at the 0.01 level and have the expected signs, with only some few exceptions such as the case of variable *UNEMPL*. In this respect, the unexpected significant ($p<0.01$) and positive coefficient on *UNEMPL*, both in *AbSOC_Tot* and *AbSOC_Conf* regressions, may be due to the fact that regions with lower unemployment may attract more immigrants, even illegal, willing to accept undeclared employment (conforming LTAV), consistent with the aforementioned marginalization thesis holding that spatially and socio-economically marginalized groups are more likely to participate in UDW (Taiwo, 2013; Williams & Horodnic, 2015). Furthermore, lower unemployment may foster the *moonlighting type* UDW, consisting in qualified craftsmen and professionals with another regular employment offering undeclared services as a second job (Pfau-Effinger, 2009).

In summary our regression results show that, to properly detect and measure LTAV as well as its trends, it is essential to adopt proxies capable of signalling both conforming and non-conforming LTAV strategies. Indeed, firms may simultaneously engage in both strategies or, as occurred in our sample of LTAOFs, the most difficult to measure conforming LTAV may be the prevalent strategy, for providing more room to avoid SOCs and being more easily disguisable in front of tax authorities. Furthermore, our regression results show that several factors at firm and macroeconomic level significantly affect LTAV practices. Regulators may consider them, to enhance the fight against illegal LTAV and detect abuses, in violation of the spirit of the labour law, aiming to reduce the labour tax burden.

4.4 Additional Analyses and Robustness Checks

4.4.1 LTAV Proxies Based on Effective SOCs Rates

Besides *ABSOCs*, we develop and test alternative and more direct LTAV proxies based on effective SOC rates (*ESOCRs*), which are more similar to ETRs used for ITAV. However, these proxies may only partially capture the phenomenon and then be less effective in signalling LTAV, as well as producing more biased results than our main proxies. Indeed, these proxies may fail to isolate the effects of the industry characteristics, firm scale, productivity, capital intensity, year-specific macroeconomic and regulatory conditions, that may influence their values, without being related to LTAV.

That said, we produce the first alternative LTAV measure (*ESOCR_Tot*), by dividing SOCs (deflated by natural logarithm of lagged assets) by the expected personnel costs, computed as the fitted value of the Eq. (6) model, individually estimated for each of the 138 three-digit industry SIC codes.

$$\frac{PERS_{i,t}}{ln(TA_{i,t-1})}=\beta_0+\beta_1\frac{1}{ln(TA_{i,t-1})}+\beta_2\frac{S_{i,t}}{ln(TA_{i,t-1})}+\beta_3\frac{\Delta S_{i,t}}{ln(TA_{i,t-1})}+\beta_4\frac{\Delta I_{i,t}}{ln(TA_{i,t-1})}+FirmFE+YearFE+\varepsilon_{i,t} \quad (6)$$

Because of being based on expected personnel costs, *ESOCR_Tot* proxy may be able to signal both conforming and non-conforming LTAV. However, it bears most of the *ESOCRs* limitations, relative to our main proxies, especially the inability to isolate effects that vary for each specific industry and year. Therefore, to partially relieve these latter concerns, we standardize *ESOCR_Tot* by three-digit SIC industry-year.

Our second ESOCR proxy (*ESOCR_NConf*) is the ratio of SOCs to actual personnel costs standardized by three-digit SIC industry-year. It is noteworthy that proxy *ESOCR_NConf* can only capture non-conforming LTAV strategies, given that it is only based on reported personnel costs and then cannot be influenced by unpaid SOCs arising from undeclared personnel costs.

Finally, we compute a third ESOCR proxy (*ESOCR_Conf*) by subtracting proxy *ESOCR_NConf* from composite proxy *ESOCR_Tot.* Proxy *ESOCR_Conf* may be able to only measure the effect of conforming LTAV, by isolating it from composite proxy *ESOCR_Tot*. Table 6 shows the estimations of the Eq. (5) base regression model for the three LTAV proxies based on *ESOCRs*.

(Insert Table 6 here)

Again, all the estimated regressions are significant at the 0.01 level according to the F tests. Importantly, the coefficient on the variable *LTAV_FY* is negative and significant ($p<0.01$) in all three regressions. Hence, *ESOCRs* indicate that, relative to the other firms, LTAOFs engage more in conforming and non-conforming LTAV strategies. It is noteworthy that these results are partially different from previous estimations based on *ABSOCs*, which only provide clear evidence of conforming LTAV strategies within LTAOFs. Most of the coefficients on the other control variables are significant at conventional levels, although in some cases their signs are not consistent with those of the corresponding coefficients in *ABSOCs* regressions.

In summary, our results suggest that LTAV proxies based on *ESOCRs* could complement proxies based on *ABSOCs*, despite some concerns on the measurement abilities of the former. Nonetheless, additional empirical analysis may be needed to come to more definitive conclusions on the differences in terms of performance between the two types of LTAV proxies.

