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Clearing the bar: Improving tax compliance for small firms through target setting☆

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ABSTRACT

We use a new dataset of the universe of Greek corporate tax returns to study a voluntary tax compliance program for small firms. This "self-assessment" program prescribed target taxable profit margins (the ratio of taxable profits to revenues) for different types of activities. Firms that reported profit margins above these targets in a given year were exempt from audits in that year. We find that the firms that take up the program report significantly larger taxable profits than non-eligible firms, with some evidence for longer-lasting effects on tax reporting. Firms that take up the program for more years exhibit stronger effects. We also find that firms can easily and substantially manipulate reported revenue (decreasing it by up to 40%) to help meet prescribed profit margins without paying more in taxes. Overall, the program increased tax revenues collected from small firms, but points to a very large level of baseline under-reporting of profits and the ease of manipulating reported revenues.

1. Introduction

Tax compliance and enforcement have become one of the main foci of tax authorities that aim to improve revenue collection across developed and developing economies. The challenges of tax enforcement and revenue collection are especially large when it comes to small firms. What programs can increase tax compliance without incurring excessive administrative and enforcement costs?

In this paper, we investigate a tax compliance mechanism in Greece, designed to increase the share of taxable profits reported to the tax authority. We use new corporate tax data for the universe of Greek corporate tax returns, matched to financial accounting statements for a subset of them.[1] The program we study involves an unusual type of government guidance that sets targets on what taxable profit margins (the ratio of taxable profits to revenues) are deemed acceptable and reasonable for small firms, i.e., those with revenues below €300,000.

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[1] Corporate tax returns in Greece mainly come from Limited Liability Companies (LLC) and *Sociétés Anonymes* (SA). We describe the different legal statuses for Greek enterprises in Appendix A.1.

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The Greek economy is a particularly interesting setting to study issues surrounding tax compliance and evasion. The country had large budget deficits preceding the 2010 debt and financial crisis.[2] This crisis and the long history of sovereign defaults were symptomatic of the inability to raise sufficient revenue and of weak tax compliance – challenges that are faced by other countries too. Greece has defaulted five times on its sovereign debt since the beginning of the modern Republic in 1821, and most recently restructured its debt in 2012. The country's approach to tax compliance relies heavily on tax amnesties and forgiveness programs, especially when the government's budget constraint makes additional revenues urgent. Greece has offered 11 voluntary tax programs since 1978, mostly for individual taxpayers. The program we study in this paper is instead targeted to small firms and is a special type of such forgiveness policies, called the "self-assessment program." It attempts to specifically address the tax compliance challenges of Greece as one of the largest shadow economies in the OECD with an unusually high number of small enterprises (OECD, 2011).

In this self-assessment program for small firms, the government posts target taxable profit margins for different types of economic activities. If firms that engage in these activities reported profit margins at least as large as the guidelines in a given year, they were guaranteed to not be audited for that year. Thus, despite not being a typical amnesty program, this program represents a partial, temporary "amnesty" from audits for the year the firms take up the program.

In general, it is unclear whether such amnesty-type policies have the intended effect of increasing compliance and tax revenues. On the one hand, they may reduce compliance for non-participating firms or for years of non-participation. On the other hand, they can bring formerly delinquent tax payers back to the compliance pool and smooth the transition from a regime of low enforcement to one of stricter enforcement thanks to initial special treatments (Leonard and Zeckhauser, 1987). The net effects of amnesty policies are therefore ambiguous.

Firms opting into the self-assessment program comply by internally calculating their share of given activities and then filing taxes that meet the prescribed government taxable profit margins. There are several ways of meeting these target margins, not all of which are beneficial for tax revenues. On the one hand, firms can reduce revenues to lower the profit level needed to comply with the margin target. This can be achieved through a real reduction in sales, by delaying recognition of legitimate sales, or by providing temporary discounts to consumers. Alternatively, firms can manipulate reported revenues, by not issuing invoices or by creating fake invoices exhibiting lower sales. On the other hand, firms can meet targets by increasing taxable profits, either by reducing deductions used to avoid taxes or by directly topping up profits with a special "self-assessed" amount introduced for the purposes of the program – essentially a discretionary add-on to their taxable profits. Only increases in reported taxable profits represent gains in terms of tax revenues for the tax administration; reductions of revenues through lower real activities or outright manipulation do not.

We use event studies and difference-in-differences to examine the effect of the program on all these potential adjustment margins, comparing outcomes between eligible and non-eligible firms, as well as between years in which eligible firms take up the program and those in which they do not.

We find that taxable profits increase significantly for self-assessing firms. Most of the effects come from firms that previously reported negative or zero taxable profits and start reporting positive amounts after taking up the program. For firms that take up the program for four years, for example, the increase in taxable profits is about 255% to 470% of the 2002 average taxable profits for firms that report positive taxable profits (the year before the program starts). These results expressed in percent are large given the low level of taxable profits reported at baseline and we thus also provide detailed results in levels. Self-assessing firms meet the target primarily by changing their additional" self-assessed" amount. They also reduce their use of the tax loss carryforward deduction – the main tax deduction firms use in Greece to avoid taxation in years following losses. Yet, depending on the number of take-up years, reported revenue can decline by up to 40%, showing that firms also adjust revenues in order to make it easier to meet the target profit margin. The magnitude of the revenue change is larger for firms that take up the program for fewer years, but the magnitude of the taxable profits change is larger for firms that take up the program for more years. The findings highlight how challenging self-assessment can be when reported revenues are so easily manipulable. While the tax administration does collect more taxes thanks to this program, firms can still hide a substantial amount of their activity.

The paper proceeds as follows: Section 2 highlights the contributions of our paper relative to the existing literature, Section 3 describes the data and some important facts on tax reporting in Greece; Sections 4 and 5 delve into the institutional features of the self-assessment program and describe take-up; Section 6 shows non-parametric evidence on the effects of the self-assessment program based on the revenue and profit distributions, followed by a formal event-study estimation of the program's effects; Section 7 provides extensions, robustness checks, and discusses the implications for tax revenue. Finally, Section 8 concludes.

2. Related literature

This paper is related to the abundant literature on tax enforcement and compliance, and more specifically to studies of tax amnesties and forgiveness. Stella (1991) and Leonard and Zeckhauser (1987) discuss the costs and benefits of tax amnesties. Theoretical work is skeptical of amnesty policies' success if they are designed to forgive and cancel *past* evasion, without changing the costs or benefits of compliance for firms through improved tax administration (Andreoni, 1991; Malik and Schwab, 1991; Graetz and Wilde, 1993). Early empirical studies have reinforced this worry with mixed compliance results for U.S. state amnesty policies, unless the amnesty is coupled with tax enforcement improvements (Joulfaian, 1988; Alm et al., 1990;

[2] The *Financial Times* and many other news sources reported that Greece had in fact falsified its budget numbers leading up to the crisis (Financial Times, 2010).

Alm and Beck, 1993). The exception is Christian et al. (2002) who find that state amnesties are successful in bringing in new filers into the tax system.

Most recent studies have focused on cross-border amnesty policies. Tax administrations use types of amnesties that allow for the repatriation of foreign profits or wealth without penalties, and usually by imposing a lower tax rate than the gap between foreign and domestic tax rates. Corporate tax forgiveness or amnesty policies are naturally designed to bring profits back from tax havens (see Hines, 2010; Dharmapala, 2008, for a review on the tax haven literature). Studying a wealth repatriation policy in Norway, Alstadsæter et al. (2019) show that the very wealthy increase reported wealth when selecting into a tax amnesty program. Recent evidence on U.S. firms suggests that the repatriation tax holiday effects are immediate, but temporary (Zucman, 2014). Profit repatriation policies may therefore backfire by discouraging honest taxpayers or taxpaying firms and allowing for strategic intertemporal shifting. Langenmayr (2017), for example, shows that tax evasion increases after the introduction of voluntary disclosure for individuals; Desai et al. (2004a) provide evidence that multinationals shift profits to tax havens to strategically delay repatriating profits. Forgiveness policies must therefore take into account firms' incentives to strategically shift or report profits (Desai et al., 2004b, 2006).

While repatriation policies are highly relevant for firms operating across borders, tax compliance policies for domestic firms rely on third-party reporting – especially for small firms– (Slemrod et al., 2017; Naritomi, 2019; Best et al., 2015), electronic filing (Okunogbe and Pouliquen, 2018), withholding taxes on credit card sales (Brockmeyer and Hernandez, 2016) and the advantageous enforcement properties of the VAT (Waseem, 2020). Slemrod (2019) provides a review of the growing literature that studies the effects of government policies to tackle tax evasion for small firms. Recent work has emphasized the effect of audit threats and changing audit probabilities on tax compliance (see for example Kleven et al., 2011; De Andrade et al., 2013; Choudhary and Gupta, 2019). These types of policies have been studied in the context of Spain (Almunia and Lopez-Rodriguez, 2018) and Italy (Di Gregorio and Paradisi, 2019).

A main feature of the Greek program is a that it sets target taxable profit margins in exchange for a lower or even zero audit probability. Target margins are based on firm activity and guide firms to report taxable profits based on their revenue - a de facto estimation by the Greek tax authority of how much firms should be reporting in profits. This is a form of presumptive tax, and it can be beneficial for the tax authority in settings of low compliance and enforcement capacity. Rajaraman (1995) provides an overview of forms of presumptive taxes used in developing countries. Although Greece is not a developing country, its corporate tax system was characterized by low compliance especially in the years preceding the debt crisis (OECD, 2011).

The literature on taxation and tax systems in Greece is small, but growing, examining the Greek payroll tax system reforms (Saez et al., 2012), the extent of evasion in the personal income tax system (Artavanis et al., 2016), and responses to inheritance taxation (Tsoutsoura, 2015). Kanellopoulos (2002) studies tax audits and penalties and estimates a tax evasion rate of 20.4% of the total amount owed for firms listed on the Athens stock exchange for 1991–1999. Stamatopoulos et al. (2017) use firm survey and financial statements data to provide correlations between compliance costs and characteristics of firms and industries. Our paper is the first study addressing tax reporting based on the universe of corporate tax returns in Greece.

3. Data and facts on tax reporting

3.1. Sources and summary

This paper uses new data on corporate income tax returns from the Greek tax administration for the years 1999–2016. The data contains the universe of Greek Limited Liability Companies (LLCs), and *Sociétés Anonymes* (SAs) – the near equivalent to Public Limited Companies (PLCs) in UK law and Public Companies in U.S. law. The data contains all the main tax variables, including taxable profits, revenues and net income, taxes withheld, as well as tax-relevant firm characteristics, including the firm's legal status and whether it takes up the self-assessment program.

We exclude observations with duplicate tax returns filed in the same year (about 1% of all firms), and exclude the 24% of firms that have revenues below 10,000, 73% of which only file one tax return in the period 1999–2016 and are likely to be inactive. We also do not include firms in the financial services, insurance, and construction industries, and special shipping and agricultural firms (about 8% of firms), because they receive special tax treatments. Our final sample of around 100,000 firms covers about 67% of all Greek corporations filing tax returns between 1999 and 2016, and Table 1 shows some summary statistics for the sample over this time period.

In the take-up analysis in Section 5 and in the heterogeneity analysis by industry in Section 7.3, we supplement the tax data with digitized financial statements data for the years 2003–2016 from the leading statistics firm in Greece, *Hellastat*. About a third of all firms filing taxes are in the *Hellastat* data. Larger firms usually have more detailed financial statements than smaller ones, including breakdowns by different types of costs and R&D expenses. Nevertheless, the main firm characteristics that are proxies for size – such as total assets and total employment – are available for nearly 50% of firms. We match firms using accounting profits and revenues, as these two variables should be exactly the same in these datasets.[3] Table A1 in the appendix compares the full sample used in the main analysis to the sample matched to financial statements. Although firms that are matched are on average larger (since younger and smaller firms are less likely to have public statements available through *Hellastat*), the distributions of taxable and accounting profit margins are similar in both samples.

[3] We exclude firm-year observations where the definitions of tax year and financial statement year do not coincide.

Table 1
Summary statistics 1999–2016.

	Mean	25th perc.	Median	75th perc.
	$/€ mean exchange rate (1999–2016) = 1.21			
Revenue (1000's €)	3822	116	424	1472
Accounting Profits (1000's €)	67	−16	10	58
Taxable Profits (1000's €)	−241	−49	5	50
Accounting Margins (%)	−0.17	−0.07	0.02	0.10
Taxable Margins (%)	−0.65	−0.19	0.01	0.08
Firm Age (years)	10.7	4	9	15
Firm-year observations	774,859			

Notes: Summary statistics for the tax data sample from 1999 to 2016. Accounting and taxable profits refer to profits or losses (if negative). Accounting and taxable margins are defined as profits (or losses) as a percentage of revenue.

The Greek corporate tax system is characterized by low compliance and includes complex and often uncertain rules on deducting expenses, which are also prone to abuse and misinterpretation (OECD, 2018; Vasardani, 2011).[4] The 1999–2016 period in question was subject to frequent changes in the statutory corporate tax rate; it was 40% in 1999, reached a low of 20% by 2011 after several changes, and increased gradually to 29% by 2016. Furthermore, prior to 2013 especially, tax collection did not rely on mandatory electronic filing, adding to the administrative costs of tax collection.

The self-assessment program we study considers "small firms" to be eligible if they have less than €300,000 in revenue. We therefore use this definition of "small firms" throughout the paper. These small firms make up 72% of all firms in our tax sample between 1999 and 2016. We begin by noting a few differences between small and large firms' tax reporting.

3.2. Filing and scrutiny by tax authorities

Greek tax returns are filed by initially reporting revenue and accounting profits, then applying several adjustments to obtain taxable profits, and finally reporting the amount owed to the tax authority. There are two main sources of differences between accounting and taxable profits: first, as in many countries, there is a so-called "book-tax difference" whereby many variables are not defined the same way for accounting and for tax purposes. In particular, the corporate tax system does not allow for full deduction of certain categories of expenses, which are counted as accounting expenses in the financial statements in accordance with the accounting standards. Second, the tax loss carryforward deduction allows taxable profits to be lower than accounting profits in years when earlier losses are deducted. Taxable and accounting profits and profit margins are therefore defined as follows:

$$\pi_{it}^{Acc} = R_{it} - C_{it}, \quad m_{it}^{Acc} = \frac{\pi_{it}^{Acc}}{R_{it}}$$
$$\pi_{it}^{Tax} = R_{it} - C_{it}^{a}, \quad m_{it}^{Tax} = \frac{\pi_{it}^{Tax}}{R_{it}}$$

for firm i in year t, where π corresponds to profits, m to margins, R to revenue, C to costs, and C^a to adjusted costs (to tax rules and deductions). *Acc* denotes accounting and *Tax* denotes taxable.

