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THE MARKET EXTERNALITIES OF TAX EVASION

by Irene Di Marzio*, Sauro Mocetti* and Enrico Rubolino**

Abstract

This paper presents evidence of the market externalities of tax evasion: firms' tax non-compliance distorts the outcomes of their competitors. Using novel administrative data on the universe of Italian firms, we compute a tax evasion proxy as the fraction of individual firms who manipulate their revenue to meet eligibility criteria for preferential tax regimes. Our empirical approach uses policy-induced changes in tax notch sizes to predict the fraction of non-compliant firms in each market. We find that non-compliant firms generate significant revenue and productivity losses for their competitors, who then pass on some of this burden to their workers. This unfair competition harms aggregate productivity, partly due to a worsening of allocative efficiency. Our findings show that cracking down on tax evasion not only increases tax revenues and promotes tax fairness, but can also enhance market efficiency by levelling the playing field.

JEL Classification: H26, H25, D22, D43.

Keywords: tax evasion, market competition, preferential tax regimes.

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1 Introduction[1]

Tax evasion poses significant hindrances to a well-functioning economy. By diverting funds away from public coffers, tax evasion limits the development of fiscal capacity (Besley and Persson 2013), compromising the ability of governments to invest in essential public services. Moreover, it exacerbates income inequality and erodes tax equity (Slemrod 2007, Alstadsæter et al. 2019, Alstadsæter et al. 2022, Bachas et al. 2024), placing a disproportionate tax burden on law-abiding citizens and businesses that fulfill their fiscal responsibilities (Gordon and Li 2009, Best et al. 2015, Rubolino 2023).

Tax evasion can also lead to inefficient market outcomes. By altering net-of-tax prices and profits, tax evasion creates an uneven playing field, where firms that are able to evade taxes have a competitive advantage over their competitors.[2] This might misallocate resources by rewarding non-compliant firms, potentially stifling productivity in the broader economy (Restuccia and Rogerson 2017). However, the distortions that tax evasion induces to market functioning and compliant firms' outcomes have received no attention in the existing literature (see, e.g., Slemrod 2007 and Slemrod 2019 for reviews). This is likely due to two main empirical challenges: the difficulty of having measures of tax compliance at the firm level and that of obtaining clean evidence on the distortions that tax evasion creates on market outcomes.

This paper aims to break new ground on the market externalities created by tax evasion: how firms' tax non-compliance distorts the outcomes of their competitors[3].

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[2] Slemrod (2007) provides an interesting example of how the opportunity for noncompliance can distort resource allocation: "Because the income from house painting can be done on a cash basis and is therefore harder for the IRS to detect, this occupation is more attractive than otherwise. The supply of eager housepainters bids down the market price of a house painting job. Thus, the amount of taxes evaded overstates the benefit of being a tax-evading housepainter. The biggest loser in this game is the scrupulously honest (or risk-averse) housepainter, who sees his or her wages bid down by the unscrupulous competition, but who dutifully pays taxes." (p.42).

[3] Throughout this paper, we focus on a specific form of tax evasion: revenue manipulation by individual firms aiming to access preferential tax regimes. This particular phenomenon is measurable and offers exogenous variability due to changes in the regulatory framework. While this measure does not capture all forms of tax evasion, we believe it offers a valuable perspective for understanding the broader market implications of tax evasion practices.

Our research design is based on comparing markets that differ in the extent of firms' non-compliance, but are otherwise comparable. We develop a market-level proxy for tax evasion based on the fraction of individual firms that manipulate their revenue to be eligible for preferential tax regimes in Italy. The extent to which tax evasion gives individual firms a competitive advantage should be reflected in the revenue of their competitors, which we identify as firms not eligible for preferential tax schemes (because of their pre-determined legal form) that operate in the same market.

Our empirical analysis rests on a novel administrative dataset covering the universe of Italian firms over the 2005–2019 period. We access firm-level information on various financial and tax variables, covering around 65 million firm-year observations. The individual firms included in our data, such as electricians, plumbers, or IT consultants, provide an excellent setting to study the market distortions caused by tax evasion. These businesses, which make up nearly one-fourth of the Italian workforce, heavily rely on cash transactions and self-report their income, facilitating under-reporting of revenue (OECD 2023). Moreover, these firms typically operate locally in a specific business activity, thus allowing us to define their relevant market precisely. We leverage the richness of our data to define markets at a highly granular level, down to the municipality-industry level.

We first show that individual firms have a strong propensity to report revenue just below the cutoff determining eligibility for preferential tax schemes. This result suggests that notches have high inefficiency costs: by creating strong price distortions, they induce large behavioral responses when tax evasion is a possible margin of response (Saez 2010, Chetty et al. 2011, Kleven and Waseem 2013, Aghion et al. 2024). We use the excess fraction of individual firms that bunch below the eligibility cutoff as a proxy for the share of non-compliant firms in a given market. This approach assumes that excess bunching below the notch primarily results from revenue under-reporting, rather than production or labor supply adjustments. The prevailing perspective in public finance suggests that responses to tax notches predominantly reflect tax evasion.[4] We also provide several pieces of evidence corroborating the notion that such bunching behavior predominantly indicates revenue manipulation.

We identify the market externalities of tax evasion by relating changes in the market-level share of non-compliant individual firms with the outcomes of their competitors. To account for endogeneity issues, we use policy-induced changes in the size of the tax notch to predict the market-level share of individual firms that are likely to engage in tax evasion. We consistently show that bunching responses strongly relate to variation in the size of the tax notch. Namely, bunching responses

[4]For instance, Aghion et al. (2024) show that bunching responses to the introduction of preferential tax regimes for the self-employed in France reflect evasion responses. Similar findings have also been documented from firm-level bunching responses to tax kinks or notches in other contexts (see, e.g., Saez 2010, Kleven and Waseem 2013, Best et al. 2015, Almunia and Lopez-Rodriguez 2018, Bachas and Soto 2021, and Lobel et al. 2024).

systematically (and discontinuously) vary by firm age, industry, and over time in accordance with variations in the size of the tax notch. We then create a shift-share instrument that predicts market-level non-compliance rates by exploiting the differential cross-market exposure to various changes in preferential tax regimes' characteristics. These reforms generate exogenous variation in a firm's expected tax burden when moving from the ordinary to the preferential tax regime.

Our 2SLS estimates show that, as the share of individual firms that engage in tax evasion increases, their competitors experience significant revenue losses. On average, when the share of non-compliant firms in the market increases by 1 percentage point, the revenue earned by each of their competitors decreases by about 1.9 percent. The impact is concentrated on smaller competitors, which are more likely to compete in the same markets as individual firms. In response to this competitive pressure, firms cut their wage bill, thus passing on some of the tax evasion costs to workers. The cut in labor costs reflects both extensive (number of workers) and intensive (average wage per worker) effects. This drop in labor costs, coupled with the absence of heterogeneous effects across areas with different attitudes toward tax evasion, suggests the externality effect on competitors to mostly reflect a real response, rather than reciprocity in tax evasion.

Tax evasion of individual firms also results in significant productivity losses for their competitors. Moreover, the whole market becomes less productive as non-compliant firms become more prevalent. According to our calculations, bringing to zero the number of bunchers would lead to an increase in aggregate productivity between 4 and 7 percent. Following the decomposition approach proposed by Melitz and Polanec (2015), we show that the aggregate (market-level) productivity loss mostly comes from a deterioration in the performance of incumbent firms. However, we also find a significant impact on allocative efficiency, with a decrease in the covariance between firm productivity and size. Therefore, in markets more exposed to tax evasion, there is a lower tendency for workers to move from smaller and less productive firms (including self-employed solo workers) to relatively larger and more productive firms.

Our results are robust to a number of sensitivity checks. First, even absent revenue manipulation, preferential tax rates for individual firms can systematically affect market competition by introducing a wedge in marginal costs across eligible and non-eligible firms. Our empirical strategy accounts for this potential violation of the exclusion restriction, exploiting policy-induced changes exclusively in the tax rate differential resulting from moving from the ordinary to the preferential tax regime.[5] Second, changes in the generosity of the preferential tax schemes can affect business

[5]In this respect, it is worth noting that our paper is not a policy evaluation of the preferential tax regimes. We exploit changes in the features of the preferential tax regimes to identify the market externalities of tax evasion, accounting for other potential effects that the preferential tax regimes might generate.

creation. These channels are unlikely to take place in our context since the policy changes that we exploit do not significantly affect the incentive for business creation (or relabeling). Moreover, our results are remarkably stable when we include additional controls accounting for business dynamism. Third, following Goldsmith-Pinkham et al. (2020), we show that our pre-determined shares - used to predict the differential cross-market exposure to policy changes - are not correlated with changes in our outcomes variables. Finally, our results are confirmed when we adopt different definitions of "market", such as expanding the geographical scope of analysis or employing a finer industry classification.

Our paper contributes to various strands of the existing literature. The studies most closely related focus on the causes and implications of tax evasion (see Andreoni et al. (1998), Alm (2012), and Slemrod (2019) for excellent reviews). Slemrod (2019) emphasizes the role of firms, and, in particular small firms, as one of the most "understudied empirical issues" in tax evasion. To the best of our knowledge, we offer the first empirical evidence of how tax evasion distorts resource allocation among non-compliant and compliant firms. Our findings suggest that cracking down on tax evasion is desirable not only for raising tax collections and ensuring tax equity (see, e.g., Alstadsæter et al. 2019, Guyton et al. 2021, Alstadsæter et al. 2022), but also for preventing non-compliant firms from enjoying an artificial cost advantage over their compliant counterparts. This distortion creates an uneven competitive landscape, which hinders firm growth and market efficiency.

Our findings also relate to studies showing bunching responses of firms and the self-employed to tax notches and kinks. This rapidly growing literature was initiated by Saez (2010), who shows that self-employed earners respond to tax incentives created by the EITC in the U.S. (see, e.g., Chetty et al. 2011, Kleven and Waseem 2013, Best et al. 2015, Almunia and Lopez-Rodriguez 2018, Harju et al. 2019, Bachas and Soto 2021, Aghion et al. 2024, and Lobel et al. 2024). Similar patterns of tax evasion have been documented in Italy, where tax notches contribute to widespread non-compliance (MEF 2023). Experimental evidence indicates that the tax compliance rate is close to 100 percent when there is third-party reporting, but it is much lower when income is self-reported (Slemrod et al. 2001, Kleven et al. 2011).[6] The direct implication of these findings is that countries that have more self-employed taxpayers collect lower taxes (Torrini 2005, Kleven et al. 2016). Our findings suggest that firm tax noncompliance depresses tax revenue both *directly* and *indirectly* through spillover effects on their competitors.

Finally, our paper contributes to the literature examining the distortions produced by size-dependent regulations. The key finding of these previous works is that in-

[6]See, among others, Pomeranz (2015), Carrillo et al. (2017), Almunia and Lopez-Rodriguez (2018), Naritomi (2019), Brockmeyer et al. (2019), and Boning et al. (2020) for evidence of the role of tax enforcement in reducing tax evasion.

stitutions and policies preventing the equalization of the marginal value of inputs across firms can potentially generate large losses in aggregate productivity (Hsieh and Klenow 2009, Restuccia and Rogerson 2017). A series of papers have considered explicit policies or constraints that generate wedges in the allocation of resources across firms (Guner et al. 2008, Bartelsman et al. 2013, Garicano et al. 2016, Bachas et al. 2019). Our findings shed light on the inefficiencies created by preferential tax regimes for individual firms, a policy applied by most countries (OECD 2023). We show that these regimes involve significant under-reporting of revenue that, in turn, harms aggregate productivity and growth. The implications of our findings are that policies incentivizing firms to remain unincorporated might prevent economies from developing. In this respect, our results are consistent with Jensen (2021), who shows that, as countries develop, their employment structure shifts from self-employment to employees.[7]

The paper is structured as follows. Section 2 describes the data and institutional background. Section 3 discusses the empirical strategy. Section 4 shows bunching responses of individual firms on preferential tax regimes, while Section 5 examines how these bunching responses affect firm outcomes and aggregate productivity. Section 6 contains some concluding remarks.

2 Data and Institutional Background

This section presents the data and the markets (Section 2.1) and describes the preferential tax regimes for individual firms (Section 2.2).

2.1 Data and Variables

Our data cover the universe of Italian firms operating over the 2005-2019 period. This dataset is the outcome of a collaboration between the Bank of Italy and the Italian National Statistical Agency. It combines information from statistical, administrative, and fiscal sources (see Abbate et al. (2017) for details). The data contain information on key demographic and economic firm-level variables. For each firm, the dataset provides information on the legal form, age, industry classification (5-digit NACE code), location (municipality), and main balance sheet information, including revenue, value-added, labor costs, and the number of employees, among others.

Our dataset is composed of about 65 million observations, covering around 4.3 million firms per year. Table 1 reports summary statistics on the full sample of individual firms - which are those potentially eligible for preferential tax regimes - and non-individual firms – which are the potential competitors. An individual firm is an unincorporated business (sole proprietorship) that has just a single owner who

[7] Our findings explain the strong association evident both across and within countries on self-employment rates, tax evasion, and productivity. See Figure A1 for visual evidence.

pays personal income taxes on profits earned from the business. While the owner is solely responsible for business management, they may employ family members or other employees. Over the period covered in our data, the representative individual firm reports revenue of approximately 92 thousand euros. Non-individual firms include firms with other legal forms, such as general partnerships and limited liability companies. They are not eligible for preferential tax regimes. These firms tend to be larger in size and more productive (as measured by their value-added per worker).

Table 1: Summary Statistics

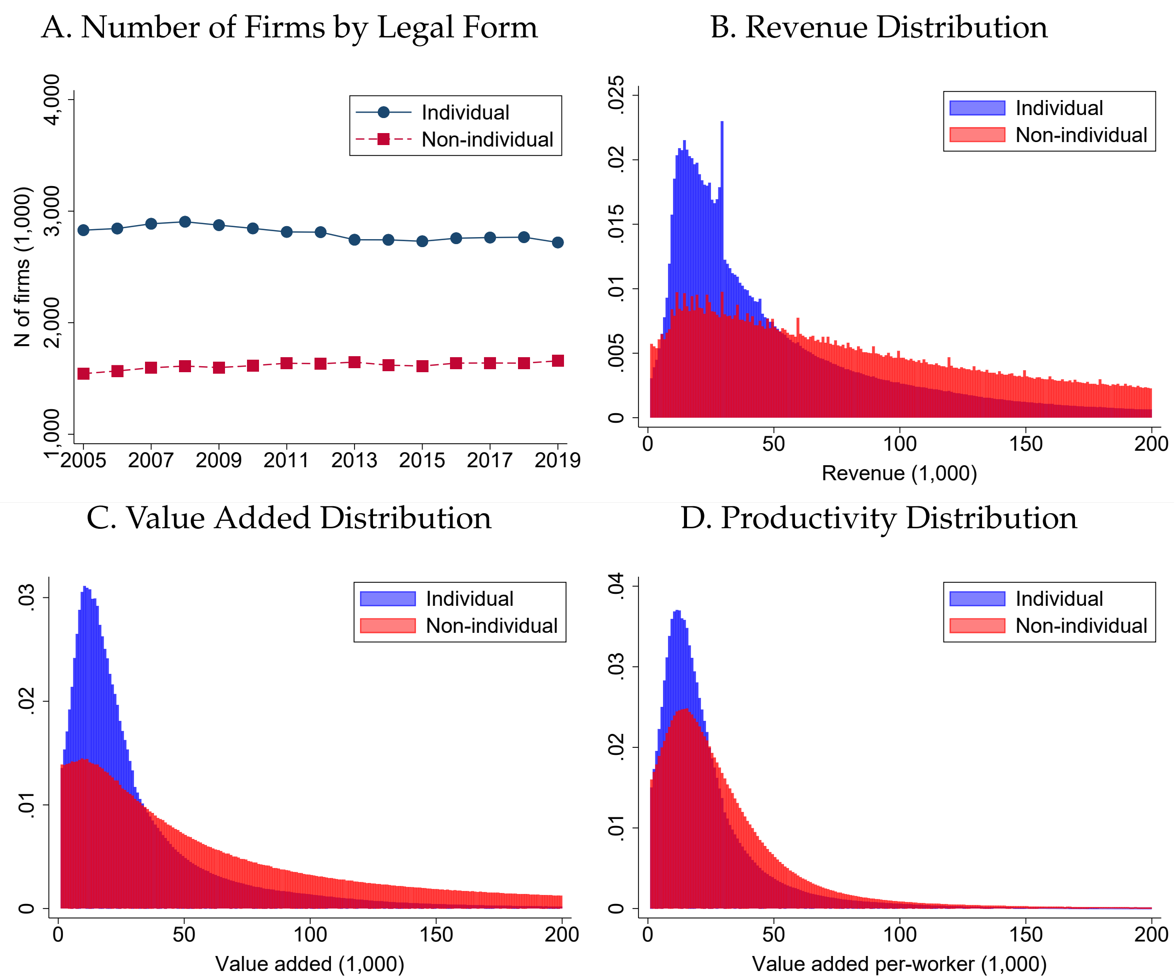
	Individual firms		Non-individual firms	
	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)
Revenue (1,000)	91.964	262.557	1,730.782	61,626.391
Value-added (1,000)	34.465	82.501	407.514	16,116.892
Value-added per-worker (1,000)	21.800	50.283	37.760	903.820
Wage bill (1,000)	8.850	35.431	223.093	6,618.407
Entry rate	0.092	0.291	0.082	0.274
Exit rate	0.094	0.298	0.077	0.265
N of workers	1.537	1.431	7.857	164.704
N of self-employed	1.113	0.389	1.351	0.733
N of employees	0.425	1.431	6.506	164.705
Age	14.140	10.611	14.472	11.705
Number of observations	41,211,544		23,711,612	

Note: This table shows summary statistics on several firm-level variables on the full sample of individual firms – which are those potentially eligible for preferential tax regimes – and non-individual firms – which are the potential competitors. Data from ISTAT over the 2005-2019 period.

Panel A of Figure 1 shows trends in the number of firms by legal form. The figure shows that trends were fairly stable over our temporal window, with a slight decrease in the number of individual firms. Specifically, the number of individual firms in 2019 was 4 percent lower with respect to 2005, while that of non-individual firms increased by 7 percent. These patterns do not seem to be attributable to the preferential tax regimes, which have had quite similar benefits for *new* businesses. Instead, they are probably attributable to some regulatory interventions that have made it easier to set up limited liability companies over time. As discussed below, this provides reassuring evidence in support of the exclusion restriction of our instrument. If the policy changes we exploit affect business creation or (ad hoc) changes in the legal form, we should observe an *increase* trend in the number of individual firms.

Panels B, C, and D plot the distribution of revenue, value-added, and value-added per worker for individual and non-individual firms. Two main remarks emerge from these graphs. First, there are clear differences in the moments of the distribution across the two groups of firms. This might stem from various factors, such as the scale of operations, access to capital, regulatory environments, and market reach. This cross-firm heterogeneity suggests that if tax evasion enables individual firms to gain market power over their (on average, larger size) competitors, we could observe

Figure 1: Descriptive Evidence



Note: Panel A depicts the trend in the number of individual (blue circles) and non-individual (red squares) firms. Panels B, C, and D report the distribution of revenue, value-added, and value-added per worker, respectively, for individual (blue) and non-individual (red) firms. For graphical purposes, panels B, C and D cut the sample at 200,000 of the variable of interest (these observations are included in the empirical analysis). Authors' calculations, based on data from the Italian Institute of Statistics covering the universe of Italian firms over the 2005-2019 period.

significant aggregate distortions if productivity and size are positively correlated, as assumed in classical models of the firm size distribution (Lucas 1978, Melitz 2003). Second, there is a clear spike in the revenue distribution of individual firms at around 30,000 euros. As we will discuss below, this corresponds to where the cutoff determining eligibility for preferential tax regimes was set for most of the period covered in our analysis. It thus provides *prima facie* evidence that preferential tax regimes shape the revenue distribution of individual firms.

To define markets, we adopt two criteria. First, we consider two firms operating in the same market if their products are close substitutes. To approximate this condition, we use the standard industry classification (NACE) at a two-digit level. The implicit assumption is that firms belonging to the same industry produce goods and services that are more likely close substitutes. Second, we consider the geographical dimension: under the assumption that there are transportation costs and/or any other distance-related costs, firms compete more fiercely when they operate in the same geographical area. This is especially true for smaller firms, which lack the organizational complexity required to operate in more distant markets. We thus consider two firms operating in the same market if they are located in the same municipality. Accounting for these two criteria, we define a market at the municipality-industry level.[8]

2.2 Preferential Tax Regimes for Individual Firms

Over the recent decades, many countries have implemented preferential tax regimes targeting "hard-to-tax" businesses, such as small enterprises, farmers, unincorporated businesses, and the self-employed (see OECD (2023) for an overview). These businesses typically present low incomes and use cash payments, making it difficult for the tax authority to monitor them and ensure compliance (Thuronyi 2004).