4.4.2 Addressing Differences in Firm Efficiency

To relieve concerns that differences in firm efficiency may affect our results and specifically more labour efficient firms may wrongly appear as labour-tax avoidant because of their relatively low reported personnel costs, we compute an additional efficiency-adjusted LTAV proxy (*AbSOC_EAdj*). More specifically, we first estimate the input efficiency score for each firm-year by using Data Envelopment Analysis (DEA) method with variable returns to scale, applied to each three-digit SIC industry-year group to include firms with comparable business models, technologies and cost structures. Indeed, DEA is a linear programming nonparametric methodology to measure the relative efficiency of multiple firms, based on the relationships between multiple inputs and outputs used in the production conversion process (Cook, Tone, & Zhu, 2014). The DEA input efficiency score (*EFF_SCORE*) ranges from 0, minimum efficiency, to 1, maximum efficiency. Based on previous studies (Demerjian, 2017; Doumpos & Cohen, 2014), we estimate *EFF_SCORE* by considering one output and three inputs, all derived from firms' publicly available financial reports. In particular, as output variable we use the value added (*VALUE_ADDED*), computed by deducting material consumption and service expenses from sale revenues increased by changes in finished product and work-in-process inventories. On the other hand, we include as DEA input variables: Net Property, Plant, and Equipment (*PPE*), net intangible fixed assets (*INTANG*), and total personnel costs (*PERS*). We consider the beginning of period balance for *PPE* and *INTANG.* Importantly, we assume that underreporting of a single input such as labour costs, affected by LTAV strategies, does not significantly affect the efficiency exhibited by the firm, even because it may be offset by underreporting of some outputs (e.g., undeclared revenues). Therefore, the efficiency computed through DEA may be a valid approximation of the real firm efficiency also for LTAOFs. Table 7 presents descriptive statistics of DEA input, output variables, and computed efficiency scores for LTAOFs and the other firms. Values of input and output variables are expressed in thousands of euros. It is noteworthy that untabulated Shapiro-Wilk tests for normality lead to rejection of the hypothesis of normal distribution of all DEA variables. Therefore, when comparing variables between LTAOFs and the other firms, we rely more on Wilcoxon test than t-test.

(Insert Table 7 here)

Interestingly, LTAOFs show significantly ($p<0.01$) higher median values for all output and input variables. In contrast, LTAOFs are only marginally significantly ($p<0.10$) more efficient than the other firms. More precisely, the *EFF_SCORE* median for LTAOFs (0.12) is 19% higher than that for the other firms (0.10). The significant difference in size between LTAOFs and the other firms, inferred from the variable magnitude differences, may be consistent with the difference in efficiency.

Subsequently, we adjust both personnel costs and SOCs for all firm-year observations by multiplying them by the corresponding input efficiency score (*EFF_SCORE*). Finally, we estimate the efficiency-adjusted LTAV proxy (*AbSOC_EAdj*) in the same way as the composite LTAV proxy *AbSOC_Tot*, by replacing actual personnel costs and SOCs with the efficiency-adjusted ones in the Eq. (1) and Eq. (2), respectively. Table 8 shows the estimation of the Eq. (5) base regression model for *AbSOC_EAdj* proxy.

(Insert Table 8 here)

The estimated regression is significant at the 0.01 level according to the F test. More importantly, the coefficient on the variable *LTAV_FY* is negative and significant ($p<0.01$), consistent with our previous estimations, providing further support for our hypothesis.

In summary, our robustness test suggests that it is unlikely for our findings on lower *ABSOCs* for LTAOFs to be significantly driven by differences in efficiency among the firms in our sample.

4.4.3 Propensity Score Matching

As a further robustness test for our results, we address the concern on a possible selection bias of the LTAOFs included in our sample. Hence, we re-estimate the Eq. (5) base regression model within a matched sample built through a propensity score procedure, which allows to identify a control group of other SABI firms as well as accounting for a possible endogeneity (Tucker, 2010). More specifically, we estimate the propensity of a firm to be included within LTAOFs using a logit regression, where the dependent variable is a dichotomous variable taking value of 1 for LTAOFs and 0 otherwise, whereas the independent variables are the control variables included in the Eq. (5) base regression model and fully described in the Appendix A. The predicted probabilities from the logit regression are the propensity scores. Therefore, we match each LTAOF-year to one SABI firm-year[8] by nearest propensity score without replacement. We then then re-estimate the Eq. (5) base regression model using the propensity score matched sample. Table 9 reports the results of this estimation.

(Insert Table 9 approximately here)

Interestingly, regression results for the propensity score matched sample are mostly consistent with those of previous estimations for the whole population, leading to similar conclusions in terms of support for the hypothesis of our study. In summary, the documented robustness of our results to different estimation methods and matching procedures can relieve concerns that our findings are driven by uncontrolled factors or selection bias.

5 Conclusions

In this study, we build novel proxies for LTAV, based on SOCs reported in the income statements of 857,790 Spanish firm-years for the period 2001-2015. Subsequently, we determine whether the developed LTAV proxies can provide evidence of LTAV strategies within a sample of 189 LTAOFs in the years of their supposed infraction. Our multivariate regression results support our hypothesis on the abnormally low SOCs exhibited by LTAOFs because of adopted non-conforming LTAV strategies. These results confirm the efficacy of our proxies to signal LTAV and its variability with a wide sample of firms.

