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Cost burden and cost reliability

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Abstract

As documented by empirical research, tax compliance costs are a considerable burden for private businesses. However, cost estimates may be biased due to survey non-response and questionnaire framing effects. This paper investigates the impact of both aspects on cost estimates. We do not find significant evidence for a non-response bias. By contrast, our results indicate that framing effects regarding the temporal dimension of cost measurement (temporal framing effects) might alter cost estimates by about 39 percent downwards (65 percent upwards) on average and by up to 53 percent downwards (respectively 112 percent upwards) for small businesses. We also test a number of cost drivers with a focus on e-government features. We do not find any evidence that the use of Belgian e-government applications in 2002 and 2004 significantly reduced compliance costs.

Keywords

Compliance cost measurement, cost measurement error, cost drivers, non-response bias, temporal framing, e-filing, e-government

JEL Classification

C81, H21, H25, M41

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1. Introduction

Tax complexity and tax simplification are important topics of the debate about an efficient and cost-saving tax system (Alm 1996; Slemrod and Yitzhaki 2002; Guyton et al. 2005; Marcuss et al. 2013). From a taxpayer perspective, complex rules result in tax compliance burdens, which reduce the economic resources of businesses and individual taxpayers without increasing the fiscal budget of the government. Furthermore, empirical evidence suggests that compliance burdens may negatively affect entrepreneurship (Dijankov et al. 2002) and impair the overall compliance within a tax system (Erard and Ho 2003; Alm et al. 2010). Therefore, compliance costs can be regarded as an economic problem for the society.

Taking into account the high complexity of tax regulations, it is no surprise that corresponding cost estimates are substantial (e.g. Marcuss et al. 2013, for a recent literature review see Eichfelder and Vaillancourt 2014). This is especially the case for small businesses with low information capacities and limited internal resources. According to Evans, Tran-Nam and Lignier (2014), the compliance burden of the smallest firm size category of Australian businesses is about 9 percent of sales revenue.

As compliance costs are not disclosed by business annual reports or other publicly available sources, existing research relies typically on (more or less representative) surveys (for other methods of cost measurement like qualitative interviews or diary studies see European Communities 2013; for a review of compliance cost studies see Evans 2003; Vaillancourt and Clemens 2008; Eichfelder and Vaillancourt 2014). While this method is generally appropriate for obtaining a consistent cost estimate, it also involves a number of methodological challenges and cost measurement problems. These include for example intended or unintended misstatements of survey participants, retrospection bias resulting from the neglect of "forgotten" cost components, the misallocation of costs (e.g. tax compliance costs versus other record-keeping costs), and the misevaluation of the value of compliance time effort as one of the most important cost components (for a broader discussion of these issues see Sandford 1995;

Tran-Nam et al. 2000; European Communities 2013). In this paper, we focus on two important problems of cost measurement (for an earlier version of this research see also Eichfelder 2013). Since the pioneering contribution of Tversky and Kahnemann (1974) it is well known that framing has an impact on the perception of risks and costs. Thus the wording of survey questions might very well affect compliance cost estimates (Sandford 1995). Klein-Blenkers (1980) asked German enterprises for an aggregate cost estimate, as well as for an itemization of cost components (bookkeeping costs, costs of tax law changes, etc.). He found that the average sum of cost components was almost twice as high as the average aggregate estimate.[1] A potential explanation for this outcome is a neglect of cost components in the aggregate cost estimate. However, a double counting of costs as part of different components in the itemized cost estimate might be possible as well. Apart from this rather anecdotal evidence, there is clearly a lack of empirical research regarding the impact of framing effects on compliance cost measurement.

A second relevant problem results from the fact that, due to self-selection, survey samples may not be representative (Sandford 1995). Investigations on business compliance costs reveal considerable variations in survey response. Response rates of about 10 percent have been reported by Slemrod and Venkatesh (2002). The response rate of Hansford and Hasseldine 2012 amounts to only about 1 percent. By contrast, OECD (2001) reports response rates ranging from 19 percent to 83 percent, while the average response rate of the 2010 ITB survey of the IRS was 42 percent (Marcus et al. 2013).

From a theoretical perspective, the impact of survey non-response on compliance cost estimates is not straightforward. On the one hand, there may be an incentive for taxpayers with high cost burdens to participate in a survey in order to put public pressure on standard-setters and governments to reduce tax complexity. On the other hand, taxpayers with a low degree of cost-efficiency and a high compliance burden might be unwilling to participate in compliance cost surveys because they do not want to waste their resources on additional bureaucratic effort

(Sandford 1995). This second argument is underlined by evidence of low response rates from small businesses for which the cost burden would be relatively high (e.g. Allers 1994, 113).

Empirical evidence for a significant impact of survey non-response on cost estimates is limited. Wicks (1965) reports anecdotal evidence for overestimation of cost burdens in view of low response rates. Allers (1994) supplemented the survey questionnaire with an additional postcard asking the simple question if the participant had a high or low burden compared with others. Using information on participants that answered the postcard but not the regular questionnaire, Allers (1994, 112) provides evidence for cost-underestimation due to survey non-response. Using a similar method as Allers (1994), Collard et al. (1998) and Rametse and Pope (2002) find no significant evidence for a biased cost estimate due to survey non-response. The same holds for Schoonjans et al. (2011), Evans, Tran-Nam and Lignier (2014) and Tran-Nam, Evans and Lignier (2014), who compare cost estimates of early and late survey respondents and interpret a late response as a proxy for non-response.

A shortcoming of the existing literature lies in the limited validity of the research methods applied. Existing comparisons of early and late responses are based on the assumption that both subsamples (early, late) are representative for the whole dataset and do, therefore, not account for multivariate econometric methods. In addition, if response rates are low (< 10 percent), such a strategy may not be sufficient to identify a non-response bias. Regarding the postcard method of Allers (1994) and others, a multivariate analysis is simply not possible as the postcard does only provide qualitative self-assessments of taxpayers if they regard their compliance costs as high compared to others. In addition, such qualitative self-assessments are debatable as taxpayers will typically not have information on the compliance burdens of other taxpayers. Therefore, multivariate analysis regarding survey non-response should be a valuable contribution to the literature.

In our paper we use a unique data set of Belgian businesses to address the impact of temporal framing and survey non-response on compliance cost estimates. A major benefit of the data is

that it includes eight different random samples for two groups of business taxpayers and for four years with different response rates. This enables us to empirically test the correlation between non-response and compliance cost estimates. Furthermore, there is a change in the wording of the survey questionnaire being related to the temporal dimension of cost measurement. While costs are initially calculated on a monthly basis, the 2006 questionnaire asks for cost estimates per year. As the Belgian tax law remained almost stable over time, the data may also be used to analyze the impact of temporal framing on cost estimates. Apart from the rather anecdotal evidence already mentioned (e.g. Klein-Blenkers 1980; Allers 1994), we are not aware of any similar investigation. In addition, this is the first paper analyzing the impact of temporal framing on compliance cost estimates and general cost measurement.

We contribute to the literature in three ways. First and most relevant, we find significant evidence that small differences in questions on tax compliance costs may result in strong differences in cost estimates. Corresponding to our regression results, a change of the temporal dimension of cost measurement (yearly cost estimate instead of monthly cost estimate) may result in a reduction of the average cost estimate by about 39 percent. While we are not certain that yearly cost estimates are more realistic than monthly cost estimates, this outcome strongly underlines the high relevance of the questionnaire design. Hence, there might be considerable bias in existing cost estimates and cross-country comparisons of compliance cost estimates based on different samples and survey instruments should be hard to establish (see also Blaufus, Eichfelder, and Hundsdoerfer 2014). In case of small businesses with relatively weak accounting systems we observe a stronger temporal framing effect. Corresponding to our results, yearly (monthly) cost estimates of small businesses might be biased downwards (upwards) by up to 53 percent (112 percent).

As a second important finding, we do not observe any significant correlation between the response rate of a subsample and the average cost estimate of the corresponding subsample. This holds for all cost categories (total costs, internal costs, external costs) and all model

specifications. Therefore, average cost estimates do not seem to be significantly biased by survey non-response and survey non-response does not seem to be one of the major problems of compliance cost measurement. This can be taken as good news, as non-response is an important problem of business surveys and response rates are small in a lot of cases.

As an additional finding, we cannot provide evidence that e-government applications of the Belgian tax administration in the years 2002 and 2004 resulted in a significant reduction of compliance burdens. This fits well with a number of quite recent studies with relatively weak empirical evidence on the impact of e-filing, pre-filled tax returns and other electronic features on the compliance burden of a tax system (Vaillancourt 2011; Eichfelder and Schorn 2012; Yilmaz and Coolidge 2014). Hence, while e-government, pre-filled income tax returns and e-filing have been important topics of tax policy debate in recent times, the size of corresponding cost savings seems to be debatable.

The paper is organized as follows: The second section presents the data, the third section the hypotheses and methods, and the fourth section the results. The last section draws the principal conclusions from the analysis. Appendix 1 contains relevant questions from the survey instrument and a list of variable definitions, while Appendix 2 reports regression cross checks.