Italy has a long tradition of taxing individual firms with preferential tax regimes. These regimes have different eligibility criteria, but share certain characteristics. Conditional on reporting revenue below a certain cutoff, these regimes offer a lower flat tax rate and an industry-specific presumptive tax base. Moreover, these regimes exempt firms from maintaining detailed accounting records, which *de facto* makes them unsuitable for tax audits by the Tax Agency. These regimes are extremely popular among taxpayers, with approximately 74 percent of total individual firms (i.e., around 1.9 million taxpayers) in Italy benefiting from a preferential tax scheme in 2019. During the period covered in the analysis, the Italian government implemented five different preferential tax regimes, which vary in the determination of the eligibility cutoff and the preferential tax rate.[9]

Eligibility criteria. To qualify for the preferential tax regime, firms must meet three main eligibility conditions. First, the firm must have a *legal form* of a sole proprietorship. Firms of any other legal form are not eligible. This exclusion aims to reduce tax optimization behaviors, such as artificially splitting or downsizing the activity of an incorporated business to meet the eligibility requirements.[10] The sec-

[8] In a sensitivity analysis, we verified the robustness of our results after perturbation of the boundaries of the market, i.e., by moving to a wider geographical unit of analysis (the local labor market: a cluster of contiguous municipalities identified through commuting patterns) and using a finer industry classification (NACE 3-digit level).

[9] These reforms can be considered a sudden and unforeseen change in Italian legislation. Despite being a recurring topic in election campaigns and broader political discourse, the critical eligibility criteria (such as the revenue cutoff, the sector-specific profitability coefficient, and the age threshold) are typically determined at the last minute, and the reforms are approved through emergency decrees. Appendix Table A1 provides an overview of the main features of the preferential tax regimes in force during the period covered in our analysis.

[10] To avoid the creation of fictitious individual firms (e.g., through within-firm transformations of employee work into self-employment), the government excludes eligibility to individuals who re-

ond condition is based on reporting revenue below an *eligibility cutoff*. This cutoff has significantly changed over time and, in some years, across industries (Figure 2, Panel A). Until 2008, the preferential tax regime exclusively targeted businesses reporting up to 30,000 euros of revenue (Law 388/2000). During the 2015-2018 period (Law 140/2014), the revenue cutoff was industry-specific, ranging from a minimum of 15,000 euros to a maximum of 40,000 euros.[11] In 2019, Law 145/2018 homogenized the eligibility cutoff across industries and raised it to 65,000 euros.[12] Third, in some years, the preferential tax regime is available only to firms below a certain *age limit*. As shown in panel B of Figure 2, the regime targeted exclusively firms in their first three years of operation until 2007. The regime was then extended to all firms (Law 244/2007) and later restricted to firms younger than five years (Law 98/2011). Finally, the introduction of the "forfettario regime" (Law 140/2014) extended again the preferential tax regimes to all firms.[13]

Tax rate. The preferential tax regime replaces the payment of income taxes (including regional and local taxes) with a unique, flat, and relatively lower tax rate. The preferential tax rate has varied over time and by the firm's age. Panel C in Figure 2 compares the preferential tax rate with the bottom marginal tax rate on the personal income tax (the tax rate that a firm reporting revenue just above the eligibility cutoff is likely to pay). For firms younger than three years, the tax rate was 10 percent until 2012, and 5 percent thereafter (including firms younger than five years since 2012). For firms older than three years (or five years since 2012), the preferential tax regime has applied since 2008 with a tax rate of 20 percent, which was reduced to 15 percent in 2015. Under a pure tax savings perspective, the generosity of the preferential tax regime thus depends on the firm's age.

Tax base. Under the preferential regime, the tax base is defined by the firm's revenue, scaled by an industry-specific profitability coefficient. In panel D of Figure 2, we report the profitability coefficient for each industry (following the classification of the Italian government). The profitability coefficient varies from a minimum of 40 percent for street vendors, the food and beverage industry, and the accommodation and catering industry, to a maximum of 86 percent for the construction and real estate industry. The tax base is thus based not only on the firm-specific output,

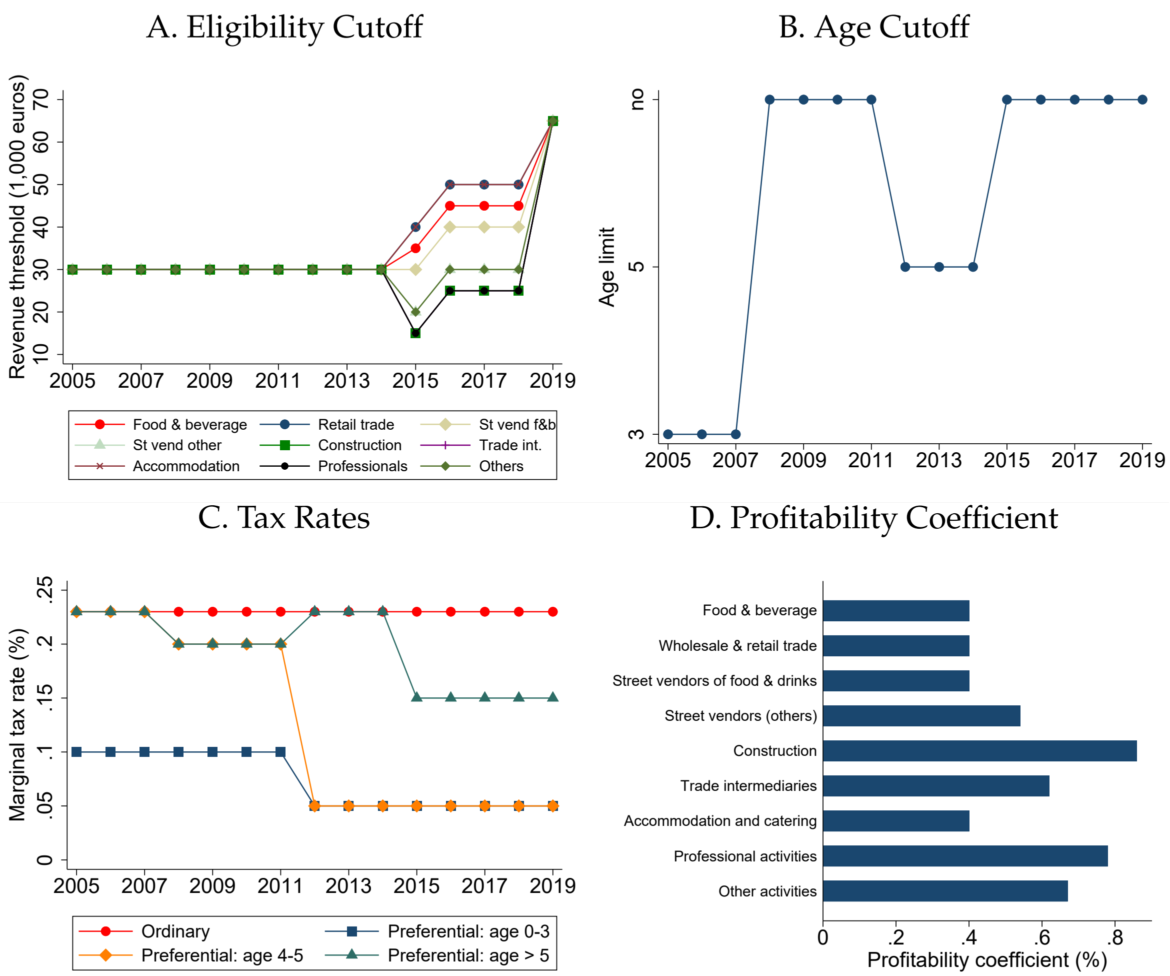
ceived wage income of at least 30,000 euros over the previous years.

[11]See Appendix Table A2 for details on the industry-specific revenue cutoff.

[12]Two additional criteria determine eligibility for the post-2015 period. First, firms must not report gross expenses for ancillary work, employee work, and compensation paid to collaborators above 5,000 euros. Second, the total cost of capital goods, gross of depreciation, does not exceed 20,000 euros. However, given the small size of these businesses, these conditions are hardly a constraint for individual firms in practice.

[13]Individual firms reporting revenue above the threshold are defaulted into the ordinary personal income tax regime, which was changed in 2007 (see Appendix Table A3 for details). The preferential regime ceases to be effective from the year an eligibility requirement is not met.

Figure 2: Main Features of the Preferential Tax Regimes for Individual Firms



Note: This figure depicts the main characteristics of the preferential tax regimes for individual firms. Panel A displays the revenue cutoff, determining eligibility for the preferential tax regimes each year and for each economic activity. In panel B, we show the age limit determining eligibility for the preferential tax regimes. Panel C presents trends in the marginal tax rate under the ordinary regime (where the marginal tax rate applied to the first tax bracket of the personal income tax is displayed) and the preferential tax rate for each firm age group. In panel D, we report the industry-specific profitability coefficient, which determines the share of revenue subject to the preferential tax rate. The industries displayed follow the classification made by the Italian government (see Appendix Table A2 for details of the preferential tax regimes by economic activity). Authors' elaboration based on the tax laws described in Appendix Table A1.

but also on the presumed profitability that the firm should obtain in its industry. Since taxation of turnover (rather than profit) is advantageous to taxpayers with high-profit margins (Best et al. 2015), the profitability coefficient aims at adjusting for cross-industry heterogeneity in average profitability. The only deductible source of expenses is social security contributions. In comparison, the tax base under the standard regime is defined by individuals' net business income, which is revenue minus costs. This means that the standard regime remains convenient for corporate businesses with large (deductible) costs, such as those with many employees, significant investments, and high operating expenses.

Exemption from value-added tax payments and book-keeping rules. Eligible firms are exempted from value-added tax (VAT) requirements, including VAT payment. This implies that firms do not have to remit the VAT, and they cannot deduct the VAT paid on their inputs. Moreover, firms are exempted from maintaining accounting books, such as annual accounts, bank statements, and cash books. However, they are required to record purchase invoices and to emit VAT invoices for supplies to other VAT-registered businesses. Compared to the standard regime, the preferential regime is thus easier to handle and reduces the amount of red tape imposed on taxpayers.

Ease of misreporting in the preferential regime. The exclusion of eligible firms from maintaining accounting books makes it challenging to perform tax audits. The preferential regime thus *de facto* exempts individual firms from monitoring by the Italian Revenue Agency. As a result, the cost of misreporting revenue under the preferential tax regimes is substantially lower than under the standard regime. This is key for the interpretation of our empirical results. The revenue-based eligibility threshold creates a tax-induced incentive to under-report revenue. This raises concerns about tax evasion responses, since monitoring from the tax administration is missing, and cash payments are frequent among individual firms. The Italian tax authority is aware of the risk of easing tax evasion responses. For instance, the annual government report on tax evasion (see Ministero dell'Economia e delle Finanze 2022) documented that the tax gap from self-employment income was nearly 30 million euros per year, corresponding to nearly 70 percent of the potential revenue from self-employment income.[14]

3 Empirical Strategy

This section describes our strategy to measure our proxy of market-level tax evasion, using bunching responses to preferential tax regimes (Section 3.1) and discusses our empirical approach to uncovering the market externalities of tax evasion (Section 3.2).

3.1 Using Bunching Responses to Identify Revenue Manipulation

As emphasized in OECD (2023), preferential tax regimes for hard-to-tax businesses might present several shortcomings. In our context, they may create a bunching ef-

[14]Tax authorities in other countries implementing comparable preferential tax schemes for self-employees have faced similar issues. For instance, the French tax authority carried out an audit program in 2011 on 1,162 randomly selected taxpayers who benefited from a generous preferential tax regime (Aghion et al. 2024). They found that 30 percent of taxpayers were under-reporting income and extrapolated that around 400 million euros could be recovered if all the self-employed had been audited.

fect: an incentive for individual firms to manipulate their reported revenue in order to meet the regime's eligibility threshold. This section describes our methodology to elicit such bunching responses.

Notches created by the preferential tax regimes. The cutoff determining eligibility for the preferential tax regimes can be considered as a *notch*: a discontinuity in the firms' average payoffs. As described in Section 2.2, when a firm crosses the eligibility cutoff, it experiences four main changes. First, the firm's average tax rate discontinuously changes at the cutoff. The extent of this change, which is the difference between the preferential and the basic tax rate, varies over time, by the firm's age, and across industries based on the location of the eligibility cutoff. Second, there is a discontinuous change in the firm's tax base at the eligibility cutoff. The magnitude of this change depends on the industry-specific profitability coefficient. Third, there is a discontinuous increase in the hassle costs of maintaining accounting books. Finally, the probability of getting caught while evading taxes discontinuously changes at the eligibility cutoff. To benefit from these incentives, we expect that individual firms will strategically report their revenue just below the eligibility cutoff. Our methodology is not concerned with the reasons behind this strategic response, but rather with the extent to which it occurs across firms within a given market over time. However, note that only the *tax rate* notch is time-varying, while the notch based on tax enforcement, the tax base, and tax simplicity are time-invariant.

Bunching. We use bunching methods to identify behavioral responses at the eligibility cutoff between the basic and the preferential tax regimes (Saez 2010; Chetty et al. 2011; Kleven and Waseem 2013).[15] Since the eligibility cutoff varies over time and, in some years, across industries, we first normalize each cutoff point. We then group firms into j bins of revenue and calculate the number of firms in each bin, n_j, centered at the eligibility cutoff. We define an excluded range around the notch $[m_L, m_U]$, such that $m_L < 0 < m_U$, and we then run regressions as follows:

$$n_j = \sum_{i=0}^{p} \beta_i \cdot (m_j)^i + \sum_{i=L}^{U} \gamma_i \cdot 1(m_j = i) + u_j, \tag{1}$$

where the first term on the right-hand side is a p-th degree polynomial that accounts for potential curvature in the counterfactual density; the second term is an indicator function for bins located in the excluded range. Following Chetty et al. (2011), our baseline approach uses a seventh-degree polynomial (p = 7). To determine the excluded range, we follow the procedure proposed by Kleven and Waseem (2013): the lower bound is determined by visual inspections, defined as the point where excess bunching starts to emerge; the upper bound is computed such that excess bunching below the notch equals the missing mass above the notch.

[15] Appendix B describes the theory behind bunching responses to tax notches.

We can then calculate counterfactual bin counts as the predicted values from equation (1), omitting the contribution of dummies in the excluded range:

$$\widehat{n_j} = \sum_{i=0}^{p} \beta_i \cdot (m_j)^i. \tag{2}$$

We estimate excess bunching by comparing the observed and counterfactual revenue distributions:

$$\widehat{B} = \sum_{j=L}^{0} (n_j - \widehat{n_j}). \tag{3}$$

The excess bunching estimate, $\widehat{B}$, computes the difference between the observed density of firms located in the excluded range and the counterfactual distribution. For instance, a $\widehat{B} = 1$ would suggest that the excess mass around the notch is 100 percent of the average height of the counterfactual distribution within the dominated area range. A larger $\widehat{B}$ estimate implies that a larger share of firms are manipulating their revenue to get eligibility for the preferential tax schemes.[16]

Bunching responses can be categorized into two main types of behavioral responses: labor supply reductions and tax evasion. In Section 4.3, we argue - and provide corroborating evidence - that bunching is likely to reflect firm non-compliance.

Market-level bunching rate. Several issues might arise when using the methodology described above to calculate the extent of market-level bunching responses. One of the problems is that some markets are small, which means that several revenue bins may not contain any firms. Moreover, since the number of markets is large, the procedure to determine the excluded range based on visual inspections would be cumbersome to implement for each market. Another concern is that the upper bound can vary significantly across markets.

To overcome these issues, we compute a "simplified" market-specific bunching measure B_m. This measure considers the share of individual firms located in an area just below the eligibility cutoff, compared to the number of firms operating in a given market. As a baseline, we apply the graphical inspection to a randomly selected sample of markets, and the results are then applied to all the other markets. Following this procedure, we define the "excess bunching" region – the area just below the (normalized) eligibility cutoff where bunchers are located – as the $[-5,000; 0]$ (normalized) revenue range. We consider the number of individual firms in the "excess bunching" region, compared to the universe of firms, as a market-level proxy of tax

[16] Following Chetty et al. (2011), we compute the standard error of $\widehat{B}$ by using a parametric bootstrap procedure in which a large amount of gross income distributions are generated by random resampling the error term u_j. This procedure generates a new set of counts that can be used to calculate new $\widehat{B}$ estimates. We can then define the standard error of $\widehat{B}$ as the standard deviation of the distribution of $\widehat{B}$ that we obtain through this iterative procedure.

evasion. In Appendix Figure C1, we show that the "classical" measure of bunching is strongly correlated with our "simplified" measure of bunching. This correlation holds very well across markets, municipalities, and industries.

On average, around 3.5 percent of firms in a market report revenue in the normalized revenue range, and approximately 14 percent of markets have no firms in the bunching area. There is significant variation in the distribution of the bunching rate across both municipalities and industries.[17]

3.2 Identification Strategy of Market Externalities of Tax Evasion

This section describes the identification strategy employed to measure the market externalities resulting from tax evasion. Our goal is to estimate how market-level tax evasion, approximated by the market share of individual firms that manipulate their revenue, impacts the outcomes of their competitors, which we identify as firms not eligible for preferential tax schemes that operate in the same market.[18]

Focusing on each competitor f, operating in market m at year t, our goal is to estimate β from equations of the following form:

$$y_{f,t} = \beta \cdot B_{m(f),t} + \theta_f + \gamma_t + \rho_{a(f),t} + u_{f,t}, \tag{4}$$

where $y_{f,t}$ is a firm-level outcome. The treatment variable of interest, $B_{m(f),t}$, is the bunching rate, our proxy for market-level tax non-compliance, observed in the market m where the firm f operates. As described above, this is computed as the market-level share of individual firms reporting revenue in the (normalized) revenue range [-5,000-0]. Firm fixed effects, θ_f, capture time-invariant determinants of firms' outcomes, while year fixed effects, γ_t, account for common policy changes and shocks.[19] Cohort-year fixed effects, $\rho_{a(f),t}$, account for age-specific patterns in firms' outcomes. For example, the growth rate (and its variance) varies significantly depending on the age of the firm, especially in the first years after its birth. Finally, $u_{f,t}$ are idiosyncratic firm-level shocks.

Our parameter of interest is β, which calculates the market externalities of tax evasion: how the extent of firms' tax non-compliance affects the outcomes of their competitors. A negative β estimate would suggest that competitors tend to perform relatively worse when a larger share of individual firms in the market manipulates their

[17]Appendix Figure C2 depicts the distribution of the bunching rate, while Appendix Figure C3, Figure C4, and Figure C5 show variability along the geographical and sectoral dimensions.

[18]Our focus on non-individual firms as competitors implies that we neglect another set of firms in the market, i.e., the compliant *individual* firms that are not in the bunching area. We exclude these firms because they are an endogenously selected sample of the eligible firms.

[19]Firm fixed effects implicitly account also for market fixed effects, thus capturing other non-tax evasion-related time-invariant factors that encourage firms to report revenue just below the eligibility cutoff, such as heterogeneity across markets in firm preferences or prices (Blomquist et al. 2021).

revenue. The key identifying assumption is that changes in revenue manipulation from individual firms reflect a quest to get eligibility for preferential tax schemes, and not responses related to other spurious time-varying market-specific factors. If there are shocks or other policies that affect the market, then our estimator would be biased. In our setting, a demand shock is an example, because it could jointly affect the revenue of individual firms and those of their competitors. Moreover, there might be a reverse causality issue if the nexus goes from competitors to individual firms. To address these concerns, we exploit the policy changes described in Section 2.2 to implement an instrumental variable strategy.

According to the seminal work by Allingham and Sandmo (1972) and Yitzhaki (1974), a firm conceals up to the point where the marginal cost of evasion equals the marginal return, where the latter depends on the tax rate and the profitability coefficient. Keeping the cost of evading fixed, the amount of tax saved by evading determines the firm's tax non-compliance. In our context, tax savings are determined by the *size of the tax notch*: the difference between the average tax rate in the ordinary and preferential regime, weighted by the profitability coefficient. Therefore, from a firm's perspective, tax evasion is likely to increase when the size of the tax notch increases.[20]

As described in Section 2.2, our setup allows us to exploit policy-induced changes in the size of the tax notch. There are three main sources of policy changes that create variation in the size of the tax notch. First, the preferential tax regimes offer a lower tax rate to firms younger than 3 years (period 2005-2011) or younger than 5 years (years 2012-2019). The extent of this preferential tax treatment for younger firms also varies over time. These policy variations in the firm's age-specific tax rate generate variations across markets depending on the age composition of firms. We thus expect bunching responses to be relatively larger in markets with a higher prevalence of younger firms when the preferential tax regimes are more generous for younger firms, compared to a market with a higher prevalence of older firms.

Second, a change in the location of the industry-specific cutoff creates variation in the tax rate differential across industries over time. These changes are generated by the 2014 and 2018 reforms, which first introduced and then repealed the industry-specific cutoffs.

Third, changes in the cutoff are likely to affect firms differently depending on the profitability coefficient. For instance, consider a (uniform) change in the location cutoff. Firms operating in an industry with a higher profitability coefficient (i.e., a broader tax base) will experience a relatively smaller change in the tax rate

[20]The classical Allingham-Sandmo model (Allingham and Sandmo 1972) also recognizes that other factors, such as the probability of being caught and the severity of the punishment for tax evasion, can play a role in determining the level of tax evasion. Moreover, as recognized by Aghion et al. (2024), individual firms might shift towards the preferential tax regimes questing for tax simplicity. These factors are substantially time-invariant and are controlled by our set of fixed effects.

differential, compared to those with a lower profitability coefficient. This source of cross-industry variation is created by the 2007, 2011, and 2018 reforms.[21]

We operationalize these policy-induced sources of variation in the construction of the instrument, $Z_{m,t}$, which then captures the policy-induced incentive for bunching:

$$Z_{m,t} = \sum_{a=1}^{3} \underbrace{\omega_{a(m)}}_{\text{market share}} \times \underbrace{\tau_{a(m),t} \cdot \mu_{s(m)}}_{\text{policy change}}, \tag{5}$$

where $\omega_{a(m)}$ is the share of individual firms in the age groups a = [0-3; 3-5; 5+] in market m. We select these three groups because the tax notch can vary within them. Following the existing literature's convention (see, e.g., Goldsmith-Pinkham et al. 2020), we fix age shares to the initial period, that is 2005 in our dataset. $\tau_{a(m),t}$ is the size of the tax notch (i.e., the average tax rate differential between the ordinary and preferential tax regime) for the age group a at period t. Finally, $\mu_{s(m)}$ is the profitability coefficient set for industry s.