Our study is pioneer in the examination of LTAV based on financial accounting information. Importantly, the analysis of LTAV may provide a more comprehensive picture of tax planning

[8]We perform additional estimations by matching each LTAOF-year to two and three SABI firm-years, respectively, and we obtain results qualitatively analogous to the one-to-one matching estimations.

strategies pursued by companies as well as of their determinants, which are widely examined in the extant mature literature on ITAV. Indeed, companies could envisage LTAV as simultaneous or alternative to ITAV strategies, especially in strongly competitive and economically volatile contexts, where the labour tax burden represents an important driver of the company performance (Anagnostopoulos et al., 2015). In this regard, various studies (Flórez & Perales, 2016; Harney, 2011; International Labour Office (ILO), 2016; Sikka, 2006) document that, in recent years, the globalization, the interconnectedness of businesses across the world fostered by technological advances (digital economy), social changes (e.g., the increased role of women in the labour force), labour regulatory changes relaxing the employment protection, the growth of international migrations, all together, have encouraged the use of more precarious, temporary, and in general non-standard employment arrangements (NSE), including, for example, the so-called gig workers who provide contracted, freelance work on a short-term basis especially via digital platform technologies (Lobel, 2017). These NSE provide employers with more opportunities to engage in LTAV practices, by escaping from employment protection law, given that workers in NSE are sometimes excluded by law from full social security coverage and protection, because of their, often questionable, self-employed status (International Labour Office (ILO), 2016; Todolí-Signes, 2017). Indeed, in some cases, evading traditional regulations, especially labour and income taxes, appears to have been a key rationale for establishing digital businesses in the first place (Stewart & Stanford, 2017). It is noteworthy that the violation of employee social rights is particularly widespread in Asian developing countries, where local labour-intensive companies, subcontracted by multinational companies, engage in socially irresponsible practices towards their employees aiming to reduce labour costs and satisfy the demand of low-priced products from their international business customers (Azmat & Haque, 2015; Belal, Cooper, & Khan, 2015).

On the other hand, the results of our study may support authorities in the fight against labour tax evasion and related labour exploitation practices, by enhancing their detection and by directing the related public policies. The consequent desirable increase in the tax revenue may alleviate the difficulties of several European countries in sustaining their public pension systems, which have been suffering a steady reduction of contributions over the past few years (French & Jones, 2012; Han, 2013). Importantly, the consequent stricter enforcement of labour protection regulations may lead firms to adopt more socially responsible and sustainable practices towards their employees, whose interests may be unfairly sacrificed in favour of other stakeholders.

These findings, however, are subject to some limitations. Specifically, we cannot exclude the presence of a selection bias in our sample, considering that we only examine LTAOFs whose infraction notifications have been published and firms whose financial statements are available on the SABI database. Hence, the validity of our LTAV proxies should be empirically tested on wider and more diversified samples even to define *ABSOCs* thresholds, below which firms are more likely to be engaging in LTAV practices. As further suggestions for future research, this study could be replicated in other countries and more specific determinants of LTAV could be examined to also assess whether the results of previous studies on ITAV are confirmed for LTAV.

Appendix A. Definition of Variables

LTAV_PROXY (LTAV proxy) = one of *AbSOC_Tot*, *AbSOC_NConf*, *AbSOC_Conf*, *ESOCR_Tot*, *ESOCR_NConf*, *ESOCR_Conf*, *AbSOC_EAdj*:

AbSOC_Tot = abnormal SOCs equal to residuals from Eq. (2) simultaneously estimated with Eq. (1)

AbSOC_NConf = abnormal SOCs equal to residuals from Eq. (3)

AbSOC_Conf = *ABSOC_Tot* minus *ABSOC_NConf*

ESOCR_Tot = SOCs, deflated by natural logarithm of lagged assets, divided by the expected personnel costs computed as the fitted value of Eq. (6), standardized by industry-year

ESOCR_NConf = SOCs divided by personnel costs, standardized by industry-year

ESOCR_Conf = *ESOCR_Tot* minus *ESOCR_NConf*

AbSOC_EAdj = abnormal SOCs equal to residuals from Eq. (2) simultaneously estimated with Eq. (1), by using personnel costs (*PERS*) and SOCs (*SOC*) multiplied by input efficiency score (*EFF_SCORE*) from DEA

LTAV_FY = dummy variable taking value of 1 for LTAOFs in the years of the infraction and 0 otherwise

CONTROLS = control variables of Eq. (5) regression model:

SIZE = natural logarithm of total assets in thousands of euros, standardized by industry-year

AGE = firm's age in years, standardized by industry-year

LEVTOT = Short-term debt plus long-term debt, divided by total assets, standardized by industry-year

CAPINT = net tangible and intangible fixed assets divided by total assets, standardized by industry-year

ROA = income before tax divided by total assets, standardized by industry-year

LOSS = dummy variable that takes a value of 1 if the firm had two or more consecutive years of negative income including the current and 0 otherwise

GROWTH = percentage change in net sales relative to previous year, standardized by industry-year