2. Data

The data presented here comprises four cross sections of surveys of Belgian businesses conducted by the Bureau Fédéral du Plan (Federal Planning Bureau) in Brussels on behalf of the Belgian government. It contains compliance cost estimates of business taxes (including business income tax, VAT, and other taxes like customs and property taxes) from 1,590 observations. The data does not constitute a panel; nevertheless, some of the businesses approached participated in more than one year. For each year, there are two sub-samples (incorporated enterprises and independent self-employed businesses). Sample sizes, usable responses (= number of questionnaires that has been considered as usable response by the

Bureau Fédéral du Plan), and response rates (= ratio of usable response to sample size) for each sample are reported in Table 1. Response rates in our sample vary from 7.8 percent to 22.4 percent (7.8 percent to 13.5 percent for the self-employed and 16.9 percent to 22.4 percent for enterprises), a fact that can be used to investigate the impact of survey non-response.

[Table 1 about here]

Cost measurement has been executed on a similar basis to that used in other large-scale surveys on tax compliance costs (e.g. Sandford 1995; Rametse and Pope 2002; Slemrod and Venkatesh 2002). Overall compliance costs are calculated as the sum of internal compliance costs (including the time effort of employees, managers and directors) and external compliance costs (including expenses for tax advisers and tax accountants). The value of the compliance burden per working hour is self-assessed by survey respondents. Apart from costs for computer hardware and software (only available for 2000 and 2002), the data does not account for other monetary expenses for tax compliance (e.g., room costs, postage costs). While the relevance of this cost component is relatively limited (especially for SME firms), this might nevertheless lead to a lower-bound cost estimate in our data.

In contrast to other investigations (e.g. Rametse and Pope 2002; Slemrod and Venkatesh 2002), information on cost burdens has been raised by relatively general questions on the aggregate burden (see Appendix A) and no itemization of the compliance burden into different compliance activities (bookkeeping, tax calculation, tax planning) or taxes (corporate income tax, VAT) has been undertaken. This might result in an underestimation of the cost burden if specific compliance activities have been overlooked by survey participants. Klein-Blenkers (1980) reports evidence that aggregate compliance cost estimates of German businesses were considerably lower than the sum of itemized cost-elements. However, a higher degree of aggregation may also reduce measurement error under certain conditions (Cardinaels and Labro 2008). For example, if costs are itemized, compliance hours might be considered more than once if they are relevant for more than one compliance activity. In addition, respondents might

also misallocate costs of related activities (e.g., financial accounting compliance costs, management costs) as tax compliance costs. Therefore, an overestimation of the real cost burden might be possible as well. Note that corresponding sources of measurement error are a general problem in compliance cost research.

The cost measurement procedure remained generally unchanged, with two exceptions. In 2000 and 2002 the questionnaire inquired not only about internal time effort and external adviser fees, but also about monetary expenses for computer hardware and software with a minor relevance for the overall cost burden. The average fraction of these hardware and software expenses to total compliance costs is only about 2 percent. To ensure a consistent cost definition over the whole period, we do not consider these expenses and calculate the total burden as the sum of internal time effort (internal costs) and adviser costs (external costs). As we investigate not only the total burden, but also cost categories (internal costs, external costs) and alternative proxy variables (fraction of external costs to total compliance costs, compliance hours), our empirical results should be robust with regard to the exact definition of the cost burden.

Second and more relevant, the wording of the questions on compliance cost measurement was changed in the 2006 questionnaire. Up to 2006 survey participants had been asked to consider the best possible estimate of the monthly compliance effort, taking into account the months with a higher or lower effort (average monthly compliance cost). The 2006 questionnaire asked about the cost of working hours and adviser fees spent on tax compliance activities per year (yearly compliance cost). The exact wording of these questions is given in Appendix 1. The implications of this change in cost measurement are discussed in the next section.

For further analysis, we have excluded all observations with missing information on (1) total compliance costs (435 observations), (2) sales revenue (77 observations) and (3) other relevant control variables like industries (88 observations). Table 2 document price-adjusted revenue (in thousand €) as well as absolute and relative[2] compliance cost estimates for the remaining 990 observations. Prices are adjusted to the base year 2000 using the general inflation index of

Statistics Belgium.[3] In line with the European Communities' Recommendation K (2003) 1422 of the May 6, 2003, small (medium) enterprises are defined by a price-adjusted revenue of less than €10 m (€50 m). With few exceptions, self-employed businesses are very small with a mean (median) revenue of €1.7 m (€53,000).

[Table 2 about here]

Reflecting the findings of the literature (Slemrod and Venkatesh 2002; Marcuss et al. 2013; Eichfelder and Vaillancourt 2014), absolute compliance costs increase with business size, while relative cost estimates are especially high for the smaller size classes. The mean fraction of compliance costs to revenue is 13.77 percent for self-employed businesses and 0.10 percent for large enterprises. This substantial difference underlines the strong economies of scale within the tax compliance process of Belgian businesses.

In addition to compliance costs and sales revenue, the data presented here includes information on industries, regions, the number of employees and Likert scale ratings for tax legislation and tax administration. For a limited number of years data is also provided on business age, the number of establishments in Belgium, the use of different information technology tools for tax and other purposes, and proposals to simplify the tax system.[4]

3. Hypotheses and Empirical Specification

The variation in survey response rates between the different subsamples is used here to analyze the correlation between non-response and cost estimates. Corresponding to Sandford (1995), we argue that businesses with a relatively high bureaucratic effort are unwilling to participate in a compliance cost survey as they do not want to waste their economic resources on additional bureaucratic effort. This argument fits well with the empirical observation of lower response rates of small businesses with relatively high cost burdens in our data (see Table 1). As non-response therefore implies an underestimation of the true cost burden, we expect a positive correlation of the response rate and estimated tax compliance costs.

H1: *The estimated compliance burden increases with the survey response rate.*

It is also evident that cost estimates might have been affected by the temporal dimension of cost measurement (monthly cost estimate versus yearly cost estimate). Such a temporal framing effect has already been identified for other areas of business research. Gourville (2003) provides evidence that a "pennies-a-day" pricing strategy of reframing a large aggregate payment of money as a small daily expense may help to reduce the perceived costs to customers and, therefore, to increase sales. Corresponding strategies have been used for car leasing contracts, sales strategies for furniture, and donations for charitable organizations ("donate only 27 cents a day").

A theoretical foundation is provided by studies that analyze temporal framing on judgments of health risk (Chandran and Menon 2004; Gerend and Cullen 2008). According to this literature, a shorter time period in the questionnaire may reduce the perceived temporal distance between the reference point of the survey respondent (typically today) and the point of occurrence of the event under consideration. Corresponding to construal level theory (Trope and Libermann 2003), temporal distance changes peoples' responses to future events by changing the way they represent those events in their minds. Temporal framing effects are not limited to the perception of the future, but may also affect recognition of the past. As reported by Ross and Wilson (2003) and Haynes et al. (2007), temporal framing of questions may reduce or increase the psychological distance of survey respondents.

Combining both arguments, the wording of a survey instrument should have an impact on the way compliance costs and past compliance activities are mentally represented by the survey participants. If the questionnaire includes a request on the average monthly burden, respondents might have been framed to think of shorter and more recent reference periods (e.g. a recent month) to calculate the compliance cost estimate. Thus, even if the Bureau Fédéral du Plan asked in the pre-2006 questionnaires for the average monthly burden accounting for months with an especially high or low effort, survey respondents might have been focused on

compliance activities within the last month (or a recent month) and not on the average costs of a representative month over the whole period.

Taking into account the limited ability of respondents to capture the real cost burden (Klein-Blenkers 1980; Cardinaels and Labro 2008), and the impact of the passage of time and more recent activities on memory processes (Donkin and Nosofsky 2012), compliance activities in the remoter past might simply have been "forgotten". This argument suggests an underestimation of estimates derived on a yearly basis. In addition, an overestimation of monthly cost estimates should be possible as well. Cost estimates driven by recent experience (for example last month) are not necessarily representative of the whole year. Since the compliance cost surveys of the Bureau Fédéral du Plan were conducted between May and the first week in September, some interference might have taken place with the general deadline for income tax declarations in Belgium at the end of June. Considering that the preparation of the tax return comprises a significant fraction of the overall compliance burden (Slemrod and Venkatesh 2002), monthly cost estimates could have been biased upwards by recent tax filing experience. As both arguments imply a lower yearly cost estimate, we hypothesize:

H2a: *Cost estimates derived on a yearly basis are lower than cost estimates derived on a monthly basis.*

Cost measurement will predictably be more complex for internal compliance costs than for external adviser costs. In the latter case, problems of measurement emanate from the allocation of the well-documented aggregate sum of adviser costs to different components (tax compliance, financial accounting compliance, compliance with other legal obligations, etc.). In the former case, even the aggregate sum of internal resources spent on compliance activities may be uncertain or have been "forgotten" (Allers 1994, 48). This holds especially if reporting activities have not been executed by a tax department (as in the case of small businesses). Considering these arguments, we expect a stronger temporal framing effect for the internal cost component.

H2b: *The effect of cost measurement per year (2006 questionnaire) is stronger for internal compliance costs.*

In addition, we hypothesize a stronger temporal framing effect in the case of businesses with a weak accounting system. As documented in Table 1, the data presented here includes not only incorporated enterprises but also self-employed businesses with limited information processing capacities. In line with the Belgian Accounting Law of July 17, 1975, there are no formal disclosure requirements for small sole proprietorships. In addition, small businesses are allowed to keep a simplified set of books under certain conditions (for a more detailed description of Belgian GAAP see European Commission 2008, Annex 1.B; PriceWaterhouseCoopers 2010). The 2006 survey instrument can, therefore, be expected to have a stronger framing effect on self-employed businesses.