Nevertheless, as Fig. 1 shows, in each year before 2010, nearly 35–40% of both large and small firms reported taxable profits equal to their accounting profits. A possible explanation for this is that there was little scrutiny by tax authorities especially on deductions and expenses prior to 2010. In fact, Greek firms have been found to manipulate accounting profits in accounting studies. For example, Leuz et al. (2003) estimate that Greece had the highest mean aggregate profits manipulation score (28.3) in their study of 31 countries; the U.S. had the lowest score (2.0). In 2010, as the fiscal crisis began, the tax system came under review. This culminated in the passing of Law 3842/2010, which mandated that a certified accountant or tax consultancy office in the case of small firms, and auditing firms in the case of larger firms, co-sign on tax returns as well as financial statements and be liable in case of detected evasion (Karagounis and Partners, 2010). Firms were also required to submit supplementary documents displaying analytically all adjustments made to accounting profits in order to yield taxable profits. And indeed, the figure shows that the share of firms reporting revenues and accounting profits on their tax forms without adjustments declined sharply after 2010, to about 15% for small firms and less than 10% for large firms.

3.3. The tax loss carryforward option

Significant shares of small and large firms report negative or zero taxable profits, which implies that they pay no tax. A firm that has positive accounting profits can still end up with zero or negative taxable profits if it takes deductions or uses the tax loss

[4] In 2018, Greece ranked 72nd in the world according to the World Bank's "Paying Taxes" indicator, 28th among OECD countries by the time spent completing tax payments, and 27th among OECD countries according to an index of time spent on post-filing procedures including VAT refunds, tax audits and administrative tax appeals.

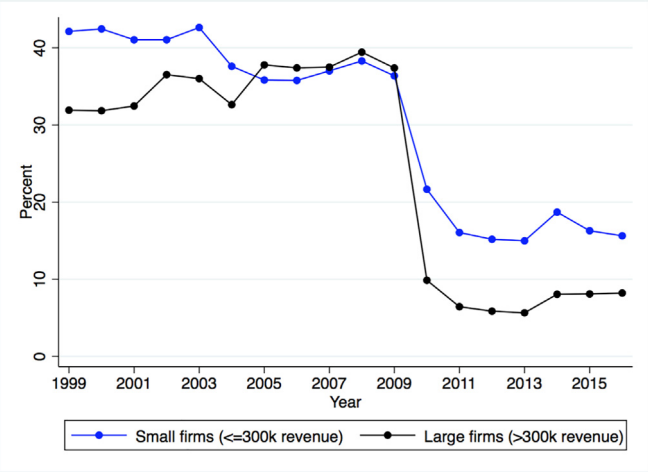

Fig. 1. Percent of firms not adjusting tax returns. Notes: Firms not adjusting their tax returns means reporting taxable profits equal to accounting profits. "≤300 k revenue" and ">300 k revenue" refer to the self-assessment revenue threshold.

carryforward option. Fig. A1 considers where negative or zero taxable profits come from mechanically. This figure shows that a large share of firms that report negative or zero taxable profits would have reported positive profits if it weren't for the tax loss carryforward option.[5]

The financial and debt crisis had important effects on the share of firms with negative or zero profits. The share of firms reporting positive taxable profits and paying taxes was steady at about 70–75% for large firms and 45–50% for small firms in the pre-crisis years until 2009, but dropped to below 55% for large firms and less than 40% for small firms at the peak of the crisis in 2012. This is mirrored by a decline in real, accounting profits during the crisis. Beginning in 2013, the percent of tax returns that report negative taxable profits rises despite having positive accounting profits in the same year, as firms made use of the tax loss carryforward to claim losses made in the crisis years. As a result, the economy's gradual rebound post−2012 did not lead to a commensurate recovery in the percent of firms reporting positive taxable income.

4. Institutional background on self-assessment

Greece has a long history of tax forgiveness and amnesty programs dating back to 1978. The government's rationale for these programs was to collect tax revenues from previous years' non-audited tax returns, without incurring the costs of mass audits. The self-assessment program targets smaller firms and attempts to guide them to meet what are deemed to be "reasonable" taxable profit margins without having to do costly audits.

4.1. How the self-assessment program works

The self-assessment program works as follows. For each type of economic activity as defined by the government, there is a taxable margin target that the government deems "reasonable." Firms who take up the program in year t and choose to "self-assess" must report at least the prescribed taxable margins. Firms that engage in more than one of these activities have to take a weighted average of the target margins, weighted by the share of each activity in their total revenue.

Formally, if firm i chooses to "self-assess" in year t, it reports at least the following average taxable margin:

$$m_{it}^{Tax} \geq \sum_j m_j^g w_{jt}$$

where m_j^g is the government-prescribed margin on activity j, and w_{jt} is the share of revenue of the firm from that activity in year t.

Firms self-report their activity or shares of revenues from each activity to the tax authority. While firms may be able to misreport these to some extent, and while activities are not directly translatable into sectors or industries, we do not observe clear changes in sectoral composition as a result of the self-assessment program. In addition, there are activities that are harder to misreport (see our heterogeneity by industry in Appendix E.1).

The law allows self-assessment only for firms with revenue less than or equal to €300,000. This cutoff remained consistent across all years of the program. We call firms that fall below it "small" firms, and those that are above it "large" firms. For some service sector firms, a lower threshold of €150,000 is specified for service activities. However, there was effectively no way for the tax authorities to identify the sources of revenue of firms, and whether all activities by a firm are service activities,

[5] This option has been extensively studied in the U.S. (Auerbach and Poterba, 1987; Altshuler et al., 2009; Auerbach, 2007).

which essentially allowed these firms to report revenues higher than €150,000 and remain eligible for the program. We therefore use the higher cutoff of €300,000 as the one cutoff for all firms. Indeed, Fig. A9 shows that while some service industry firms bunch at €150,000, the distribution of firms in these industries extends well into the €150,000 to €300,000 range.

There are three additional eligibility criteria of the program: (1) submitting tax forms on time and without visible tax violations, (2) not having been randomly selected for audits before filling the tax form, and (3) not having faced fines on previous tax forms.

Until 2006, firms were entirely excluded from being randomly chosen for any corporate tax or VAT audits in years in which they chose to self-assess. In 2006, the rules were changed, so that self-assessing firms could still be subject to a separate audit process and chosen at random to be audited on their self-assessment year or previous self-assessment years. This alarmed firms to the possibility of being audited and penalized if not self-assessing truthfully. However, while the threat of audit was made salient in the media, the number of ordinary audits changed very little for all companies after 2005, according to *Kathimerini*, the daily Athens newspaper (Chatzinikolaou, 2006).[6] Another change in 2005 prohibited the use of the loss carryforward deduction for self-assessing firms.[7]

Thus, a firm is faced with the following audit probability p_{it}^{audit} for year t:

$$p_{it}^{audit} = \begin{cases} 0 & \text{if eligible and self-assessing in } t \in \{2003, 2004, 2005\} \\ \widetilde{p}_{it} > 0 & \text{if eligible and self-assessing in } t \geq 2006 \\ p_{it} > 0 & \text{otherwise} \end{cases}$$

where p_{it} is the audit probability the firm would have faced absent the self-assessment take-up, and $\widetilde{p}_{it}$ is the (potentially quite small) audit probability it faces after 2006, when the program rules were updated.[8]

The program is thus not a typical amnesty program, since it does not forgive years that are not self-assessed, and therefore does not erase the possibility of being caught for earlier tax evasion.

4.2. Steps of corporate tax filing and self-assessing

The tax form is designed for self-assessment in the following way:

1. Firms will complete their tax returns as usual, starting from accounting profits and taking out tax deductions to reach their taxable profits before making self-assessment adjustments. We call this the "pre-self-assessment" taxable profits. For firms that do not self-assess, it is equal to the final taxable profits, or taxable profits for short.
2. Firms will then calculate their taxable margins as a function of their revenues and pre-self-assessment taxable profits.
3. To meet the prescribed government margins, firms with taxable margins *below* the prescribed margins but that still want to self-assess will add the missing amount of taxable profits in a special field in the tax form. This is the "self-assessed amount," over which firms have control. Pre-self-assessment taxable profits plus the self-assessed amount yield taxable profits for self-assessing firms.

More formally, firms report their revenue R_{it}, which is used to compute the profit margins on the tax form, and apply the following steps to go from accounting to taxable profits:

$$\begin{aligned} & \pi_{it}^{Acc} && \text{Accounting profits (from financial statements = on tax returns)} \\ +& E_{it} && \text{Adjusted expenses (those treated differently for tax versus accounting purposes, e.g., depreciation adjustments)} \\ -& D_{it} && \text{Deductions (e.g., tax loss carryforward deduction, profits taxed from other sources)} \\ =& \pi_{it}^{Self} && \text{Pre-self-assessment taxable profits} \\ +& S_{it} && \text{Self-assessment amount} \\ =& \pi_{it}^{Tax} && \text{Taxable Profits} \end{aligned}$$

4.3. How firms can meet the target margins

If they decide to self-assess, firms can meet the target taxable margins in multiple ways. The first is to reduce revenue before filling the tax form, either by reducing real activity and sales, or by misreporting sales. The latter may be easier when transactions lack a paper trail, which is not uncommon.[9] The second way is the one actually intended by the tax authority, namely to report higher taxable profits on the tax forms. To do so, firms can i) report higher accounting profits to start with; ii) reduce adjusted

[6] We have no data on actual audits specifically for self-assessing firms, or audits for firms with SA and LLC legal statuses.

[7] Ministerial Decree 1027.

[8] As in other countries, the audit algorithm is not publicly known. It is thus not clear what the baseline audit probability, absent self-assessment depends on. Presumably, it would depend on the gap between taxable margins and the target taxable margins per activity.

[9] *To Vima*, a Greek daily newspaper reports that in the 2006, about 5000 citizens filed complaints with the Special Audit Service about firms not issuing receipts (Siomopoulos, 2008). The widespread use of cash likely maintains a large informal sector that Bitzenis et al. (2016) estimate to account for more than 25% of Greek GDP.

Table 2
Examples of prescribed taxable margins by activity.

Activity	Industry	Taxable Margins
Luxury hotels	Section I: Accommodation and food	16%
Non-luxury hotels	Section I: Accommodation and food	13%
Pharmaceuticals	Section C: Manufacturing	11%
Economic studies	Section M: Professional, scientific, technical	26%
Courier services	Section G: Wholesale and retail	30%

Notes: Industry classifications - called "sections" – according to European NACE codes. Activities classified according to Greek tax authorities.

costs to reach a higher pre-self-assessment profit level; and/or iii) report a higher amount in the self-assessment field. To highlight the channels of adjustments, we decompose taxable profits in Section 6 into its components above. Note that since the self-assessed amount is entirely discretionary for the firm, they could in principle end up reporting *higher* taxable profits than they actually have (i.e., over-report). While the goal of the program is to incentivize firms to not under-report profits, some firms may find audits too costly and prefer reporting higher taxable profits rather than being audited. Furthermore, the target margins are set by the government, presumably to reflect what is considered a reasonable "average" profit margin for each activity. Firms with higher or lower costs than average by activity may end up having profit margins quite different from the target one, even if reporting accurately. They then need to decide whether they prefer topping up their profits (or manipulating their revenues) to participate in the program and avoid audits, or not.

Table 2 lists examples of activities with the prescribed taxable margins by the tax administration. Each industry often has a large number of activities, with different prescribed margins, and a given firm can have one or more activities in its industry. The manufacturing industry, for example, includes, among others, the following activities: manufacturing of pharmaceuticals (11% target), clothes (10%), baby food (13%), and dairy production (12%). Similarly, the professional services industry includes the following activities: business advisory (30%), travel agencies (28%), and security services (20%). There is substantial variance in prescribed taxable margins: business advisory and courier services are expected to report 30% of their revenue in taxable profits, for example, while pharmaceuticals are expected to report only 11%. While a large share of firms may operate under multiple activity labels (e.g., in manufacturing when multiple products are produced), some firms are very specialized (e.g., non-luxury hotels or restaurants tend to report a single activity).

4.4. Take-up over time

The take-up for the self-assessment program was highest at 6–10% of eligible firms in the 2003 to 2009 period, before dropping to 2% of eligible firms in 2010 and less than 1% in 2013 (see Fig. 2).[10] In 2010, there was a simultaneous increase in the attempt to enforce tax collection, mainly through the introduction of auditors and auditor liability as described above, and declining economic activity and profits due to the debt and economic crisis. We will thus mainly focus on the period 2003–2009.[11]

The two main changes to the program in 2005 and 2006 described above could explain the declining take-up and the low-frequency of take-up.

4.5. A note on the VAT

Firms that participate in the self-assessment program are also subject to a VAT adjustment, whereby they pay an additional amount of VAT taxes applied to their cost of inputs (see the exact formula for the additional tax in Appendix B.1). This clearly raises the cost of participating in the program and creates an incentive to decrease or manipulate the cost of inputs. At the same time, adjusting the cost of inputs down would increase accounting profits and potentially taxable profits. The reduction in revenue we will document suggests that firms could have decreased their reported input costs. We do not have access to the VAT data or any measure of input costs, so we leave the VAT adjustment out of our analysis.

5. Which firms take up the self-assessment program?

Changes in the rules of the program stated in Section 4 can explain changes in the take-up frequency overall. The majority of firms take up the program once or twice, while many firms take up the program in non-consecutive years (see appendix Fig. A4). Recall that the most advantageous rules of the program were in its early years, 2003 and 2004. If we split firms by the number of years for which they self-assess - i.e., by frequency of self-assessment– we see that firms that self-assess in a few years only tend to do so predominantly in these early years (see Panel A of Fig. A7). The changes in 2005 and 2006 are therefore likely to have been a key cause of why many firms self-assess only once or twice before deciding it is no longer worth it.

Looking at take-up by industry, the ones with the highest number of firms self-assessing are food and accommodation, manufacturing, wholesale and retail, professional and scientific, information and communication, and mining (see Fig. A5 in the

[10] The take-up patterns are very similar for the sub-sample matched to the financial statements data (see Appendix Figure A3).
[11] We later report results for multiple periods including the crisis period in the extensions section.