Once we instrument market-level tax evasion with $Z_{m,t}$, the implied empirical strategy is an exposure research design, where the market age shares measure the differential exogenous exposure to the common shock (the policy change). This instrument is similar in spirit to a Bartik shift-share instrument.[22]

We implement a two-stage least-squares (2SLS) model to identify the market externalities of tax evasion. The 2SLS model compares the difference in competitors' outcomes across markets exposed to different amounts of firm tax non-compliance. Maintaining the same notation as above, we run systems of equations of the following form:

$$B_{m(f),t} = \pi \cdot Z_{m(f),t} + \zeta_f + \sigma_t + \lambda_{a(f),t} + v_{m(f),t}; \tag{6}$$

$$y_{f,t} = \beta \cdot B_{m(f),t} + \theta_f + \gamma_t + \rho_{a(f),t} + u_{f,t}, \tag{7}$$

We compute our coefficient of interest, β, by regressing competitors' firm-level outcomes on the instrumented market-level bunching rate. Because the effect of tax non-compliance is likely to be correlated within a market over time, we account for any dependence between observations within a market by clustering all regression results at the market level.

[21] These policy-induced changes in the size of the tax notch are represented in Figure C6, which presents significant variation in the size of the tax notch depending on the age of a firm, the industry in which it operates, and over time. To see these sources of variation, consider a firm created by less than 3 years. By bunching at the revenue eligibility cutoff, this firm can reduce its average tax rate by 12.5 percent in 2005, by 17.5 percentage points in 2012, and between 17.5 and 25 percentage points in 2019, depending on the industry in which such a firm operates. Age-based eligibility for preferential regimes also implies that we do not observe any tax notch in some years (e.g., 2005 for firms age 4+, 2012 for firms age 5+).

[22] See Adão et al. (2019), Goldsmith-Pinkham et al. (2020), and Borusyak et al. (2022) for recent critical discussions on this empirical approach.

In the empirical analysis (Section 3), we also add a rich set of fixed effects, at the municipality- and industry-level and also for market characteristics. This allows to control for potential violation of the exclusion restriction and to exploit variability only due to changes in the tax notch around the eligibility thresholds. We also discuss the exogeneity of the instrumental variable. Finally, we check the robustness of our results to perturbation in the definition of our key variables.

4 Bunching Responses to Preferential Tax Regimes

This section provides evidence of bunching responses from individual firms at the eligibility cutoff for preferential tax regimes (Section 4.1). We then offer graphical evidence that bunching responses are related to policy variation in the incentive to bunch (Section 4.2). Finally, we provide suggestive evidence that bunching responses are consistent with evasion responses (Section 4.3).

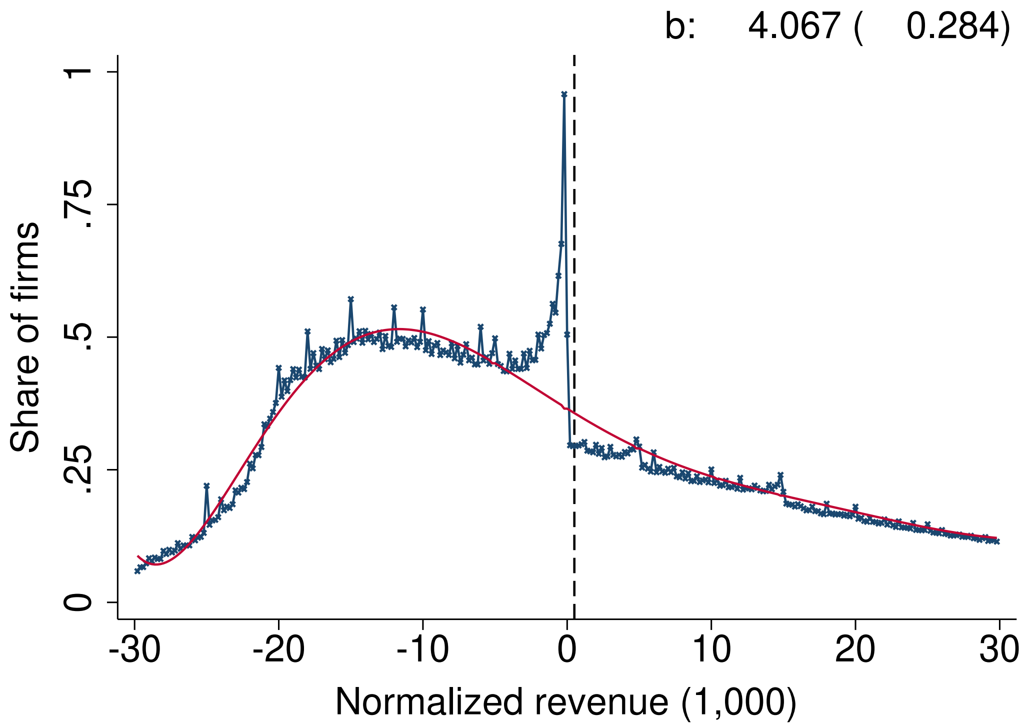
4.1 Overall Responses

Figure 3 presents bunching responses of individual firms to preferential tax regimes. To construct this figure, we first pool individual firms across all industries and years over the 2005-2019 period. We group firms in 200 euro bins of (normalized) revenue, and we calculate the fraction of firms in each bin around the cutoff determining eligibility for preferential tax regimes (demarcated by the black dashed vertical line). We then compare the observed distributions (blue dots) with the counterfactual distribution (red solid line). The figure also reports excess bunching estimates, obtained from equation (3), and bootstrapped standard errors.

The figure provides clear evidence of bunching responses. Relative to the counterfactual distribution, there is a clear excess mass of individual firms reporting revenue just below the cutoff. We estimate excess bunching of 4.067 times the height of the counterfactual revenue distribution. The standard error associated with our excess bunching estimate is 0.284. The bunching estimate suggests that the density of individual firms located in a revenue range strictly below the preferential tax regimes' eligibility cutoff is about 4 times larger than the density that we would have observed in the absence of the policy.

Note that this bunching response captures the firm response to notches created by the preferential tax regimes in the tax rate, tax enforcement, tax base, and hassle costs. It is, therefore, inconclusive whether the bunching response reflects variation over time in the size of the *tax rate* notch. By relating changes over time in the bunching response with variations in the size of the tax notch, we can explicitly study the role of tax motives in determining bunching, controlling for the other reasons that are, instead, time-invariant.

Figure 3: Bunching Response to Preferential Tax Schemes



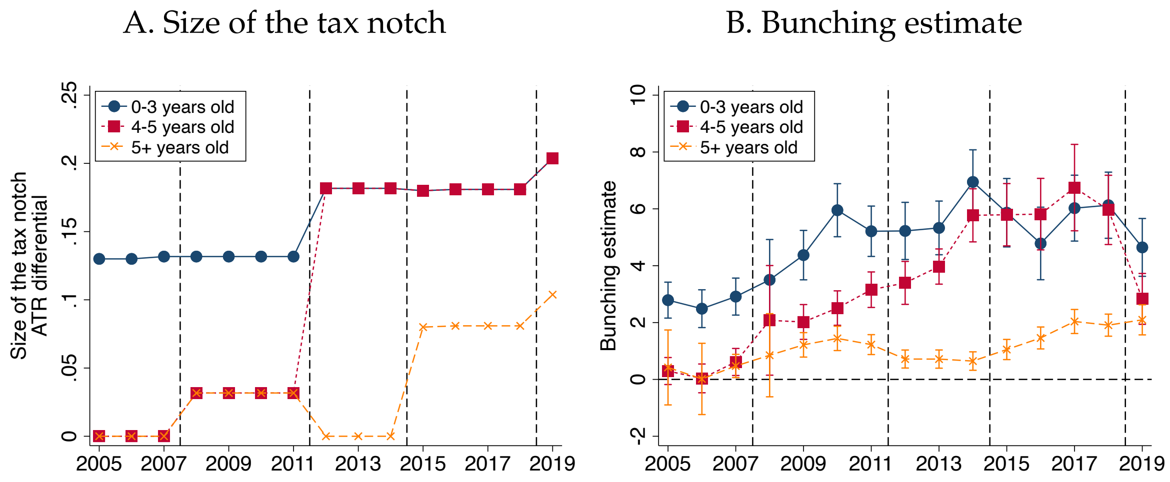
Notes: This figure shows the reported distribution of revenue (blue dots) and the estimated counterfactual (red curve), using pooled data for the period 2005–2019. The horizontal axis reports normalized revenue: the distance from the revenue cutoff determining eligibility for preferential tax schemes. The black dashed vertical line indicates the normalized threshold. The bins are €200 wide. The figure also reports the bunching estimate and the bootstrapped standard error, calculated as described in Section 3.1.

4.2 Bunching Responses to Variation in the Size of the Tax Notch

In this section, we compare bunching responses with policy-induced changes in the size of the tax notch. These comparisons aim to test the relevance of our instrument. We first compare bunching responses with changes in the size of the tax notch within each firm's age group. Figure 4 compares the size of the tax notch (left graph) with the corresponding bunching estimates and 95 percent confidence intervals (right graph). The black vertical lines indicate reforms in the preferential regime, which created variation in the size of the tax notch.

Two main remarks emerge from this figure. First, the size of the tax notch is strongly related to the magnitude of the bunching response within a given preferential tax regime. Firms that face a more generous tax regime tend to respond more strongly. For instance, during the 2007-2011 period, when the tax rate differential was 10 percentage points larger for firms created from less than 3 years, the size of the bunching response was around three times larger for firms facing the more generous tax regime.

Figure 4: Bunching Responses and Policy Variations in the Incentive to Bunch



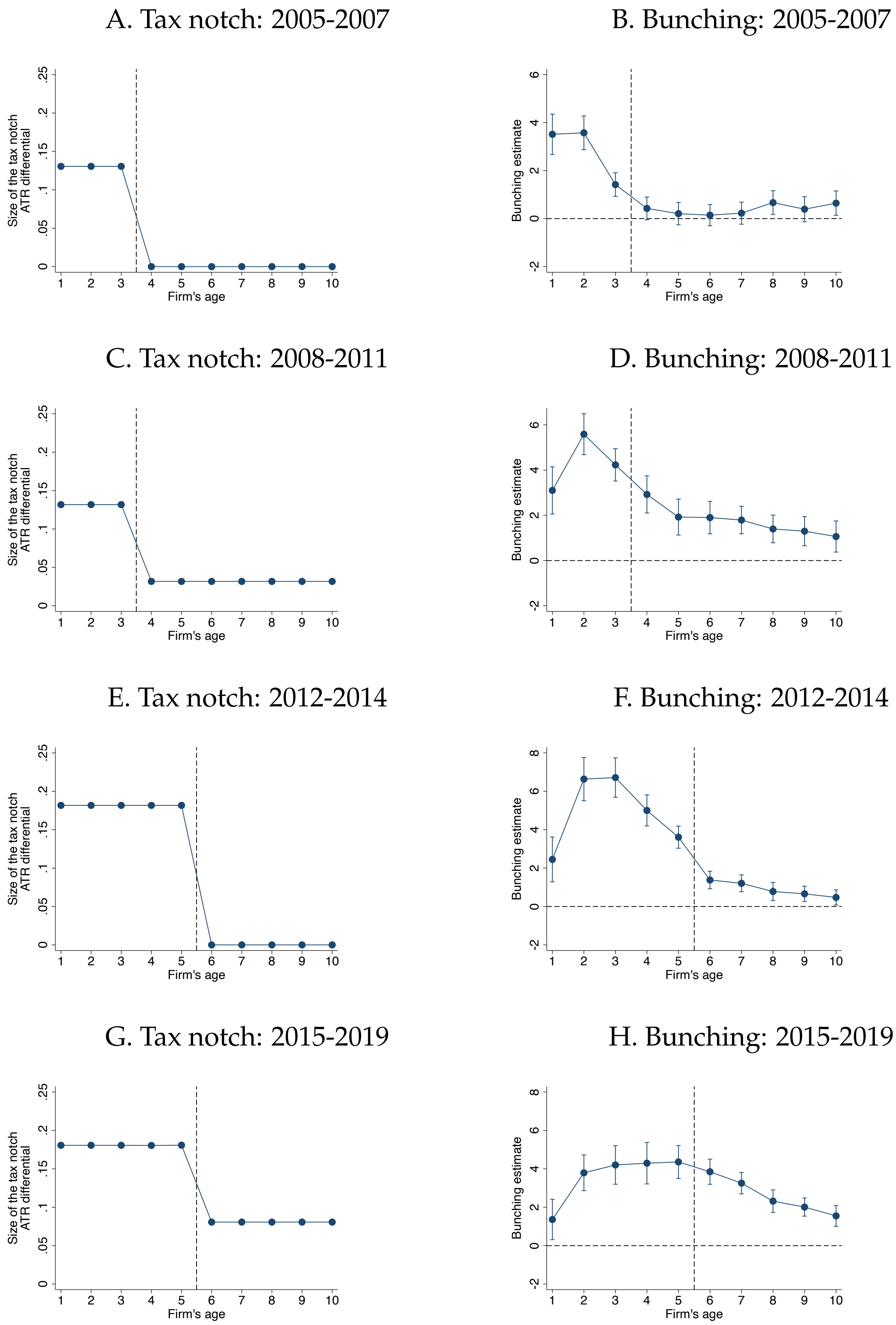
Note: This figure compares bunching responses with changes in the size of the tax notch over time within each firm's age group. The left graph shows trends in the size of the tax notch, that is the tax rate differential between the preferential and ordinary regime at the eligibility cutoff. The right graph depicts bunching estimates and 95 percent confidence intervals, calculated as described in Section 3.1. We present time trends in these two variables over the 2005-2019 period for the three groups of firms that might face a different tax rate under the preferential tax regimes: firms created from less than 3 years; between 3 and 5 years; and from more than 5 years. The black vertical lines denote the preferential regime's change, which creates variation over time and across firms in the size of the tax notch.

Second, time variation in the size of the notch is associated with the extent of the bunching response for each group of firms. Consider, for example, the trend followed by firms created from more than 5 years. Until 2007, the total tax burden was similar under the ordinary regime and the preferential regime. Accordingly, we find no evidence of bunching responses during that period. Bunching responses started to emerge in 2008, when the preferential tax regime became convenient for firms created from more than 5 years. The larger bunching response observed after 2015 also reflects a higher policy incentive to bunch.

We now zoom in on the discontinuity in the policy incentive based on a firm's age. In Figure 5, we examine whether the response to the incentives shows any discontinuity based on the age of the firms. The left graphs display the size of the tax notch (vertical axes) by years since business creation (horizontal axes). Each graph corresponds to a specific preferential tax regime, which provides variation both in the location of the tax notch (at year 3 over the 2005-2007 and 2008-2011 period; at year 5 over the 2012-2014 period and 2015-2019 period) and in the size of the tax notch. The right graphs present the associated bunching response.

The figure provides graphical evidence that bunching responses are associated with the size of the tax notch. The discontinuous change in the size of the tax notch during the periods 2005-2007 and 2012-2014 gives rise to a clear difference in the

Figure 5: Bunching Responses and Policy Discontinuities in the Incentive to Bunch



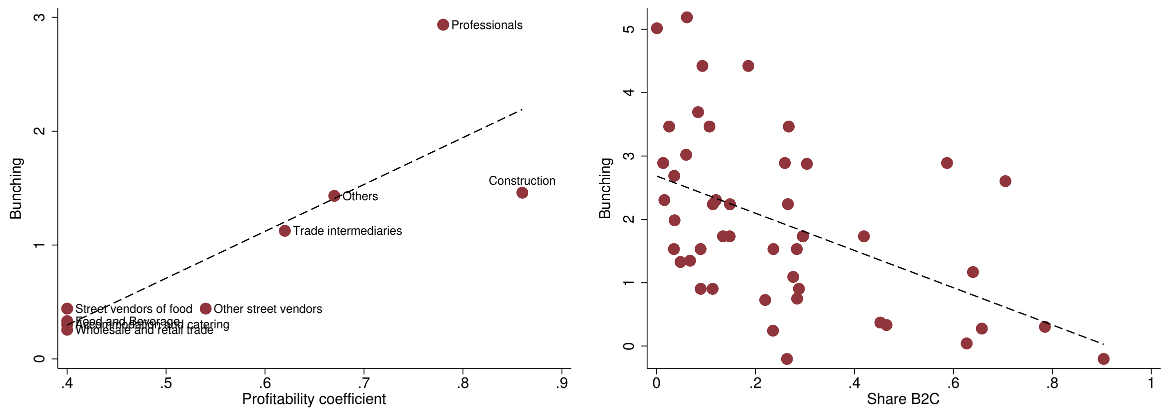
Note: This figure tests whether bunching responses follow discontinuities in the policy incentive by firms' age. For each regime, we report the size of the tax notch by years since business creation (on the left) and the associated bunching response and 95 percent confidence intervals (on the right).

magnitude of the bunching response. For example, during the period of 2005-2007, when the tax notch was around 20 percentage points for firms younger than 3 years, there was a large and statistically significant bunching estimate for firms created between 1 and 2 years (panels A and B). However, there was no statistically significant bunching response for firms created from more than 3 years. By contrast, the bunching response over the firm's age distribution is smoother when the discontinuous change in the size of the tax notch was relatively smaller (i.e., 2008-2011 and 2015-2019 periods). Although of a lower magnitude, we observe significant bunching responses above age 3 (2008-2011) and age 5 (2015-2019).

Figure 6: Bunching Responses and Sector Characteristics

A. Profitability Coefficients

B. Share of Final Consumer Sales



Note: The figure shows the correlation between the bunching estimates at the industry level, the corresponding profitability coefficients (Panel A), and the share of final consumer sales (Panel B).

Finally, we explore bunching responses across sectors. First, we examine the correlation between the bunching estimates across sectors characterized by, *ceteris paribus*, different tax bases. We expect that a higher tax base, due to increased profitability coefficients, raises the likelihood of individual firms misreporting revenue. Indeed, the bunching response is positively correlated with the profitability coefficients (Figure 6, panel A).

Second, our findings are in line with Almunia and Lopez-Rodriguez (2018). They show that the bunching response is stronger in upstream sectors, where transactions leave more paper trail, compared to downstream sectors, which sell mostly to final consumers. We also find a negative correlation between the average bunching estimate at the industry level and the share of final consumer sales (Figure 6, panel B). These results suggest that the incentive to manipulate revenue to get eligibility for preferential tax regimes is higher for firms whose misreported transactions are easier to detect.

4.3 Bunching as a Proxy for Tax Evasion

The prevailing view in public finance is that responses to tax notches and kinks mostly capture evasion responses. For instance, a recent study (Aghion et al. 2024) shows that bunching responses to the introduction of preferential tax regimes for the self-employed in France reflect evasion responses. Combining bunching responses with a structural model, their estimates imply a sizable evasion elasticity and a negligible real income elasticity. Similar findings have also been documented from firm-level bunching responses to tax notches in Costa Rica (Bachas and Soto 2021), Honduras (Lobel et al. 2024), and Pakistan (Best et al. 2015).

We argue that these previous findings can also be extrapolated to our contexts. A key mechanism facilitating revenue under-reporting is the exclusion of eligible firms from maintaining accounting books, which makes it challenging to perform tax audits. The preferential regime thus *de facto* exempts individual firms from monitoring by the Italian Revenue Agency. Weaker tax enforcement implies that noncompliance costs are substantially lower among firms eligible for preferential tax regimes.[23] Several studies have provided clear evidence of how tax enforcement influences tax evasion. Using a tax enforcement field experiment in Denmark, Kleven et al. (2011) show that external tax auditing reduces the scope for tax evasion. Almunia and Lopez-Rodriguez (2018) exploits firm size-dependent tax enforcement to provide evidence that stricter tax enforcement reduces noncompliance. Lobel et al. (2024) show that taxpayers are more likely to locate immediately below a tax exemption threshold when the tax authority has limited ability to independently assess declared revenue. Harju et al. (2019) emphasize that compliance costs affect behavioral responses to size-dependent discontinuities among small firms in Finland.[24]

To corroborate our hypothesis that bunching mostly reflects tax evasion responses, we offer three additional pieces of suggestive evidence in Appendix D. First, using exogenous variation over time in the eligibility cutoff, we show that annual firm-level growth in revenue significantly increases (decreases) when the cutoff is raised (reduced). However, the firm-level change in input costs does not change accordingly, indicating that the response to the threshold is likely to be a revenue manipulation response rather than a real response. Second, in line with Aghion et al. (2024), we find that individual firms disproportionately report 0 as the last digit in the bunching region, suggesting strategic reporting and data manipulation. Finally,

[23]Under weak tax enforcement, firms eligible for preferential tax schemes still report some of their revenue for two main reasons. First, tax evasion comes with real resource costs (Chetty 2009), such as the need to keep separate accounting books to track "black" payments made in cash. Firms that evade taxes may also miss out on business opportunities by refusing credit card or bank payments, as cash transactions are easier to conceal. Second, because some firms use intermediate inputs in production and sell their outputs to other firms, their transactions leave paper trails that cannot be hidden from the authority (Pomeranz 2015; Liu et al. 2021).