H2c: *The effect of cost measurement per year (2006 questionnaire) is stronger for small self-employed businesses.*

Our empirical specification is based on previous research (e.g. Hudson and Godwin 2000; Slemrod and Venkatesh 2002; Eichfelder and Schorn 2012; Marcuss et al. 2013). As measurement error might be related to specific cost components (e.g. internal compliance costs), we rely on four proxy variables of compliance costs (*Cost*). First of all, we consider the natural logarithm of total compliance costs (*TotalC*) as well as the natural logarithm of external costs (*ExternalC*, especially tax adviser costs) and the natural logarithm of internal compliance costs (*InternalC*) as dependent variables. We adjust all three cost proxies by the natural logarithm to account for economies of scale suggesting a non-linear relationship between costs and business size (e.g. Slemrod and Venkatesh 2002; Marcuss et al. 2013). Second and in order to test H2b, we also calculate regressions on the ratio of external costs to total compliance costs (*Cost ratio*). The model is described by

$$Cost_i = \beta_0 + \beta_1 \cdot Response_i + \beta_2 \cdot Questionnaire_i + \beta_3 \cdot Trend_i + \beta_4 \cdot Repeated\ Observation_i + \beta_5 \cdot Advice_i + \beta_6 \cdot Complexity_i + \beta_7 \cdot Size_i + \beta_8 \cdot Self-employed_i + \sum_{m=1}^{4} \beta_{m+8} \cdot Industry_{i,m} + \sum_{n=1}^{2} \beta_{n+12} \cdot Region_{i,n} + u_i \quad (1)$$

and estimated by pooled OLS. An overview of all regression variables is provided by Table 7 in Appendix 1. Note that both main variables of interest (*Response* and *Questionnaire*) are related to the survey period and that most businesses participated in only one year. Therefore, we abstain from including firm fixed effects and year fixed effects.

As documented by the descriptive statistics in Table 1, the survey response rate is linked to other important factors like the survey sample (e.g. lower response rates for self-employed businesses). This might result in multi-collinear regression results. To overcome this technical problem, we define *Response* as the difference between the response rate of the current year and the mean response rate of the corresponding sampling group (self-employed businesses and enterprises) over all periods. The framing effect of the 2006 questionnaire is accounted for by the *Questionnaire* dummy that takes a value of 1 if compliance costs are derived on a yearly basis. This variable is equivalent to a year dummy for the 2006 survey sample.

Furthermore, we have included variables controlling for other important aspects affecting the compliance burden. Due to the correlations of *Questionnaire* and *Response* with survey samples and periods (see Table 1), no time dummies can be accounted for. So we have included a linear *Trend* which increases by one for each period (1 in 2000, 2 in 2002, etc.). This approach can be justified if there is either a linear trend in compliance cost burdens or a zero trend (no significant changes in cost burdens over time). Apart from *Cost ratio*, we do not find any significant evidence for trends (Table 4) or even changes of price-adjusted compliance burdens over time (see the insignificant results for the 2002 and the 2004 dummy variables in Table 9, Models 1 to 3 in Appendix 2). In addition, the results for the 2002 and 2004 dummy variables in Table 9, Model 4 suggest a linear trend for the *Cost ratio* with an increase in *Cost ratio* of about 3.3 percentage points for each two-year period (from 2000 to 2002 and from 2002 to 2004). Thus,

controlling for *Trend* should be sufficient to account for changes in price-adjusted compliance burdens over time. As previously mentioned, the data does not constitute a panel. However, some of the requested businesses participated in more than one year. To account for the fact that 2nd and 3rd observations of the same business may be structurally different, the dummy *Repeated Observation* is included, with a value of 1 in these cases.

A problem of the *Questionnaire* dummy lies in the fact that it cannot separate the questionnaire effect as such from other putative changes of the Belgian tax system in 2005 and 2006 (including tax legislation, litigation and administration). Therefore, we consider two variables to control for the complexity of that system. As documented by empirical research, the demand for external tax advice is positively and significantly affected by tax law complexity (Slemrod, 1989; Christian, Gupta, and Lin, 1993; Eichfelder et al. 2012 with further references). Therefore, we include the dummy *Advice* as a proxy for tax complexity, which takes a value of 1 in case of external support.

Furthermore, the data includes qualitative statements on the legislative and administrative complexity of the tax system in the form of five-point Likert scales (e.g. the understandability of tax regulations or the information content of administrative answers). This information is used to construct a second *Complexity* variable, which is defined as the unweighted average of all 14 items[5] on legislative and administrative complexity (for an alternative specification using a weighted average, see Appendix 2: Table 8). In view of the close connections between the 14 items, we refrain from defining two distinct variables on administrative and legislative complexity (for an analysis of the separate effects of tax administration and legislation on compliance costs see Eichfelder and Kegels 2014).

Moreover, we control for business *Size* (measured by the logarithm of sales revenue) and survey sample (*Self-employed*), as well as for industries and regions. In detail, the model includes a dummy for self-employed businesses in the primary sector (*Primary*), the industrial sector (*Industrial*), and the construction sector (*Construction*). Other self-employed businesses are

typically active in the service sector. Due to limited information, incorporated enterprises only have a dummy for the industrial sector (*Industrial enterprise*). Dummies are also included for the Belgian regions of *Brussels* and *Flanders*, with Wallonia as point of reference. We abstain from including additional control variables that are only available for a limited number of observations and periods (for example the number of establishments in Belgium is exclusively available for enterprises in 2000 and 2002). Nevertheless, the controls of equation (1) fit well with the existing literature (e.g. Hudson and Godwin 2000; Slemrod and Venkatesh 2002; Marcuss et al. 2013; Eichfelder and Kegels 2014).

Compliance cost estimates can be biased by measurement error. For that reason, we exclude observations with an unusually high or low burden as outliers. As identification criterion we have used a regression on total compliance costs including all control variables of equation (1) but not our main variables of interest (*Response, Questionnaire*). Observations are defined as outliers if the residual of this regression exceeds twice its standard deviation. Table 3 presents the descriptive statistics of the remaining sample, excluding 49 outliers (941 observations). Compared to the original data, mean cost estimates and corresponding standard deviations are lower. This holds especially for medium-sized enterprises and implies a limited number of businesses with very high cost estimates in the original data. Compared to the original data, self-employed businesses also reveal a strong reduction in mean revenue. Predictably, median values are almost unaffected by the exclusion of outliers.

[Table 3 about here]

4. Results

Using the whole data set except outliers, we estimate a full set-up (including all controls) and a simplified model (excluding *Trend* and *Repeated Observation*). The main reason for excluding these variables is to test the robustness of the results with regard to multi-collinearity (as both parameters are correlated to *Response* and *Questionnaire*). Furthermore, both variables are

typically not significant, and their impact on the outcome is limited. Within the regressions on the logarithm of external costs (*ExternalC*) and the ratio of external costs to total costs (*Cost ratio*), *Advice* is excluded because of collinearity concerns.

Regression results are calculated by pooled OLS and presented in Table 4. We use the so-called Huber/Young/Sandwich estimator to account for heteroscedasticity. As the adjusted R^2 is not available for corresponding heteroscedasticity-robust standard errors, we exclusively report the regular R^2. In alternative regressions with non-robust standard errors (not reported), we also calculated the adjusted R^2. We obtained almost identical values as for the regular R^2. We tested for the normality of standard errors by a Kolmogorov-Smirnov test, for non-linearities by a RESET test, and for multi-collinearity by the calculation of variance inflation factors (vif). These test statistics do not provide evidence of a biased estimate. The mean vif varies between 1.62 and 2.16, the *Response* vif between 1.06 and 1.61, and the *Questionnaire* vif between 1.51 and 5.13 (with a higher vif in the models including *Trend* and *Repeated Observation*). For models on cost burdens (total costs, external costs, internal costs), the R^2 is high and ranges from 55.1 percent to 66.7 percent. By contrast, R^2 is small if the dependent variable is *Cost ratio*.

[Table 4 about here]

H1 is not confirmed. While the sign of *Response* is generally positive as expected, the coefficient is not significantly different from zero. This implies a potentially positive, but nevertheless limited effect of survey response rates on compliance cost estimates. In other words, we cannot provide evidence that non-response of survey participants has a significant effect on the estimated cost burden. That holds for total costs, external costs and internal costs and *Cost ratio*.

By contrast, the results strongly support H2a. The *Questionnaire* dummy is negative and significant for all cost categories. From a quantitative perspective, the corresponding impact is large. The results imply that estimates of total costs in 2006 are lower by some 39 percent to 42

percent (with a smaller effect if *Trend* and *Repeated Observation* are included). These absolute effects are somewhat different from the (marginal) regression coefficients of the *Questionnaire* dummy.[6] Regarding internal compliance costs, the maximum negative effect (Model 8) is even higher (54 percent). This implies a strong temporal framing effect that results from the calculation of the compliance burden per year instead of the average burden per month.

Regarding H2b, we do not find significant evidence for our models with all regression controls. Thus, we only find a clearly stronger impact of *Questionnaire* on internal costs compared to external costs (documented by a significant increase of the ratio of external costs to total costs measured by *Cost ratio*) if *Trend* and *Repeated Observation* are not included in the regression model (see Model 4 and Model 8 of Table 4). Considering that the coefficient of *Trend* is significant in Model 4 and the R^2 of this model is higher than in Model 8, we can therefore not confirm H2b.