DAC = discretionary accruals estimated from the performance-adjusted modified Jones model (Kothari, Leone, & Wasley, 2005)

AbMAT = abnormal material costs equal to residuals from the following Eq. (7) with material costs (*MAT*) as dependent variable, estimated cross-sectionally for each industry-year

$$\frac{MAT_{i,t}(SERV_{i,t})}{\ln(\mathrm{TA}_{i,t-1})} = \beta_0 + \beta_1 \frac{1}{ln(TA_{i,t-1})} + \beta_2 \frac{S_{i,t}}{ln(TA_{i,t-1})} + \beta_3 \frac{\Delta S_{i,t}}{ln(TA_{i,t-1})} + \varepsilon_{i,t} \qquad (7)$$

AbSERV = abnormal service costs equal to residuals from Eq. (7) with service costs (*SERV*) as dependent variable, estimated cross-sectionally for each industry-year

CASH = cash and cash equivalents divided by total assets, standardized by industry-year

AbETR = abnormal effective tax rate equals to industry- and size-matched GAAP ETR minus firm's GAAP ETR, where GAAP ETR is the total tax expense divided by pre-tax income. Industry- and size-matched GAAP ETR is the average GAAP ETR for the portfolio of firms in the same quintile of total assets and the same industry over the same time period

Std_ROA = standard deviation of ROA over the past four years, standardized by industry-year

INVENT = inventory divided by total assets, standardized by industry-year

UNEMPL = annual unemployment rate of autonomous region, provided by INE (Spanish Statistical Office)

POPUL = natural logarithm of autonomous region population, provided by INE

GDP_PC = natural logarithm of autonomous region GDP per capita (CPI deflated, 2010 equivalents), provided by INE

Δ*%GDP* = autonomous region GDP growth rate, provided by INE

HLBRC = total hourly labour cost (CPI deflated, 2016 equivalents), provided by INE

FIRM FE = firm fixed effects

IND FE = dummy variables for two-digit SIC code industries

YEAR FE = dummy variables for fiscal years

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Table 1. Industry distribution of LTAOFs and other SABI firms for the period 2001-2015

		LTAOFs				Other SABI firms			
		Firms		Firm-years		Firms		Firm-years	
Sic code	Industry description	Freq.	%	Freq.	%	Freq.	%	Freq.	%
02	Agricultural Production-Livestock	2	1.06	7	1.37	269	0.15	1,805	0.21
07	Agricultural Services	1	0.53	1	0.20	95	0.05	513	0.06
15	Building Construction-gen Contractors	16	8.47	43	8.41	3,148	1.77	16,780	1.96
16	Heavy Construction Except Building	6	3.17	19	3.72	362	0.20	2,976	0.35
17	Construction-special Trade Contractors	31	16.40	65	12.72	1,388	0.78	6,917	0.81
20	Food & Kindred Products Mfrs	4	2.12	13	2.54	9,030	5.07	51,499	6.00
27	Printing Publishing & Allied Industries	6	3.17	20	3.91	5,327	2.99	27,377	3.19
30	Rubber & Miscellaneous Plastics Mfrs	2	1.06	6	1.17	2,599	1.46	15,799	1.84
32	Stone Clay Glass & Concrete Prods Mfrs	6	3.17	23	4.50	3,192	1.79	19,337	2.25
34	Fabricated Metal Products Mfrs	7	3.70	14	2.74	9,100	5.11	49,085	5.72
35	Industrial & Commercial Machinery Mfrs	5	2.65	14	2.74	3,513	1.97	20,699	2.41
42	Motor Freight Transportation/warehouse	8	4.23	24	4.70	8,480	4.76	38,986	4.54
50	Wholesale Trade-durable Goods	20	10.58	62	12.13	26,272	14.76	149,222	17.40
51	Wholesale Trade-nondurable Goods	10	5.29	25	4.89	21,688	12.18	116,747	13.61
54	Food Stores	4	2.12	12	2.35	5,643	3.17	25,525	2.98
56	Apparel & Accessory Stores	2	1.06	5	0.98	3,777	2.12	17,173	2.00
57	Home Furniture & Furnishings Stores	4	2.12	7	1.37	7,339	4.12	33,138	3.86
58	Eating & Drinking Places	7	3.70	12	2.35	495	0.28	2,009	0.23
59	Miscellaneous Retail	3	1.59	4	0.78	9,628	5.41	41,455	4.83
70	Hotels Rooming Houses & Camps	2	1.06	6	1.17	840	0.47	6,559	0.76
72	Personal Services	2	1.06	7	1.37	4,874	2.74	16,501	1.92
73	Business Services	26	13.76	73	14.29	17,257	9.69	69,904	8.15
75	Auto Repair Services & Parking	1	0.53	3	0.59	8,771	4.93	36,785	4.29
79	Amusement & Recreation Services	5	2.65	13	2.54	4,674	2.63	19,238	2.24
82	Educational Services	2	1.06	9	1.76	3,981	2.24	14,004	1.63
87	Engineering & Accounting & Mgmt Svcs	7	3.70	24	4.70	16,312	9.16	57,757	6.73
Total		189	100	511	100	178,054	100	857,790	100