[24]Naritomi (2019), Brockmeyer et al. (2019), and Boning et al. (2020) also emphasize the role of tax enforcement in determining tax evasion responses.

we provide evidence that bunching responses at the municipality level strongly correlate with existing tax evasion indicators, such as the share of unregistered (taxable) buildings and the national TV fee non-compliance rate.

Note, however, that if the bunching response that we attribute to tax evasion is partly due to labor supply responses, our estimates would be conservative, since competitor firms would take advantage of the reduced labor supply of their (competitor) individual firms.

5 Market Externalities of Tax Evasion

In this section, we present the impacts of individual firms' tax evasion, using bunching as a proxy, on the outcomes of their competitors. We start by providing graphical evidence of the "first-stage" and "reduced form" relationship in Section 5.1. We then present our 2SLS estimates in Section 5.2. In Section 5.3, we discuss the robustness of our results, while Section 5.4 and Section 5.5 explore, respectively, heterogeneous effects – to get some insights on the mechanisms at work – and aggregate effects.

5.1 Graphical Evidence

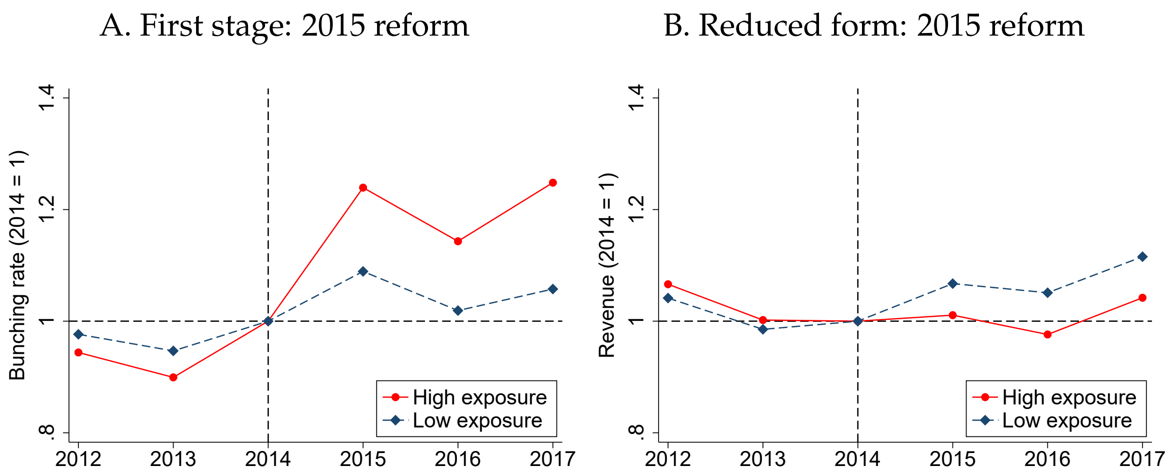
We start by showing simple graphical evidence of the effects of the first stage and the reduced form. As discussed previously, there are many policy changes that generate variation in the size of the tax notch depending on a firm's age and industry and across years. We focus on the 2015 reform, which provides a compelling case for identifying policy effects for one main reason. It created a tax notch for firms older than 5 years, but kept the notch for other firms unaffected (see panel C of Figure 2). Therefore, it creates a differential exposure across markets depending on the fraction of individual firms older than 5 years. We thus look at two groups of firms: i. *high exposure*: competitor firms operating in markets where the share of individual firms older than 5 years is in the top quartile of the distribution; ii. *low exposure*: competitor firms operating in markets where the share of individual firms older than 5 years is in the bottom quartile of the distribution.[25] The differential exposure to the policy change is sizable between the two groups: the average share of individual firms older than 5 years in the bottom quartile is just about 5 percent, while it is over 60 percent in the top quartile.

Figure 7 displays the changes in the bunching rate (Panel A) and the revenue of the competitors (Panel B), before and after the 2015 reform, for high-exposed and low-exposed markets. The outcome variables are normalized to the pre-reform year. Two key findings can be drawn from this figure. First, after the reform, we observe

[25] For simplicity, this exercise neglects any potential cross-industry differences in exposure to the 2015 policy change due to differences in profitability coefficient and revenue threshold determining eligibility. The results remain consistent if we include industry fixed effects.

an immediate increase in the bunching rate of high-exposed markets, compared to low-exposed markets. Second, following the higher bunching rate among individual firms, we consistently observe an immediate and persistent (relative) drop in the revenue of their competitors. This result offers a *prima facie* evidence of market externalities of tax evasion: tax non-compliance from individual firms depresses the revenue of their competitors.

Figure 7: Graphical Evidence



Note: The figure shows the effect of the 2015 reform on the market-level bunching rate (panel A) and the revenue of competitors (panel B). The outcome variables are normalized to the pre-reform year. The 2015 reform created a tax notch for firms older than 5 years, but kept the notch for other firms unaffected. Therefore, it creates a differential exposure across markets depending on the fraction of individual firms older than 5 years. We focus on two groups of firms: i. *high exposure*: competitors operating in markets where the share of individual firms older than 5 years is in the top quartile of the distribution; ii. *low exposure*: competitors operating in markets where the share of individual firms older than 5 years is in the bottom quartile of the distribution.

5.2 2SLS Results

Table 2 presents our results on the impact of individual firms' non-compliance on their competitors' revenue. The table reports the β parameter estimates from the 2SLS model presented in equations (6) and (7). We report standard errors clustered at the market level, which are uniformly very small, reflecting the size of our micro-data.

There are four columns characterized by a different set of fixed effects. The first column includes firm- and cohort-year fixed effects. In columns 2 to 4, we progressively include municipality-year fixed effects – to account for local shocks that are common to the firms located in the same municipality –, industry-year fixed effects – to account for shocks that are common to the firms belonging to the same industry – and fixed effects that account for the different demographic composition of *individual* firms in the market.

We find significant effects of individual firms' non-compliance on the revenue of their competitors (panel A). According to our preferred specification, as the fraction of individual firms engaging in tax evasion in a market increases by 1 percentage point, the revenue earned by each of their competitors decreases by about 1.9 percent, on average.[26]

The results for the value added (Panel B) and productivity (Panel C), measured by the log of the value added per worker, are qualitatively similar. Notably, according to our preferred specification, a percentage point increase in the fraction of individual firms manipulating their revenue decreases the productivity of their competitors by 2.5 percent, on average.

Reduced sales and poor business performance lead competitors to pass some of this burden to their workers. Table 3 shows that an increase in the fraction of non-compliant firms decreases the wage bill of their competitors. The cut in labor costs reflects both extensive and intensive margin responses. As the market share of non-compliant firms increases, we find a significant reduction in both the number of workers and the wage per worker of their competitors. Moreover, there is a shift in the workforce composition, as the number of employees decreases sharply compared to that of the self-employed.

5.3 Robustness

In this section, we discuss the robustness of our results. In a nutshell, (*i*) we discuss how we dealt with the potential violation of the exclusion restriction, and (*ii*) we examine the robustness of the results against different definitions of the variables of interest.

Concerning the violation of the exclusion restriction, the policy changes that we exploit would threaten our identification assumption in three main cases.

First, policy changes might also influence compliance firms' outcomes through other margins that are not related to the share of non-compliant firms in a market. For instance, changes in the generosity of the preferential tax schemes might stimulate business creation.[27] If this is the case, then competitor firms' outcomes would be

[26] In the Appendix Table E1, we report the OLS estimates, whose point estimate is essentially equal to zero and not different from zero also from a statistical point of view. OLS estimates are biased toward zero for several reasons. First, there might be a measurement error of the market-level bunching response that leads to an attenuation bias. Second, there are several sources of correlation between the bunching rate and the error term in the OLS equation (4) that can push the estimated coefficient towards positive values. For instance, a negative demand shock at the market level can jointly draw more firms out from the bunching region and reduce the revenue of their competitors. Moreover, there might be a reverse causality issue, if an increase in the revenue of the competitors is associated with a decrease in that of individual firms, pushing a larger fraction of them into the bunching region.

[27] This also includes the possibility that compliant firms changed their legal form (Smith and Miller 2021) or the incentives for a large firm to "masquerade" as many small firms by separately incorporating business segments (Onji 2009). Note that if firms' creation reflects *fake* business creation

Table 2: The Impact of Market-Level Tax Evasion on Competitor Firms' Outcomes

	(1)	(2)	(3)	(4)
	A. *Outcome:* Revenue			
Market-level bunching rate	-0.017***	-0.014***	-0.012**	-0.019***
	(0.006)	(0.005)	(0.005)	(0.006)
	B. *Outcome:* Value added			
Market-level bunching rate	-0.040***	-0.036***	-0.047***	-0.054***
	(0.006)	(0.006)	(0.007)	(0.008)
	C. *Outcome:* Productivity			
Market-level bunching rate	-0.027***	-0.024***	-0.023***	-0.025***
	(0.004)	(0.004)	(0.004)	(0.005)
Observations	23,314,059			
Firm FE	Yes	Yes	Yes	Yes
Year-cohort FE	Yes	Yes	Yes	Yes
Municipality-year FE	No	Yes	Yes	Yes
Industry-year FE	No	No	Yes	Yes
Age share-year FE	No	No	No	Yes

Note: This table presents the 2SLS estimates of the effect of (instrumented) market-level bunching rate on firm-level outcomes. All outcomes are in logs. It shows the β coefficient estimated from equation (7). Column 1 reports the estimate from a model with firm and year-cohort fixed effects. In column 2, we enrich the model with industry-year and municipality-year fixed effects. The sample is composed of "competitor" firms, which are all firms that are not individual firms. The market-level bunching rate is calculated as the fraction of individual firms that report revenue just below the cutoff determining eligibility for preferential tax schemes. The instrument, described in equation (5), is based on policy changes and a market's (fixed) demographic composition. Each market is defined at the municipality-industry-year level. Standard errors clustered at the market level are reported in parentheses.

influenced by tougher (fair) competition, rather than through (unfair) competition driven by tax evasion. In fact, there is variation (a tax cut of 5 percentage points) in the preferential tax rate for newly created firms following the 2012 reform. However, as shown in Panel A of Figure 1, we do not observe an increase in the number of individual firms after the reform. Moreover, we find reassuring evidence that our coefficient estimates remain remarkably stable when controlling for changes in the

(e.g., within-firm transformations of employee work into self-employment), our bunching estimate captures these responses as long as the new business reports revenue in the excess bunching region. In that case, the bunching estimate is a combination of "intensive" margin responses (i.e., existing firms adjusting their reported revenue to locate below the eligibility cutoff) and "extensive" margin responses.

Table 3: The Impact of Tax Evasion on Competitor Firm Labor Outcomes

	(1)	(2)	(3)	(4)	(5)
			Outcome: log of		
	labor costs	N of workers	N of employees	N of self-employed	average salary
Market-level bunching rate	-0.074***	-0.025***	-0.076***	-0.021***	-0.031***
	(0.010)	(0.004)	(0.010)	(0.002)	(0.004)
Observations			23,314,059		
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-cohort FE	Yes	Yes	Yes	Yes	Yes
Municipality-year FE	Yes	Yes	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes	Yes	Yes
Age share-year FE	Yes	Yes	Yes	Yes	Yes

Note: This table presents the 2SLS estimates of the effect of (instrumented) market-level bunching rate on firm-level outcomes. All outcomes are in logs. It shows the β coefficient estimated from equation (7). We report estimates from a model with firm, year-cohort, industry-year, and municipality-year fixed effects. The sample is composed of "competitor" firms, which are all firms that are not individual firms. The market-level bunching rate is calculated as the fraction of individual firms that report revenue just below the cutoff determining eligibility for preferential tax schemes. The instrument, described in equation (5), is based on policy changes and a market's (fixed) demographic composition. Each market is defined at the municipality-industry-year level. Standard errors clustered at the market level are reported in parentheses.

number of firms operating in a market (see Section E.2 in the Appendix).

Second, even absent revenue manipulation, preferential tax rates for individual firms can systematically affect market competition by introducing a wedge in marginal costs across eligible and non-eligible firms. Our empirical strategy accounts for this by controlling for a wide set of fixed effects. For example, industry-year fixed effects account for any shock at the industry level, including tax changes that are *common across industries*. Moreover, the age share-year fixed effects account for any shock at the market level related to a different demographic composition of individual firms. Stated differently, a variation of the tax rate that is *common across firms within the same age bracket* considered by the tax regime (0-3, 4-5, and 5+) is controlled by these fixed effects.[28]

Third, our instrument rests on the assumption that initial market age composition does not predict *changes* (rather than levels) of the outcomes. Following Goldsmith-Pinkham et al. (2020)'s recommendations, we show that market age shares are not

[28]To see this, consider Figure C6, which depicts the average tax rate by normalized revenue bins. The figure shows that the size of the tax notch (i.e., the jump in the average tax rate when moving from the preferential to the ordinary tax regime) varies over time, by firm's age, and by industries. However, there is no variation in the tax rate across firms that are in the preferential (or ordinary) tax regime within a given firm's age group, industry, and year. Therefore, our set of fixed effects cancel out any tax rate changes *within* eligible (or non-eligible) firms, but still allow for variation in the size of the tax notch *across* markets.

correlated with changes in our outcome variables (see Section E.3 in the Appendix).

Our empirical strategy also rests on the definitions of the variables of interest. First, we replicate the main analysis using different definitions of markets. We both employ a different geographical unit of analysis (i.e., moving from municipalities to a cluster of contiguous municipalities) and a different definition of industry (moving from NACE at the 2 digits to NACE at the 3 digits). The results are remarkably stable (see Section E.4 in the Appendix). Second, we validate our main results when using alternative measures of the bunching rate (see Section E.5 in the Appendix).

5.4 Mechanisms

This section discusses several potential mechanisms that could explain our findings. The competitive pressure exerted by non-compliant firms can affect their competitors through several channels. First, note that to try to maintain their competitiveness, competitor firms could either reduce prices or reduce the level of activity, as their market share is partly absorbed by non-compliant firms. However, we do not observe prices at the firm level, and therefore, we are not able to distinguish whether the reduction in competitors' revenues is due to prices or quantities.[29]

Second, we study whether competitors could also subsequently become non- compliant themselves, following the reciprocity principle of "an eye for an eye, a tooth for a tooth" (Fehr et al. 1997). To shed light on whether the revenue loss is partly due to tax evasion responses, we examine whether it is systematically larger in places with weaker tax compliance attitudes, proxied by the municipality share of unregistered (taxable) buildings. If tax evasion is part of the response, we expect the combination of "real" and tax evasion responses would lead to larger marginal effects on revenue losses for firms located in places with weaker tax compliance attitudes. Column 1 of Table 4 shows that an increase in the bunching response of individual firms is associated with a decrease in revenue, while we do not find statistical differences across municipalities characterized by weaker tax compliance. These results suggest that the effects on competitors come from a real effect. It is also worth noting that competitors face a higher risk of getting caught, compared to individual firms, due to stricter monitoring by the Tax Authority. This implies a larger marginal cost of evasion for these firms, making revenue under-reporting more difficult. Moreover, the observed reduction in labor costs would be difficult to reconcile with a pure under-reporting response.

Next, we study the role of market power. There are several sources of market power, including high (natural or regulatory) barriers to entry, increasing returns to scale, brand loyalty, and the degree of substitutability of the different products offered by firms (De Loecker et al. 2020). The existence of (these sources of) market

[29]This distinction, although interesting, is not relevant under a pure tax revenue perspective: both a price or a quantity reduction would decrease firms' revenue and, therefore, tax revenue.

power can confer a competitive advantage, making firms more resilient to the competitive pressure exerted by tax non-compliant firms. In columns 2 and 3 of Table 4, we explore whether the market externalities of tax evasion are heterogeneous across markets characterized by a different extent of market power. We employ two typical definitions of market power: the Lerner index – the ratio between the gross operating margin and revenue – and the Herfindahl index – a measure of the size of firms in relation to the industry they are. In both cases, we find evidence that the impact of individual firms' non-compliance on their competitors' revenue is attenuated in markets where competitor firms likely have greater market power.

Table 4: The Heterogeneous Impact of Tax Evasion by Market Features

	(1)	(2)	(3)
	Tax compliance attitudes	Lerner index	HHI
Market-level bunching rate	-0.018***	-0.045***	-0.020***
	(0.006)	(0.014)	(0.006)
x 1(Above median)	-0.002	0.023***	0.008***
	(0.007)	(0.008)	(0.002)
Observations	23,314,059		
Firm FE	Yes	Yes	Yes
Year-cohort FE	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes
Municipality-year FE	Yes	Yes	Yes
Age share-year FE	Yes	Yes	Yes

Note: This table presents heterogeneous 2SLS estimates of the effect of (instrumented) market-level bunching rate on firm-level log revenue across industries based on tax compliance attitudes (column 1) and market power indicators (columns 2 and 3). We augment the 2SLS model presented in equations (6) and (7) with an (instrumented) interaction for a dummy variable equal to 1 for observations with an above-median value. Each specification includes firm, year-cohort, industry-year, municipality-year, and age share-year fixed effects. The sample is composed of "competitor" firms, which are all firms that are not individual firms. The market-level bunching rate is calculated as the fraction of individual firms that report revenue just below the cutoff determining eligibility for preferential tax schemes. The instrument is based on policy changes and a market's (fixed) demographic composition. Each market is defined at the municipality-industry-year level. Standard errors clustered at the market level are reported in parentheses.

In Table 5, we explore heterogeneous effects by firm size. Our prior is that the effect is stronger for smaller competitors for two main reasons. First, it is likely that, within the same market, firms of different sizes sell their products to different customers. Namely, larger firms are more likely to sell their products to customers who are more geographically distant. Thus, the competition of non-compliant individual firms should more severely affect smaller competitors. Second, larger firms have likely greater market power and, in light of the results discussed above, are more resilient in the face of competition from non-compliant individual firms.

We distinguish competitors in different groups, those with less than 5 workers (column 1), between 5 and 9 workers (column 2), between 10 and 19 workers (column 3), and between 20 and 49 workers (column 4).[30] As expected, for each variable analyzed (revenue, value-added, and productivity), the effect decreases as the size class of the competitors increases. For example, as the fraction of individual firms engaging in tax evasion in a market increases by 1 percentage point, the revenue earned by their competitors with less than 5 workers decreases by 3.8 percent. By contrast, the estimated effect for larger firms is zero, both from an economic and statistical point of view.

Table 5: The Heterogeneous Impact of Tax Evasion by Competitor Size

	Firm size:			
	0-4	5-9	10-19	20-49
	A. Revenue			
Market-level bunching rate	-0.038***	-0.031***	-0.021*	-0.001
	(0.005)	(0.007)	(0.011)	(0.022)
	B. Value added			
Market-level bunching rate	-0.076***	-0.034***	-0.022**	-0.001
	(0.008)	(0.007)	(0.010)	(0.015)
	C. Productivity			
Market-level bunching rate	-0.033***	-0.019***	-0.016*	-0.005
	(0.006)	(0.006)	(0.009)	(0.013)
Observations	17,103,787	3,459,847	1,674,176	719,028
Firm FE	Yes	Yes	Yes	Yes
Year-cohort FE	Yes	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes	Yes
Municipality-year FE	Yes	Yes	Yes	Yes
Age share-year FE	Yes	Yes	Yes	Yes

Note: This table presents heterogeneous 2SLS estimates of the effect of (instrumented) market-level bunching rate on firm-level (log) outcomes across competitors with different sizes. We replicate the 2SLS model presented in equations (6) and (7) for different samples of competitors. Each specification includes firm fixed effects, year-cohort fixed effects, industry-year fixed effects, municipality-year fixed effects, and age share-year fixed effects. The sample is composed of "competitor" firms, which are all firms that are not individual firms. The market-level bunching rate is calculated as the fraction of individual firms that report revenue just below the cutoff determining eligibility for preferential tax schemes. The instrument is based on policy changes and a market's (fixed) demographic composition. Each market is defined at the municipality-industry-year level. Standard errors clustered at the market level are reported in parentheses.

[30] We do not consider firms with 50 workers or more because association to a specific market is less reliable. Indeed, while it is plausible to assume that the market of a small firm has a narrow geographic scale, larger firms might sell their products to wider markets, even internationally. Firms with at least 50 workers represent around one percent of the universe of firms.

5.5 Aggregate Effects and Allocative Efficiency

In this section, we provide some evidence on the impact of tax evasion on aggregate productivity. We start with some back-of-the-envelope calculations and then move to estimate at the aggregate level to distinguish between different components of aggregate productivity variation employing the approach by Melitz and Polanec (2015).

To have a population average effect, we exploit the results shown in Table 5 and use simple algebra. We start recognizing that the average productivity at the aggregate level is the weighted average of productivity of different firms' size classes, using employment in each of these classes as weight. We then calculate the implied reduction of productivity for each size class due to the presence of non-compliant individual firms. For example, bringing to zero the number of bunchers would decrease the labor productivity of competitors with less than 5 employees by 12 percent (i.e., 3.5 times 3.3), which, however, have a limited share of total employment. If we replicate the exercise for each size class, we get that bringing to zero the number of bunchers would decrease the aggregate productivity by 4.5 percent. Obviously, this estimate is purely indicative because it is extrapolated from coefficients that are local in nature and because we do not account for general equilibrium effects.