Regarding our measures for cost burdens, we do not obtain significant results for *Trend* and *Repeated Observation*. As expected, the control variables for complexity (*Advice* and *Complexity*) have a positive and significant sign. The other control variables confirm existing research. If business *Size* (measured by the logarithm of sales revenue) increases by 1 percent, compliance costs increase by about 0.29 percent. This underlines the significant economies of scale within the compliance process and the disproportionately high burden on small businesses (Hudson and Godwin 2000; Slemrod and Venkatesh 2002).

A higher cost burden is also evident for enterprises. Corresponding to Model 1, total costs are about 26 percent lower for self-employed businesses compared to incorporated enterprises. This can be ascribed to the more complex tax obligations (e.g. tax-relevant treaties between associates and the firm) and accounting standards of corporations. In addition, Model 4 and 8 reveal that self-employed businesses rely to a smaller degree on the support of external tax advisers (significantly smaller ratio of external costs to total compliance costs). This again fits well with a higher degree of tax complexity for incorporated taxpayers.

Cost estimates of enterprises in the industrial sector are higher, while self-employed businesses in the primary sector bear a much lower burden. Corresponding to Model 1, we observe for *Primary (Self-employed)* a reduction of total costs by about 60 percent. This effect should be mainly driven by simplified tax schemes for Belgian farmers, including an option for lump-sum taxation and cash-based tax accounting. In addition, cost burdens in the Belgian regions of Brussels and Flanders seem to be higher than in Wallonia. This may be driven by a higher price level within these regions, as there is no significant impact on the number of compliance hours (see Appendix 2: Table 9, Model 5).

Our baseline regression model does not allow to significantly test H2c suggesting a stronger impact of *Questionnaire* for small self-employed businesses with a weak accounting system. Therefore, we complement equation (1) by two interaction terms of *Self-employed* and our main variables of interest (*Response*, *Questionnaire*). Using these interaction terms (*Self-employed x Response, Self-employed x Questionnaire*), we test if there is a stronger impact of the response rate and especially the questionnaire (temporal framing effect) on small self-employed businesses with a weak accounting system. Regression results are documented by Table 5. While the coefficient of *Self-employed x Response* is not significant, we observe a strong and negative impact of *Self-employed x Questionnaire* on total compliance costs and internal costs. That holds also if *Self-employed x Response* would be excluded. Thus, Table 5 clearly confirms H2c. Combining the coefficients of *Questionnaire* and *Self-employed x Questionnaire*, Table 5 suggests a reduction of the total cost estimate by 51 percent to 53 percent if compliance costs of small self-employed businesses are measured on a yearly instead of a monthly basis. Hence, cost estimates of small businesses could be biased by up to 53 percent downwards or 112 percent upwards.

[Table 5 about here]

As already indicated, the *Questionnaire* dummy is collinear to a year dummy for 2006. Therefore, one might suspect that the significant coefficient of *Questionnaire* is due to Belgian

tax reforms that are not captured by the control variables (especially *Trend*, *Complexity* and *Advice*). However, we can provide a number of strong theoretical as well as empirical arguments supporting our interpretation that the estimated coefficient of *Questionnaire* results from the changed wording of the survey instrument.

(1) Taking into account the literature on tax compliance burdens (see Allers 1994; Vaillancourt and Clemens 2008; Eichfelder and Vaillancourt 2014, with further references), it seems extremely unlikely that the average tax compliance costs of Belgian businesses could have been reduced by about 39 percent (!) within two years by tax simplification measures. No major tax reform took place in Belgium during the years 2005 and 2006. Apart from a few legal changes that cannot generally be regarded as simplifications, the system remained relatively stable for businesses over that period.[7] Thus, an excessive reduction of the real compliance burden of Belgian businesses cannot be regarded as theoretically convincing.

(2) A major reduction in tax compliance costs should also reduce alternative tax complexity proxies. Thus, we estimated additional regressions with complexity proxies as dependent variables (Appendix 2: Table 9, Model 5 to 8). These variables (*Advice*, *Complexity* and *WComplexity* as weighted alternative to *Complexity*, see Appendix 2) are closely correlated to the cost burden (see Table 4, Table 8) and should therefore be well-suited for our analysis. Nevertheless, we do not find any significant coefficient for *Questionnaire* in these additional regressions. Hence, apart from changes in compliance cost estimates, we find no empirical evidence for a change in tax complexity in Belgium.

(3) A potential reason for recent compliance cost reductions might be e-government applications like the information platform FISCONET or the electronic submission of tax declarations by the Tax-on-Web system. However, the data implies that some of these tools were already widely used in 2004. For example, 138 of 270 available observations of the 2004 original survey stated use of Tax-on-Web. In order to test the potential impact of e-government, we performed additional regressions including dummy variables for businesses using e-

government applications for specific survey periods. This information is not available for the whole period and therefore not included in the baseline regression model. If the use of e-government applications simplified the Belgian tax system, we should also find a negative effect on total tax compliance costs on the firm level. In unreported cross checks, we also conducted regressions for cost components (internal costs, external costs) with similar results.

In detail, we test the impact of six e-government applications on the logarithm of total costs by the inclusion of dummy variables: FISCONET (online information database for tax issues, data available for 2002), Portail fédéral (online portal of the federal administration, available for 2002), FINFORM (online tax form, available for 2002), electronic VAT declaration (available for 2002 and 2004), provision of electronic tax bills (available for 2004) and Tax-on-web (electronic submission system for taxes on income, available for 2004). Apart from the inclusion of dummy variables for e-government applications, the specification of these models is similar as in equation (1). As we only consider observations with full information on each e-government application, our data base is typically restricted to 2002 or 2004 (2002 and 2004 in case of electronic VAT declaration). Therefore, we do not account for variables referring to more than one period (*Response*, *Questionnaire*, *Trend*, *Repeated observation*), which would typically drop out in these regressions.

[Table 6]

The results of Table 6 do not reveal any significant effect of the Belgian e-government applications on the compliance burden. Hence, there is no evidence that the coefficient of *Questionnaire* (temporal framing effect) might be partially driven by e-government issues. Furthermore, this raises some doubt on the effectiveness of the Belgian e-government policy to reduce tax complexity for private businesses (at least for the historical period of 2002 and 2004). Regarding the regression control variables, the results are very close to our baseline specification in Table 4. Thus, our regression model seems to be stable over time.

As reported cross checks, we performed regressions for the logarithm of compliance hours of staff members, managers and business owners as alternative cost measure (Appendix 2: Table 9, Model 5) and tax complexity proxies as alternative dependent variables (Appendix 2: Table 9, Model 6 to 8). In addition, we tested for an alternative specification of our baseline models including a weighted version of the *Complexity* proxy (Appendix 2: Table 8). These models confirm the results of our baseline specification.

In addition, we performed a number of unreported cross checks. The outcomes of these cross-checks are very close to our original specification. First of all, we redefined *Response* as the untreated survey response rate (in percentage points), to increase the variation of this variable. To prevent a multi-collinear estimate, we excluded *Trend* in these models. Second, we calculated standard errors accounting for the fact that the data consists of eight different samples of a business survey instead of a single random draw (for a description of this method see O'Donnell et al. 2008). Third, a series of regression models was drawn up including interaction terms between *Response, Questionnaire* and the control variables to identify potential interdependencies affecting the impact of both parameters. Fourth, we tested the effect of outlier correction by the inclusion of outliers and by the use of a median regression estimator. For all these cross checks our regression results remain virtually unchanged.

5. Conclusion

In this paper we have investigated the impact of survey non-response and temporal framing effects on compliance cost estimates. This is a relevant topic, as compliance cost estimates derived from business surveys may suffer from measurement error. To address these issues we have used a series of repeated cross sections of Belgian businesses with varying response rates and a change in the temporal dimension of cost measurement.

While the sign of the regression coefficient for survey non-response (*Response*) is positive in most specifications (see Table 4 and Table 5), there is no evidence for a significant correlation

of the survey response rate and the cost estimate. This holds for all cost categories (total costs, internal costs, external costs) and all model specifications. Therefore, survey non-response does not seem to be one of the major problems of compliance cost measurement. This can be taken as good news, as response rates of business surveys are low in a lot of cases and could therefore induce severe bias.

However, our results suggest that the wording of the survey questionnaire may strongly affect cost estimates. While the pre-2006 questionnaire required the calculation of an average monthly burden considering months with especially high and low costs (see Appendix 1 for the wording of survey questions), the 2006 questionnaire asked for the aggregate compliance burden per year. Controlling for tax complexity and other relevant control variables, we observe an about 39 percent lower cost estimate in 2006. As the Belgian tax law remained relatively stable between 2004 and 2006, there is no reason for such a strong increase in the true compliance burden. Therefore, compared to average monthly costs, the derivation of a yearly cost estimate seems to have significantly reduced the estimated cost burden. A theoretical foundation for corresponding effects is provided by the psychological and marketing literature (Trope and Libermann 2003; Chandran and Menon 2004; Haynes et al. 2007; Gerend and Cullen 2008). Therefore, temporal framing can affect the temporal distance of survey respondents. In other words, asking for a monthly compliance cost estimate might frame respondents to think of shorter and more recent reference periods (the last month or a recent month) in order to calculate the cost estimate.