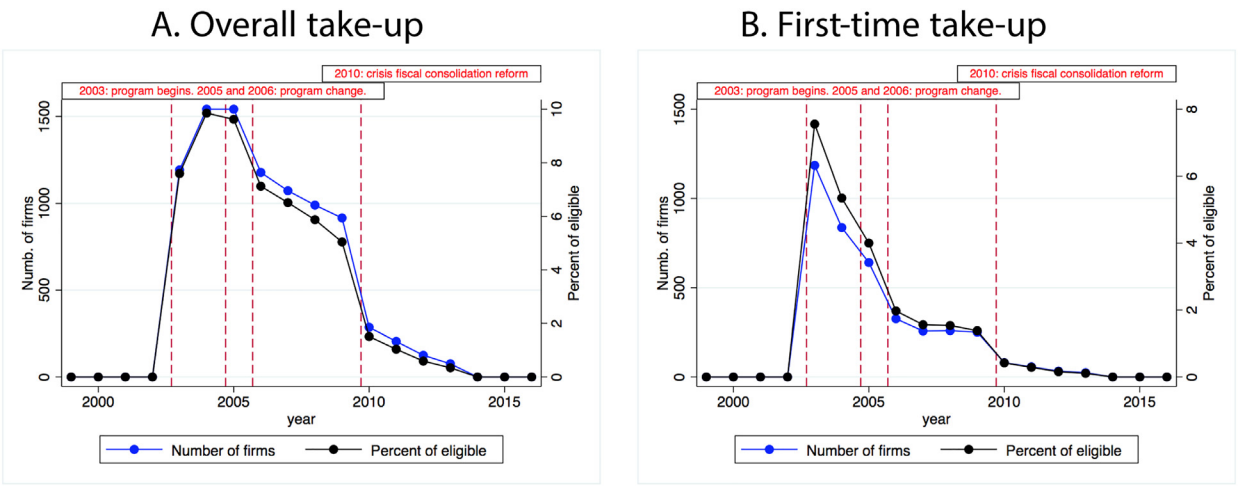

Fig. 2. Overall take-up and first-time take-up. Notes: the 2005 change prevented self-assessing firms from concurrently using the tax loss carryforward deduction, and the 2006 change introduced separate audits on self-assessment. Overall take-up refers to all firms self-assessing in any given year, and first-time take-up refers to those self-assessing for the first time. The left y-axis shows the numbers; the right one ("Percent of eligible") shows the share of firms taking up among those eligible (i.e., with revenue ≤ €300,000).

appendix). The food and accommodation industry stands out for the largest percentage of eligible firms taking up the program (see Fig. A6 in the appendix).

5.1. Which characteristics determine take-up?

To correlate firm characteristics with take-up, we regress an indicator for taking up self-assessment on firm characteristics available in our tax data and in the financial statements. We report results in Appendix subsection C.3 and Table A2.

A number of factors determine whether a firm decides to take up the self-assessment program, even if it implies having to pay higher taxes than they otherwise would. Firms selecting into self-assessment have lower revenue. This is not a pre-existing characteristic, but rather one of the responses to the policy as we demonstrate in Section 6. Second, more established, older firms are more likely to take up. They may find it more difficult to simply ignore the government's attempt to increase compliance through the self-assessment. These firms are more salient to the tax collector and may have better knowledge of the tax code. Third, controlling for age and access to government contracts, employment and assets – proxies for firm size – are negatively associated with selecting into the program, even after controlling for revenue. It is possible that firms with more assets and employees have higher costs for a given revenue (which we control for) and that the government prescribed margins are not accurate and attainable for them.

Fourth, around 30–40% of firms in the tax sample sell goods or services to the government each year, i.e., are on a government contract. Being on a government contract can shape tax compliance incentives because a share of the sales to the government are already withheld at source, i.e., the government withholds 4–8% of the payment it owes the firm as taxes, depending on the industry. We find that firms on a government contract are more likely to select into the program, even after controlling for revenue, age, assets, and employment (see also the time series of take-up among firms on a government contract in Panel B of Fig. A7). These firms may also be more aware of and more inclined to take up government compliance programs because they want to remain in good standing with the government.[12] Finally, the cost structure of a firm should affect take-up. The prescribed taxable profit margins may be off for firms that have either too high or too low costs relative to the average. In particular, firms with high running costs may not be able to pay the required tax if their actual profit margin is much lower than the government's target one.

5.2. Is eligibility manipulable?

Can firms that are not eligible manipulate their revenue in order to be part of the program? In Fig. 3, we restrict the sample to firms self-assessing in at least one year between 2003 and 2009, and show the distribution of reported revenues in two cases: (1) before the self-assessment program was in place (1999–2002), which is the closest we have to a counterfactual distribution, and (2) during years in which the program was in place and *only* for years in which firms self-assess. The revenue distribution for

[12] Self-assessing firms on government contracts may still be able to manipulate revenue as long as they do not report revenue below the level of revenue generated in the government contract. In fact, since most small firms generate a large portion of their sales from non-government sources, they can still substantially misreport revenues.

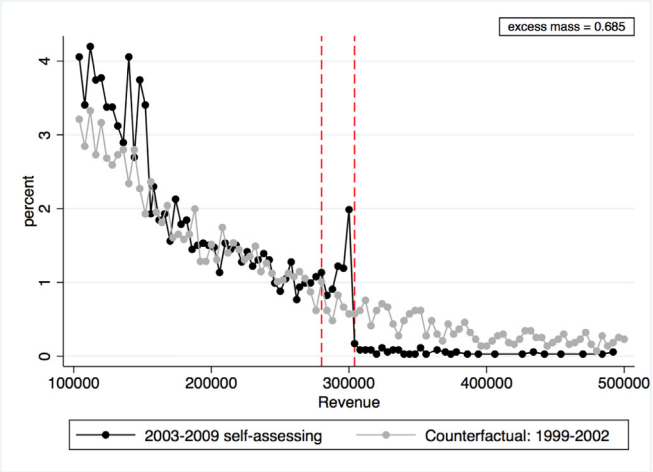

Fig. 3. Bunching at the €300,000 revenue cutoff. Revenue distributions conditional on firms taking up the self-assessment program between 2003 and 2009. Excess mass is calculated as a ratio. The numerator is the difference between the percent of firms in the chosen interval and the counterfactual empirical distribution, which is the distribution in the pre-program period (1999–2002). The denominator is the empirical counterfactual distribution. We use 100 bins for both distributions. The bunching interval contains 6 bins and is between €280,000 and €304,000 in revenue.

years in which firms self-assess shows a clear spike at €300,000 and some excess mass also at €150,000, which is the threshold for a few activities, especially in the service sector, as explained earlier.[13] On the other hand, the 1999–2002 distribution does not show such spikes. This figure suggests that – within some range – eligibility can be manipulated. Therefore, in the analysis below in Section 6, when we consider as a control group firms that are not eligible for the program, we choose €400,000 as a cutoff instead of €300,000 (and exclude firms with revenues between €300,000 and €400,000 from the main control group).

Appendix Fig. A9 plots the revenue distributions for self-assessing years for different industries and confirms that firms with service activities, such as those in the"Information and communication" sector, bunch at the €150,000 cutoff, but there is still plenty of mass up to the €300,000 threshold (confirming that the lower threshold is not well-enforced).[14] Non-service industries such as manufacturing have mostly smooth distributions around the €150,000 mark and exhibit excess mass at the €300,000 cutoff.

6. Reporting response to the self-assessment program

In this section, we first provide graphical evidence on the reporting responses to self-assessment for self-assessing firms. We focus on the peak period of the program, 2003–2009, before the changes in tax enforcement described in Section 3 took place. We then turn to the formal estimation of these reporting responses using regressions and event-study designs. Recall that firms can hit the target profit margin by a mix of i) reporting higher accounting profits; ii) reporting higher pre-self-assessment profits (i.e., lower deductions or higher adjusted costs), iii) by adjusting downward the revenue reported, or iv) by reporting a higher self-assessed amount.

6.1. Graphical evidence: the distributions of accounting and taxable profits and revenue

We start by plotting the distributions of taxable and accounting profit margins and profit levels, for all firms that take up self-assessment at least in one year, comparing years in which these firms do self-assess to those in which they do not. Panel A of Fig. 4 shows that taxable profit margins are much higher in years in which firms take up the program than in years in which they do not. Furthermore, there are clear spikes in the distribution of taxable profit margins and the main spike is at 13%, corresponding to the prescribed margins that are relevant for the following notable activities: non-luxury hotels, restaurants, rubber production, dried fruit trading, manufacturing or retail trade of clothing, baby food production, manufacturing furniture, and trading computer consumables.[15] By contrast, when margins are positive, accounting margins' distributions appear similar in self-assessing and non-self-assessing years. The distribution of pre-self-assessment taxable profit margins is almost exactly the same as accounting margins when margins are positive, and shows a large spike at zero for firms with negative accounting profits.

Panel B shows a right shift in the distribution of taxable profit levels relative to accounting profits, in years in which firms self-assess. The right sub-panel decomposes the taxable profits distribution into pre-self-assessment profits and the self-assessment

[13] Recall that the €150,000 threshold is not truly binding for many firms, either because firms can perform multiple activities or because the tax administration is unable to verify the exact activities.

[14] Because the "Information and communication" sector, for example, does not necessarily have only firms with 100% service activities, we do not observe revenue reporting only below or at 150,000.

[15] This is not an exhaustive list, but includes a number of the activities from multiple industries.

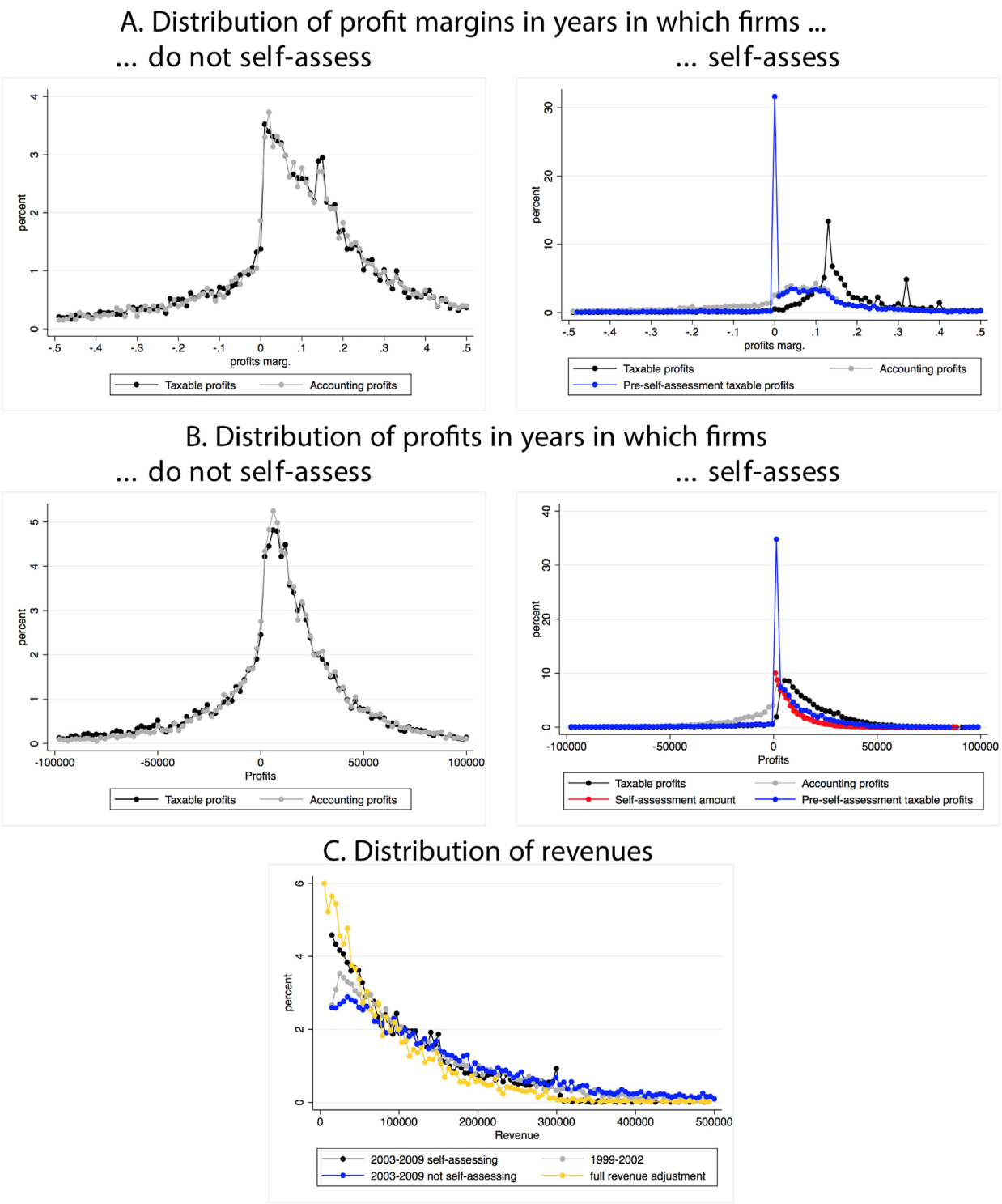

Fig. 4. Graphical evidence for responses to self-assessment. Notes: The sample here is restricted to firms that self-assess in at least one year. In Panels A and B, the distributions in the left and right sub-panels are for the same firms, pooled over 2003–2009. Taxable profits in self-assessment years (right) are decomposed into pre-self-assessment taxable profits and the self-assessment amount. A firm's accounting or taxable profit margin is the firm's accounting or taxable profit to revenue ratio. In Panel C, "2003–2009 self-assessing" refers to years in which firms self-assess. "2003-2009 not self-assessing" refers to years in which firms do not. We construct the "full revenue adjustment" series as a counterfactual distribution where firms report prescribed margins, but do the entire adjustment by lowering revenue, i.e., we use reported accounting profits as the counterfactual for taxable profits if there was no self-assessment.

Fig. 5. Profit margins of firms in the accommodation and food industry. Notes: The distributions are for firms in the accommodation and food industry and are conditional on self-assessing in at least one year between 2003 and 2009. The distributions (left and right) are for the same firms, pooled for the self-assessment policy years 2003–2009. A firm's accounting or taxable profit margin is the firm's accounting or taxable profit to revenue ratio.

amount. The positive part of the distribution of pre-self-assessment profits is almost identical to that of accounting profits, which suggests that most of the adjustment is coming directly and simply from the self-assessment amount. To the contrary, for the many firms reporting negative accounting profits, pre-self-assessment taxable profits are reported as zero. This indicates an additional adjustment through reported costs and deductions for those firms with negative accounting profits.

Do firms also adjust their reported revenues to lower their tax burden while targeting the prescribed margins? Panel C of Fig. 4 compares the revenue distributions of firms that self-assess in at least one year with their own closest counterfactual distribution – their revenue reporting in years prior to the self-assessment policy, 1999–2002. The 1999–2002 revenue distribution and the 2003–2009 distribution for non-self-assessing years are very similar in shape. The 2003–2009 distribution for self-assessing years shows a clear leftward shift. The "full revenue adjustment" curve on this figure constructs a hypothetical distribution of revenues that would apply if firms reported taxable profits equal to accounting profits (doing no adjustments on the taxable profit margin), but only adjusted their revenues to meet the target margin. This shows that, although firms do adjust revenues substantially, that is not their only margin of adjustment (the distribution of revenues in years in which firms self-assess remains to the right of that hypothetical revenue distribution). Because we do not observe explicitly which activities firms engage in (as these activities do not map neatly into industries or sectors), we can give an example from one industry which has two dominant activities with a very clear profit margin target. The "non-luxury hotels" and "family restaurants" activities have a 13% profit margin target and belong to the "Food and accommodation" industry. Fig. 5 shows the distributions of taxable and accounting profit margins in the food and accommodation industry, again restricting the sample to firms that self-assess at least once during the program period. It compares the distributions in years in which firms self-assess to those in years in which firms do not.