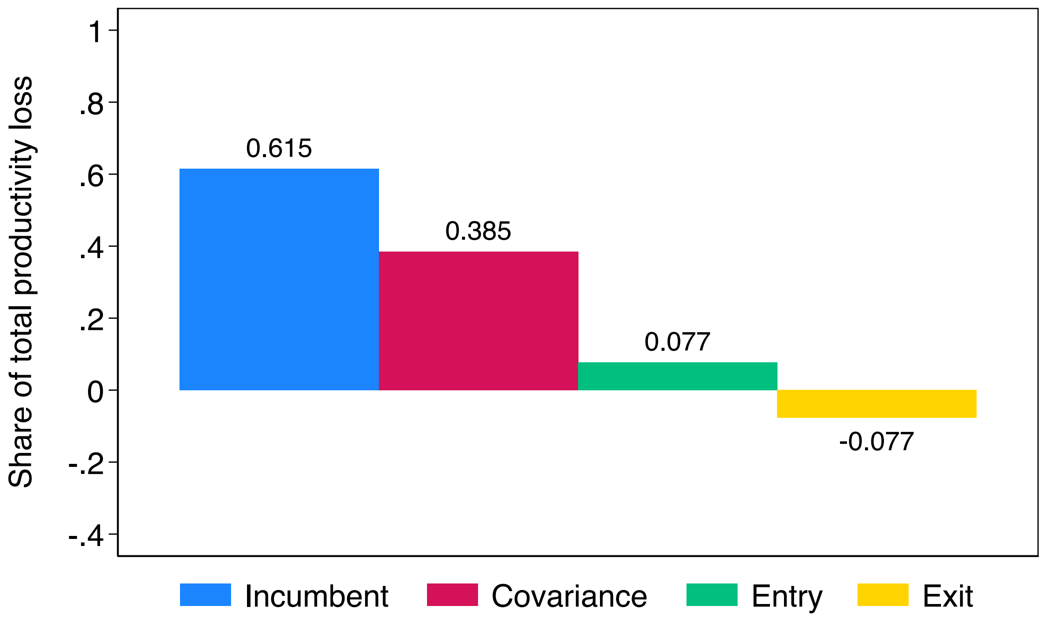
Then, we move to the aggregate level to explore distortions to allocative efficiency. This analysis allows us to evaluate the extent to which resources are allocated based on tax evasion rather than productivity. More specifically, we examine the effects of a variation of the bunching rate on variations of productivity at the market level. Employing the decomposition approach proposed by Melitz and Polanec (2015), we then isolate the different components of aggregate productivity variation. This approach allows us to assess, for any period, the relative contribution of three groups of firms: the ones that survive (i.e., incumbents), entrants, and exiting firms.[31] For incumbents, it is possible to further distinguish the contribution of two more components: (i) the variation in the efficiency of individual firms (i.e., within margin), and (ii) the reallocation of resources to firms characterized by different productivity levels (i.e., between margin). Therefore, for each market and any year, we decompose the productivity change into four main components: the productivity growth of incumbent firms, the covariance between employment shares and productivity (which measures the extent of reallocation), and the contribution of entering and exiting firms.

We consider only markets with at least 10 firms and trim extreme outliers. Then, we run regressions at the market-year level as the following:

$$\Delta y_{m,t} = \beta \cdot \Delta B_{m,t} + \gamma_m + \delta_t + u_{m,t}, \tag{8}$$

[31] This is an extension of the Olley and Pakes (1996) decomposition of aggregate productivity changes. See Section F for a formal discussion of the decomposition approach.

Figure 8: Productivity Loss Decomposition



Notes: This figure shows the fraction of the total productivity loss in a market that stems from different factors, using a decomposition approach à la Melitz and Polanec (2015). The first (blue) bar represents incumbent firms; the second (red) bar indicates the portion of productivity loss stemming from the covariance between firm productivity and size; the third (green) bar shows the fraction of productivity loss from firm entry; the fourth (yellow) bar displays productivity losses from firm exiting the market. The coefficients are computed from the model with industry-year, municipality-year, and age share-year fixed effects. The sample is composed of markets where at least 10 firms operate.

where $\Delta y_{m,t}$ represents the variation in labor productivity or one of the four components of its dynamic decomposition, $\Delta B_{m,t}$ is the variation in the (instrumented) bunching rate, and γ_m and δ_t are market and year fixed effects, respectively. The coefficient of interest is β, which captures the impact of a variation in tax evasion on labor productivity.

According to our preferred specification, β is equal to 0.013 (with a standard error equal to 0.005). If we could bring to zero the number of bunchers, the aggregate productivity would increase by 6.8 percent.[32]

Looking at the different components, Figure 8 shows that the largest part of the effect comes from the incumbents: an increase in the non-compliance rate of individual firms is associated with a decrease in the productivity growth of existing firms. Moreover, we also find an impact on reallocation, with a decline in the covariance between firm productivity and size. This suggests that tax evasion hampers the reallocation of workers towards more productive firms. Namely, tax evasion might limit the incentive to grow for both individual firms under the preferential tax regime and

[32] This estimate is not properly comparable with that discussed above as it is based on regressions at the market level (instead of the firm level).

their competitors who suffer tax evasion-induced competition.[33] The impact of the selection channel (entry and exit) is more limited.

6 Conclusions

This paper presents the first empirical evidence that tax evasion distorts firm growth and hinders market efficiency. Using administrative data on the universe of firms in Italy, we compute a tax evasion proxy as the fraction of individual firms manipulating their revenue to meet eligibility criteria for several preferential tax regimes. We show that a significant portion of individual firms under-report their revenue to gain eligibility for these generous preferential tax schemes. The extent of revenue manipulation strongly responds to variations in the size and location of the notch determining eligibility for these preferential schemes. These responses generate considerable heterogeneity in the extent of revenue manipulation across places, industries, and over time within municipality-industry cells, our granular definition of a market.

Using policy-induced changes in the size of the notch to predict the market-level share of individual firms that engage in tax evasion, we establish a causal link between market-level tax evasion and the revenue of their competitors. The latter is defined as firms that are non-eligible for preferential tax regimes (because of their pre-determined legal form) and operate in the same market.

According to our findings, the increasing power of non-compliant firms taking over market share from competitors creates a lopsided playing field, where compliant firms find it hard to keep up. Reduced revenue and productivity losses lead firms to cut workers' salaries and reduce their workforce. This unfair competition also has negative effects on aggregate productivity, partly owing to worsening allocative efficiency.

In terms of policy implications, our results highlight the inefficiencies created by preferential tax regimes for individual firms, a policy applied by most countries (OECD 2023). We show that this public policy contributes to revenue manipulation and negative market externalities. This channel may explain the strong association evident both across and within countries (Kleven et al. 2016, Jensen 2021) on self-employment rates, tax evasion, and productivity. Moreover, fighting tax evasion not only increases tax revenue and promotes tax fairness (see, e.g., Alstadsæter et al. 2019, Guyton et al. 2021, Alstadsæter et al. 2022), but can also enhance market efficiency by leveling the playing field.

[33] A growing literature has examined the interplay between firm-level productivity, the business environment, and overall economic performance (see Restuccia and Rogerson (2008) and Hsieh and Klenow (2009) for seminal contributions; Restuccia and Rogerson (2017) for a review). The key finding of this literature is that distortions preventing the equalization of the marginal value of inputs across firms can potentially generate large losses in aggregate productivity.

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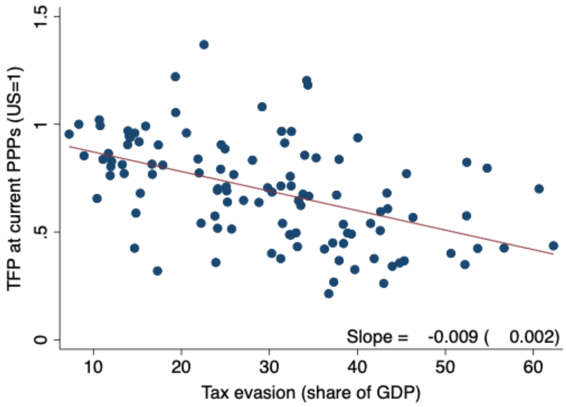
Appendix

A Additional Tables and Figures

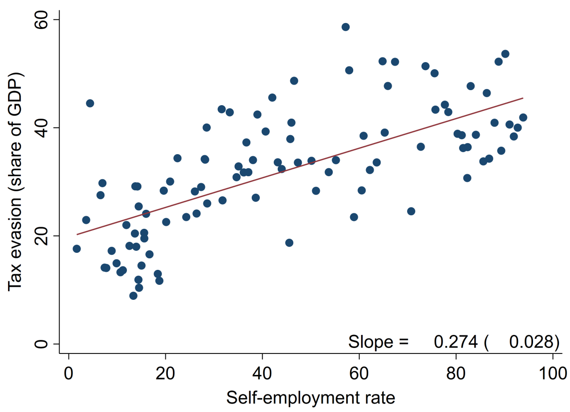
Figure A1: Self-Employment Share, Tax Evasion, and Productivity

A. Productivity and tax evasion: cross-country correlation

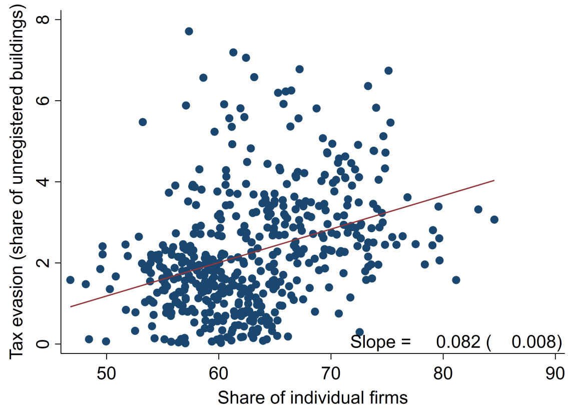


B. Productivity and tax evasion: cross-Italian LLM correlation

C. Tax evasion and self-employment: cross-country correlation



D. Tax evasion and self-employment: cross-Italian LLM correlation



Notes: The top panel presents the relationship between productivity and tax evasion. The left-hand side graph provides a cross-country comparison between total factor productivity at current power purchasing prices (from the Penn World Table) and a proxy for the size of the shadow economy (from Medina and Schneider 2018). The right-hand side graph plots the relationship between the log of the value added per worker (from the Italian Institute of Statistics) and the share of unregistered buildings (from the Italian Internal Revenue Agency) across Italian local labor markets. The bottom panel depicts the association between tax evasion and the share of self-employed taxpayers. The left-hand side graph provides a cross-country comparison between a proxy for the size of the shadow economy (from Medina and Schneider 2018) and the self-employment rate (World Bank data). The right-hand side graph plots the relationship between the share of unregistered buildings (from the Italian Internal Revenue Agency) and the self-employment rate across Italian local labor markets.

Table A1: Preferential Tax Regimes for Individual Firms

Regime (1)	Period (2)	Revenue cutoff (3)	Age cutoff (4)	Tax rate (%) (5)	Tax rate by age? (6)	Tax base by industry? (7)	Cutoff by industry? (8)	VAT duties? (9)
Agevolato: Law 388/2000	2000-2011	30,000	3 years	10%	No	Yes	No	No
Minimi: Law 244/2007	2008-2011	30,000	No	20%	No	Yes	No	No
Minimi agevolato: Law 98/2011	2012-2014	30,000	5 years	5%	No	Yes	No	No
Forfettario I: Law 140/2014	2015-2018	15,000 -40,000	No	5%-15%	Yes	Yes	Yes	No
Forfettario II: Law 145/2018	2019-	65,000	No	5%-15%	Yes	Yes	No	No

Note: This table presents the main features of the preferential tax scheme for individual firms in Italy. For each preferential tax regime for individual firms, the table provides the following information: *column 1*: the regime's denomination and the relevant law; *column 2*: the period when the regime applies; *column 3*: the revenue cutoff (in euros) determining eligibility (with minimum and maximum values in case of different cutoffs by industries); *column 4*: the firm's age cutoff determining a change in the preferential tax rate; *column 5*: the preferential tax rate (or the tax rate below and above the age cutoff in case the tax rate varies by age); *column 6*: whether the tax rate varies by firm's age; *column 7*: whether the tax base varies by industry; *column 8:* whether the revenue cutoff determining eligibility varies by industry; *column 9*: whether the regime grants exemption from value-added tax fulfillment.

Table A2: Industry-Level Information on Preferential Tax Regimes for Individual Firms

Industry	NACE-2007	Revenue cutoff (euros) 2005-2014	2015	2016-2018	2019	Profitability coefficient (%)
		(1)	(2)	(3)	(4)	(5)
Food & beverage	10-11	30,000	35,000	45,000	65,000	0.4
Wholesale and retail trade	45; 46.2-46.9; 47.1-47.7; 47.9	30,000	40,000	50,000	65,000	0.4
Street vendors of food and drinks	47.81	30,000	30,000	40,000	65,000	0.4
Street vendors of other products	47.82-47.89	30,000	20,000	30,000	65,000	0.54
Construction and real estates	41-43; 68	30,000	15,000	25,000	65,000	0.86
Trade intermediaries	46.1	30,000	15,000	25,000	65,000	0.62
Accommodation and catering	55-56	30,000	40,000	50,000	65,000	0.40
Professional activities	64-66; 69-74; 85; 86-88	30,000	15,000	30,000	65,000	0.78
Other industries		30,000	20,000	30,000	65,000	0.67

Note: For each industry and regime, the table presents information on the revenue cutoff determining eligibility for the preferential tax regime (columns 1-4), and the profitability coefficient, which is the portion of the tax base subject to the preferential tax rate (column 5).

Table A3: Personal Income Tax Schedule

Taxable income (euros per-year)	Marginal tax rate (%)
A. Period 2005-2006	
$< 26,000$	23
26,001-33,500	33
33,501-100,000	39
$> 100,000$	45
B. Period 2007-2019	
$< 15,000$	23
15,001-28,000	27
28,001-55,000	38
55,001-75,000	41
$> 75,000$	43

Note: This table displays information on the Italian personal income tax (IRPEF) over the 2005-2006 period (top panel) and 2007-2019 period (bottom panel). The tax base is defined as net of deductible expenses, such as social security and welfare contributions or donations to non-profit organizations.

B Bunching Responses to Tax Notches

B.1 Bunching Theory

The preferential tax scheme creates a notch in the budget constraint of the self-employed: a discontinuity in the choice set of taxable versus net income. This notch induces self-employed individuals, who would otherwise report more revenue, to instead bunch right at the tax notch.

Figure B1 provides a simple illustration of how self-employed individuals would respond to the preferential tax scheme notch. Panel A presents a budget set diagram; panel B the density distributions. Before the introduction of the preferential tax scheme, self-employees report taxable income, y, that maximizes their own utility subject to their budget constraint. Income is distributed according to a smooth density distribution $h(y)$ and any heterogeneity is due to preferences or idiosyncratic shocks. With the introduction of the preferential tax scheme, self-employees will face a tax notch at income level y^*. The notch generates a region of strictly dominated choice in the income interval $(y^*, y^* + \Delta y^D]$, where it is possible to increase both leisure and consumption (net income) by moving to the notch point y^*. At this income level, a self-employee can maximize net income by paying the preferential tax rate τ^p instead of the basic tax rate τ^b. All self-employees located in the income interval $(y^*, y^* + \Delta y^*]$, where the bunching region is larger than the area of strictly dominated choice, $\Delta y^* > \Delta y^D$, will respond to the preferential tax scheme notch by bunching.

In this example, we illustrate responses from two types of "bunchers". We define self-employed L as the one with the lowest income before the introduction of the preferential tax scheme, y^*; self-employed H as the one with the highest income, $y^* + \Delta y^*$. The preferential tax scheme leads self-employed L to continue to choose income y^* and benefit from an increase in net income. Self-employee H will also bunch at the tax notch because is exactly indifferent between the notch point y^* and the interior point y^I. Self-employed L and H represent the two extreme cases: each self-employed between L and H will bunch at the preferential tax scheme notch. Therefore, because no one is willing to locate between the tax notch y^* and the interior point y^I, this model would predict a density hole in the segment $(y^*, y^I]$ and excess bunching at the notch y^*.

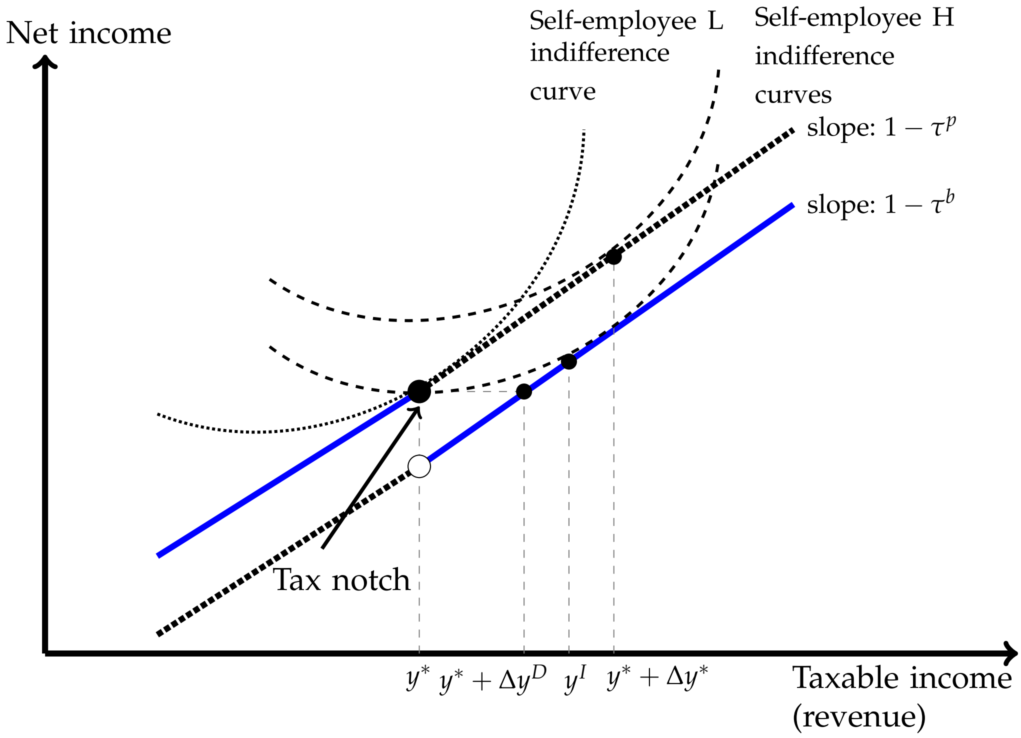
In practice, the predictions of this benchmark model can be questioned due to optimization frictions, such as adjustment costs or inattention, and heterogeneity in the advantages of the preferential regime across firms. For instance, since revenue-based taxation is advantageous to taxpayers with high-profit margins, the standard regime might be convenient for self-employees with large (deductible) costs, such as those with many employees, significant investments, and high operating expenses. Changes in the location of the eligibility cutoff, which varies across industries and over time, and in the size of the preferential tax rate, also introduce heterogeneities in the size of the tax notch across industries, by firm's age, and over time. These heterogeneity and optimization frictions might prevent some self-employed individuals from bunching, creating a significant density mass in the (otherwise empty) strictly dominated region.

Assuming that the counterfactual density $h_0(y)$ is roughly constant on the bunching segment $(y^* + \Delta y^*)$, we can express excess bunching at the tax notch as a function of the counterfactual density and the marginal buncher:

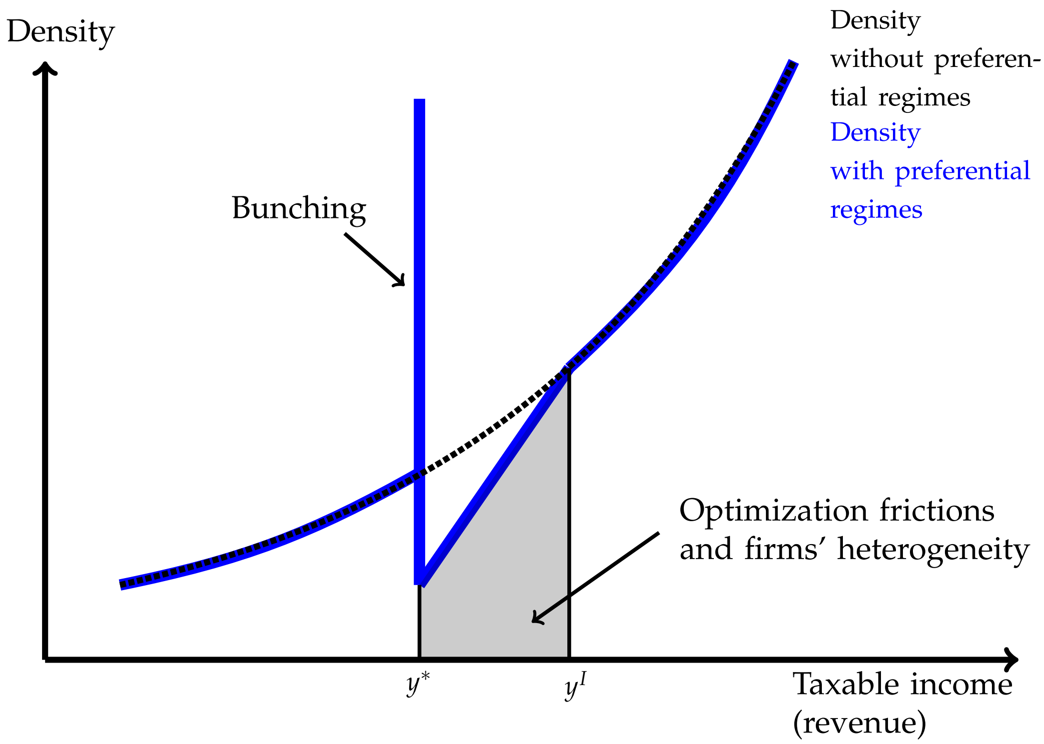
$$B = \int_{y^*}^{y+\Delta y^*} h_0(y)dy \approx h_0(y^*)\Delta y^*. \tag{9}$$

Figure B1: Bunching Responses to the Tax Notch

A. Budget Sets



B. Density Distributions



B.2 Tax Savings Under the Preferential Tax Regime

The tax savings under the preferential tax regime vary over time, across industries, and with respect to the age of the firm. An example of the tax savings is shown in Figure B2, where the tax burden for two representative taxpayers, an electrician and an IT consultant, is compared under the ordinary and preferential tax regimes. We simulate the amount of taxes paid in 2019 when reporting revenue right at the eligibility cutoff (65,000 euros).