Source: SABI database, 2017

Table 2. Regression estimations of normal and abnormal SOCs

	$SOC_{i,t}/ln(TA_{i,t-1})$		
Variables	**Coef.**	**z-stat**	**p-val.**
$1/ln(TA_{i,t-1})$	-5.523	-0.607	0.446
$[PERS_{i,t}/ln(TA_{i,t-1})]$	0.274	79.161	0.000
FIRM_FE	Yes		
YEAR_FE	Yes		
Intercept	0.179	-0.581	0.339
Mean R^2	0.945		
Mean Wald χ^2	157,185		0.000
Mean obs.	10,009		
Total obs.	1,381,257		
Number SIC-industries	138		

Notes: The p-values are two-tailed. The coefficients and R^2 are the mean values of coefficients and R^2 of panel data fixed effect estimations across 138 three digit SIC-industries. The z-statistics are calculated using the standard error of the related mean coefficient across industries. $ln(TA_{i,t-1})$ is the natural logarithm of lagged total assets; $SOC_{i,t}$ is social contribution expenses; $[PERS_{i,t}/ln(TA_{t-1})]$ is fitted personnel costs deflated by $ln(TA_{i,t-1})$ based on first stage regression in Eq.(1); *FIRM_FE* is firm fixed effects; *YEAR_FE* is year fixed effects.

Table 3. Descriptive statistics and variable comparisons between LTAOFs and firm population from SABI database

	LTAOFs			Other firms			LTAOFs vs. Other firms	
	Mean	**Median**	**Std**	**Mean**	**Median**	**Std**	**t-test**	**Wilcoxon test**
Dependent Variables								
AbSOC_Tot	-8.231	-4.274	26.853	-0.957	0.234	14.359	***	***
AbSOC_NConf	8.416	-2.292	34.185	-0.106	-0.367	13.364	***	***
AbSOC_Conf	-16.647	-3.480	27.933	-0.851	0.201	12.958	***	***
Control Variables								
SIZE	1.526	1.735	0.987	0.476	0.353	1.038	***	***
AGE	1.007	0.924	1.066	0.886	0.743	0.865	***	**
LEVTOT	0.046	0.058	0.587	-0.099	-0.073	0.822	***	***
CAPINT	-0.249	-0.444	0.780	-0.088	-0.280	0.922	***	***
ROA	-0.070	0.069	0.957	0.092	0.071	0.751	***	***
GROWTH	0.006	-0.190	1.123	-0.036	-0.183	0.865		
DAC	-0.010	-0.011	0.188	-0.002	0.001	0.185		
AbMAT	-23.789	-4.952	159.027	-1.733	2.180	84.823	***	***
AbSERV	31.669	19.036	52.407	4.440	1.704	34.412	***	***
CASH	-0.489	-0.643	0.497	-0.121	-0.431	0.849	***	***
AbETR	-0.007	-0.033	0.203	-0.012	-0.053	0.176		
Std_ROA	-0.197	-0.452	0.770	-0.107	-0.359	0.803	**	***
INVENT	-0.149	-0.311	0.658	-0.003	-0.276	0.917	***	**
UNEMPL	15.213	13.860	7.658	10.553	9.560	4.793	***	***
POPUL	15.266	15.670	0.756	15.093	15.402	0.768	***	***
GDP_PC	10.051	10.018	0.241	9.963	9.977	0.231	***	***
Δ%GDP	0.987	1.060	2.820	3.155	3.460	1.628	***	***
HLBRC	19.785	19.148	2.596	18.830	18.290	2.543	***	***
%LOSS	15.07%			7.94%			***	
Number obs.	511			857,790				

Notes: The sample full period spans 2001–2015. *, ** and *** denote significance levels at 10%, 5% and 1%, respectively, based on a two-tailed Wilcoxon test and a two-tailed t-test for the differences in medians and means of continuous variables, respectively. Pearson chi-squared test of independence for categorical variable *%LOSS* = percentage of firms with two or more consecutive years of negative income. LTAOFs = labour tax-avoidant offending firm-years; Other firms = population of firm-years extracted from SABI database. The rest of the variables are defined in the Appendix A.