6.2. Staggered difference-in-difference estimator

Moving beyond the analysis of distributions, we estimate the effects of self-assessment on profits and revenues using the staggered difference-in-differences estimator of De Chaisemartin and d'Haultfoeuille (2020) and report results in event study graphs. This estimator is the most appropriate one in our setting, since we have a staggered adoption of the program by different firms; possibly heterogeneous treatment effects over time and between groups (characterized by different take-up frequencies); and firms that switch status or leave the program altogether (a firm that chooses to self-assess in a year t does not necessarily continue to choose so in subsequent years). The estimation compares tax reporting for self-assessing firms to the main control group of ineligible firms, consisting of those with revenue between €400,000 and €1,000,000.

We therefore run the following two-way fixed effect specification, using De Chaisemartin and d'Haultfoeuille (2020)'s estimator:

$$Y_{it} = \alpha_i + \beta_t + \sum_{t=E_i-3}^{E_i+3} \gamma_k 1\{K_{it} = k\} + \psi X_{it} + \varepsilon_{it} \quad (1)$$

where α_i denotes firm fixed effects, β_t denotes the calendar year dummies, E_i is the first year in which a firm chooses to self-assess (regardless of whether it keeps doing so in subsequent years), and $K_{it} = t - E_i$ are dummies for the relative time to the event defined by the first-year of self-assessment. X_{it} are time-varying firm characteristics, namely, firm age, and an indicator for whether the firm is on a government contract. We test for systematic differences between the take-up frequency groups and the control group prior to take-up (Table A3). The set of coefficients γ_k are the main coefficients of interests. For $k < 0$, they capture pre-trends (or lead effects).

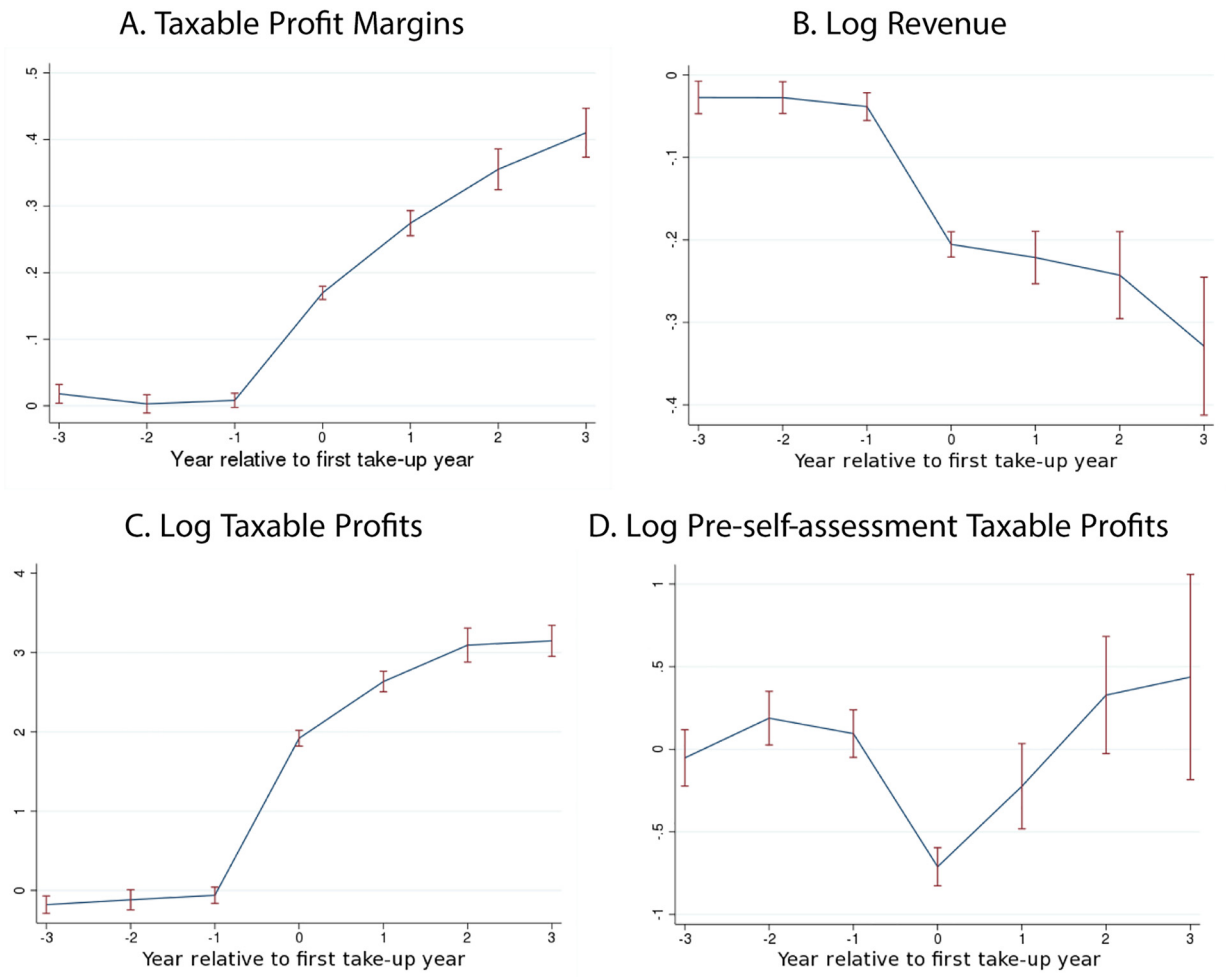

Fig. 6. Event study of responses to self-assessment. Notes: Staggered diff-in-diff estimator with year and firm FEs, controlling for firm age and whether a firm is on a government contract. Standard errors are bootstrapped and confidence intervals are at the 95% level. Log taxable profits net of self-assessment refers to log of taxable profits after netting out the reported self-assessment amount. Margins are measured as profits to revenue ratio. Negative and zero taxable reported profits treated as zero (+1 when taking logs). Firm age is imputed for missing observations by a missing dummy. Margins are winsorized at the 1% and 99% levels.

For $k > 0$ they capture the dynamic correlation between self-assessment and the outcome variable Y_{it} and measure the change in the outcomes of self-assessing firms relative to the reference year prior to self-assessment, over and above the change observed for the control group firms. This specification enables us to test the parallel trends assumption – i.e. whether firms taking-up the program were on the same outcome or tax reporting trajectory than firms not taking up the program, before taking up self-assessment for the first time.

Fig. 6 shows the results for all four outcomes (taxable margins, revenue, taxable profits, and pre-self-assessment profits). None of these variables shows a pre-trend relative to the control group, prior to the first take-up year. We then observe a large and increasing effect for additional years of take-up for taxable margins and taxable profits. Taxable profits rise by an average of 1.7 log points (450%) in the first year to 3.2 log points (2400%) by the fourth year. This pooled effect reflects a weighted average of the responses by take-up groups, which we report in the next section. The percent changes appear large, but do not necessarily reflect substantial increases in levels. Rather, the large proportional changes are mostly driven by an increase of compliance for firms who reported zero or negative taxable profits before self-assessing. Confidence intervals are wider the higher the number of years on the program because there are fewer firms taking-up the program more than once or twice. Panel D shows that firms report largely stable pre-self-assessment profits, except from a drop in the first year by nearly 0.6 log points. In the next section, we show that this initial drop is mainly driven by firms that self-assess for one year only.

Panel B shows a large revenue adjustment in the first year, and declining revenue relative to the control group with additional years in the program (from an average of a 18% decline in the first year to nearly 30% for firms in the fourth consecutive year of self-assessment). Firms adjust both taxable profits and revenue to increase their taxable profit margins from about 17% in the first year to nearly 40% by the fourth year.

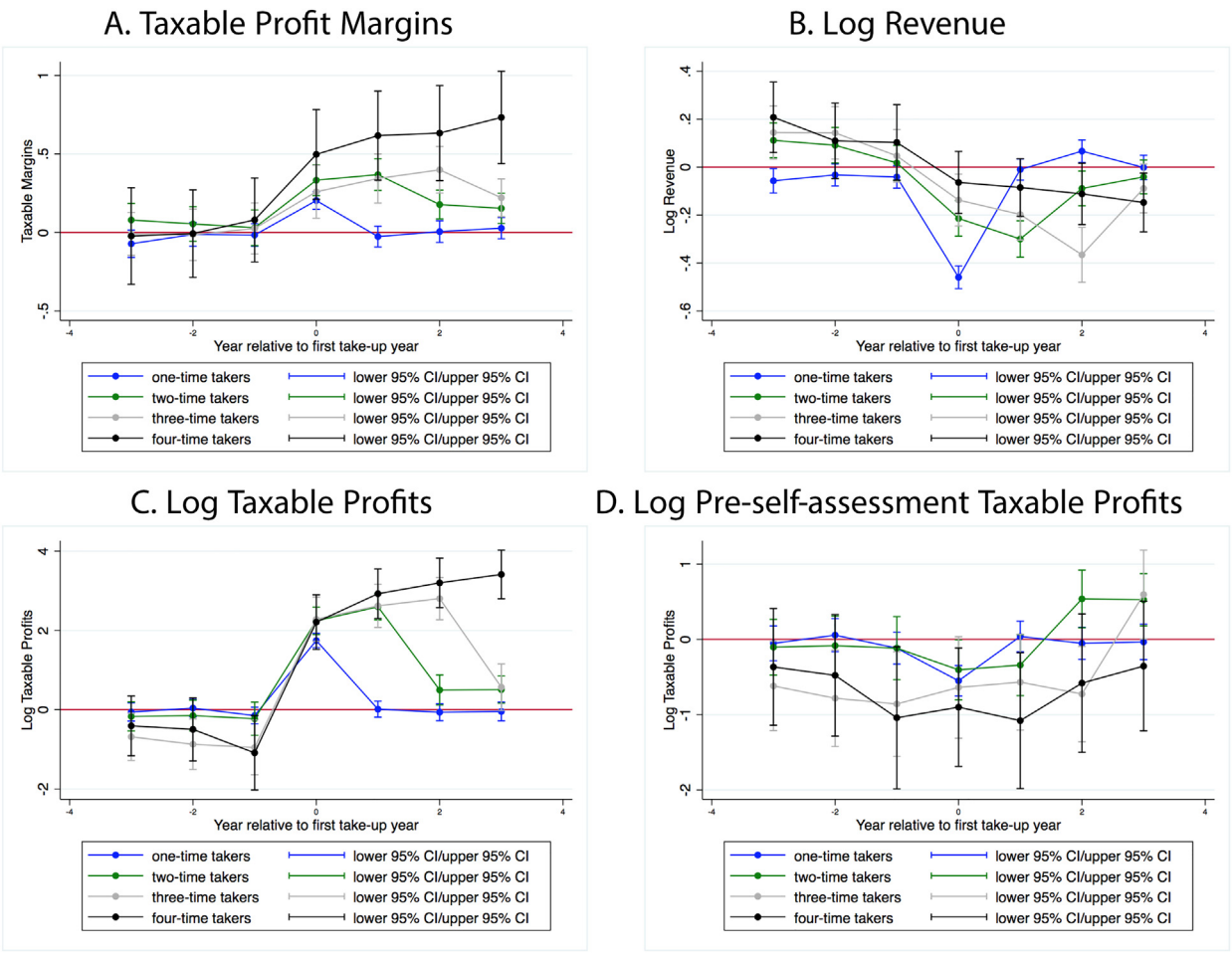

Fig. 7. Event studies of responses to self-assessment, by take-up frequency. Notes: Each group only includes consecutive take-ups and is evaluated against the control group of non-takers (€400 k-1 m firms). Our specification includes year and firm fixed effects, and controls for firm age and whether a firm has a government contract. Negative and zero taxable reported profits treated as zero (+1 when taking logs). Margins are winsorized at the 1% and 99% levels.

6.3. Heterogeneity by take-up frequency group

We now turn to heterogeneous effects by groups of firms that take up the program for a different number of years. We divide firms into four "take-up frequency" groups defined by the number of consecutive years (from one to four) for which they take up the program. We then estimate the following relation separately for each of these take-up groups:

$$Y_{it} = \alpha_i + \beta_t + \sum_{t=E_i-3}^{E_i+3} \gamma_k 1\{K_{it} = k\} + \psi X_{it} + \varepsilon_{it}$$

where the specification is identical to that in subsection 6.2. The results are in Fig. 7, and coefficients on relative year dummies for log taxable profits and log revenue outcomes are reported in Table A4 in the Appendix.

Four-time takers have the largest cumulative effect on taxable margins from the year before take-up of the program to the last consecutive year of take-up, followed by two-time and three-time takers; the lowest increase in margins is for one-time takers. Taxable profits increase by about 2 log points (nearly 600%) on average for one-time takers and by nearly 3 log points (1900%) for four-time takers in the first year of the program, and continue to rise for this group as they self-assess in later years. On the other hand, one-time takers manipulate revenue the most in their one year of take-up, reducing it by nearly 40%. Thus, taxable profit margins increase the most for four-time takers, by a cumulative 70%, and the least for one-time takers, by about 20%. Pre-self-assessment profits barely change, except for one-time takers where there is a slight decline. Therefore the increase in taxable profits is almost entirely driven by the self-assessment amount.

There are no long-lasting reporting responses for one-time takers. Self-assessment by these firms creates a one time increase in revenue for the government, but they revert to the same profit and revenue reporting relative to the control group after their one year of self-assessment. In fact, one-time takers have higher baseline taxable profits in 2002 than the other groups and

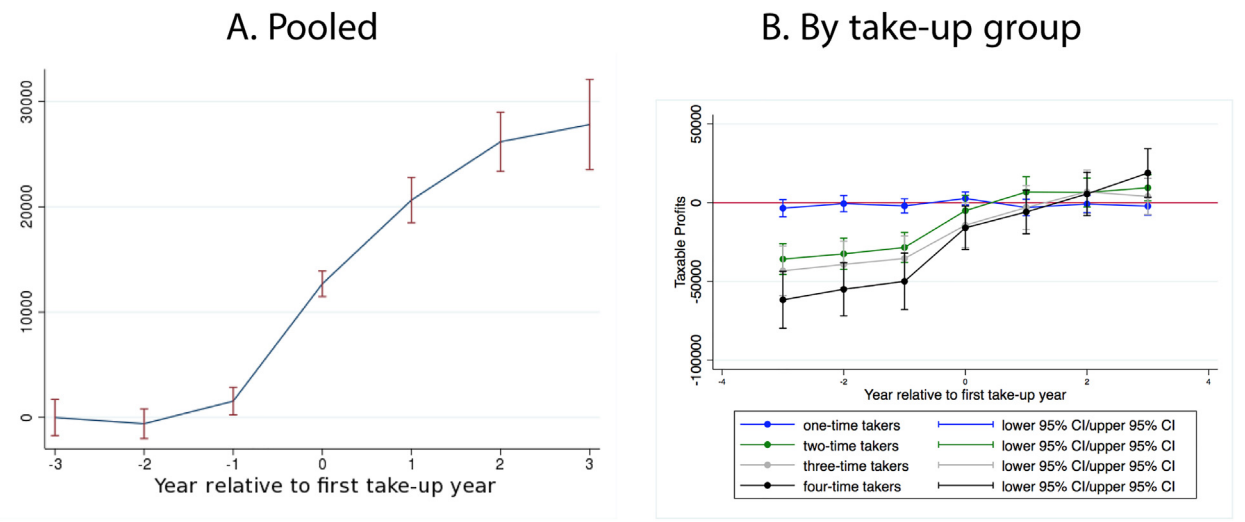

Fig. 8. Taxable profits levels response to self-assessment by take-up groups. Notes: Taxable profits are winsorized at the 5% and 95% levels. Each group in panel A only includes consecutive take-ups and is evaluated against the control group of non-takers (€400 k-1 m firms). The specifications in panels A and B include year and firm fixed effects, and control for firm age and whether a firm has a government contract. Firm age is imputed for missing observations by a missing dummy. Panel B clusters standard errors by firm, and panel A bootstraps standard errors.

therefore did not require a large profit response to reach the target margins. On the other hand, two-time and three-time takers end up with lower margins in the post-take-up years than during the years of self-assessment, but these margins are higher than in years prior to the program. The higher margins seem driven by both a lower revenue reporting in the post-take-up years, and by an increase in taxable profits.