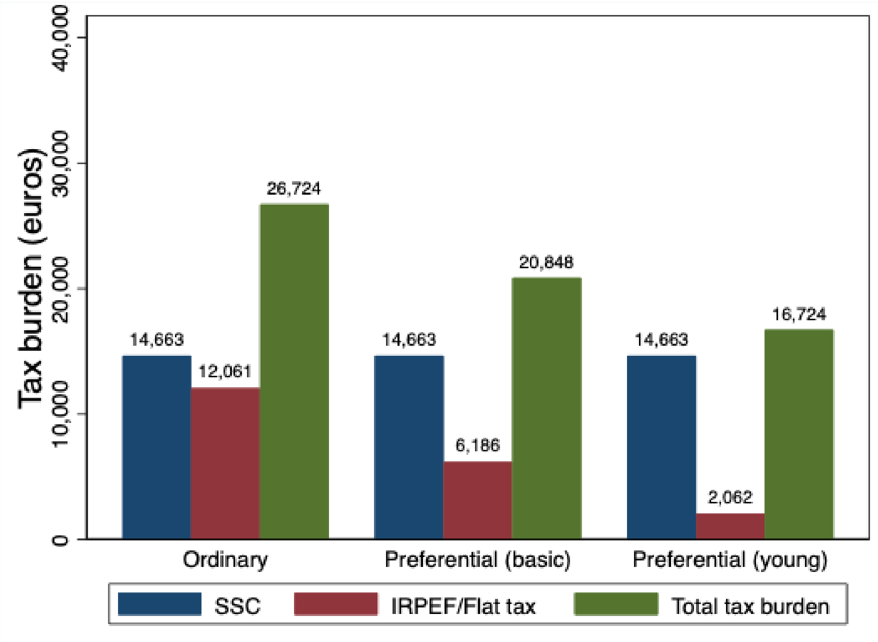
The figure shows that the size of tax savings strongly varies depending on the industry and the age of the firm. For instance, an electrician who created the business less than five years ago would save 10,000 euros in taxes under the preferential regime. This corresponds to a large effective total tax rate differential. When accounting for both income taxes and social security contributions, the difference between the ordinary and preferential tax regime is 17 percentage points. Tax savings are also conspicuous for businesses created for more than five years (5,876 euros). The IT consultant would also benefit from a significant reduction in the tax burden under the preferential regime, but to a lower extent compared to the electrician (6,619 euros if the business was created less than five years ago; 3,407 euros otherwise).

Due to the progressivity of the income tax under the ordinary regime, the extent of tax savings strongly varies along the tax base distribution. Figure B3 simulates the tax burden under the different regimes when the two taxpayers report 15,000 euros of revenue. In this scenario, the preferential tax regime is not more convenient than the ordinary regime in any circumstance for the IT consultant, and if the business is older than 5 years for the electrician. This result suggests that variations in the location of the revenue cutoff determining eligibility for the preferential regime generate large variations in the tax burden differential across the two regimes.

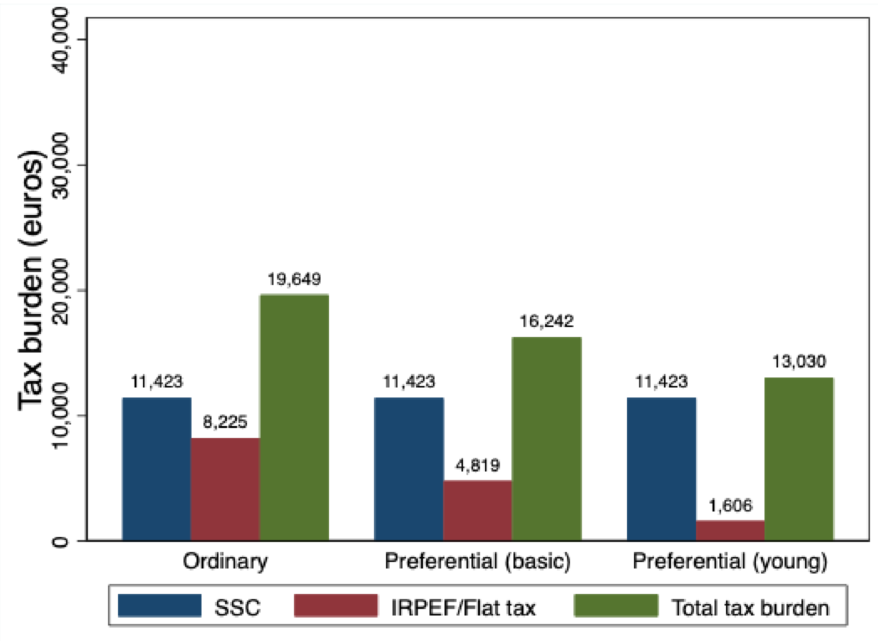
Overall, the variation in the extent of the tax savings tremendously varies across industries due to the profitability coefficient, and over time due to variation in the tax rate and the location of the revenue cutoff. The empirical analysis leverages these granular sources of tax rate variations across industries and firms' age over time.

Figure B2: The Tax Burden in 2019 Under Different Tax Regimes

A. Electrician
revenue: 65,000 euros



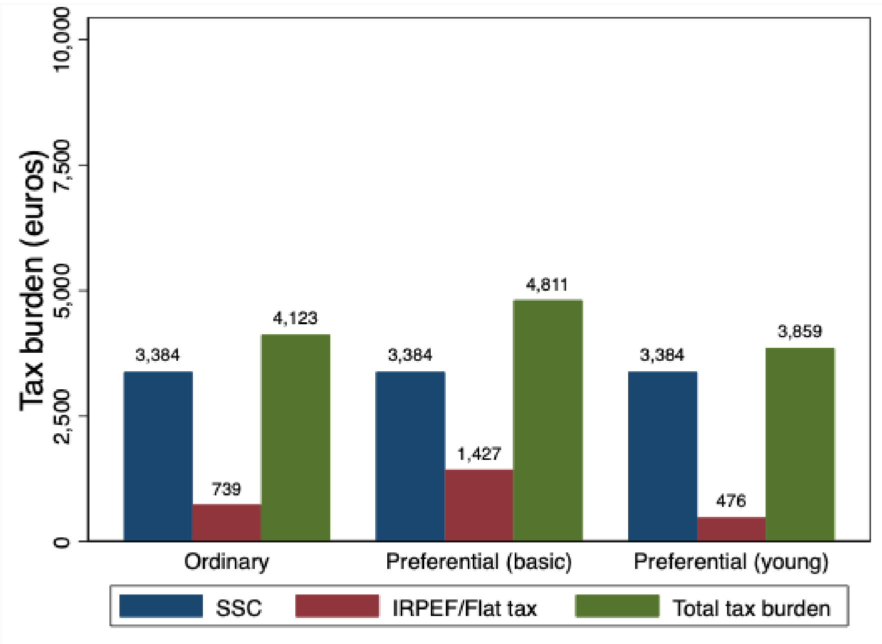
B. IT Consultant
revenue: 65,000 euros



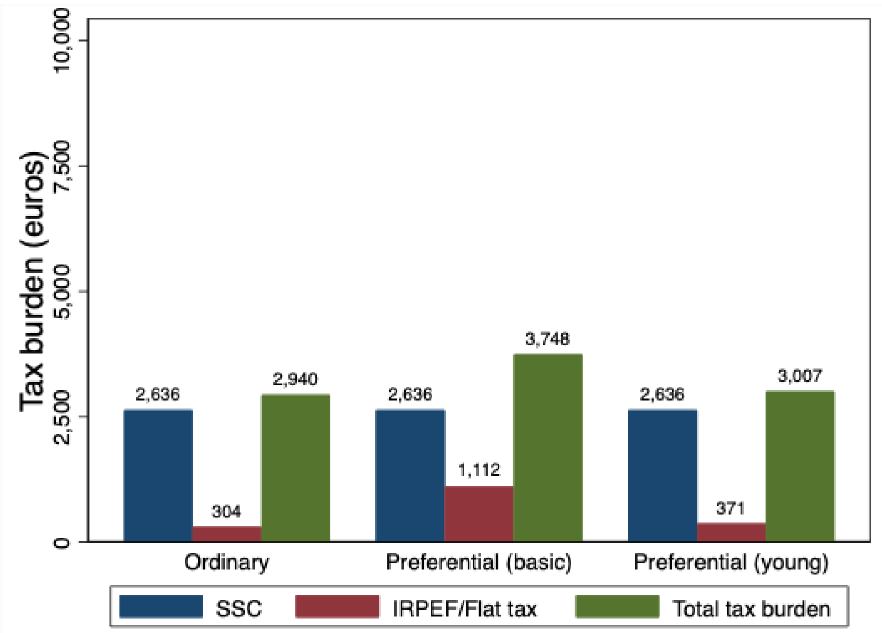
Note: This figure compares the total tax burden for the ordinary and preferential tax regimes (for basic (>5 age) and young (≤ 5 age) individual firms) between two representative taxpayers, an electrician and an IT consultant. Following Bordignon et al. (2022), we simulate the amount of taxes paid in 2019 when reporting revenue right at the eligibility cutoff (65,000 euros) under the ordinary regime (left-hand side bars), the preferential tax regime for firms older than five years (middle-hand side bars), and the preferential tax regime for firms younger than five years (right-hand side bars). We apply the respective profitability coefficients and we compute the tax burden due to social security contributions (blue bars) and the income taxes paid under ordinary or preferential regimes (red bars). We then show the total tax burden (green bars).

Figure B3: The Tax Burden in 2019 Under Different Tax Regimes

A. Electrician
revenue: 15,000 euros



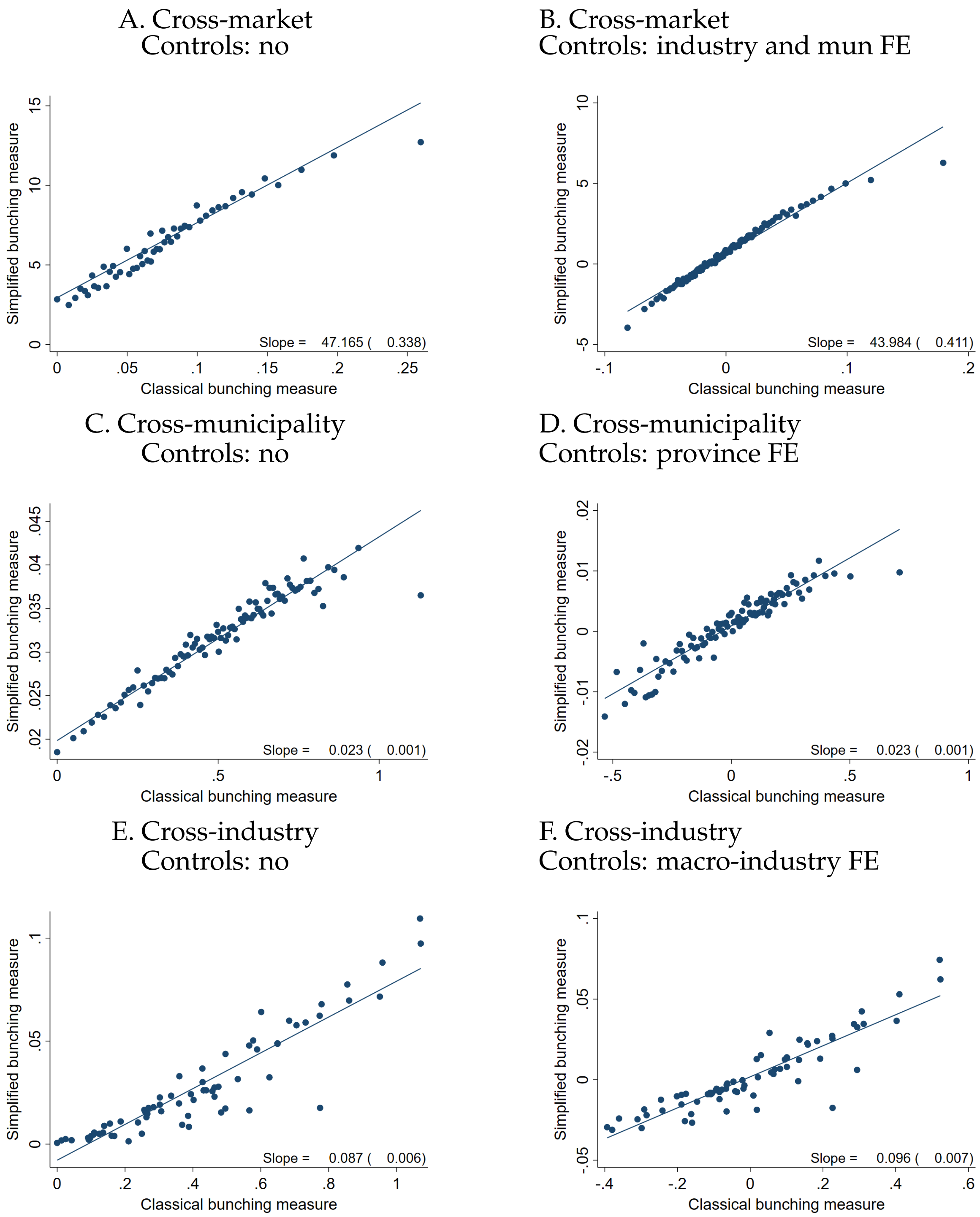
B. IT Consultant
revenue: 15,000 euros



Notes: This figure compares the total tax burden for the ordinary and preferential tax regimes (for basic (>5 age) and young (≤ 5 age) individual firms) between two representative taxpayers, an electrician and an IT consultant. Following Bordignon et al. (2022), we simulate the amount of taxes paid in 2019 when reporting revenue of 15,000 euros under the ordinary regime (left-hand side bars), the preferential tax regime for firms older than five years (middle-hand side bars), and the preferential tax regime for firms younger than five years (right-hand side bars). We apply the respective profitability coefficients and we compute the tax burden due to social security contributions (blue bars) and the income taxes paid under ordinary or preferential regimes (red bars). We then show the total tax burden (green bars).

C Data Appendix

Figure C1: Correlating "Simplified" and "Classical" Bunching Measures

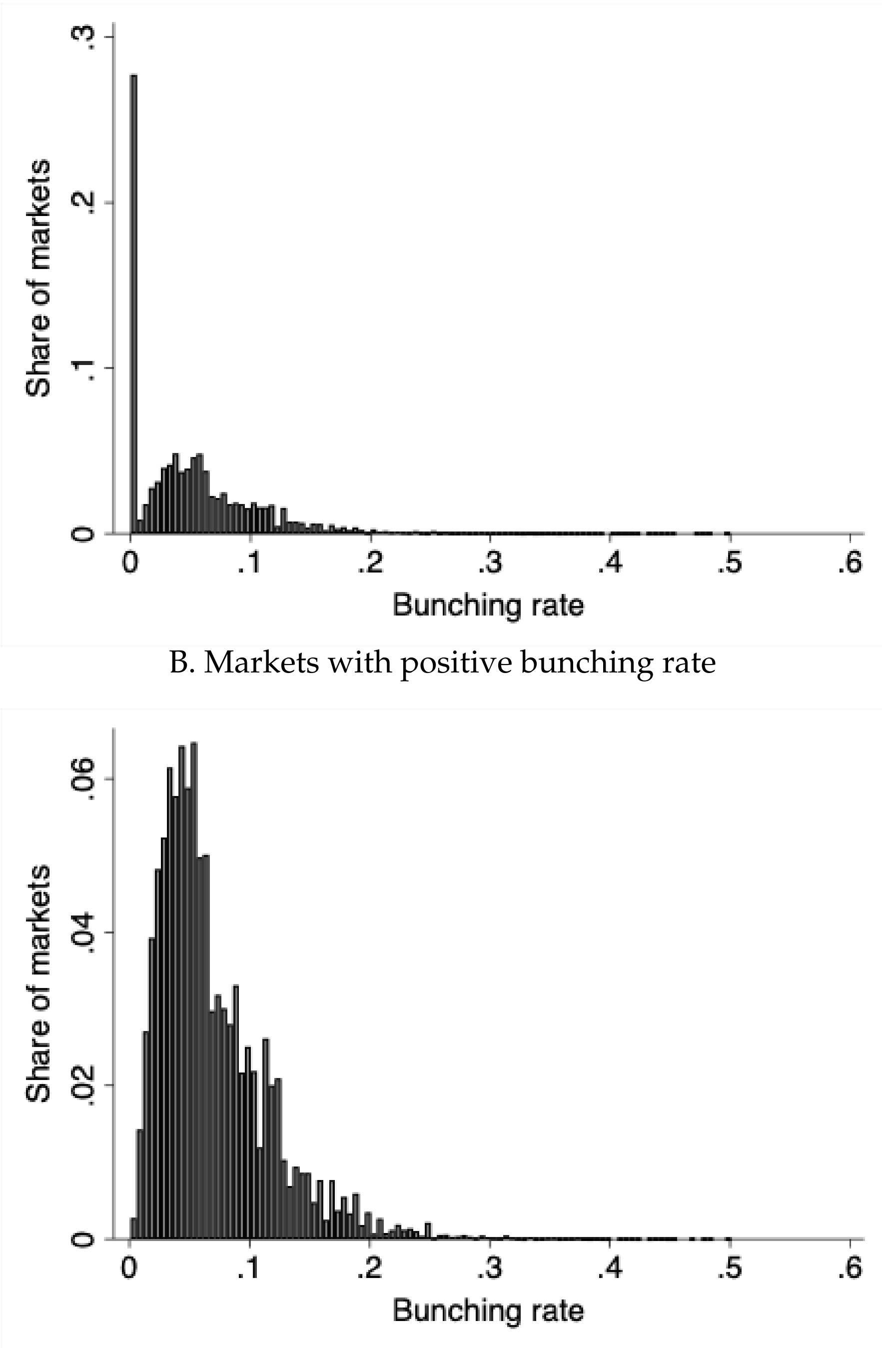


Notes: This figure compares the "simplified" bunching measure (vertical axes) with the "traditional" bunching measure (horizontal axes). We depict the cross-market correlation in the upper panel; the cross-municipality correlation in the middle panel; the cross-industry correlation in the lower panel. Each graph depicts the two variables in 100 equal-sized bins and shows the line of best fit. The right-hand side graphs depict the residuals obtained by regressing the two variables on municipality and industry fixed effects (top panel), province fixed effects (middle panel), or macro-industry fixed effects (bottom panel). Each graph also reports the estimated slope and the associated standard error.