We are not certain, which temporal dimension of cost measurement (monthly cost burden, yearly cost burden) will typically lead to more realistic cost estimates. On the one hand, as the monthly cost estimate is more closely related to recent experience, there should be a smaller bias due to the neglect of “forgotten” costs or cost components of the longer past. On the other hand, a shorter cost estimation period may induce measurement error if the recent experience of the respondent (e.g. the previous month) is not representative of the whole reference period.

For example, asking for a monthly cost estimate may result in an overestimation of costs if compliance activities were unusually high in the recent time (e.g. due to a recent filing of the tax return).

In addition to the analysis of cost measurement, we also perform tests on the impact of a number of e-government applications on compliance costs as an alternative explanation to the strong decline in cost estimates in 2006. Contrasting political promises of the cost-saving virtue of e-government on the burden of tax compliance, we cannot provide any significant evidence for lower cost burdens of Belgian businesses using e-government applications in the years 2002 and 2004. Of course, this finding should be interpreted with caution as it might be driven by properties of the Belgian e-government features during that period. Nevertheless, it also raises some doubt regarding the amount of potential cost savings from e-government.

We should make reference to potential limitations of our research. First of all, the survey data might be biased by additional sources of measurement error (e.g. incorrect answers by survey respondents). Unfortunately, the data does not provide information on response delays, which might be interpreted as a proxy for incorrect answers and other sources of measurement error. We have excluded outliers, tested for a number of specifications and made cross-checks to account for this aspect. Second, because response rates and survey questions are connected to different survey samples, the analysis is restricted to cross-sectional evidence and we are not able to control for individual fixed effects. With regard to response rates, our baseline regressions are driven by the within-variations of subsamples (7.8 percent to 13.5 percent for the self-employed and 16.9 percent to 22.4 percent for enterprises), which are not high. In unreported robustness checks, we also use the fully variation of response rates (7.8 percent to 22.4 percent) and still obtain insignificant results. Nevertheless, as the literature reports a wider variation in survey response (1 percent in Hansford and Hasseldine 2012; up to 83 percent in OECD 2001) and cost estimates might also have been affected by other sources of measurement error, we cannot rule out the possibility that non-response significantly affects cost estimates.

Third, the coefficient of the *Questionnaire* dummy might be driven not only by the temporal framing of the survey instrument but also by changes in compliance cost trends and tax complexity that have not been caught by our control variables.[8] However, there are strong theoretical and empirical arguments confirming our interpretation. During 2005 and 2006 there was no relevant tax simplification of the Belgian tax system. In addition, we do not find significant effects with regard to the use of e-government applications or alternative proxies for tax complexity (*Complexity*, *WComplexity* and *Advice*). Moreover, the estimated "cost reduction" of about 39 percent seems to be hard to explain from a theoretical perspective if it would be real.

Appendices

Appendix 1: Selected Survey Questions and Variable Definitions

The original survey questions on compliance cost measurement were presented in French and Flemish.[9] Here they are given in English. As well as the survey questions, the questionnaire included instructions on the general definition of tax compliance costs, which remained unchanged from 2000 to 2006. The survey questions on cost measurement are as follows:

1. How many staff and management hours are spent on average per month in your enterprise in order to comply administratively with tax regulations? (Consider the best possible estimate for the average monthly time effort, taking into account months with a markedly high or low effort.)

   Number of hours per month:
2. What is the monthly cost in Euros of these hours spent by staff and management of your enterprise to comply administratively with tax regulations?

   Monthly cost:
3. How much does your enterprise spend on average per month for the purchase of external services to account for administrative dispositions regarding tax regulations? (Consider the best possible estimate for average monthly expenses. Take into account within your

estimate all payments for external support, such as fees for auditors, lawyers or consultants as well as payments for information material necessary to comply with tax regulations.)

Monthly average expenses:

In survey year 2006 the wording of these questions was changed. The main difference was that costs were now estimated on a yearly basis:

1. How many staff and management hours were spent in your enterprise in 2006 in order to comply administratively with tax regulations?

   Number of hours:

2. What is the yearly cost in Euros of these hours spent by staff and management of your enterprise to comply administratively with tax regulations?

   Cost in Euros:

3. How much did your enterprise spend in 2006 for the purchase of external services to account for administrative dispositions regarding tax regulations? (Take into account in your estimate all payments for external support, such as fees for auditors, lawyers or consultants as well as payments for information material necessary to comply with tax regulations.)

   Expenses in Euros:

A more detailed documentation of the questionnaire is given by Eichfelder and Kegels (2014). An overview of the definition of the various regression variables is provided by Table 7. We distinguish between dependent variables, two sets of important explanatory variables (variables on cost measurements and variables on e-government) and two sets of control variables (general controls and dummy variables for legal form, industry and region).

[Table 7 about here]

Appendix 2: Additional Regression Results

In this appendix, we present relevant cross checks of our baseline regression models. As controlling for tax complexity is important in order to identify the impact of non-response and temporal framing on cost estimates, we calculated a weighted alternative measure for our *Complexity* control variable (*WComplexity*). As weights, we use coefficients of a first-stage regression of all 14 items of administrative and legislative complexity on the logarithm of total compliance costs (for a detailed overview of all 14 items and a similar weighting approach see Eichfelder and Kegels 2014). Apart from including these 14 items instead of the unweighted variable *Complexity*, the specification of this regression conforms to equation (1). However, we do not consider observations in 2006 to account for temporal framing effects that might bias the weighted complexity proxy. We use the coefficients of this regression as weights in order to calculate *WComplexity*. In case of items with negative regression coefficients, the applied weight is zero. Furthermore, Table 8 provides regressions results for equation (1) with *WComplexity* instead of *Complexity* as tax-complexity control variable. The results are almost identical to our baseline specification in Table 4.

[Table 8 about here]

Table 9 contains additional regression estimates with a focus on time trends and alternative dependent variables. In the first four models we include dummies for 2002 and 2004 instead of the *Trend* variable (a "2006" dummy would be identical to the *Questionnaire* dummy). We exclude *Response* from these models to prevent multi-collinearity. The results of these models suggest that the replacement of the year dummies (2002 and 2004) with *Trend* in the baseline regressions (see Table 4) is unproblematic. The coefficients of year dummies are not significant for total costs, external costs or internal costs. In addition, we find some evidence for a positive trend for *Cost ratio* (the ratio of external costs to total compliance costs), which should be approximated by *Trend*.

[Table 9 about here]

In Model 5, we report regression results for the logarithm of internal compliance hours (*Hours*) as an alternative measure of the compliance burden. Confirming our baseline specification (Table 4), we obtain a strong and significantly negative coefficient for *Questionnaire*, while *Response* is not significant. Hence, we are able to confirm H2a also for the number of compliance hours. In addition, we analyze three proxy variables of tax complexity, which are not related to the temporal dimension of cost measurement and should – therefore – not be affected by temporal framing of the survey questions. By contrast, these cost proxies should be affected by a significant change in tax law complexity reducing the real burden of tax compliance. We re-estimate our baseline model (1) with the proxy variables *Complexity*, *WComplexity* and *Advice* as dependent variables (Table 9, Model 6 to 8). We do not find any significant evidence for an impact of *Response* or *Questionnaire* on all three tax complexity proxies (*Complexity*, *WComplexity* and *Advice*). Hence, while cost estimates significantly decreased in 2006, the proxy variables for tax complexity remain virtually unchanged. This suggests that the reduction in cost estimates in 2006 was driven by the changed wording of the survey instrument (effect of temporal framing on cost measurement) and not by changes in the tax system (impact of tax complexity on the real cost burden).

Notes

1. A somewhat similar result is provided by Rametse and Pope (2002). However, this investigation should be interpreted with caution, as the aggregate cost estimate is measured by a maximum willingness to pay for getting rid of all tax compliance obligations.
2. A small number of businesses report very low sales revenue (probably start-ups). As this might bias the relative cost estimate, we assume a maximum ratio of compliance costs to revenue of 100%. This accounts for the limited ability of businesses to bear higher cost burdens in the long run.
3. See also http://statbel.fgov.be/en/statistics/figures/economy/consumer_price_index/inflation/ (request from February 29, 2016).