6.4. The magnitude of the taxable profit response

The response of self-assessing firms on taxable profit reporting is substantial when measured in percent terms, relative to other firm tax compliance studies because a large number of self-assessing firms start from very low or negative reported taxable profits. In other settings where this is not the case, Slemrod et al. (2017) find that electronic filing raises reported receipts by up to 24% and reported expenses by as much as 13%. Naritomi (2019) finds that a consumer reward system can raise tax revenues by 9.3%, and finds stronger effects for the retail sector. Best et al. (2015) consider changing the tax system from profit to turnover taxation and find this could reduce evasion by 60–70% in Pakistan.

However, the response in our results is largely driven by the large share of firms reporting zero or negative taxable profits before self-assessing. We therefore repeat our estimation using the levels of taxable profits rather than their log to obtain a better sense of the magnitude of the change. Fig. 8 shows the results overall and splitting by take-up group.

The pooled estimation in Panel A shows a nearly €12,000 average increase in the first year and up to €28,000 average cumulative increase by the fourth year of self-assessment. When we split by take-up frequency groups in Panel B, one-time takers increase taxable profits by about €4500 (23% of the average profits for one-time takers that that report positive taxable profits in 2002) relative to the control group. Four-time takers have the lowest baseline taxable profits and tend to increase their cumulative taxable profits by nearly €38,000 (255% of 2002 average profits for four-time takers that report positive taxable profits in 2002), on average, in the first year and continue to increase profits in the following years to a cumulative €70,000 increase by the fourth year (470% of 2002 average profits for four-time takers that report positive taxable profits in 2002).[16] However, firms that self-assess in multiple years start with a baseline of significantly negative average taxable profits and therefore a large part of the increase in taxable profits does not lead to higher tax payments. Finally, while there are no long-lasting effects on one-time takers, two-time and three-time takers increase taxable profits substantially on average in self-assessing years, and remain at those higher levels in years after self-assessing, relative to the control group. These results confirm that the large positive response is coming from previously negative or zero profit firms.

6.5. Tax adjustments

The previous section offered some evidence that firms that self-assess adjust their reported revenue down and increase their discretionary self-assessed amount in order to meet their taxable profit margin targets. Here, we study whether two other components of taxable profits also adjust to the policy, thinking back to the accounting equations in Section 4, i.e., total tax adjustments through cost adjustments and tax deductions.

[16] Conditional on paying taxes, the average 2002 (pre-program) reported taxable profits are €19,591 and €14,860 for one-time and four-time takers respectively.

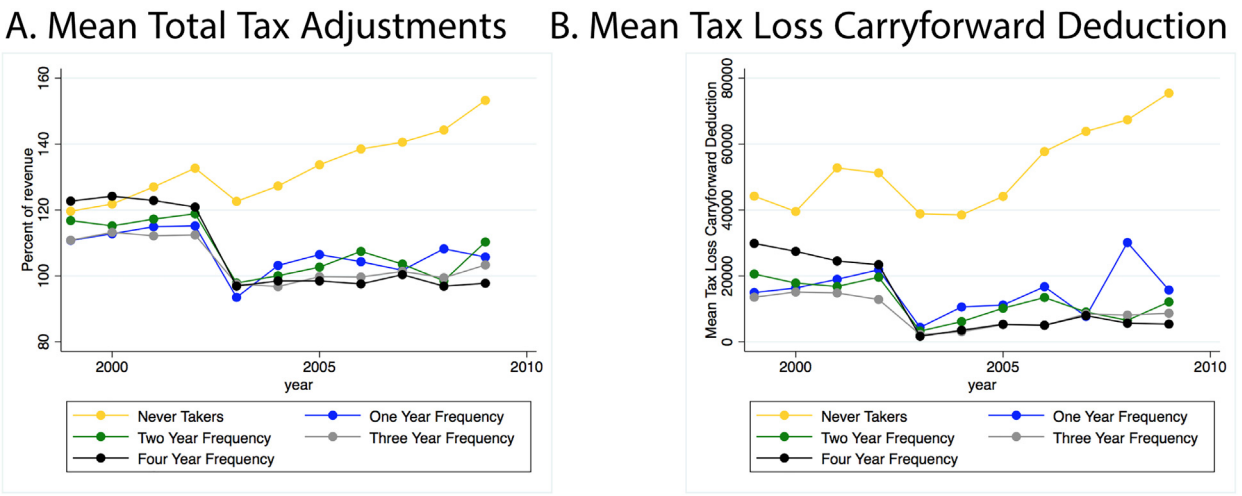

Fig. 9. Total Tax adjustments and tax loss carryforward deduction. Notes: We condition on firms eligible in the program (≤€300,000 in revenue). The never takers are therefore eligible firms who never take up the program. In both Panels A and B, the one to four year frequency groups time series is the mean for firms belonging to those groups and self-assessing in those years. We normalize Panel A by dividing the implied costs by reported revenue. Tax adjustments are winsorized at the 5% and 95% levels.

"Total tax adjustments" are the difference between revenues and pre-self-assessment taxable profits as:

$$\text{Adj}_{it} = R_{it} - \pi_{it}^{Self}$$

Fig. 9 shows the time series of total tax adjustments and the loss carryforward deduction. Firms do not substantially change their tax adjustments following self-assessment in their self-assessing years, while firms who never self-assess have generally stable or rising adjustments. This result was already expected given Fig. 4, where almost all of the increase in taxable profits could be mapped to an increase in the self-assessed amount.

Yet, there is a subtlety. Fig. 4 also shows a spike in the pre-self-assessing distribution at zero that is most likely coming from firms that have negative accounting profits. These negative accounting profit firms first add back some expenses that are non-deductible expenses for tax purposes to get their pre-self-assessment profits to be zero, which explains the excess mass at zero. Negative profit firms may find it easier to respond by reporting higher non-deductible expenses since they have no tax benefit from not doing so, while positive accounting profit firms may under-report these non-deductible expenses. Still, these adjustments are not large. Self-assessing firms also used the tax loss carryforward deduction – one of the main avoidance tools – less than non-self-assessing firms.

Thus, when accounting profits are negative, firms first adjust their accounting costs to bunch exactly at zero before applying the self-assessment payment. When accounting profits are positive, the main adjustment is through the self-assessment amount directly.

7. Robustness, extensions, and discussion

In this section, we provide several robustness checks and extensions, and discuss our results' broader tax implications.

7.1. Robustness: other control groups

In the previous estimation, we used one main control group: firms with revenue between €400,000 to €1,000,000 because they are most comparable by revenue while also being ineligible for the program. In Fig. A10 in the appendix, we repeat the main specification using two other possible control groups. First, we consider eligible firms that are never takers (i.e. never self-assess but have revenues below the cap for eligibility). Second, we look at eligible firms that do self-assess in some years but use them as controls for those years in which they do not self-assess. We look at the two extremes of one-time takers and four-time takers. Our results are similar with these alternative control groups.

7.2. Heterogeneity across time periods

We previously noted that the changes made to the program over time, such as the introduction of a separate audit process for self-assessing firms led to a decrease in take-up, notably after 2005. We also highlighted the very low take-up after the Greek crisis and the 2010 fiscal consolidation reform when the tax authority increased scrutiny on tax revenue collection. We therefore split the full sample period into three periods – 2003-2006, 2006–2009, and 2010–2013 – to check for changing effects over time.[17]

We show the results for one-time takers of self-assessment and three-time takers in appendix Fig. A11.[18] The earlier period of 2003–2006 has the largest sample size and, therefore, the results for this period largely resemble the results for the entire sample. In the later program periods, one-time takers exhibit lower revenue and higher taxable profits than the control group in years before they take up the program. This combination suggests that the type of firms self-selecting into self-assessment in the later program years is already paying somewhat higher taxes than the control and is therefore more able to reach target taxable margins. This sort of selection does not appear to be an issue in the early program years and in our main results.

7.3. Heterogeneity by industry

Industries differ in tax reporting prior to self-assessment, as shown by the distribution of taxable profits by industry over the period 1999–2002 in Fig. A12. For instance, more firms in the food and accommodation industry report negative taxable profits than firms in the manufacturing industry. We also observe differential take-up by industry in Section 5. Is there also heterogeneity by industry in the responses to the program? In Section E.1, we show that the largest effects on taxable profits are for the food and accommodation industry, which also has some of the smallest changes in revenue reporting (11%). Food and accommodation is also the industry with the highest share of take-up of the program. The large average percentage change in taxable profits reporting is driven by a large extensive margin response; firms who were reporting zero or negative taxable profits are now reporting positive and significant profits. It is possible that the food and accommodation industry came under increased scrutiny, and felt more pressure to take up and comply with the policy. Furthermore, within that industry, large fast-food restaurants already relied heavily on internal and external paper-trails making it difficult to under-report sales (Artavanis, 2015). To the contrary, the information and communication industry and the professional and scientific industry exhibit the lowest effects on taxable profits (nearly 600% for both) and the largest drop in revenue reporting of 26% and 24%. Artavanis et al. (2016) similarly find that the professional services industry is highly prone to tax evasion when studying self-employment income.

7.4. Interpretation: real or reporting effects?

The fact that firms also adjust their revenue down is indicative of at least some avoidance or evasion, especially given the sharp bunching at the revenue eligibility thresholds. The increase in taxable profits due to the direct self-assessment amount on the other hand represents a gain for the tax administration. There are two important and related issues here. First, is this increase in taxable profits a real effect or rather just a reporting effect? Second, if it is a reporting effect, is it the case that firms are now reporting *higher* profits than they actually make ("over-reporting") simply to get above the threshold and avoid being audited; or are they reporting profits they were previously hiding (correcting under-reporting)?

On the first question, the sharp bunching at the target profit margins suggests that firms do have very strong control over their profit margins. Since real profits are presumably not so easy to control, and since the adjustment comes mostly from the self-assessed amount, not from accounting or pre-self-assessment profits, this is suggestive of a reporting rather than a real effect.

On the second question, it seems unlikely that for "honest" firms, the hassle costs of audits are so large that they decide to over-report profits simply to avoid being audited. It is much more likely that firms were engaging in routine avoidance and evasion and simply try to reveal a bit more of their (possibly much larger) profits to avoid being audited, caught, and have an even higher penalty imposed on them. Incidentally, our take-up analysis showed that firms that self-select into the program tend to be older and more likely to be on a government contract than other eligible firms (see Fig. A7). This suggests that if the tax authorities looked at non self-assessing small firms, they may uncover even more under-reporting.

7.5. Did the program increase tax revenues?

Did the increase in taxable profits accompanied by a reduction in revenues lead to a net increase in tax receipts by the government? Panel A of Fig. 10 is an event study analysis comparing the evolution of taxes owed by eligible firms (all firms with revenue below or at €300,000) and the main control group of firms with €400,000 to €1,000,000 in revenue, using 2002 as the base year and 2003 as the first event year. Reported taxes owed to the government for eligible firms have increased noticeably in 2003 by about 60% on average, and remained at that level until 2007 before declining from 2007 to 2009. In contrast, mean taxes owed by the main control group increased slightly in 2003 but declined and continued to decline from 2003 to 2009.[19]

[17] We overlap the 2003–2006 and 2006–2009 time periods by one year to allow for policy effects for four years in the 2003–2006 period.

[18] When splitting by period and by take-up frequency, we lose a lot of power. We choose three-time takers rather than four-time takers as it yields higher sample size.

[19] Note that we can only observe the tax burden owed by firms, which may not necessarily be fully paid in the same fiscal year, e.g. due to delinquency or late payments.

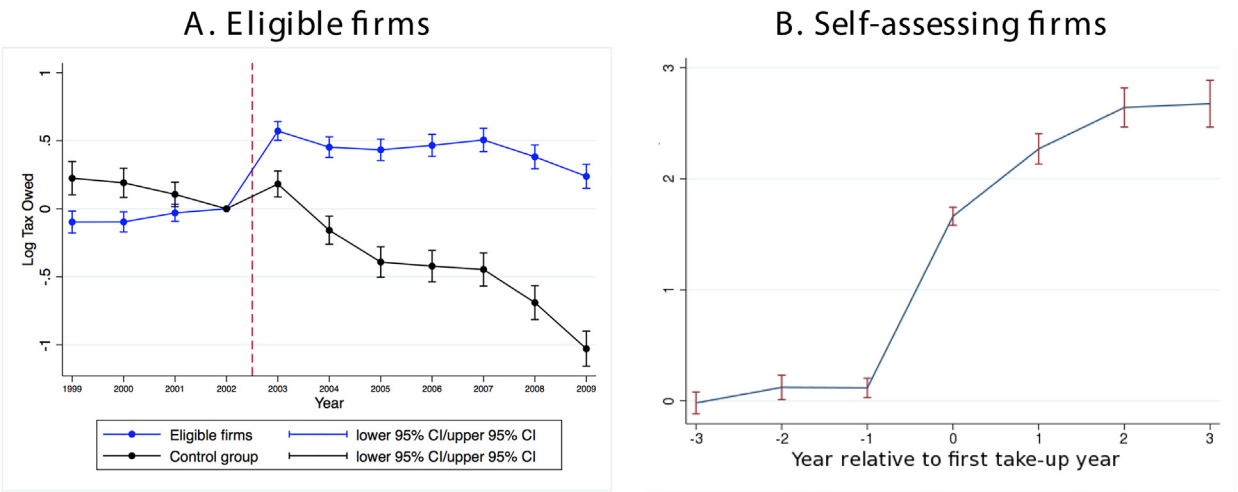

Fig. 10. Taxes owed. Notes: In Panel A, eligible firms refer to all firms with ≤€300,000, and the main control group refers to firms with revenue of €400,000 to €1,000,000. Panel A uses 2002 as the reference year, and uses firm and industry fixed effects. In Panel B, we use the staggered diff-in-diff estimation with year and firms fixed effects, and bootstrapped standard errors. Confidence intervals are at the 95% level. Taxes owed on the tax form are the tax amounts the firm reports that it owes based on its final taxable income, post adjustments and self-assessment ($\tau * \pi_{it}^{Tax}$). This measure excludes refunds.