Table 4. Pearson correlations between base regression model variables

Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1.AbSOC_Tot	1										
2.AbSOC_NConf	0.826	1									
3.AbSOC_Conf	-0.016	-0.577	1								
4.SIZE	0.044	0.264	-0.405	1							
5.AGE	***-0.001***	0.117	-0.209	0.372	1						
6.LEVTOT	0.036	0.005	0.043	-0.269	-0.201	1					
7.CAPINT	0.024	-0.016	0.064	0.005	-0.053	0.068	1				
8.ROA	-0.014	0.008	-0.034	0.205	0.053	-0.467	-0.075	1			
9.LOSS	0.017	0.023	-0.015	-0.024	0.102	0.226	0.060	-0.343	1		
10.GROWTH	0.016	0.003	0.019	-0.028	-0.155	0.053	-0.003	0.073	0.006	1	
11.DAC	0.010	***0.001***	0.012	-0.002	-0.016	-0.056	0.025	0.043	-0.013	0.038	1
12.AbMAT	-0.026	-0.105	0.145	-0.045	-0.048	0.059	-0.051	-0.065	0.022	-0.002	0.028
13.AbSERV	0.040	0.166	-0.237	-0.026	-0.001	0.012	0.079	-0.047	0.070	-0.005	0.014
14.CASH	-0.052	-0.081	0.068	-0.295	-0.092	-0.140	-0.308	0.096	-0.110	0.023	-0.235
15.AbETR	0.017	***-0.001***	0.025	-0.018	-0.010	0.148	0.079	-0.200	0.252	-0.005	0.003
16.Std_ROA	***0.000***	-0.029	0.052	-0.350	-0.170	0.340	-0.063	-0.235	0.104	0.102	-0.006
17.INVENT	0.017	-0.012	0.046	-0.010	0.030	0.118	-0.299	-0.061	0.051	-0.029	0.081
18.UNEMPL	0.057	0.137	-0.160	-0.019	-0.025	0.010	0.031	0.002	0.162	0.003	0.007
19.POPUL	-0.035	-0.004	-0.044	-0.001	-0.011	0.035	-0.018	-0.018	0.003	0.012	0.002
20.GDP_PC	-0.024	0.039	-0.104	0.064	0.041	-0.007	-0.049	-0.009	0.069	0.002	-0.012
21.Δ%GDP	-0.051	-0.168	0.224	0.004	-0.002	0.005	-0.002	***-0.001***	-0.158	0.003	***0.001***
22.HLBRC	-0.024	0.043	-0.110	0.058	0.035	0.008	-0.049	-0.013	0.057	0.004	-0.013

Table 4. Pearson correlations between base regression model variables (continued)

Variables	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*
12.AbMAT	1										
13.AbSERV	-0.236	1									
14.CASH	-0.022	-0.044	1								
15.AbETR	0.021	0.045	-0.094	1							
16.Std_ROA	-0.039	0.007	0.134	0.104	1						
17.INVENT	0.094	0.008	-0.244	0.062	-0.060	1					
18.UNEMPL	0.013	0.003	-0.017	-0.009	-0.012	0.025	1				
19.POPUL	-0.020	0.016	0.010	-0.015	0.023	-0.009	0.164	1			
20.GDP_PC	-0.045	0.006	0.031	0.033	0.043	-0.064	-0.250	0.178	1		
21.Δ%GDP	0.004	***-0.001***	0.002	-0.001	0.004	-0.006	-0.595	-0.002	-0.167	1	
22.HLBRC	-0.041	0.003	0.032	0.035	0.042	-0.058	-0.157	0.314	0.861	-0.192	1

Notes: all the coefficients are significant at the 1% or lower level, based on a two-tailed test, except those in bold italics which are not significant at conventional levels. Variables are defined in the Appendix A.

Table 5. Multiple regressions of LTAV proxies based on *ABSOCs*

	Pred. Sign	*AbSOC_Tot*			*AbSOC_NConf*			*AbSOC_Conf*		
		Coef.	**t-stat**	**p-val.**	**Coef.**	**t-stat**	**p-val.**	**Coef.**	**t-stat**	**p-val.**
Variable of interest:										
LTAV_FY	–	-0.640	-3.34	0.001	-0.222	-1.15	0.252	-0.276	-3.57	0.000
Control variables:										
SIZE	–	-0.118	-5.87	0.000	0.522	27.64	0.000	-0.704	-87.16	0.000
AGE	?	-0.147	-2.35	0.019	0.506	7.93	0.000	-0.612	-24.24	0.000
LEVTOT	?	0.109	8.27	0.000	0.077	6.33	0.000	0.028	5.18	0.000
CAPINT	+	0.092	8.54	0.000	0.096	9.36	0.000	-0.018	-4.05	0.000
ROA	?	0.121	15.20	0.000	0.076	10.40	0.000	0.030	9.31	0.000
LOSS	?	-0.194	-10.00	0.000	-0.270	-14.57	0.000	0.105	13.49	0.000
GROWTH	+	0.018	3.28	0.001	0.049	9.58	0.000	-0.032	-14.93	0.000
DAC	+	0.014	0.59	0.556	0.055	2.20	0.028	-0.041	-4.36	0.000
AbMAT	–	-0.001	-6.71	0.000	-0.002	-18.08	0.000	0.001	26.10	0.000
AbSERV	–	0.003	15.76	0.000	0.004	19.86	0.000	-0.001	-12.33	0.000
CASH	–	-0.058	-6.14	0.000	-0.046	-5.46	0.000	-0.009	-2.37	0.018
AbETR	–	-0.046	-1.77	0.077	-0.071	-2.81	0.005	0.032	3.10	0.002
Std_ROA	–	-0.106	-11.64	0.000	-0.098	-11.76	0.000	0.015	4.21	0.000
INVENT	?	0.058	5.64	0.000	0.081	8.55	0.000	-0.040	-9.59	0.000
UNEMPL	–	0.010	2.73	0.006	0.006	1.53	0.126	0.004	2.86	0.004
POPUL	?	1.657	5.24	0.000	2.586	8.32	0.000	-1.178	-9.25	0.000
GDP_PC	?	2.536	8.04	0.000	3.295	10.68	0.000	-1.019	-8.02	0.000
Δ%GDP	?	-0.013	-1.68	0.092	-0.002	-0.23	0.819	-0.012	-3.69	0.000
HLBRC	?	0.064	3.52	0.000	0.036	1.98	0.048	0.027	3.64	0.000
FIRM FE		Yes			Yes			Yes		
YEAR FE		Yes			Yes			Yes		
Intercept		-50.688	-6.96	0.000	-72.265	-10.10	0.000	27.881	9.50	0.000
Number of obs.		858,301			858,301			858,301		
R-squared		0.002			0.013			0.129		
F		46.78		0.000	104.91		0.000	333.47		0.000