4. Business age is available for 2000 and 2002. For enterprises, this also holds for the legal form and the number of establishments in Belgium. The questionnaires of 2002, 2004 and 2006 include information on the use of information technology tools and tax simplification proposals; see Eichfelder and Kegels (2014) for more detailed information on that data.
5. We consider the following 14 statements on administrative and legislative quality and complexity (all statements translated from French) as items for the calculation of *Complexity*: 1. It is easy to know, which tax agency should be referred to. 2. It is easy to contact the correct tax agency. 3. The tax administration gives precise answers. 4. Administrative decisions are clearly substantiated. 5. The administration gives an answer within a reasonable delay. 6. The answer is the same regardless of the contacted service personnel. 7. The obtained information corresponds to your needs. 8. Tax regulations are brought to your knowledge in advance of their adaption. 9. They are easy to understand. 10. Their objectives are clear. 11. They are sufficiently adapted to all the situations. 12. They are brought to your knowledge within reasonable time to comply. 13. They are coherent to each other. 14. They incorporate sufficient and adequate information; for more information see also Eichfelder and Kegels (2014).
6. It has to be considered that regression coefficients of a logarithmic model can be interpreted as marginal effects that are not very meaningful for dummy variables. The absolute effect can be approximately calculated as $EXP\left(\hat{\alpha} - 1/2 \cdot Var\left(\hat{\alpha}\right)\right) - 1$, with $\hat{\alpha}$ denoting the estimated coefficient and $Var\left(\hat{\alpha}\right)$ the estimated variance of $\hat{\alpha}$ (Kennedy 1981).
7. As might be expected, a number of revisions were made in Belgian business tax law in 2005 and 2006. These include changes of depreciations occurring over the course of the year (Loi modifiant les articles 196, § 2, et 216, 2°, b), du Code des impôts sur les revenus 1992, Moniteur Belge 2004-08-03), and the introduction of tax-relevant accruals for business claims in the event of insolvency (Loi modifiant l'arrêté royal n° 4 du 29 décembre 1969 relatif aux restitutions en matière de taxe sur la valeur ajoutée, la loi du 8 août 1997 sur les faillites et le Code des impôts sur les revenus 1992, en vue d'assurer un traitement fiscal plus équitable aux créanciers dans le cadre d'un concordat judiciaire ou d'une faillite, Moniteur Belge 2005-04-20). However, there was no major reform that could be responsible for a massive reduction in tax compliance costs. We are very grateful to Francis Adyns and André Franssen of the ‘Service Public Federal Finance’ for their kind support as well as for the provision of information on the major changes to Belgian tax law in 2005 and 2006.

8. It should be noted that *Questionnaire* is not endogenous. As the dummy accounts for all relevant effects in 2006, there should be no correlation with the error term. Thus the issue is rather a question of identification than of consistency.

9. In the 2000 survey, these questions were formulated in Belgian Francs. The surveys in 2000 and 2002 included an additional question on expenses for computer hardware and software: "What is the monthly cost of amortization of information processing hardware and software necessary to comply administratively with the tax regulations?"

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Tables

Table 1: Survey information

Group	Self-employed			Enterprises		
Survey year	Sample size	Usable response	Response rate	Sample size	Usable response	Response rate
2000	2,128	165	7.8%	884	149	16.9%
2002	2,247	304	13.5%	921	206	22.4%
2004	1,725	189	11.0%	903	187	20.7%
2006	2,169	217	10.0%	907	173	19.1%

Sample sizes, usable survey response, and response rates by sampling group. Response rates have been calculated by the ratio of usable response (as defined by the Bureau Fédèral du Plan) to sample size.

Table 2: Descriptive statistics

	Revenue (T€)			Costs per business (€)			Costs per revenue (%)			
Business class	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Observations
Self-employed	1,720	53	30,894	7,364	2,520	35,852	13.77	4.55	23.43	466
Small enterprises	2,561	1,567	2,558	41,916	10,632	128,711	5.95	0.90	18.12	280
Medium enterprises	22,497	19,742	10,769	174,618	24,933	1,035,489	1.22	0.13	8.51	123
Large enterprises	323,125	170,228	403,152	195,938	64,513	364,242	0.10	0.03	0.21	121
All businesses	43,822	405	176,362	60,964	6,676	398,667	8.33	1.21	19.74	990

Descriptive statistics for observations with full information on total compliance costs. Small (medium) enterprises are defined by a price-adjusted revenue of less than €10 m (€50 m). Costs per revenue are limited to a maximum value of 100%.

Table 3: Descriptive statistics (outliers excluded)

	Revenue (T€)			Costs per business (€)			Costs per revenue (%)			
Business class	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Observations
Self-employed	277	52	1,629	4,223	2,463	5,381	12.83	4.49	21.77	454
Small enterprises	2,575	1,562	2,561	21,797	10,085	38,710	3.25	0.88	10.96	263
Medium enterprises	22,377	18,686	10,975	45,978	24,551	65,934	0.25	0.13	0.46	112
Large enterprises	328,404	163,195	416,294	120,213	58,459	160,526	0.06	0.03	0.12	112
All businesses	42,604	328	177,697	27,910	6,511	72,961	7.13	1.20	17.13	941

Descriptive statistics for observations with full information on total compliance costs excluding outliers. Small (medium) enterprises are defined by a price-adjusted revenue of less than €10 m (€50 m). Costs per revenue are limited to a maximum value of 100%.

Table 4: Baseline regression results

Model	1	2	3	4	5	6	7	8
Dependent variable	TotalC	ExternalC	InternalC	Cost ratio	TotalC	ExternalC	InternalC	Cost ratio
Response	1.461	0.654	1.622	0.0901	1.806	2.561	0.535	0.549
	(1.902)	(2.250)	(2.274)	(0.498)	(1.524)	(1.779)	(1.819)	(0.396)
Questionnaire	-0.484***	-0.540**	-0.492**	-0.00664	-0.535***	-0.357***	-0.761***	0.0706***
	(0.185)	(0.213)	(0.221)	(0.0441)	(0.0936)	(0.114)	(0.118)	(0.0267)
Trend	-0.0133	0.0864	-0.106	0.0322**				
	(0.0659)	(0.0759)	(0.0782)	(0.0155)				
Repeated Observation	0.111	0.0446	0.173	-0.0306				
	(0.0977)	(0.118)	(0.113)	(0.0228)				
Advice	1.023***		0.236*		1.011***		0.222*	
	(0.118)		(0.122)		(0.118)		(0.123)	
Complexity	0.304***	0.205***	0.355***	-0.0295**	0.304***	0.201***	0.358***	-0.0307**
	(0.0425)	(0.0501)	(0.0537)	(0.0119)	(0.0424)	(0.0498)	(0.0536)	(0.0119)
Size	0.290***	0.273***	0.299***	-0.00620	0.291***	0.274***	0.298***	-0.00603
	(0.0179)	(0.0210)	(0.0215)	(0.00433)	(0.0179)	(0.0210)	(0.0214)	(0.00433)
Self-employed	-0.228**	-0.502***	0.0399	-0.105***	-0.226*	-0.494***	0.0341	-0.104***
	(0.116)	(0.132)	(0.144)	(0.0308)	(0.116)	(0.132)	(0.144)	(0.0310)
Industrial (Enterprise)	0.188*	-0.0489	0.355***	-0.0819***	0.193**	-0.0497	0.362***	-0.0840***
	(0.0961)	(0.118)	(0.116)	(0.0249)	(0.0960)	(0.118)	(0.117)	(0.0250)
Industrial (Self-employed)	0.189	0.385	0.0342	0.0719	0.204	0.386	0.0580	0.0633
	(0.214)	(0.276)	(0.207)	(0.0581)	(0.215)	(0.281)	(0.205)	(0.0582)
Construction (Self-employed)	-0.0302	0.0571	-0.157	0.0606*	-0.0290	0.0472	-0.145	0.0567*
	(0.108)	(0.122)	(0.141)	(0.0321)	(0.107)	(0.122)	(0.139)	(0.0319)
Primary (Self-employed)	-0.906***	-0.765***	-1.073***	0.0603**	-0.907***	-0.767***	-1.073***	0.0601**
	(0.107)	(0.123)	(0.127)	(0.0255)	(0.107)	(0.122)	(0.127)	(0.0255)
Flanders	0.227***	0.218**	0.147	0.0177	0.229***	0.211**	0.157*	0.0144
	(0.0773)	(0.0919)	(0.0906)	(0.0199)	(0.0772)	(0.0913)	(0.0902)	(0.0197)
Brussels	0.267**	0.210	0.241*	0.0158	0.266**	0.202	0.247*	0.0132
	(0.110)	(0.132)	(0.137)	(0.0310)	(0.110)	(0.132)	(0.137)	(0.0310)
Constant	3.137***	3.697***	3.019***	0.613***	3.140***	3.869***	2.858***	0.671***
	(0.331)	(0.381)	(0.412)	(0.0890)	(0.317)	(0.364)	(0.393)	(0.0837)
Observations	941	855	928	855	941	855	928	855
R^2	0.667	0.552	0.567	0.056	0.667	0.551	0.565	0.052

Dependent variables: logarithm of total compliance costs (TotalC), logarithm of external costs (ExternalC), logarithm of internal costs (InternalC) and the ratio of internal costs to external costs. Estimates are calculated by pooled OLS. Heteroscedasticity-robust standard errors (Huber/Young/Sandwich estimator) are in parentheses; *** / ** / * indicate statistical significance on the 1% / 5% / 10% level; for the definition of variables see Appendix 1, Table 7.