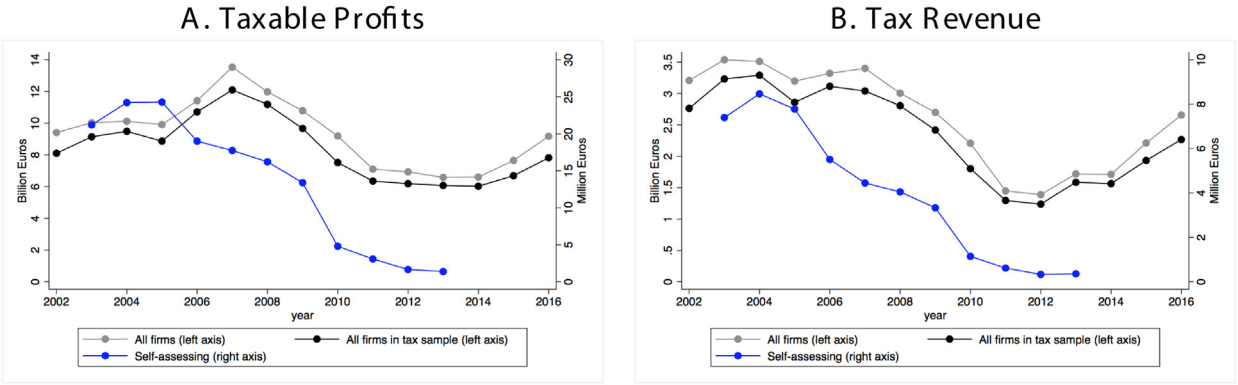

Fig. 11. Aggregate taxable profits and tax revenue owed. Notes: The series are the sum of taxable profits and taxes owed to the tax administration reported on the tax forms. "All firms" refers to all LLC and SA legal status firms in the corporate tax universe, with the exception of financial firms, and is measured in billions of Euros. This aggregate measure is very similar to official aggregates released by the Greek tax administration for years 2005–2010. "All firms in tax sample" refers to all LLC and SA legal status firms in the tax data sample, which further excludes construction firms and any firms under liquidation, and is measured in billions of Euros. "Self-assessing" refers to revenue from firms who self-assess in the given year, and are both measured in millions of Euros.

Panel B of Fig. 10 shows the evolution of mean final taxes owed relative to the year of first take-up, as estimated by our pooled analysis from Section 6.2. Final tax owed by self-assessing firms increased by at least 1.7 log points or 450%, relative to our main control group of firms with €400,000 to €1,000,000 in revenue. On balance, then, the self-assessment program increased government revenues collected from eligible, self-assessing firms.

To put the tax revenue gains into the overall revenue context in Greece, Fig. 11 shows aggregate taxable profits (in Panel A) and tax revenue owed (in Panel B) by year as reported on the corporate tax forms in our sample (labeled "all firms in tax sample") and in the entirety of the corporate tax data ("all firms"). Total taxable profits in Panel A for all firms of LLC and SA legal statuses peak at about €14 billion in 2007 before falling by a staggering 50% to a low of €7 billion in the trough of the financial crisis.[20] Reported taxable profits remained at the low 2011 level for three additional years before showing signs of a recovery. Total tax revenues (in Panel B) correspondingly declined by almost 50% from 2007 to 2011.

From 2003 to 2013, when taking up the program, the total revenue owed from 4023 self-assessing firms was about €45 million. As a comparison, this represents about 7.4% of total tax revenue owed by small firms in the eleven year period, and nearly 0.17% of total corporate tax revenue owed by all firms in our tax sample during the same eleven year period. In the peak year of the program, 2003, 12% of total tax revenue reported by small firms was reported by self-assessing firms. The lower take-up of the program over time, however, reduced its revenue raising capacities.

[20] The aggregates for "all firms" also exclude financial and accounting firms consistent with the aggregates released by the tax authority for 2005 to 2010.

8. Conclusion

The use of a new dataset of corporate tax returns in Greece allows us to uncover firms' responses to a compliance program. This temporary "self-assessment" policy encouraged and guided firms to report higher taxable profit margins in return for immunity from audits in a given year. Our analysis shows that, in order to achieve the prescribed profit margins, firms increase their reported taxable profits (the response aimed for by the tax compliance program), but also lower their reported revenues (an undesirable response) by up to 40% to make meeting the target margin easier and decrease their tax burdens. While we are not able to distinguish between revenue reductions from reducing sales (avoidance) versus outright manipulation (evasion), the findings show a significant potential for a reduction in the corporate tax base. They thus highlight that it is very difficult to impose target margins when part of that target (revenues in the denominator) can be manipulated by firms.

Nevertheless, the program generated significant revenue in the 2003–2009 period, especially as compared to the tax revenue collected from small firms overall.

The main channel through which firms increased their reported taxable profits was by topping them up with the discretionary self-assessment amount, rather than through a change in accounting profits or tax deduction adjustments. This appears to be the only channel of adjustment when accounting profits are positive. When accounting profits are negative, firms first adjust them in order to bunch exactly at zero pre-self-assessment taxable profits, before applying the self-assessment payment.

What do these findings suggest about small firms' tax compliance in Greece? The fact that firms can seemingly easily top up their profits likely means that they had significant unreported profits to start with. Firms appear to be reporting just enough to avoid audits, and avoiding audits is more attractive for firms that are engaging in tax evasion and misreporting. While it is also possible that compliant and honest firms may have decided that they would rather overpay somewhat in taxes rather than to incur the hassle costs of an audit, this seems less likely. Overall, the results point to a possibly large and widespread baseline lack of tax compliance.

Future research could explore two additional aspects of such amnesty-like policies. First, the impacts of these programs are effectively driven by a combination of two effects: the self-assessment itself, but also the possible resources freed up for tax enforcement for other (non self-assessment) firms. Disentangling the gains from self-assessment or amnesty programs that come from these two channels would be very valuable. Second, the presence of a VAT can affect the incentives to self-assess or, more generally, to participate in an amnesty in subtle and complex ways. The interaction between the VAT and tax compliance programs could affect the overall gains in tax revenues.

Appendix A. Data

A.1. Greek legal statuses

KPMG (2016) summarizes the main legal statuses for enterprises in Greece. The following legal statuses are corporations and are included in our universe of corporate tax returns data:

- Société Anonyme (SA) - Anonymos Eteria (AE) in Greek: a legal entity in which the liability of a shareholder is limited to the amount contributed to the share capital. This entity is the equivalent of the French" Société Anonyme," the German" AG", Public Limited Companies in the UK, and Public Companies in the U.S.
- Limited Liability Company (LLC) - Eteria Periorismenis Efthynis (EPE) in Greek: a hybrid legal entity of an SA and a partnership, and is equivalent to the French "Sarl" or German "GmbH." Similar to an SA, an LLC is a legal entity separate from its partners and it has limited liability, but it is similar to a partnership in the manner decisions are made.
- Private Capital Company – Idiotiki Kefalaiouhiki Eteria (IKE) in Greek: legal entity that is exclusively liable for its corporate debt, while the liability of its partners for corporate debt towards third parties is limited to the amounts specifically mentioned in its Articles of Association. This legal status was initiated in 2012, and many LLCs reincorporated as Private Companies beginning in 2013. Naturally, we do not include them in the self-assessment analysis since they are outside the relevant time period.

The following legal statuses are types of enterprises that are **not** corporations and not included in our corporate tax returns data. These have different applicable tax rates and a" hybrid" tax regime with similarities to the personal income tax system:

- General Partnership - Omorythmos Eteria (OE) in Greek: entity in which all the partners are jointly liable for the debts of the entity without limitation in liability.
- Limited Partnership - Eterorythmos Eteria (EE) in Greek: similar to a General Partnership, except that the liability is limited to the partner's contributed capital.
- Joint Venture – Kinopraxia (JV) in Greek: indicates the cooperation of individuals or legal entities for the purpose of pursuing and carrying out a specific project.
- Sole Proprietorships: Self-employed or free lancer enterprises.

A.2. Summary statistics

Table A1
Summary statistics 2003–2016.

	Tax sample				Financial statement + tax sample			
	Mean	25th perc.	Median	75th perc.	Mean	25th perc.	Median	75th perc.
	$/€ mean exchange rate (2003–2016) = 1.28							
Revenue (1000's €)	3910	114	418	1484	4171	233	817	2526
Acc. Profits (1000's €)	43	−20	9	55	77	−21	15	92
Tax Profits (1000's €)	−292	−58	4	48	−158	−65	11	85
Acc. Margins (%)	−18.95	−8.41	1.79	10.02	−11.13	−5.30	1.85	8.41
Tax Margins (%)	−82.53	−22.52	0.83	8.13	−46.23	−15.02	1.29	7.43
Firm Age (years)	11.3	4	9	16	12.4	6	11	17
Assets (1000's €)					4970	476	1255	3268
Employees					36	7	14	30
Firm-year observations	625,044				280,605			

Notes: Summary statistics for the full tax data sample (columns 2–5), and the tax data matched with financial statements sample (columns 6–9). Because the financial + tax sample is from 2003 to 2016, we limit the comparison in this table to those years, despite the availability of the tax data from 1999. Accounting and taxable profits refer to profits or losses (if negative). Accounting and taxable margins are defined as profits (or losses) as a percentage of revenue. Assets refers to total assets. The full-tax sample includes 774,859 firm-year observations between 1999 and 2016.

To obtain additional control variables, we match our tax sample with the *Hellastat* data, using accounting profits and revenue, which should be identical on both financial statements and tax returns. The financial-matched-with-tax sample – henceforth "Financial Statement + Tax Sample" – includes larger firms (median revenue of about €820,000, equivalent to $1.05 million using the average euro/dollar exchange rate for 2003–2016) than the tax sample – henceforth "Tax Sample" (median revenue of about €420,000, equivalent to $538,000). Firms in the Financial + Tax sample also have higher reported accounting and taxable profits and are older. This is likely because the nearly two thirds of firms with tax returns who do not file digitized financial statements are very small and young firms. Despite the differences in summary statistics, the take-up trends in both the Tax Sample and the Financial Statement + Tax Sample are nearly identical.

A.3. Summary figures: small versus large firms

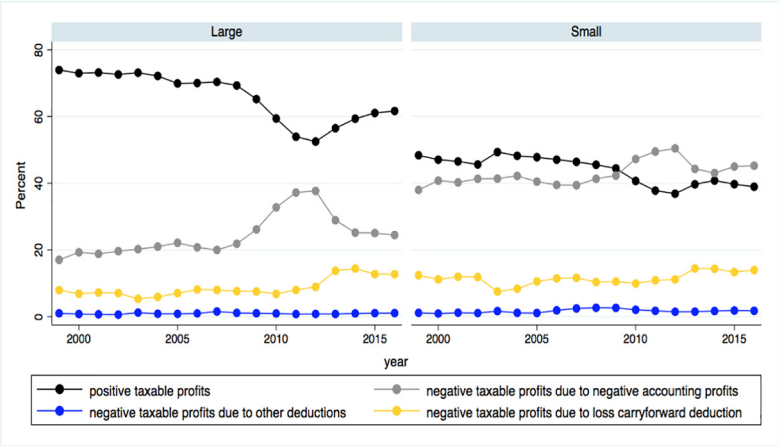

Fig. A1. Negative or zero taxable profits reporting by source. Notes: Sources of zero **or** negative taxable profits in the tax returns sample by year. "positive taxable profits" shows the percentage of firms with positive taxable profits. "negative taxable profits due to negative accounting profits" are firms reporting negative or zero accounting profits. "negative taxable profits due to loss carryforward deduction" refers to firms who have negative or zero taxable profits but would otherwise have positive taxable profits without using the loss carryforward. "negative taxable profits due to other deductions" are firms who have negative or zero taxable profits but would otherwise have positive taxable profits without using other deductions than loss carryforward.

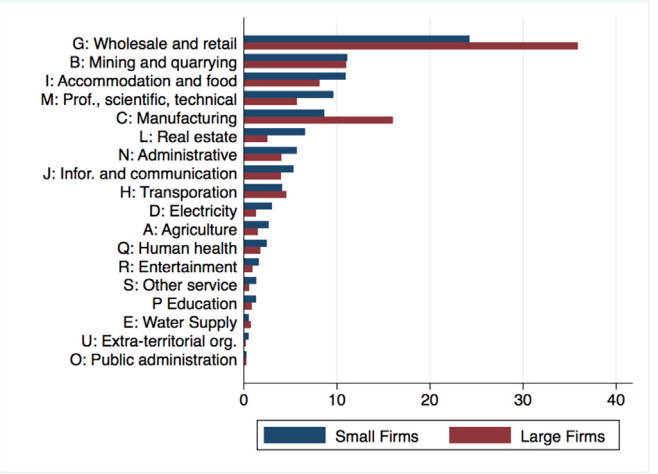

Fig. A2. Small versus larger firms industry composition. Notes: percent of total firms in the labeled industries for all years in the tax sample 1999–2016.

Appendix B. Institutional features

B.1. VAT adjustment

Firm i in period t has the following accounting variables:

- Revenue: R_{it}
- Input costs: G_{it}
- Other expenses: E_{it}
- Net accounting profits: $\pi_{it}^{Acc} = R_{it} - G_{it} - E_{it}$

The firm faces average government prescribed margins of m^g. The firm calculates a VAT profit coefficient that it applies on the input costs to obtain adjusted additional revenues A_{it} to pay an additional VAT tax on:

$$A_{it} = \frac{m^g}{100 - m^g} * G_{it}$$

Appendix C. Take-up

C.1. Take-up additional figures and tables

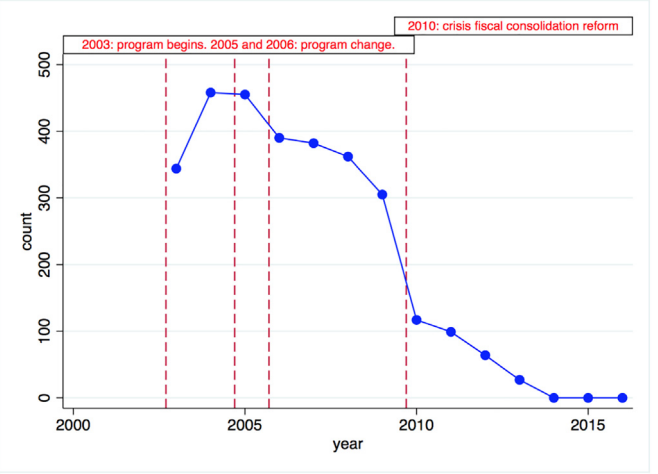

Fig. A3. Program take-up for Financial Statement + Tax Sample. Notes: Financial data is available from 2003 while tax data is available from 1999.