Notes: The sample period is from 2001 to 2015. The t-statistics are based on standard errors clustered by both firm and year. The p-values are two-tailed. Variables are defined in the Appendix A.

Table 6. Multiple regressions of LTAV proxies based on *ESOCRs*

	ESOCR_Tot			*ESOCR_NConf*			*ESOCR_Conf*		
	Coef.	**t-stat**	**p-val.**	**Coef.**	**t-stat**	**p-val.**	**Coef.**	**t-stat**	**p-val.**
Variable of interest:									
LTAV_FY	-0.207	-8.45	0.000	-0.104	-3.17	0.002	-0.104	-3.15	0.002
Control variables:									
SIZE	0.213	83.18	0.000	0.057	16.59	0.000	0.156	45.36	0.000
AGE	0.389	48.61	0.000	0.030	2.85	0.004	0.358	33.37	0.000
LEVTOT	-0.052	-30.69	0.000	0.010	4.58	0.000	-0.063	-27.58	0.000
CAPINT	0.031	22.29	0.000	0.015	8.16	0.000	0.016	8.64	0.000
ROA	-0.063	-62.33	0.000	0.015	11.19	0.000	-0.079	-57.60	0.000
LOSS	0.023	9.17	0.000	-0.016	-4.75	0.000	0.039	11.59	0.000
GROWTH	0.007	10.84	0.000	0.012	12.52	0.000	-0.004	-4.48	0.000
DAC	0.011	3.84	0.000	0.003	0.75	0.453	0.009	2.19	0.029
AbMAT	-0.001	-79.24	0.000	0.000	-3.34	0.001	-0.001	-55.56	0.000
AbSERV	0.001	50.93	0.000	0.000	-0.15	0.881	0.001	38.17	0.000
CASH	-0.004	-2.96	0.003	-0.007	-4.56	0.000	0.004	2.34	0.019
AbETR	0.054	16.33	0.000	0.006	1.24	0.214	0.050	11.10	0.000
Std_ROA	0.001	0.81	0.420	-0.011	-7.20	0.000	0.012	7.76	0.000
INVENT	0.033	24.93	0.000	0.009	4.97	0.000	0.024	13.54	0.000
UNEMPL	0.002	3.96	0.000	-0.001	-1.86	0.063	0.003	4.73	0.000
POPUL	-0.043	-1.08	0.282	0.060	1.11	0.268	-0.105	-1.95	0.052
GDP_PC	-0.077	-1.91	0.056	0.093	1.73	0.084	-0.173	-3.20	0.001
Δ%GDP	-0.006	-6.19	0.000	-0.003	-2.19	0.028	-0.003	-2.36	0.018
HLBRC	0.010	4.15	0.000	0.009	2.98	0.003	0.001	0.25	0.806
FIRM FE	Yes			Yes			Yes		
YEAR FE	Yes			Yes			Yes		
Intercept	0.877	0.94	0.346	-1.978	-1.59	0.111	2.912	2.33	0.020
Number of obs.	858,301			858,301			858,301		
R-squared	0.179			0.041			0.140		
F	11518.25		0.000	765.49		0.000	2919.2		0.000

Notes: The sample period is from 2001 to 2015. The t-statistics are based on standard errors clustered by both firm and year. The p-values are two-tailed. Variables are defined in the Appendix A.

Table 7. Descriptive statistics of DEA variables

	LTAOFs			Other firms			LTAOFs vs. Other firms	
	Mean	Median	Std	Mean	Median	Std	t-test	Wilcoxon test
Variable of interest:								
EFF_SCORE	0.26	0.12	0.31	0.18	0.10	0.22	***	*
Output variable:								
VALUE_ADDED	23,000	3,291	79,137	3,074	375	27,396	***	***
Input variables:								
PPE	4,145	676	13,148	1,818	121	54,768		***
INTANG	1,676	28	9,882	472	4	45,021		***
PERS	11,637	1,731	37,258	1,308	180	12,131	***	***
Number obs.		511			857,790			

Notes: The sample full period spans 2001–2015. *, ** and *** denote significance levels at 10%, 5% and 1%, respectively, based on a two-tailed Wilcoxon test and a two-tailed t-test for the differences in medians and means of continuous variables, respectively. LTAOFs = labour tax-avoidant offending firm-years; Other firms = population of firm-years extracted from SABI database; *EFF_SCORE* = DEA input efficiency score with variable returns to scale assumption; *VALUE_ADDED* = sale revenues increased by changes in finished product and work-in-process inventories minus material consumption and service expenses; *PPE* = net property, plant and equipment at the beginning of the fiscal year; *INTANG* = net intangible fixed assets at the beginning of the fiscal year; *PERS* = total personnel costs.