Table 5: Regression results with interaction terms

Model	1	2	3	4	5	6	7	8
Dependent variable	TotalC	ExternalC	InternalC	Cost ratio	TotalC	ExternalC	InternalC	Cost ratio
Response	1.104	2.300	1.102	0.180	1.578	4.354	-0.0180	0.668
	(2.646)	(3.205)	(3.077)	(0.685)	(2.351)	(2.781)	(2.761)	(0.605)
Questionnaire	-0.324	-0.404*	-0.255	-0.0327	-0.371***	-0.227	-0.522***	0.0451
	(0.199)	(0.230)	(0.242)	(0.0497)	(0.120)	(0.141)	(0.156)	(0.0349)
Response × Self-employed	0.752	-3.027	1.106	-0.188	0.515	-3.533	1.182	-0.256
	(3.032)	(3.549)	(3.620)	(0.796)	(3.043)	(3.537)	(3.644)	(0.795)
Questionnaire × Self-employed	-0.360**	-0.282	-0.533***	0.0622	-0.364**	-0.288	-0.533***	0.0609
	(0.156)	(0.185)	(0.200)	(0.0432)	(0.156)	(0.185)	(0.199)	(0.0431)
Trend	-0.0126	0.0818	-0.106	0.0321**				
	(0.0659)	(0.0762)	(0.0777)	(0.0154)				
Repeated Observation	0.110	0.0415	0.172	-0.0311				
	(0.0978)	(0.118)	(0.113)	(0.0229)				
Advice	1.012***		0.221*		1.000***		0.207*	
	(0.117)		(0.121)		(0.117)		(0.122)	
Complexity	0.306***	0.205***	0.357***	-0.0298**	0.306***	0.201***	0.360***	-0.0310***
	(0.0425)	(0.0501)	(0.0537)	(0.0119)	(0.0424)	(0.0498)	(0.0537)	(0.0119)
Size	0.289***	0.271***	0.296***	-0.00596	0.289***	0.273***	0.296***	-0.00581
	(0.0178)	(0.0211)	(0.0213)	(0.00433)	(0.0178)	(0.0210)	(0.0212)	(0.00434)
Self-employed	-0.166	-0.450***	0.136	-0.115***	-0.162	-0.442***	0.130	-0.114***
	(0.118)	(0.134)	(0.145)	(0.0311)	(0.117)	(0.133)	(0.145)	(0.0313)
Industrial (Enterprise)	0.184*	-0.0501	0.351***	-0.0811***	0.190**	-0.0506	0.358***	-0.0832***
	(0.0959)	(0.118)	(0.116)	(0.0249)	(0.0959)	(0.118)	(0.116)	(0.0249)
Industrial (Self-employed)	0.188	0.403	0.0316	0.0733	0.204	0.407	0.0548	0.0651
	(0.215)	(0.272)	(0.214)	(0.0590)	(0.216)	(0.277)	(0.211)	(0.0589)
Construction (Self-employed)	-0.0277	0.0578	-0.153	0.0602*	-0.0268	0.0484	-0.140	0.0562*
	(0.108)	(0.122)	(0.141)	(0.0321)	(0.107)	(0.122)	(0.139)	(0.0319)
Primary (Self-employed)	-0.897***	-0.748***	-1.061***	0.0570**	-0.898***	-0.749***	-1.061***	0.0569**
	(0.107)	(0.124)	(0.126)	(0.0256)	(0.107)	(0.124)	(0.126)	(0.0256)
Flanders	0.233***	0.228**	0.156*	0.0160	0.235***	0.221**	0.166*	0.0127
	(0.0774)	(0.0919)	(0.0908)	(0.0199)	(0.0772)	(0.0914)	(0.0903)	(0.0197)
Brussels	0.272**	0.208	0.251*	0.0149	0.271**	0.200	0.257*	0.0121
	(0.110)	(0.132)	(0.137)	(0.0311)	(0.110)	(0.132)	(0.136)	(0.0311)
Constant	3.128***	3.696***	3.003***	0.617***	3.134***	3.859***	2.842***	0.675***
	(0.330)	(0.383)	(0.409)	(0.0888)	(0.315)	(0.364)	(0.390)	(0.0835)
Observations	941	855	928	855	941	855	928	855
R^2	0.669	0.553	0.571	0.059	0.669	0.552	0.570	0.054

Dependent variables: logarithm of total compliance costs (TotalC), logarithm of external costs (ExternalC), logarithm of internal costs (InternalC) and the ratio of internal costs to external costs. Estimates are calculated by pooled OLS. Heteroscedasticity-robust standard errors (Huber/Young/Sandwich estimator) are in parentheses; *** / ** / * indicate statistical significance on the 1% / 5% / 10% level; for the definition of variables see Appendix 1, Table 7.

Table 6: Regressions for e-government applications

Model	1	2	3	4	5	6
Period	2002	2002	2002	2002-2004	2004	2004
Dependent variable	TotalC	TotalC	TotalC	TotalC	TotalC	TotalC
FISCONET	-0.0289					
	(0.201)					
Portail fédéral		0.218				
		(0.161)				
FINFORM			0.125			
			(0.253)			
Electronic VAT declaration				-0.0501		
				(0.110)		
Electronic tax bills					-0.302	
					(0.218)	
Tax-on-web						0.0817
						(0.176)
Advice	0.866***	0.901***	0.755***	1.064***	1.160***	1.261***
	(0.249)	(0.270)	(0.266)	(0.182)	(0.257)	(0.265)
Complexity	0.371***	0.360***	0.400***	0.331***	0.286***	0.305***
	(0.0906)	(0.0879)	(0.0947)	(0.0639)	(0.0986)	(0.0978)
Size	0.303***	0.284***	0.299***	0.275***	0.235***	0.218***
	(0.0403)	(0.0399)	(0.0401)	(0.0270)	(0.0441)	(0.0425)
Self-employed	-0.0784	-0.137	-0.0322	-0.346*	-0.539*	-0.721**
	(0.264)	(0.241)	(0.269)	(0.190)	(0.324)	(0.323)
Industrial (Enterprise)	0.321*	0.277	0.369*	0.195	0.133	0.123
	(0.191)	(0.199)	(0.199)	(0.137)	(0.227)	(0.219)
Industrial (Self-employed)	-0.183	0.300	-0.173	0.00696	0.145	0.259
	(0.255)	(0.434)	(0.258)	(0.209)	(0.330)	(0.479)
Construction (Self-employed)	-0.205	-0.212	-0.236	0.00507	0.205	0.326
	(0.255)	(0.243)	(0.256)	(0.174)	(0.244)	(0.252)
Primary (Self-employed)	-0.801***	-0.774***	-0.835***	-0.736***	-0.941***	-0.891***
	(0.243)	(0.224)	(0.248)	(0.168)	(0.262)	(0.289)
Flanders	0.376**	0.360**	0.361**	0.289***	0.282*	0.272
	(0.162)	(0.159)	(0.169)	(0.112)	(0.167)	(0.180)
Brussels	0.153	0.177	0.135	0.163	0.431	0.351
	(0.245)	(0.235)	(0.256)	(0.183)	(0.316)	(0.331)
Constant	2.759***	2.968***	2.767***	3.269***	3.983***	4.067***
	(0.699)	(0.681)	(0.690)	(0.470)	(0.736)	(0.752)
Observations	228	238	213	424	178	166
R^2	0.659	0.652	0.667	0.656	0.661	0.678

Dependent variables: logarithm of total compliance costs (TotalC). Estimates are calculated by pooled OLS. Heteroscedasticity-robust standard errors (Huber/Young/Sandwich estimator) are in parentheses; *** / ** / * indicate statistical significance on the 1% / 5% / 10% level; for the definition of variables see Appendix 1, Table 7.

Table 7: Definition of variables

Variable	Definition
Dependent variables (Cost)	
Cost ratio	Ratio of external costs to total compliance costs
External costs (ExternalC)	Logarithm of price-adjusted external tax adviser costs in €
Hours	Logarithm of the compliance working hours of internal staff members (including owners and managers)
Internal costs (InternalC)	Logarithm of price adjusted compliance costs for internal staff members (including owners and managers) in €
Total compliance costs (TotalC)	Logarithm of the sum of external costs and internal costs (both components price-adjusted) in €
Explanatory variables on cost measurement	
Questionnaire	Dummy variable for the 2006 questionnaire (estimation of the compliance burden on a yearly basis)
Questionnaire x Self-employed	Interaction term of Questionnaire and a dummy variable for small self-employed businesses
Response	Difference between the response rate of a current year for a sampling group (self-employed or enterprise) and the mean response rate of the sampling group for all years (1998, 2000, 2002, 2004)
Explanatory variables on e-government features	
Electronic tax bills	Dummy variable for businesses using electronic tax bills (available for 2004)
Electronic VAT declaration	Dummy variable for businesses using electronic value added tax declarations (available for 2002 and 2004)
FISCONET	Dummy variable for businesses using the online information database FISCONET (available for 2002)
FINFORM	Dummy variable for businesses using online tax forms via FINFORM (available for 2002)
Portail fédéral	Dummy variable for businesses using the online portal of the federal tax administration Portail fédéral (available for 2002)
Tax-on-web	Dummy variable for businesses using the electronic income tax declaration via tax-on-web (available for 2004)
General control variables	
Advice	Dummy variable with a value of 1 if a tax adviser has been consulted (ExternalC > 0)
Complexity	Unweighted average over 14 Likert scale ratings on legal and administrative tax complexity
Repeated observation	Dummy variable if an observation is a repeated observation of an earlier period of the same business
Size	Logarithm of price-adjusted sales revenue in €1,000.
Trend	Linear time trend with a value of 1 for the 1998 sample and a value of 4 for the 2006 sample
WComplexity	Weighted average over 14 Likert scale ratings on legal and administrative tax complexity; as weight we rely on the coefficients of a regression of the 14 ratings on total compliance costs (see also Eichfelder and Kegels 2014)
Dummy variables for legal form, industry and region	
Brussels	Dummy variable for the region of Brussels (default is Wallonia)
Flanders	Dummy variable for the region of Flanders (default is Wallonia)
Self-employed	Dummy variable for self-employed businesses (default is incorporated enterprise)
Construction (Self-employed)	Dummy variable for self-employed businesses in the construction sector (default is other industry)
Industrial (Enterprise)	Dummy variable for enterprises in the industrial sector (default is other industry)
Industrial (Self-employed)	Dummy variable for self-employed businesses in the industrial sector (default is other industry)
Primary (Self-employed)	Dummy variable for self-employed businesses in the primary sector (default is other industry)