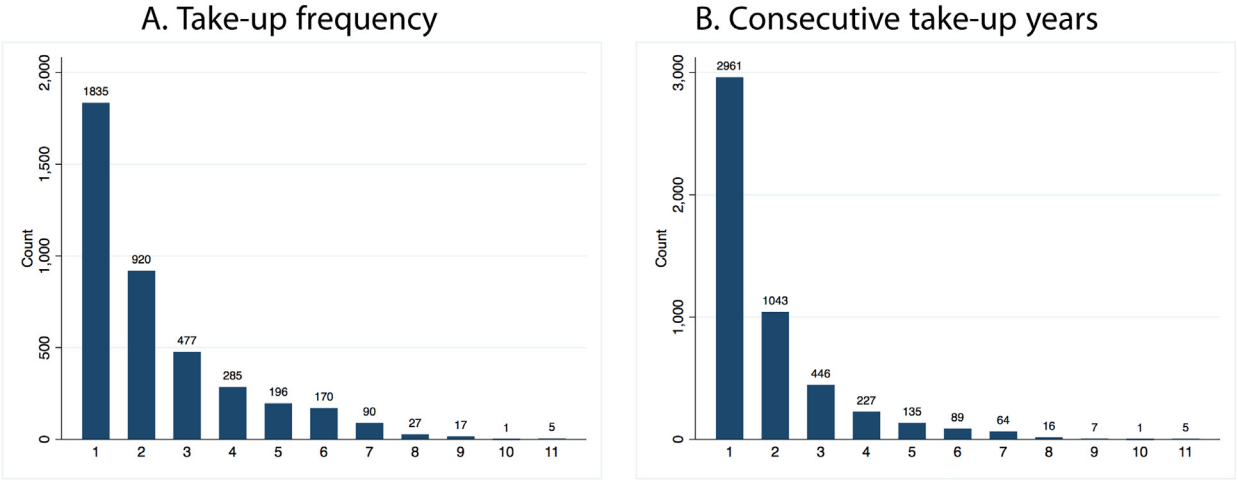

Fig. A4. Distribution of take-up by frequency and spells. Notes: these distributions are for self-assessing firms in the tax data.

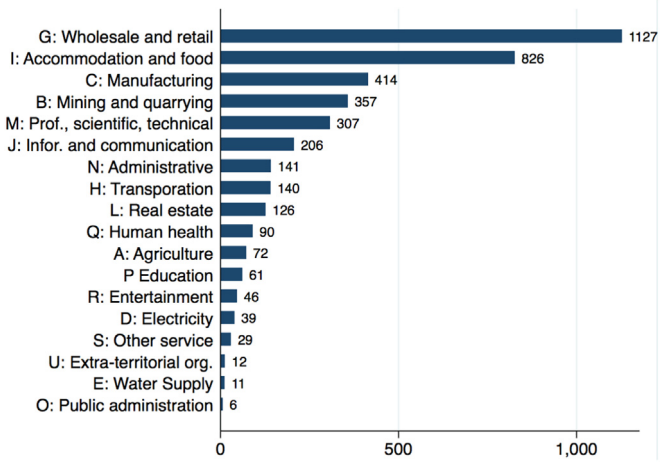

Fig. A5. Number of firms taking-up by industry: 2003–2013.

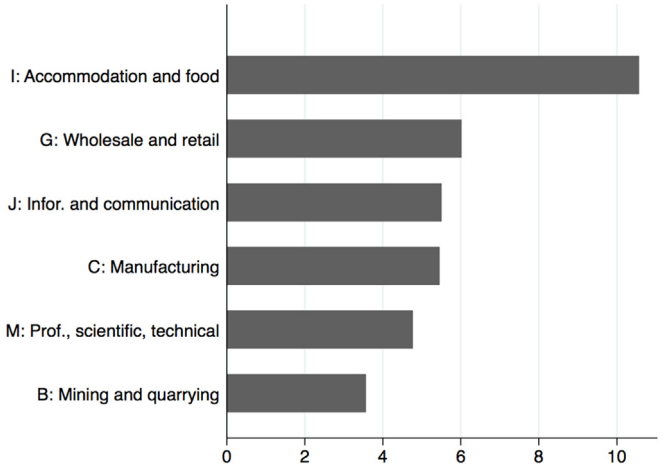

Fig. A6. Percent of small firms taking-up by industry. Notes: Take-up by industry as percent of eligible firms (revenue ≤ €300,000). We list the top six industries by the number of take-up firms.

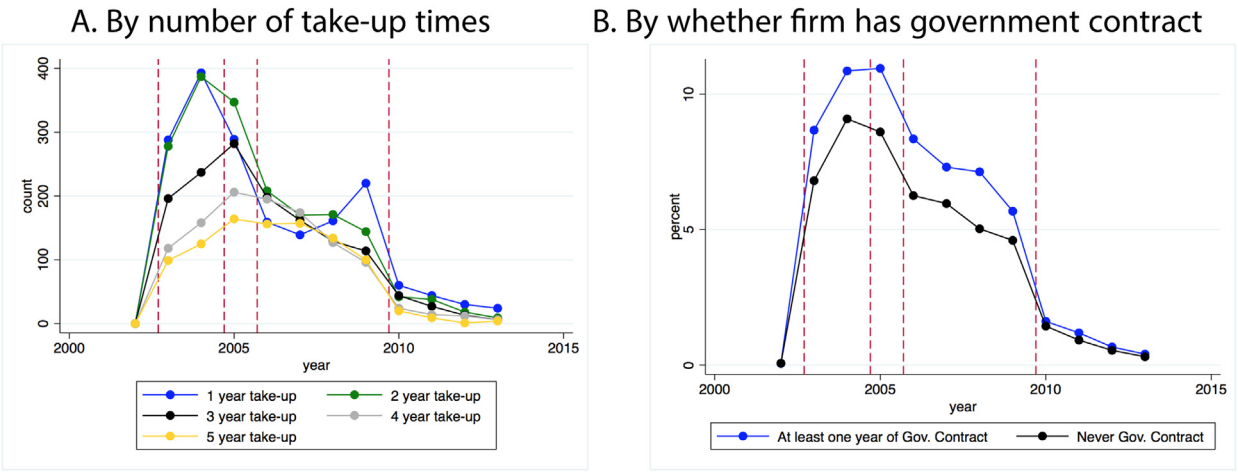

Fig. A7. Take-up of the self-assessment program by frequency and whether on government contract. Notes: In Panel B, at least one year of government contract refers to a firm with sales to the government (and taxes withheld on those sales) in at least one year in the tax returns data. Panel B shows take-up as percentage of eligible firms (≤ €300,000).

C.2. Take-up revenue cutoffs

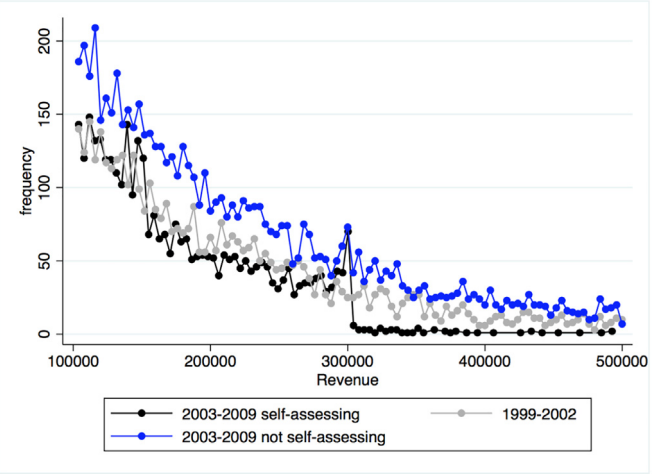

Fig. A8. Revenue distributions using frequency. Notes: The distributions include firms' reported revenue when taking up the self-assessment program between 2003 and 2009.

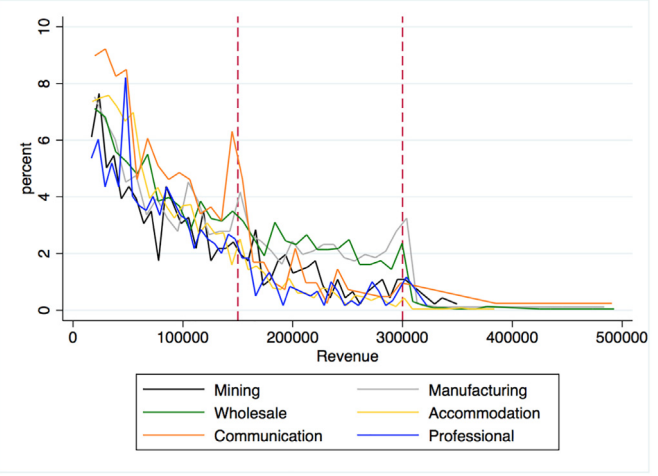

Fig. A9. Revenue distributions for self-assessing firms by main industries. Revenue distributions by industry for firms taking up the self-assessment program, while self-assessing, in 2003–2009.

C.3. Selection regressions and results

We use a linear probability model to estimate the importance of available firm-level characteristics for the take-up of the program. We control for revenue in regressions (1) to (5), and include firm age and a dummy for having a government contract in all regressions. We include year fixed effects to control for aggregate trends, and industry fixed effects in several regressions to control for industry-specific shocks. The main model specification is therefore the following:

$$\text{Self-assessment}_{it} = \alpha A_{it} + \psi X_{it} + \beta_t + \delta Z + \varepsilon_{it}$$

where Self - assessment$_{it}$ is a dummy equal to one if firm i self-assesses in year t. A_{it} is a vector of firm-level variables that include revenue, a dummy for withholding equal to one if the firm has a government contract, and firm age is a dummy equal to one if the firm is older than five years. β_t denotes calendar year dummies, Z denotes industry dummies, and X_{it} is a vector of financial variables (assets and employment, and costs in the case of the final regression). We use a dummy variable for "missing" in the case of missing values for assets, employment, and firm age.

Table A2
Policy take-up by firm characteristics.*

	Tax		Tax and Fin.			
	(1)	(2)	(3)	(4)	(5)	(6)
Log Revenue	−0.0063***	−0.0077***	−0.0180***	−0.0186***	−0.0163***	
	(0.0005)	(0.0005)	(0.0014)	(0.0014)	(0.0015)	
Older Firm	0.0132***	0.0116***	0.0218***	0.0151***	0.0189***	0.0198***
	(0.0008)	(0.0008)	(0.0019)	(0.0018)	(0.0021)	(0.0021)
On Gov. Contract	0.0072***	0.0075***	0.0071***	0.0096***	0.0097***	0.0063**
	(0.0013)	(0.0013)	(0.0026)	(0.0026)	(0.0026)	(0.0026)
Log Assets					−0.0047***	−0.0082***
					(0.0009)	(0.0009)
Log Employment					−0.0113***	−0.0115***
					(0.0026)	(0.0026)
Log Costs					0.0002	−0.0008***
					(0.0003)	(0.0003)
N (firm-year)	332,399	332,394	82,686	82,686	82,686	82,686
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	Yes	Yes

Notes: Firm-level regressions for eligible firms (at or below the 300,000 revenue cutoff). Columns 1–2 use all tax returns, and columns 3–6 use tax returns matched with financial statements. The dependent variable is a dummy equal to 1 in a year a firm uses the government policy to avoid being audited. The older firm variable is a dummy equal to one if the firm is 5 years or older. Costs are calculated as the difference between sales and gross operating profits. Standard errors are clustered at the firm level. We control for missing observations in the age, assets, and employment variables by using missing variable dummies in controls.

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Appendix D. Event study additional tables and figures

Table A3
Balance table.*

		Mean				Difference				N
	Control	Freq1	Freq2	Freq3	Freq4	Freq1-Con	Freq2-Con	Freq3-Con	Freq4-Con	
Age (months)	103.254	102.616	112.835	114.071	120.205	−0.638	9.581***	10.817**	16.951***	696,314
	[83.835]	[76.155]	[82.181]	[79.314]	[71.129]	(2.887)	(3.593)	(4.645)	(6.064)	
Gov. Contract	0.350	0.271	0.213	0.207	0.229	−0.079***	−0.138***	−0.143***	−0.121***	774,859
	[0.477]	[0.445]	[0.410]	[0.406]	[0.421]	(0.015)	(0.019)	(0.025)	(0.032)	

Notes: Statistics refer to year 2002, the year before self-assessment. Standard deviations are in brackets and standard errors in parentheses. Control is the 400,000-1,000,000 revenue group. "Freq" groups refers to the number of years of take-up during the program duration (2003−2013); Freq1 is therefore the group of firms that took up the program exactly once, and so on.

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Table A4
Policy effects on treated by take-up frequency.

	Log Taxable Profits				Log Revenue			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
T-3	−0.0584	−0.1706	−0.6818**	−0.4074	−0.0570**	0.1117***	0.1446**	0.2079***
	(0.1174)	(0.1877)	(0.3041)	(0.3848)	(0.0260)	(0.0370)	(0.0565)	(0.0750)
T-2	0.0398	−0.1486	−0.8703***	−0.4958	−0.0325	0.0912**	0.1428**	0.1097
	(0.1120)	(0.1984)	(0.3250)	(0.4046)	(0.0233)	(0.0377)	(0.0556)	(0.0801)
T-1	−0.1482	−0.2275	−0.9514***	−1.0859**	−0.0411*	0.0177	0.0470	0.1031
	(0.1082)	(0.2128)	(0.3514)	(0.4785)	(0.0237)	(0.0372)	(0.0557)	(0.0802)
T	1.7456***	2.2432***	2.2825***	2.2103***	−0.4591***	−0.2141***	−0.1373**	−0.0638
	(0.0914)	(0.1759)	(0.2845)	(0.3518)	(0.0242)	(0.0377)	(0.0551)	(0.0661)
T + 1	0.0134	2.5979***	2.6213***	2.9268***	−0.0101	−0.2997***	−0.1974***	−0.0848
	(0.1032)	(0.1691)	(0.2779)	(0.3192)	(0.0224)	(0.0386)	(0.0543)	(0.0612)
T + 2	−0.0641	0.4983**	2.8038***	3.2013***	0.0666***	−0.0889**	−0.3657***	−0.1116*
	(0.1087)	(0.1936)	(0.2725)	(0.3183)	(0.0239)	(0.0370)	(0.0583)	(0.0653)
T + 3	−0.0447	0.5079***	0.5680*	3.4129***	−0.0015	−0.0409	−0.0888*	−0.1475**
	(0.1199)	(0.1745)	(0.2994)	(0.3130)	(0.0261)	(0.0359)	(0.0518)	(0.0624)
Firm-year obs.	145,690	138,050	133,551	131,649	145,690	138,050	133,551	131,649
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Firm-level regressions. The outcome variable is log taxable profits for columns 1–4 and log revenue for columns 5–8. Regressions are by number of years of take-up from lowest (one on the left) to highest (four on the right). All regressions control for firm age and whether a firm is on a gov. contract and impute for missing age using a dummy variable. Standard errors are clustered at the firm level.