Figure C2: The Distribution of the Bunching Rate

A. All markets

B. Markets with positive bunching rate

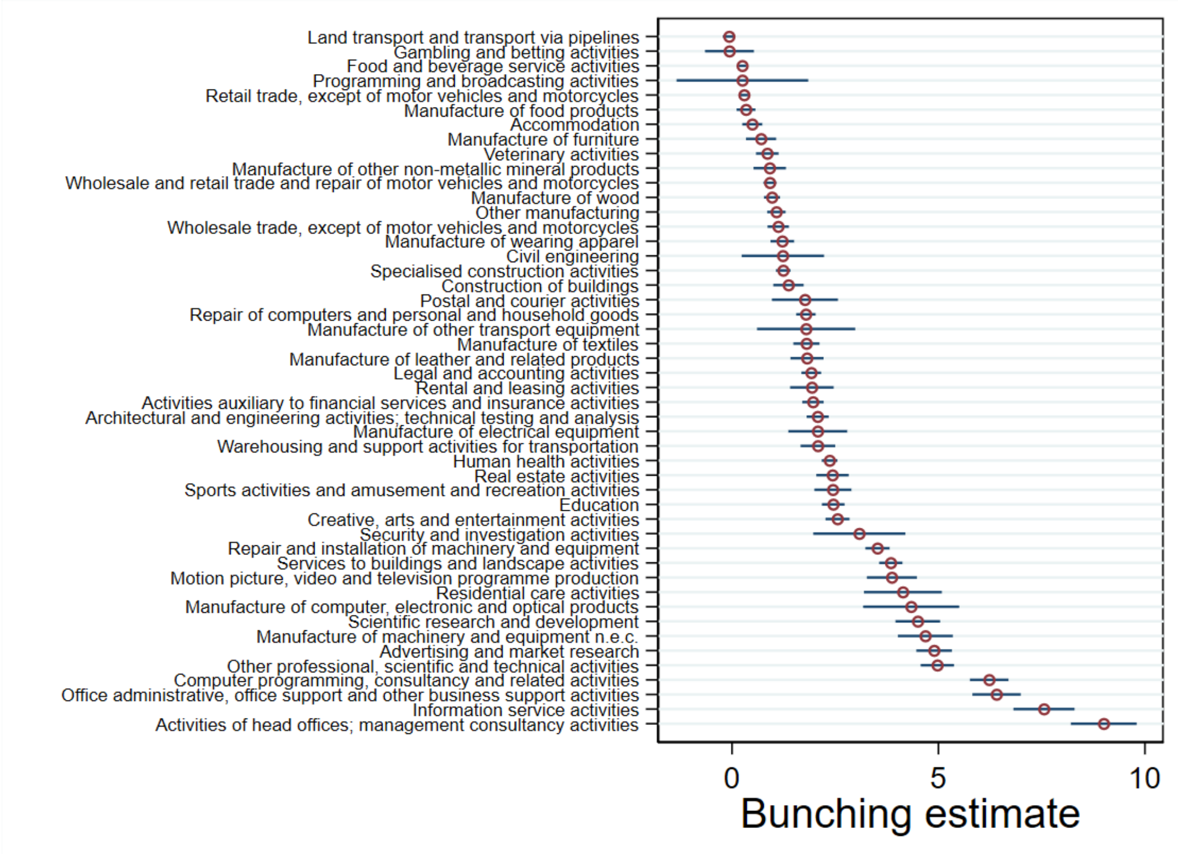


Note: The histograms show the distribution of the bunching rate, the share of individual firms reporting revenue of at least 5,000 euros below the cutoff determining eligibility for preferential tax regimes. The upper panel depicts all markets; the lower panel depicts markets with a positive bunching rate. The bars' width is 0.5 percentage points. The sample is composed of markets with at least 15 firms.

Figure C3: A Map of Bunching Rate

Notes: This figure depicts the bunching rate: the share of individual firms reporting revenue just below the eligibility cutoff determining eligibility for preferential tax regimes. Break points are quartile intervals in bunching rate. The black line refers to regional boundaries. The sample is composed of markets with at least 15 firms.

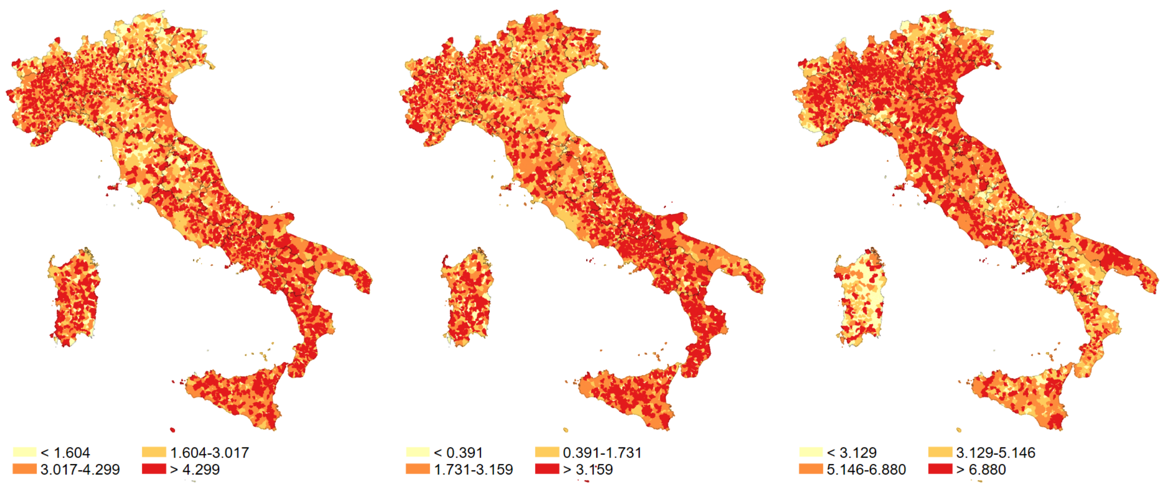
Figure C4: Bunching Rate Across Industries



Notes: This figure depicts the bunching rate and 95 percent confidence intervals for each 2-digit industry. The bunching rate is the share of individual firms reporting revenue just below the eligibility cutoff determining eligibility for preferential tax regimes.

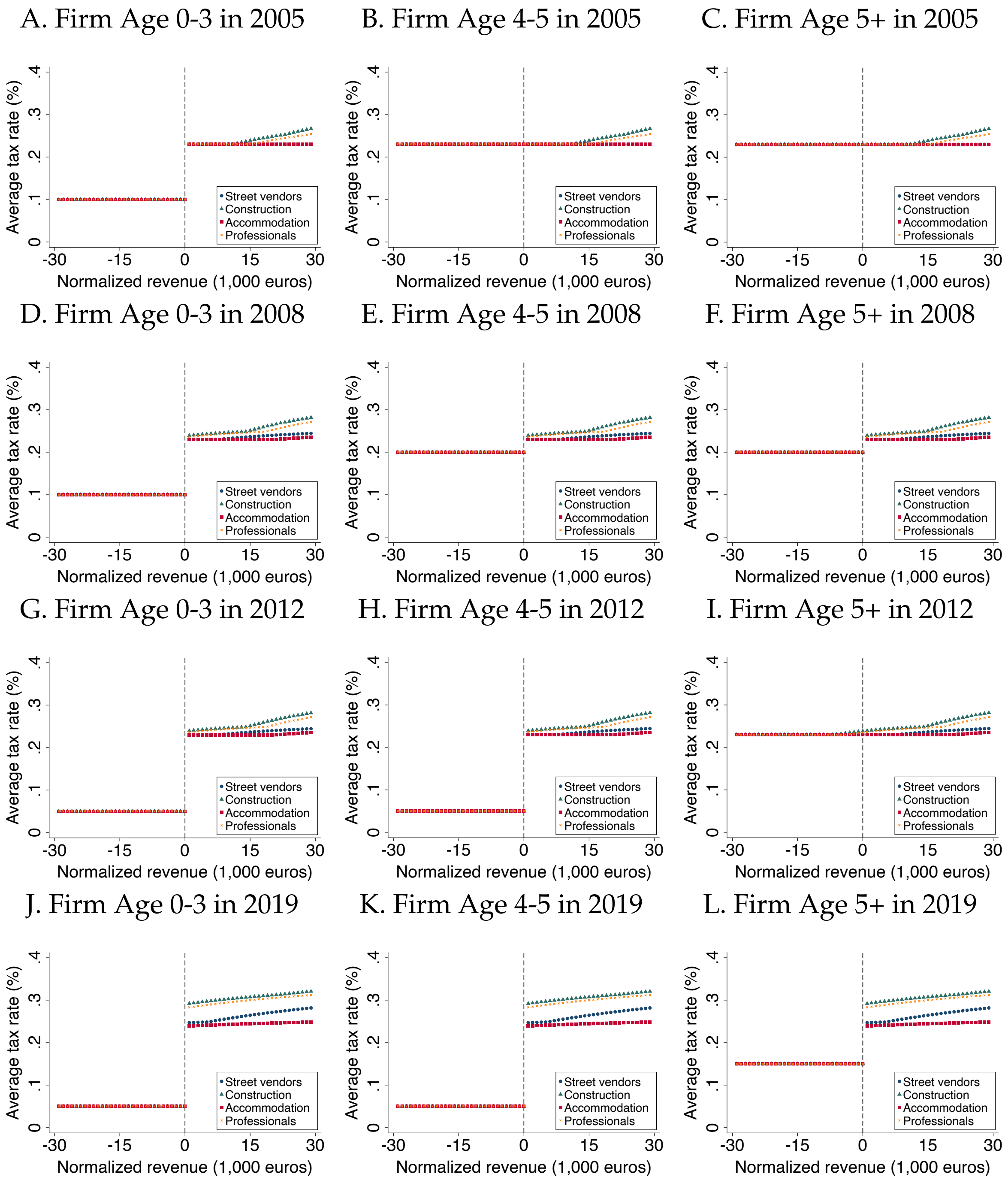
Figure C5: A Map of Bunching Rate Across Industries

A. Retail trade B. Accommodation C. Professional



Notes: This figure depicts the bunching rate: the share of individual firms reporting revenue just below the eligibility cutoff determining eligibility for preferential tax regimes. Break points are quartile intervals in bunching rate. The black line refers to regional boundaries. Panel A refers to the wholesale and retail trade industry; panel B refers to the accommodation and catering industry; panel C refers to professional activities.

Figure C6: Size of the Tax Notch



Note: This figure shows the average tax rate by normalized revenue bins. The average tax rate corresponds to the tax rate paid under the ordinary (preferential) tax regime for positive (negative) values of normalized bins. The tax notch corresponds to the differential in the average tax rate when switching from the ordinary to the preferential tax regime. It provides this information for firm age 0-3 (left-hand side graphs), 4-5 (middle graphs), and 5+ (right-hand side graphs). We focus on four selected years (2005, 2008, 2012, and 2019) and four representative industries: street vendors (blue circles), construction (green triangles), accommodation (red squares), and professionals (yellow diamonds).

D Bunching as a Proxy for Tax Evasion

D.1 Dynamic Effects on Revenue and Variable Inputs' Costs

We begin by exploiting the panel dimension of our data to study the dynamic effects of reporting discontinuities. Our goal is twofold. First, we study whether the eligibility cutoff constraints firm revenue growth. To this aim, we test whether the average revenue growth rate presents a discontinuity around the eligibility cutoff. Second, we examine whether the average revenue growth rate around the eligibility cutoff matches the average inputs' growth rate. This comparison will offer suggestive evidence of the mechanisms behind bunching responses. If our estimates mostly reflect labor supply responses from individual firms, then the two distributions should be quite similar. The notch would prevent some transactions from taking place in the market, and thus both revenue and variable inputs' costs will be distorted among firms just below the eligibility cutoff. However, if revenue under-reporting is the main channel behind bunching responses, we would observe a distortion in revenue growth rates, but not in the variable inputs' cost rates.

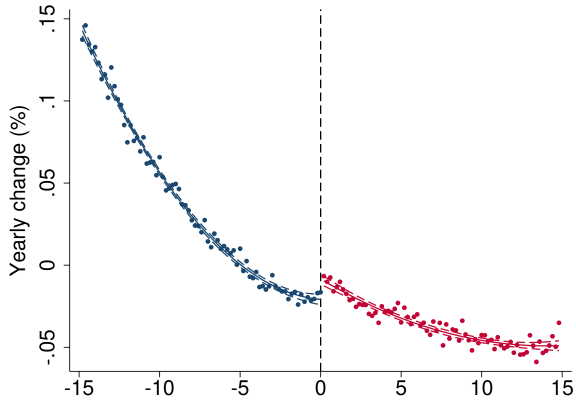
We focus on two periods: i) the 2016-2018 period, when the eligibility cutoff remained constant; ii) the 2018-2019, when the cutoff was significantly increased. During the first period, we expect that firms located just below the eligibility cutoff will experience abnormally lower revenue growth rates, compared to those that reported revenue just above the cutoff. The second period provides an opportunity to compare the revenue growth rates of firms that the eligibility cutoff might have constrained.

Figure D1 shows the changes in average reported revenue (upper panel) and variable inputs' costs (lower panel) around the (normalized) eligibility cutoff for the two periods. We also display a quadratic fit and confidence intervals around the average growth rates in each 200 euro bin. The figure provides two main findings. First, when the eligibility cutoff remains unchanged, the revenue growth rate is disproportionately lower among firms that reported revenue just below the cutoff. However, we find no evidence of a discontinuity in variable inputs' costs. This result suggests that the reduction in revenue is likely due to revenue under-reporting, rather than from reduced labor supply.

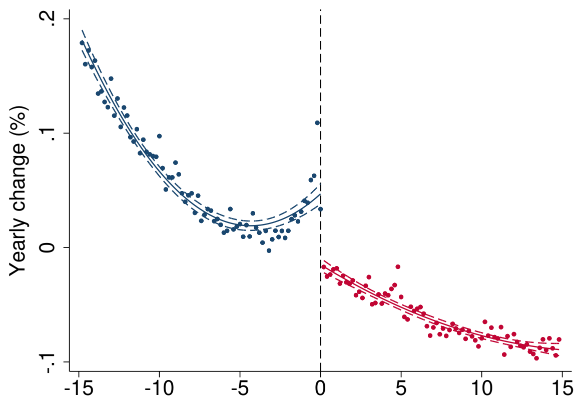
Second, when the eligibility threshold increases, we observe abnormally large revenue growth rates among individual firms that previously bunched at the eligibility threshold, compared to those that did not bunch at the threshold. This evidence of large revenue responses is not consistent with the observed variation in firms' variable costs. Strikingly, we observe similar cost growth rates among firms that bunch and those that did not. This again indicates that the increase in revenue is not due to actual changes in business activity, but rather a result of reporting.

Figure D1: Revenue and Inputs' Cost Growth Around the Eligibility Cutoff

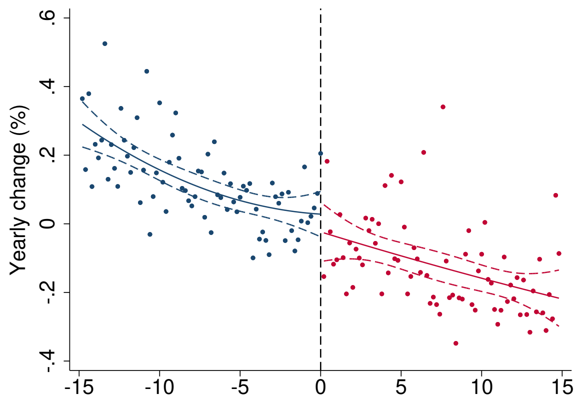
A. *Outcome*: revenue growth
Period: no cutoff change (2016-2018)



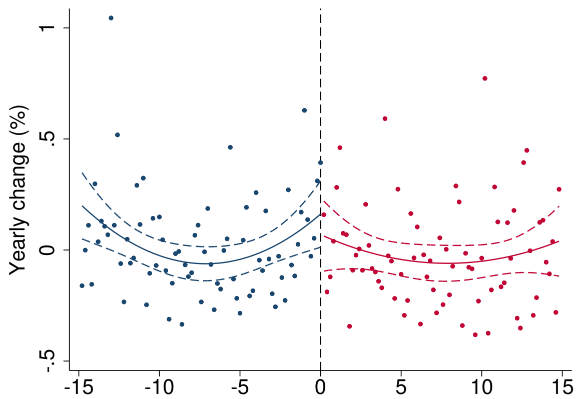
B. *Outcome*: revenue growth
Period: cutoff increases (2018-2019)



C. *Outcome*: inputs cost growth
Period: no cutoff change (2016-2018)



D. *Outcome*: inputs cost growth
Period: cutoff increase (2018-2019)



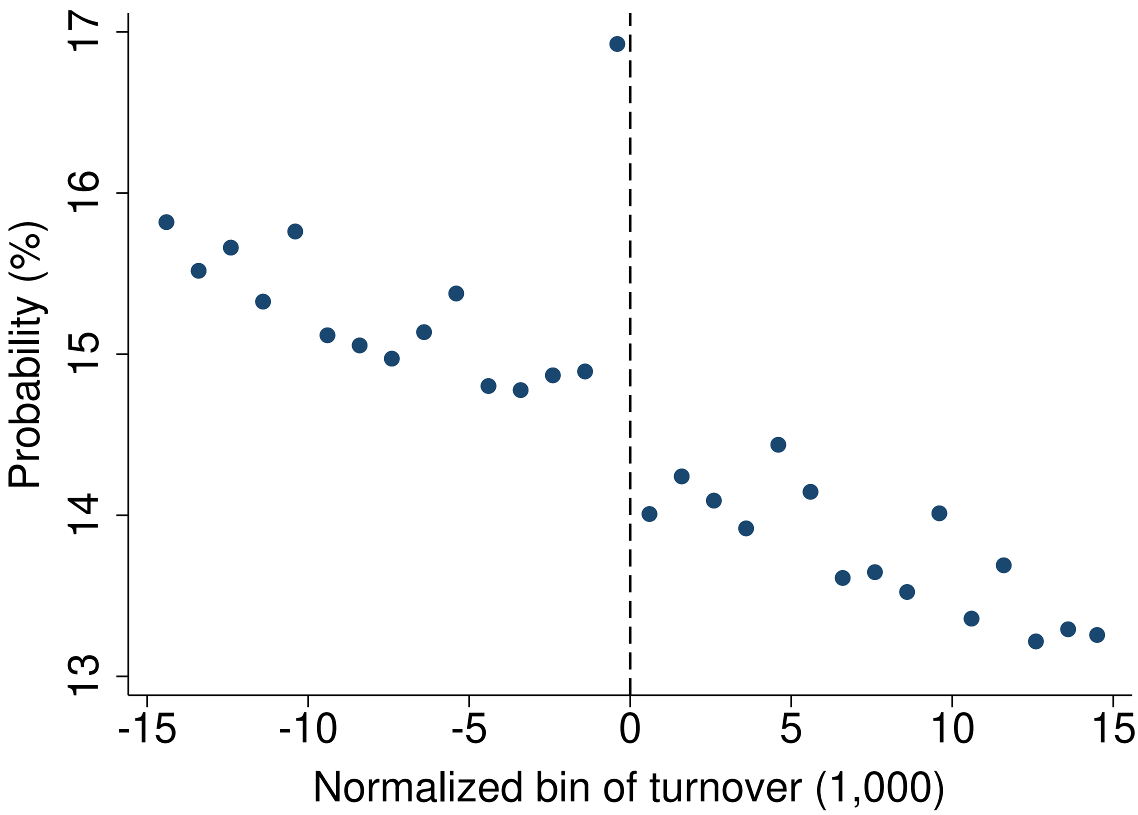
Note: The figure plots the bin-average growth rates of revenue (upper panel) and variable inputs costs (lower panel) over two periods: i) 2018 vs 2016, when the eligibility cutoff did not vary (left-hand side graphs); ii) 2019 vs 2018, when the eligibility cutoff increased (right-hand side graphs). We also report quadratic fits and confidence intervals around the bin average.

D.2 Bunching at Specific Digits

Following Aghion et al. (2024), we investigate anomalies in the last digit of reported revenues. The underlying hypothesis is the well-known Benford's law stating that the first digits in many real-life numerical data sets have an asymmetric, logarithmic distribution in which small digits are more common. However, this asymmetry diminishes for subsequent digits, and the last digit tends to be uniformly distributed. Therefore, in the absence of strategic reporting, we expect any number in the set {0,1,2,3,...9} to be reported with equal probability. Moreover, and even more importantly, we expect the probability of reporting a given number as the last digit to be the same in the bunching area as anywhere else in the distribution of revenues.

Figure D2 shows the distribution of the probability of reporting 0 as the last digit by bins (around the eligibility threshold). We see that individual firms are more inclined to report zero, regardless of their position in the revenue distribution. However, those just below the threshold exhibit a higher likelihood of doing so. This disproportionate tendency to report 0 as the last digit in the bunching regions implies strategic reporting as a means to evade taxation.

Figure D2: Bunching at Specific Digits



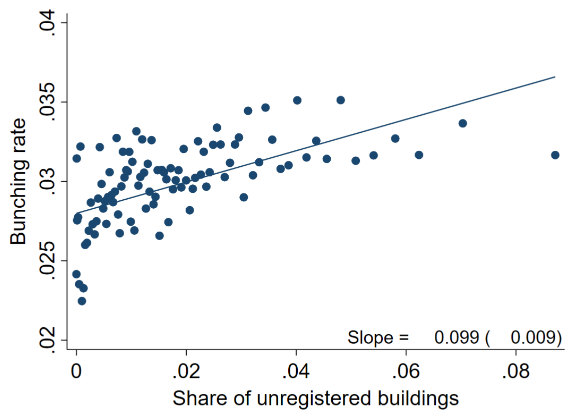
Notes: This figure shows the fraction of individual firms reporting zero as last digit of revenues, by bins.

D.3 Correlating Bunching with Other Tax Evasion Indicators

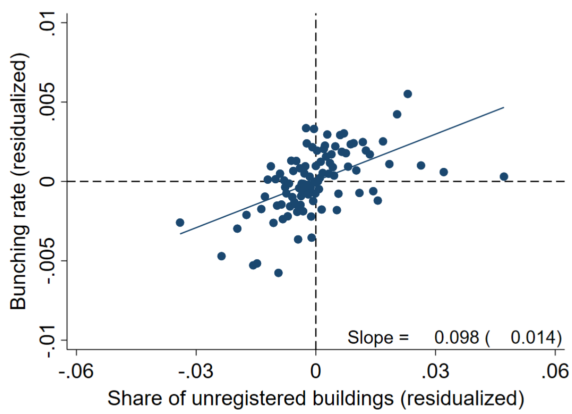
Figure D3 compares the portion of individual firms reporting revenue just below the eligibility cutoff with existing proxies of tax evasion across municipalities. We use two indicators. First, we use data from the Ghost Buildings program (Casaburi and Troiano 2016, Rubolino 2023) to proxy tax evasion as the municipality-level share of unregistered (taxable) buildings. Second, we use municipality data from the Italian Tax Authority on the national TV fee non-compliance rate. Importantly, both indicators reflect individual non-compliance behavior rather than overall tax evasion estimates at the market level that might be driven by non-compliance of large corporations. Therefore, they are more closely related to our proxy for tax evasion by individual firms. We find that both the two tax evasion indicators are strongly associated with the bunching rate. This correlation appears to be robust also to the inclusion of province fixed effects. Although we cannot decisively interpret this evidence as causal, this figure provides suggestive evidence that our bunching measure is likely to capture evasion responses.