Table 8. Multiple regression of LTAV proxy adjusted for differences in firm efficiency

	AbSOC_EAdj		
	Coef.	**t-stat**	**p-val.**
Variable of interest:			
LTAV_FY	-0.155	-2.99	0.003
Control variables:			
SIZE	0.009	1.71	0.088
AGE	0.220	12.98	0.000
LEVTOT	-0.003	-0.70	0.482
CAPINT	0.035	12.17	0.000
ROA	-0.009	-4.22	0.000
LOSS	-0.026	-5.00	0.000
GROWTH	0.000	0.02	0.986
DAC	-0.001	-0.11	0.916
AbMAT	0.000	-4.18	0.000
AbSERV	0.001	15.83	0.000
CASH	-0.015	-6.02	0.000
AbETR	-0.005	-0.67	0.505
Std_ROA	-0.011	-4.60	0.000
INVENT	0.007	2.53	0.011
UNEMPL	0.000	0.07	0.947
POPUL	0.390	4.56	0.000
GDP_PC	0.156	1.82	0.068
Δ%GDP	0.005	2.36	0.018
HLBRC	-0.036	-7.19	0.000
FIRM FE	Yes		
YEAR FE	Yes		
Intercept	-6.944	-3.52	0.000
Number of obs.	857,772		
R-squared	0.007		
F	127.63		0.000

Notes: The sample period is from 2001 to 2015. The t-statistics are based on standard errors clustered by both firm and year. The p-values are two-tailed. Variables are defined in the Appendix A.

Table 9. Multiple regressions of LTAV proxies using propensity score matching

	AbSOC_Tot			*AbSOC_NConf*			*AbSOC_Conf*		
	Coef.	**t-stat**	**p-val.**	**Coef.**	**t-stat**	**p-val.**	**Coef.**	**t-stat**	**p-val.**
Variable of interest:									
LTAV_FY	-0.189	-2.19	0.029	-0.069	-0.74	0.461	-0.258	-2.92	0.004
Control variables:									
SIZE	-0.050	-0.84	0.402	0.341	5.29	0.000	-0.686	-11.30	0.000
AGE	0.050	1.11	0.266	0.059	1.23	0.221	-0.049	-1.08	0.281
LEVTOT	0.047	0.69	0.493	0.107	1.44	0.151	-0.163	-2.33	0.020
CAPINT	0.065	1.11	0.266	-0.024	-0.37	0.709	0.157	2.60	0.009
ROA	0.028	0.44	0.657	-0.020	-0.29	0.770	0.011	0.16	0.869
LOSS	-0.230	-1.68	0.093	-0.265	-1.78	0.075	0.230	1.64	0.101
GROWTH	0.052	1.20	0.229	0.015	0.32	0.749	0.042	0.95	0.343
DAC	-0.302	-1.23	0.218	-0.051	-0.19	0.849	-0.445	-1.77	0.078
AbMAT	0.002	6.87	0.000	0.001	2.98	0.003	0.001	3.95	0.000
AbSERV	-0.001	-1.07	0.287	-0.001	-1.01	0.312	0.000	0.25	0.806
CASH	-0.089	-0.87	0.383	-0.070	-0.63	0.529	-0.068	-0.65	0.516
AbETR	0.403	1.91	0.056	0.451	1.97	0.049	-0.283	-1.31	0.190
Std_ROA	0.158	2.11	0.035	0.166	2.05	0.041	-0.047	-0.62	0.539
INVENT	-0.020	-0.30	0.761	-0.114	-1.63	0.104	0.240	3.62	0.000
UNEMPL	0.047	4.45	0.000	0.006	0.55	0.580	0.062	5.72	0.000
POPUL	-0.073	-1.05	0.292	0.034	0.45	0.650	-0.110	-1.55	0.123
GDP_PC	1.950	4.40	0.000	1.173	2.44	0.015	1.251	2.75	0.006
Δ%GDP	-0.002	-0.08	0.939	0.049	1.86	0.063	-0.082	-3.27	0.001
HLBRC	-0.032	-0.80	0.423	-0.009	-0.22	0.829	-0.045	-1.12	0.265
IND FE	Yes			Yes			Yes		
YEAR FE	Yes			Yes			Yes		
Intercept	-18.454	-4.65	0.000	-12.649	-2.94	0.003	-9.997	-2.46	0.014
Number of obs.	1,022			1,022			1,022		
R-squared	0.126			0.107			0.214		
F	6.93		0.000	5.75		0.000	13.11		0.000

Notes: The sample period is from 2001 to 2015. The p-values are two-tailed. Variables are defined in the Appendix A.