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Appendix E. Robustness and heterogeneity

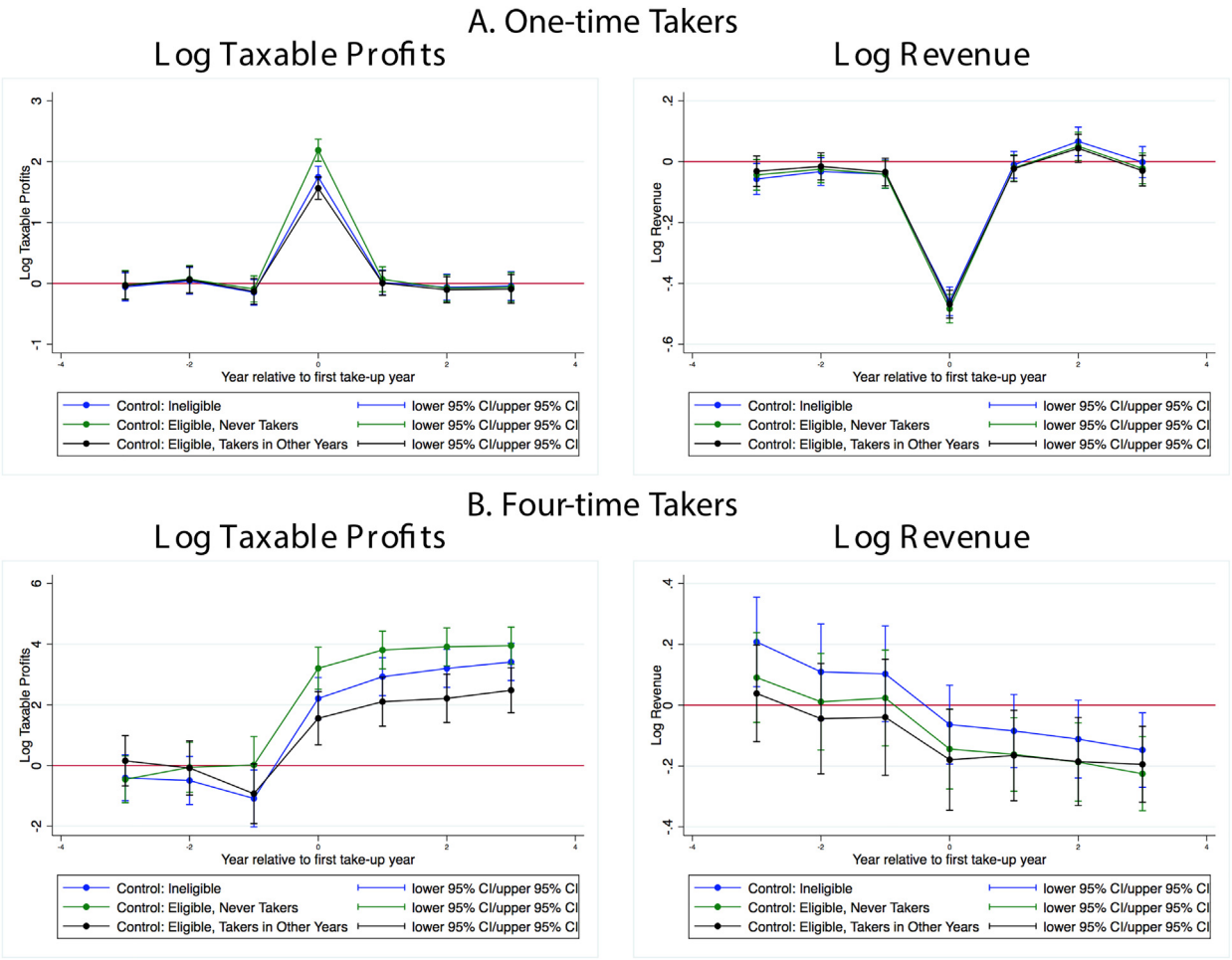

Fig. A10. Reporting responses on taxable profits and revenue using other control groups. Notes: Each group only includes consecutive take-ups and is evaluated against the labeled control group. We use year and firm fixed effects, and control for firm age and whether the firm has a government contract. Negative and zero taxable reported profits treated as zero (+1 when taking logs). Firm age is imputed for missing observations by a missing dummy.

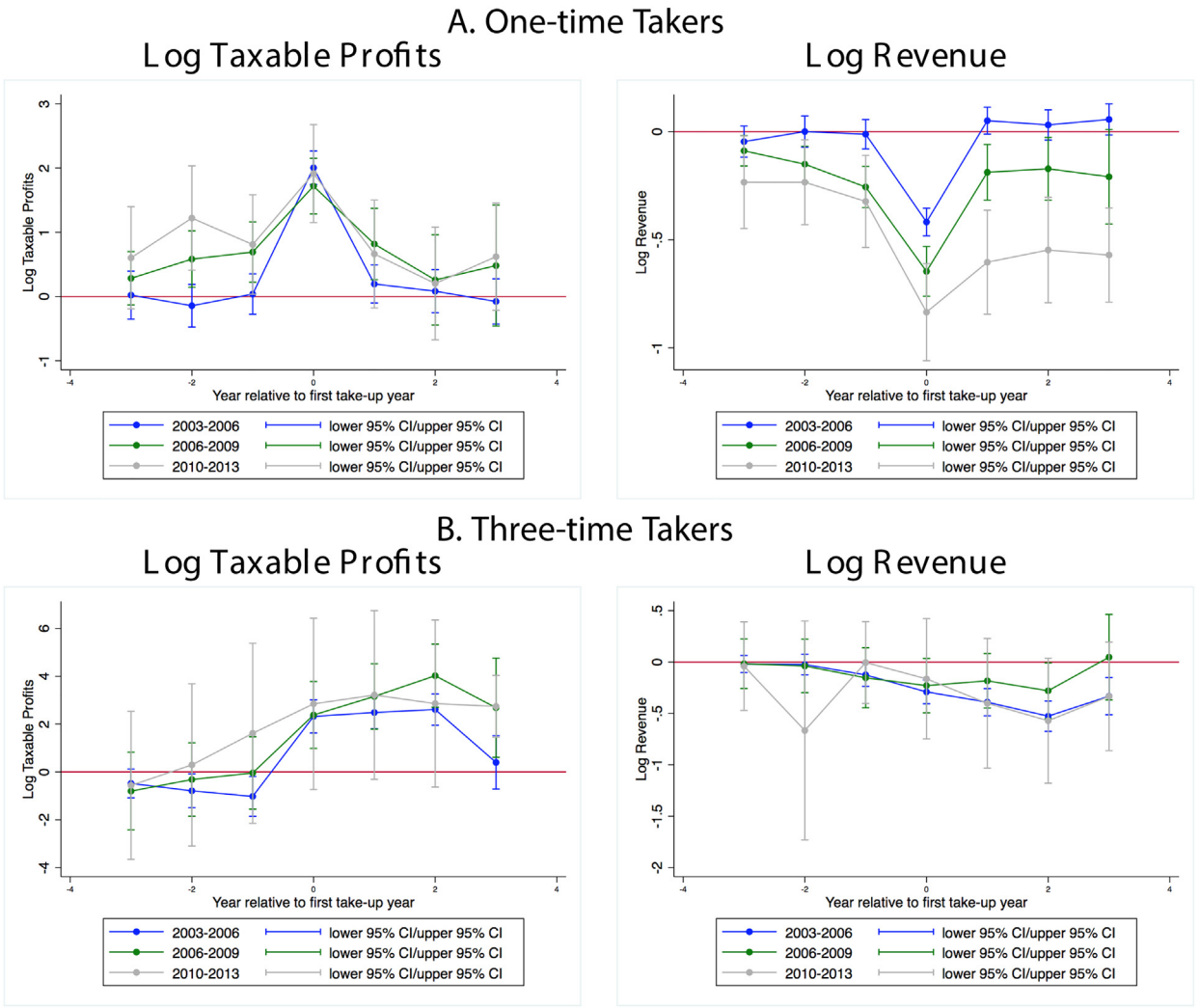

Fig. A11. Reporting responses on taxable profits and revenue across time periods. Notes: Each group only includes consecutive take-ups and is evaluated alone against the control group of non-takers (€400 k-1 m firms). The specification includes year and firm fixed effects, and controls for firm age and whether a firm has a government contract. Negative and zero taxable reported profits treated as zero (+1 when taking logs). Firm age is imputed for missing observations by a missing dummy.

E.1. Correlations of tax reporting by industry

We use a two-way fixed effects model separately for each industry. As the purpose of this estimation is to shed light on industry differences, the sample choice in effect is not restrictive; we compare treated years with all other non-treated years. We focus on the control group of firms who are eligible but not choosing to take-up in this case: eligible firms that do self-assess in some years. We therefore condition on firms having at most €400,000 in revenue in order to include eligible firms and those who may bunch to the lower cutoff of €300,000 for the purpose of being eligible. We also do not distinguish between firms by the number of years of take-up, and do not include dynamic effects. In a previous subsection we addressed the choice of the main control group and showed that the results are not sensitive to choice of the control group. We also note that we would obtain similar correlations and ranking of correlations for each industry with an event study. We estimate the following:

$$Y_{it} = \alpha_i + \beta_t + \gamma E_{it} + \psi X_{it} + \varepsilon_{it}$$

where α_i denotes firm fixed effects, β_t denotes the calendar year dummies,and E_{it} is a dummy equal to one if firm i self-assesses in year t. X_{it} is a set of firm characteristics including firm age and whether the firm is on a government contract in year t. Y_{it} is either log taxable profits or log revenue, the levers a firm can choose to reach the targeted taxable margins. γ is the main coefficient of interest and measures the correlation between profits or revenues and being in the self-assessment program in that year. We also control for log assets and log employment for firms we have financial statement data for.

Table A5
Self-assessment and tax reporting correlations by industry.

	Mining	Manufact.	Wholesale & retail	Accommod. & food	Inform. & communic.	Prof. & scient.
Panel A						
Log Taxable Profits	3.3579***	2.7321***	2.9203***	4.0773***	2.1198***	2.0180***
	(0.2414)	(0.1584)	(0.0956)	(0.1272)	(0.2202)	(0.1586)
Log Revenue	−0.1119***	−0.1371***	−0.1678***	−0.1266***	−0.2663***	−0.2344***
	(0.0415)	(0.0297)	(0.0189)	(0.0147)	(0.0441)	(0.0358)
Firm-year obs.	19,755	34,800	83,003	55,476	18,094	31,988
Panel B						
Log Taxable Profits	2.3536	2.3990***	3.4751***	2.8120***	1.6482**	2.6468*
	(2.8189)	(0.6171)	(0.5799)	(0.3889)	(0.6756)	(1.4157)
Log Revenue	0.2146	0.0965	−0.2074**	−0.0803**	−0.2976**	−0.3047**
	(0.2138)	(0.1192)	(0.0969)	(0.0311)	(0.1358)	(0.1410)
Firm-year obs.	308	3188	4812	5907	1293	1496
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Firm-level regressions limited to eligible firms and firms slightly above the cutoff (up to 400,000 in revenue). Panel A uses all tax returns, while Panel B uses tax returns matched with financial data. Columns represent effects by industry. The dependent variable is either log taxable profits (rows 1 and 3) or log revenue (rows 2 and 4) as indicated in the columns. Financial data uses controls for log assets and log employment, and all regressions control for firm age and whether the firm is on a government contract. We impute for missing values in controls variables by using missing dummies for assets, employment and age. Standard errors are clustered at the firm level.

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Table A6
Take-up frequency by industry.

Industry	Take-up Frequency											
	0		1		2		3		4		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Mining	12,449	97.1	214	1.7	96	0.7	38	0.3	29	0.2	12,826	100.0
Manufacturing	12,106	96.8	215	1.7	95	0.8	54	0.4	30	0.2	12,500	100.0
Retail & Trade	29,962	96.6	574	1.9	292	0.9	136	0.4	58	0.2	31,022	100.0
Food & Accommodation	9339	93.4	266	2.7	180	1.8	122	1.2	95	0.9	10,002	100.0
Communication & Information	4759	96.0	110	2.2	52	1.0	20	0.4	15	0.3	4956	100.0
Professional & Scientific	7990	96.4	159	1.9	83	1.0	35	0.4	22	0.3	8289	100.0
Total	76,605	96.2	1538	1.9	798	1.0	405	0.5	249	0.3	79,595	100.0

Notes: summary statistics for the number and percentage of firms in each industry by the take-up groups we consider in our analysis – zero to four. The table includes the six main take-up industries by the number of firms taking up self-assessment. Industry classifications use European NACE codes.

E.2. Profits distributions

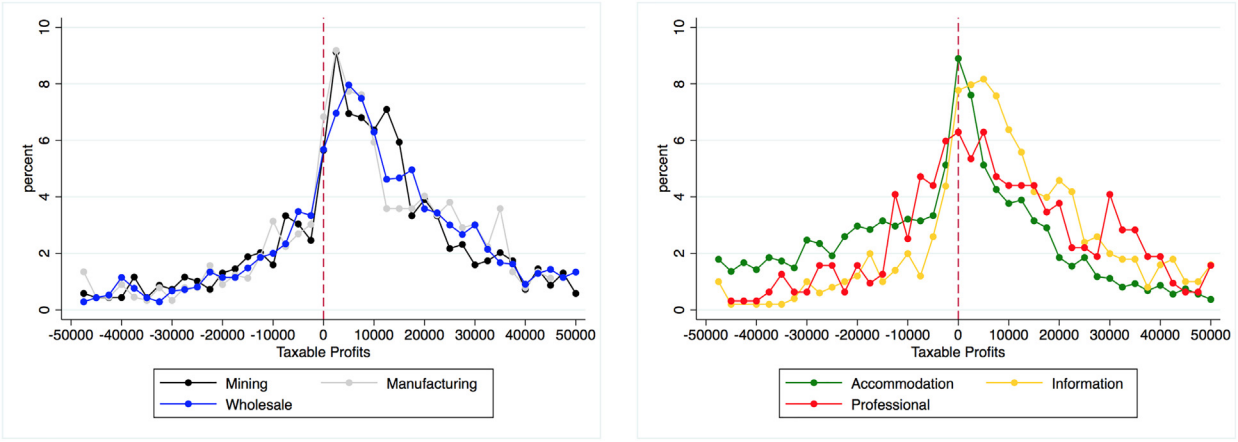

Fig. A12. Taxable profits prior to the program for firms who self-assess at least once. Notes: The figures include only firms who self-assess at least once. The distributions are for years 1999–2002 before self-assessment. For clarity we separate into two figures with profits from three industries in each. The industries are the six main industries with the highest take-up in self-assessment by the number of firms; "Accommodation", for example, refers to the "Food and Accommodation" industry.

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