Figure D3: Correlating the Bunching Rate with Other Tax Evasion Indicators

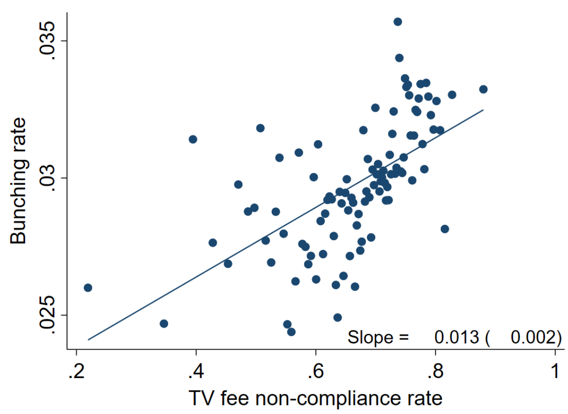
A. Bunching vs ghost buildings
Controls: no



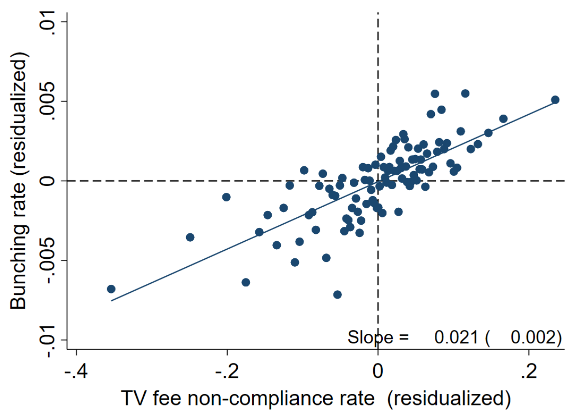
B. Bunching vs ghost buildings
Controls: province FE



C. Bunching vs TV fee evasion
Controls: no



D. Bunching vs TV fee evasion
Controls: province FE



Notes: This figure compares the bunching rate with other existing municipality-specific indicators of tax evasion. The upper panel compares the bunching rate (vertical axes) with the share of unregistered buildings (horizontal axes). The lower panel relates the bunching rate (vertical axes) with the national TV fee non-compliance rate (horizontal axes). Left-hand side graphs depict these variables in 100 equal-sized bins and show the line of best fit. The right-hand side graphs depict the residuals obtained by regressing the two variables on province fixed effects. Each graph also reports the estimated slope and the associated standard error.

E Robustness Checks and Alternative Specifications

E.1 OLS estimate

Table E1: The Impact of Market-Level Tax Evasion on Competitor Firm Revenue
OLS Estimates

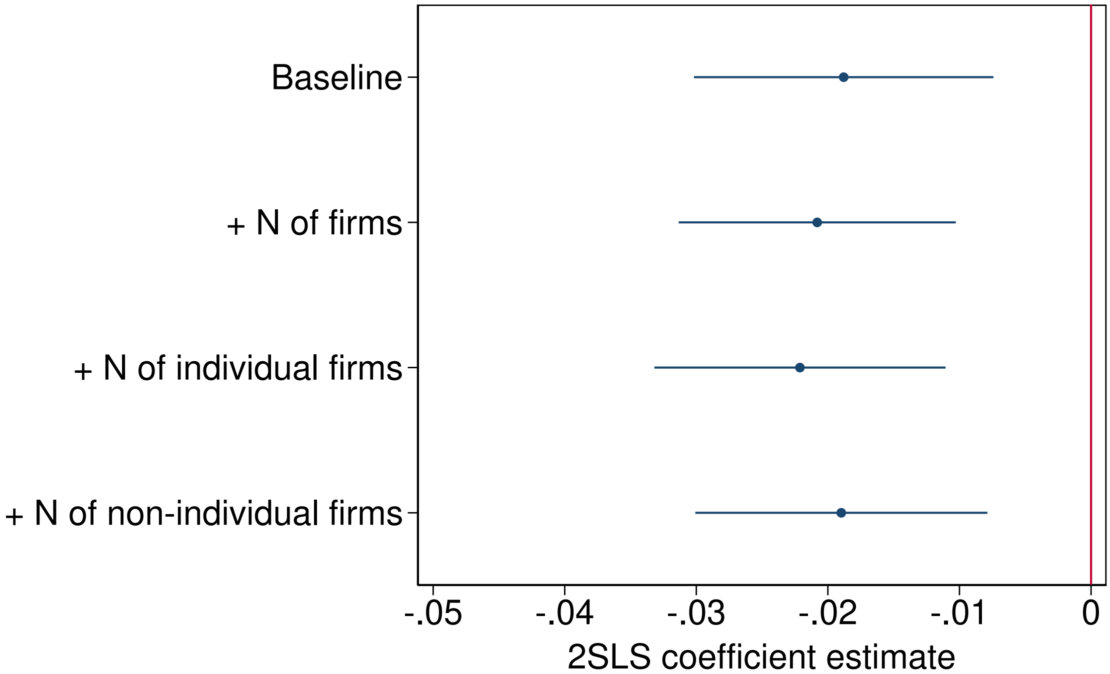
	(1)	(2)	(3)	(4)
	A. *Outcome:* Revenue			
Market-level bunching rate	0.00050***	0.00059***	0.00010	0.00010
	(0.00010)	(0.00010)	(0.00009)	(0.00009)
	B. *Outcome:* Value added			
Market-level bunching rate	0.00015*	0.00025***	0.00013	0.00014
	(0.00009)	(0.00009)	(0.00009)	(0.00009)
	C. *Outcome:* Productivity			
Market-level bunching rate	-0.00008	-0.00005	0.000004	0.000005
	(0.00008)	(0.00008)	(0.000074)	(0.000074)
Observations	23,314,059			
Firm FE	Yes	Yes	Yes	Yes
Year-cohort FE	Yes	Yes	Yes	Yes
Municipality-year FE	No	Yes	Yes	Yes
Industry-year FE	No	No	Yes	Yes
Age share-year FE	No	No	No	Yes

Note: This table presents the OLS estimates of the effect of market-level bunching rate on firm-level revenue. Column 1 reports the estimate from a model with firm and year fixed effects. In column 2, we enrich the model with municipality-year fixed effects. In column 3 we add industry-year fixed effects and in column 4 age share-year fixed effects. The sample is composed of "competitor" firms, which are all firms that are not individual firms. Market-level bunching rate is calculated as the fraction of individual firms that report revenue just below the cutoff determining eligibility for preferential tax schemes. Each market is defined at the municipality-industry-year level. Standard errors clustered at the market level are reported in parentheses.

E.2 Sensitivity to Additional Controls

In this section we test the sensitivity of our estimates to additional time-varying factors. Although our baseline model relies on a very demanding set of fixed effects - firm, industry-year, and municipality-year fixed effects - the exclusion restriction of our 2SLS model might be threatened by omitted changes in competitors' firm outcomes due to market-specific time-varying channels unrelated to individual firms' revenue manipulation. For instance, changes in the generosity of the preferential tax schemes might stimulate business creation. If this is the case, then competitor firms' outcomes would be influenced by tougher (fair) competition, rather than through (unfair) competition driven by tax evasion. To show that this is not the source of our findings, we check for significant changes in our coefficient estimate when conditioning on the number of firms operating in a market in any given year. As suggested in Altonji et al. (2005) and Oster (2019), significant changes in coefficient estimates imply the potential importance of unobserved confounders. In Figure E1 we provide reassuring evidence that our coefficient estimates, with respect to the impact on competitor revenues, remain remarkably stable when controlling for time-varying market-specific changes in i) the number of firms; ii) the number of individual firms; iii) the number of non-individual firms. Similar results are obtained when we replicate the analysis on other firm outcomes (results available upon request).

Figure E1: Sensitivity to Additional Controls



Notes: This figure tests the robustness of our baseline 2SLS estimates on the log of firm revenue, computed from a model with firm fixed effects and year fixed effects ("Baseline" in the graph). Each panel reports the 2SLS coefficient estimate and 95 percent confidence intervals from market-level clustered standard errors. On top of the baseline controls, we add the following controls: i. number of firms in the market (second row); ii. number of individual firms in the market (third row); number of non-individual firms in the market (fourth row). The sample is composed of "competitor" firms, which are all firms that are not individual firms. Market-level bunching rate is calculated as the fraction of individual firms that report revenue just below the cutoff determining eligibility for preferential tax schemes. The instrument, described in equation (5), is based on policy changes and a market's (fixed) demographic composition. Each market is defined at the municipality-industry-year level.

E.3 The Correlates of Market Shares

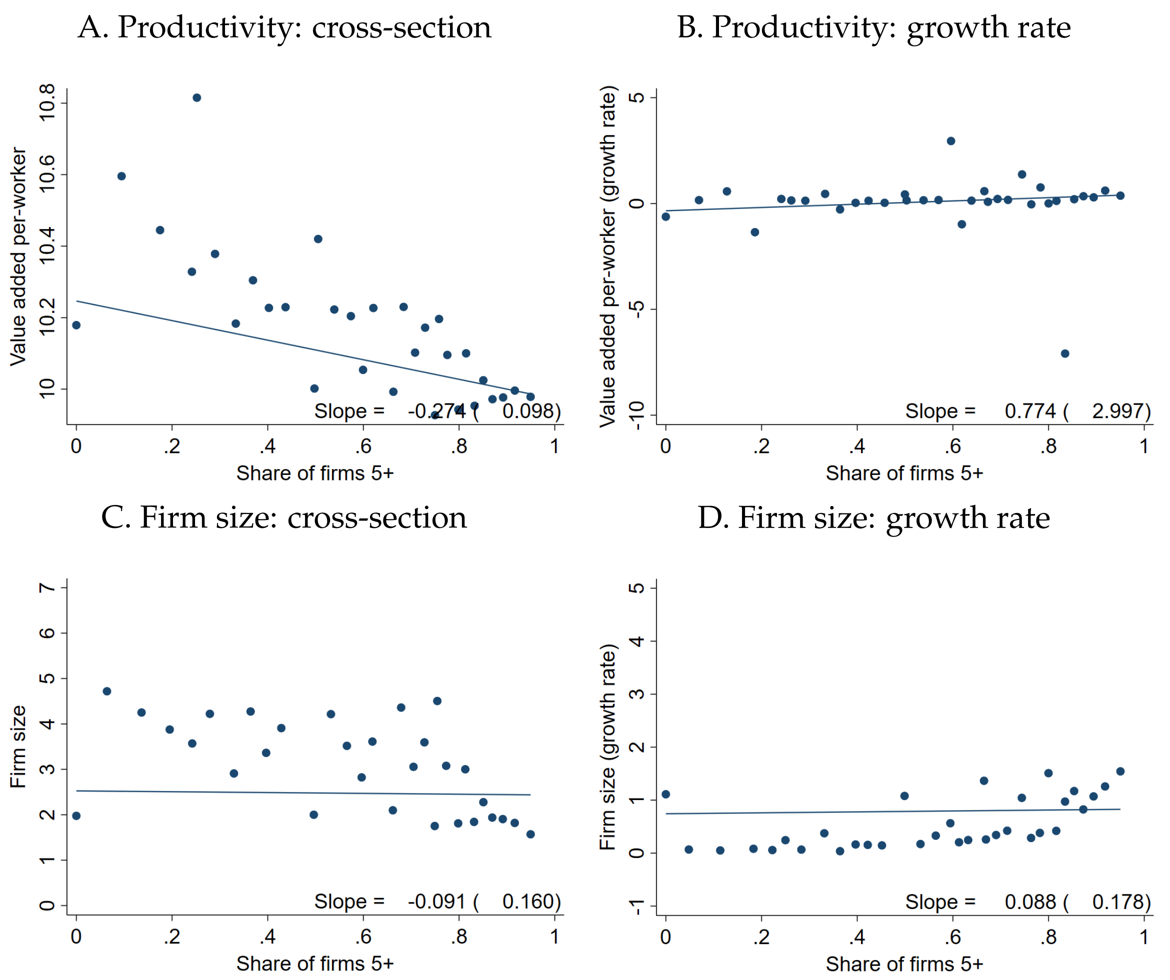
Our research design reflects differential exogenous exposure, due to the (fixed) market demographic composition, to common policy shocks. It rests on the assumption that *changes* (rather than *levels*) of firms' revenue are similar across markets with a different share of young firms.[1] The central identification concern is thus that the market shares predict firm outcomes through channels other than those due to policy changes in the incentive to bunch. For example, markets with high versus low exposure may have features that predict change in the outcome through channels other than the bunching rate, violating the exclusion restriction. As recommended by Goldsmith-Pinkham et al. (2020), one way to assess this possibility is to look at the correlates of the shares. If these correlates suggest other channels through which the shares affect outcomes, then we might be skeptical of the identifying assumption. Guided by both theoretical and empirical evidence on firm growth predictors (see, e.g., Kumar et al. 1999; Luttmer 2011), Figure E2 plots the relationship between two main predictors of firm growth. First, we find that market age shares do not predict firm size, both in levels and in changes.[2] Second, we find that the market age shares are correlated negatively with productivity. However, we find no significant association in *changes*, validating our identifying assumption.

Overall, these tests assuage concerns that market shares could be correlated with changes in firm growth's correlates, validating our identifying assumption.

[1]As emphasized in Goldsmith-Pinkham et al. (2020), "In particular, the key question researchers should have in mind is whether the correlates of the levels of the shares predict *changes* in the outcome. For the empirical strategy to be valid, it is fine if the level of the correlates is related to the level of the outcome." (p. 2605).

[2]Note that the relationship between firm growth and firm size is ambiguous. Gibrat's law of proportionate effect suggests that firm growth is independent of size. Several theories, including Lucas (1978), also either assume or imply that firm growth does not depend on firm size.

Figure E2: The Correlates of Market Shares



Notes: This figure shows scatter-plots comparing various predictors of firm revenue (vertical axes) on the market share of firms created from more than 5 years (horizontal axes). The left-hand side graphs show a simple cross-sectional correlation from the first available data point in our dataset. The right-hand side graphs compare the growth rate in each predictor (over the 2005-2019 period) versus the market share observed in 2005. We plot 50 equal-sized bins and show the line of best fit. Each graph also reports the estimated slope and the associated market-level clustered standard error.

E.4 Sensitivity to Market Definition

Our empirical strategy crucially depends on the market definition. In this section we verify the robustness of our results after perturbation of the boundaries of the market. We modify our baseline market definition along two dimensions. First, we use a finer industry classification: the NACE 3-digit level. Second, we move to a wider geographical unit of analysis: from municipality to the local labor market (LLM). Table E2 shows that our baseline estimates remain substantially similar.

Table E2: Sensitivity to Market Definition

Geography: Industry:	Municipality- NACE 3 digit (1)	LLM- NACE 2 digit (2)	LLM- NACE 3 digit (3)
	A. *Outcome:* Revenue		
Market-level bunching rate	-0.010***	-0.019***	-0.011***
	(0.004)	(0.005)	(0.003)
	B. *Outcome:* Value Added		
Market-level bunching rate	-0.039***	-0.061***	-0.046***
	(0.005)	(0.007)	(0.005)
	C. *Outcome:* Productivity		
Market-level bunching rate	-0.020***	-0.027***	-0.022***
	(0.004)	(0.005)	(0.003)
Observations	23,314,059	23,314,059	23,314,059
Firm FE	Yes	Yes	Yes
Year-cohort FE	Yes	Yes	Yes
Municipality-year FE	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes
Age share-year FE	Yes	Yes	Yes

Note: This table presents the 2SLS estimates of the effect of (instrumented) market-level bunching rate on firm-level log of revenue, log of value added and log of productivity. It shows the β coefficient estimated from equation (7). In each column we perturbate the definition of a market by using the local labor market (instead of municipality) where the firm operates and/or a more detailed industry classification (NACE at the 3 digit level). The sample is composed of "competitor" firms, which are all firms that are not individual firms. The instrument, described in equation (5), is based on policy changes and a market's (fixed) demographic composition. Standard errors clustered at the market level are reported in parentheses.

E.5 Alternative Measures of the Bunching Rate

Table E3 show that our estimates remain consistent when we use alternative measures of the bunching rate. We propose three alternative ways to define the bunching rate. First, we use our baseline classification, but keeping fixed the number of firms operating in a market from the initial period. Although we show that our estimates are not sensitive to changes in market size, we adopt this strategy to account for potential variations in our bunching measure resulting from variation in the denominator (rather than in the numerator). Second, we scale the number of "bunchers" by the number of individual firms (rather than all firms). Finally, we use a variable more closely related to the "classical" measure of bunching, calculated as the ratio of firms reporting revenue just below the eligibility cutoff (from -5,000 euros of normalized revenue) compared to those reporting revenue above the cutoff (until 10,000 euros of normalized revenue). Although the interpretation of the first-stage effect varies depending on the measure used to quantify the baseline bunching rate, we observe that regardless of the method used to measure bunching, it has a negative impact on the outcome variables of interest.

Table E3: Sensitivity to Alternative Measures of the Bunching Rate

Outcome variable:	Bunching measure:			
	Baseline	Fixed denom	Classical	Modified classical
	(1)	(2)	(3)	(4)
Outcome: Revenue	-0.019***	-0.016***	-0.003**	-0.005**
	(0.006)	(0.005)	(0.001)	(0.002)
Observations	23,314,05	23,314,059	18,994,238	23,314,059
Firm FE	Yes	Yes	Yes	Yes
Year-cohort FE	Yes	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes	Yes
Municipality-year FE	Yes	Yes	Yes	Yes
Age share-year FE	Yes	Yes	Yes	Yes

Note: This table presents the 2SLS estimates of the effect of (instrumented) market-level bunching rate on firm-level log of revenue. It shows the β coefficient estimated from equation (7). Each column yields the 2SLS estimate from using a different variant of the bunching rate measure. Column 1 reports estimates from our baseline measure of bunching, calculated as the fraction of individual firms that report revenue just below the cutoff determining eligibility for preferential tax schemes. Column 2 shows estimates when calculating the bunching rate by keeping fixed the number of firms in each market by the initial period. Column 3 reports estimates using a "classical" measure of the bunching rate, calculated as the ratio of firms below versus above the notch. Column 4 reports estimates using a variant of the classical measure, calculated as the ratio of firms below the notch versus the sum of firms below and above. Each specification includes firm, year-cohort, industry-year, municipality-year and age share-year fixed effects. The sample is composed of "competitor" firms, which are all firms that are not individual firms. The instrument, described in equation (5), is based on policy changes and a market's (fixed) demographic composition. Each market is defined at the municipality-industry-year level. Standard errors clustered at the market level are reported in parentheses.

F Dynamic Olley-Pakes Productivity Decomposition

We examine the effects of a variation of the bunching rate on variation of the productivity at the market level employing the decomposition approach proposed by Melitz and Polanec (2015). This approach allows us to assess, for any period, the relative contribution of three groups of firms: the ones that survive (i.e., incumbents), entrants, and exiting firms. For incumbents, it is possible to further distinguish the contribution of two more components: (i) the variation in the efficiency of individual firms (i.e., within margin); and (ii) the reallocation of resources to firms characterized by different productivity levels (i.e., between margin). Therefore, for each market and any year, we decompose the productivity growth into four main components: the productivity growth of incumbent firms, the covariance between employment shares and productivity (which measures the extent of reallocation), and the contribution of entering and exiting firms.

Formally, and following Melitz and Polanec (2015), we split firms into entrants (E), exiters (X), and incumbents (S), and we define Φ_{gt} and w_{gt} as the aggregate productivity and the share of employment in the group $g \in \{E, X, S\}$ at time t. Then:

$$\Phi_1 = \Phi_{S1}\omega_{S1} + \Phi_{X1}\omega_{X1}; \tag{10}$$

$$\Phi_2 = \Phi_{S2}\omega_{S2} + \Phi_{E2}\omega_{E2}, \tag{11}$$

and the difference between Φ_1 and Φ_2 is:

$$\Phi_2 - \Phi_1 = (\Phi_{S2} - \Phi_{S1}) + \omega_{E2}(\Phi_{E2} - \Phi_{S2}) + \omega_{X1}(\Phi_{S1} - \Phi_{X1}) \tag{12}$$

Following Melitz and Polanec (2015), we can rewrite the former equation as:

$$\Phi_2 - \Phi_1 = \Delta\varphi_S + \Delta Cov_S + \omega_{E2}(\Phi_{E2} - \Phi_{S2}) + \omega_{X1}(\Phi_{S1} - \Phi_{X1}) \tag{13}$$

where $\Delta\Phi_t$ measures the gain deriving from average productivity changes, ΔCov_t the increase due to reallocation of workers toward more productive firms, $w_{E2}(\Phi_{E2} - \Phi_{S2})$ the gain from new firm entering the market and $w_{X1}(\Phi_{S1} - \Phi_{X1})$ the contribution of firm exiting the market.

It is worth noting that the contribution of the selection margin at the productivity decomposition depends on the reference productivity level for entrants and exiters. Namely, entrants generate positive productivity growth if (and only if) they have higher productivity than the remaining (surviving) firms in the same time period when entry occurs. Exiters, in turn, generate positive productivity growth if (and only if) they have lower productivity than the remaining (surviving) firms in the same time period when exit occurs.

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