Table 8: Cross checks: Weighted tax complexity index

Model	1	2	3	4	5	6	7	8
Dependent variable	TotalC	ExternalC	InternalC	Cost ratio	TotalC	ExternalC	InternalC	Cost ratio
Response	1.231	0.508	1.375	0.114	1.771	2.574	0.509	0.561
	(1.879)	(2.233)	(2.251)	(0.498)	(1.499)	(1.757)	(1.795)	(0.395)
Questionnaire	-0.501***	-0.555***	-0.512**	-0.00524	-0.529***	-0.354***	-0.753***	0.0709***
	(0.184)	(0.213)	(0.220)	(0.0442)	(0.0929)	(0.113)	(0.117)	(0.0267)
Trend	-0.00269	0.0945	-0.0938	0.0317**				
	(0.0657)	(0.0761)	(0.0778)	(0.0155)				
Repeated Observation	0.109	0.0453	0.169	-0.0308				
	(0.0973)	(0.118)	(0.112)	(0.0228)				
Advice	1.014***		0.228*		1.003***		0.214*	
	(0.116)		(0.120)		(0.116)		(0.121)	
WComplexity	0.335***	0.235***	0.388***	-0.0272**	0.335***	0.230***	0.391***	-0.0286**
	(0.0396)	(0.0479)	(0.0498)	(0.0113)	(0.0394)	(0.0474)	(0.0497)	(0.0113)
Size	0.290***	0.272***	0.297***	-0.00604	0.290***	0.274***	0.297***	-0.00588
	(0.0176)	(0.0209)	(0.0211)	(0.00432)	(0.0176)	(0.0208)	(0.0211)	(0.00432)
Self-employed	-0.236**	-0.508***	0.0283	-0.105***	-0.233**	-0.499***	0.0234	-0.103***
	(0.115)	(0.132)	(0.143)	(0.0308)	(0.115)	(0.132)	(0.143)	(0.0310)
Industrial (Enterprise)	0.199**	-0.0424	0.367***	-0.0822***	0.204**	-0.0435	0.373***	-0.0843***
	(0.0952)	(0.118)	(0.115)	(0.0250)	(0.0951)	(0.118)	(0.116)	(0.0250)
Industrial (Self-employed)	0.201	0.401	0.0493	0.0696	0.215	0.401	0.0724	0.0609
	(0.218)	(0.282)	(0.203)	(0.0574)	(0.219)	(0.286)	(0.200)	(0.0574)
Construction (Self-employed)	-0.0115	0.0689	-0.135	0.0605*	-0.0117	0.0578	-0.124	0.0565*
	(0.107)	(0.121)	(0.140)	(0.0321)	(0.106)	(0.121)	(0.139)	(0.0319)
Primary (Self-employed)	-0.919***	-0.773***	-1.088***	0.0621**	-0.921***	-0.775***	-1.088***	0.0619**
	(0.106)	(0.122)	(0.126)	(0.0255)	(0.105)	(0.121)	(0.126)	(0.0255)
Flanders	0.226***	0.216**	0.145	0.0188	0.227***	0.207**	0.154*	0.0156
	(0.0767)	(0.0913)	(0.0901)	(0.0199)	(0.0766)	(0.0908)	(0.0896)	(0.0197)
Brussels	0.280**	0.218*	0.254*	0.0158	0.277**	0.209	0.259*	0.0131
	(0.109)	(0.132)	(0.136)	(0.0310)	(0.109)	(0.132)	(0.136)	(0.0310)
Constant	3.039***	3.600***	2.923***	0.602***	3.064***	3.791***	2.783***	0.660***
	(0.322)	(0.373)	(0.398)	(0.0858)	(0.307)	(0.352)	(0.379)	(0.0803)
Observations	941	855	928	855	941	855	928	855
R^2	0.673	0.555	0.573	0.056	0.672	0.554	0.572	0.051

Dependent variables: logarithm of total compliance costs (TotalC), logarithm of external costs (ExternalC), logarithm of internal costs (InternalC) and the ratio of internal costs to external costs (Cost ratio). Estimates are calculated by pooled OLS. Heteroscedasticity-robust standard errors (Huber/Young/Sandwich estimator) are in parentheses; *** / ** / * indicate statistical significance on the 1% / 5% / 10% level; for the definition of variables see Appendix 1, Table 7.

Table 9: Cross checks: Year dummies and complexity proxies

Model	1	2	3	4	5	6	7	8
Estimation method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	Logit
Dependent variable	TotalC	ExternalC	InternalC	Cost ratio	Hours	Complexity	WComplexity	Advise
2002	0.0694	0.114	-0.00253	0.0330				
	(0.0880)	(0.104)	(0.107)	(0.0240)				
2004	0.0253	0.196	-0.154	0.0675**				
	(0.108)	(0.123)	(0.130)	(0.0262)				
Response					-0.622	-1.216	-0.418	4.280
					(2.229)	(1.461)	(1.520)	(7.182)
Questionnaire	-0.492***	-0.271**	-0.769***	0.0901***	-0.769***	0.00732	0.0574	-0.630
	(0.106)	(0.129)	(0.131)	(0.0296)	(0.216)	(0.132)	(0.137)	(0.617)
Trend					-0.0331	-0.0728	-0.0978**	0.143
					(0.0763)	(0.0476)	(0.0491)	(0.216)
Repeated Observation	0.110	0.0449	0.172	-0.0304	0.0338	0.0167	0.0210	-0.781**
	(0.0976)	(0.118)	(0.113)	(0.0229)	(0.109)	(0.0661)	(0.0699)	(0.324)
Advice	1.023***		0.236*		0.211*	0.212***	0.217***	
	(0.118)		(0.122)		(0.122)	(0.0796)	(0.0815)	
Complexity	0.304***	0.205***	0.355***	-0.0296**	0.285***			0.388***
	(0.0425)	(0.0501)	(0.0537)	(0.0119)	(0.0536)			(0.145)
Size	0.290***	0.273***	0.299***	-0.00620	0.241***	-0.0102	-0.00673	0.117**
	(0.0179)	(0.0210)	(0.0215)	(0.00433)	(0.0201)	(0.0111)	(0.0115)	(0.0588)
Self-employed	-0.228*	-0.502***	0.0407	-0.105***	0.0264	-0.0597	-0.0320	0.187
	(0.116)	(0.132)	(0.144)	(0.0308)	(0.140)	(0.0926)	(0.0961)	(0.379)
Industrial (Enterprise)	0.188*	-0.0491	0.356***	-0.0820***	0.307***	-0.0810	-0.106	0.634
	(0.0961)	(0.118)	(0.116)	(0.0249)	(0.116)	(0.0631)	(0.0676)	(0.423)
Industrial (Self-employed)	0.190	0.388	0.0326	0.0729	0.274	0.190	0.136	-0.266
	(0.214)	(0.276)	(0.207)	(0.0579)	(0.345)	(0.172)	(0.206)	(0.827)
Construction (Self-employed)	-0.0297	0.0576	-0.157	0.0608*	0.0452	-0.140	-0.183*	-0.209
	(0.108)	(0.122)	(0.141)	(0.0322)	(0.130)	(0.101)	(0.104)	(0.375)
Primary (Self-employed)	-0.905***	-0.765***	-1.073***	0.0605**	-0.352***	-0.0613	-0.0157	-0.256
	(0.107)	(0.123)	(0.127)	(0.0255)	(0.125)	(0.0844)	(0.0857)	(0.340)
Flanders	0.227***	0.219**	0.147	0.0178	0.0462	-0.140**	-0.124**	0.0699
	(0.0773)	(0.0919)	(0.0906)	(0.0199)	(0.0930)	(0.0594)	(0.0612)	(0.293)
Brussels	0.267**	0.211	0.241*	0.0162	0.0728	-0.154*	-0.177**	-0.138
	(0.110)	(0.132)	(0.137)	(0.0310)	(0.135)	(0.0797)	(0.0844)	(0.434)
Constant	3.081***	3.769***	2.861***	0.644***	0.581	3.618***	3.575***	-0.604
	(0.320)	(0.372)	(0.397)	(0.0848)	(0.393)	(0.205)	(0.216)	(1.057)
Observations	941	855	928	855	928	941	941	941
R^2	0.667	0.552	0.567	0.056	0.428	0.036	0.038	

Dependent variables: logarithm of total compliance costs (TotalC), logarithm of external costs (ExternalC), logarithm of internal costs (InternalC), the ratio of external costs to total compliance costs (Cost ratio), the logarithm of compliance hours (Hours), unweighted and weighted average statements on complexity (Complexity, WComplexity), and a dummy variable for businesses with external support (Advise). Estimates are calculated by pooled OLS. Heteroscedasticity-robust standard errors (Huber/Young/Sandwich estimator) are in parentheses; *** / ** / * indicate statistical significance on the 1% / 5% / 10% level; for the definition of variables see Appendix 1, Table 7.

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