Inverse December Fever

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Abstract

We analyze earnings of self-employed taxpayers in Austria and find significant bunching of taxable income at the first kink point of the income tax schedule. Combining income tax and VAT return micro data allows us to analyze the mechanisms driving this behavioral response. Taxpayers adjust their income by claiming additional deductions and decreasing their business profits at the end of the year. In particular, we observe for taxpayers unable (or unwilling) to claim deductions a decrease in December profits of 6% relative to November and 29% relative to December of previous year.

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1 Introduction

Expiring budgets are common in organizations and lead to spending surges at the end of the year (Davis, Dempster & Wildavsky (1966), Jones (2005), Lienert & Ljungman (2009)). This results in spending of lower quality even with marginal cost outweighing marginal benefit (Liebman & Mahoney (2017) and Douglas & Franklin (2006)). Such wasteful spending creates a negative impact on overall welfare. However, end-year spending surges can not only be caused by budgeting rules, but also by the tax schedule. In this paper, we exploit administrative in-year data to investigate the existence of 'December Fever' in income taxation. We find when taxpayers are adjusting their income, they reduce their profits at the end of the year.

The phenomenon of 'December fever' is well known in traditional public finance. The underlying mechanism of economic agents facing uncertainty and start last minute adjustments at the end of the year can be found in other areas as well. Especially in taxation, this mechanism may play an important role. Taxpayers without pre-determined income face uncertainty with respect to their ultimate income and the associated tax burden throughout the fiscal year. Uncertainty is highest at the beginning of the year and is declining when approaching the end of the year. For tax planning to be accurate and efficient, the desired outcome has to be approached with minimal tax planning costs. Therefore, knowledge of the outcome before tax planning is required to avoid wasteful tax planning activity. Since knowledge of the outcome before tax planning is subject to uncertainty, tax planning is optimally conducted at the end of the year where uncertainty is the lowest.

In this study, we concentrate on self-employed which are assumed to face a bigger set of tax planning opportunities (Slemrod 2007). We take a closer look at their businesses to assess the tax planning strategies employed. Firm-owners can adjust their firm profit by reducing their taxable income. Since firm profit is defined as the difference between revenues and expenditures, taxable income of firm-owners can be reduced by increasing expenditures or decreasing revenues. Both mechanisms conflict efficiency. Increasing expenditures is in particular wasteful if solely conducted for reducing the tax burden which would not have been conducted in absence of tax planning.[1] Decreasing revenues is realized by suspending (formal) business activity. This potentially affects not only single firms, but also competition by a temporary drop in the number of market participants. Even more severe for aggregate welfare is a transfer of projects into informal markets which results in a loss of tax revenue.

Our analysis captures firm responses due to tax planning of firm-owners. We focus on the reaction of Austrian sole-proprietorship firms owned by manager-owners with taxable income close to discontinuities in the income tax schedule. We test whether, when and how firms of bunching firm-owners react to increases in the marginal tax rate. Therefore, we use bunching estimators and compare in-year business activity of treated firms with those of untreated firms. This allows us to

[1] The same argument as for end-year surges of public goods applies, see Liebman & Mahoney (2017).

reveal the timing of the bunching decision as well as identifying employed adjustment channels.

Paetzold (2018) documents significant bunching of wage-earners in Austria at the first kink point of the personal income tax schedule. We confirm these estimates for self-employed and the relevance of deductions when adjusting taxable income. In the main contribution of our paper, we investigate the mechansims through which taxpayers adjust their income. To do so, we link income tax returns of firm-owners with in-year VAT data of their firms, to investigate the development of business activity throughout the year. We then employ an event study approach to identify deviations in profits for taxpayers in the bunching region at the end of the year. As expected, the adjustment of affected firms takes place at the end of the year. We find a reduction of gross profit in December of about 6 per cent relative to November and 29% relative to December of previous year. This drop is neither accompanied by a drop in November nor an increase in December which precludes intertemporal shifting.

The results of our study contribute to several strands in the literature. First, it complements the literature using administrative tax data and exploiting discontinuities in tax schedules for determining income elasticities (see, e.g, Saez (2010), Chetty, Friedman, Olsen & Pistaferri (2011), Kleven & Waseem (2013), Asatryan & Peichl (2016), Lediga, Riedel & Strohmaier (2016)). We contribute by providing elasticity estimates for firm-owners of small- and medium-sized sole-proprietorships in a developed country in Central Europe. So far, evidence for firm income tax elasticity is scarce and primarily limited to developing and Scandinavian countries.

Second, we contribute to the literature interested in the margins of adjustment channels of small firms. Previous studies showed that self-employed optimize their income by retaining earnings (le Maire & Schjerning 2013), transferring business activity to informality (Waseem 2013) and strategically switching between wage and dividend payouts for firm-owner remuneration Devereux, Liu & Loretz (2014). In addition, Almunia & Lopez-Rodriguez (2015) and Harju, Matikka & Rauhanen (2015) found evidence for reduced firm growth once tax compliance burdens are increased. We supplement this literature by showing that firms reduce business activity temporarily if the firm-owner can reduce her tax burden.

Third, our study complements the literature dealing with in-year analysis and intertemporal shifting. This literature encompasses contributions from different areas. For personal income taxation, Kreiner, Leth-Petersen & Skov (2014) use monthly wage data of Danish top-managers to show strategic tax planning at the end of the year. The same authors found a similar pattern for Danish wage-earners (Kreiner, Leth-Petersen & Skov 2016). LaLumia, Sallee & Turner (2015) revealed that taxpayers antedate births of their children to be eligible for tax benefits. In health economics, Einav, Finkelstein & Schrimpf (2015) found end-year surges in medical spendings for the US Medicare program. In labor economics, Oyer (1998) found proof that incentive schemes for salespersons and management lead to an increase in business activity at the end of the year. We complement this literature by showing the in-year business activity of firms is adjusted to meet

tax-planning goals of the owner. To the best of our knowledge, we are the first who analyses the influence of tax-planning on in-year business activity.

Fourth, by employing in-year business data we can explain the decision-making of taxpayers to bunch with the factor of uncertainty. According to our findings, tax-planning is conducted at the end of the year. This not only helps to understand bunching better, but is also of practical use for fiscal authorities to plan tax audits more efficiently.

The remainder of this paper is structured as follows. In section 2, the institutional setting of taxation of sole-proprietorships in Austria as well as the adjustment process is shown in a stylized model. Section 3 outlines the empirical strategy and the dataset we use. Then, in section 4 we show our preliminary results and conclude in section 5.

2 Conceptual Framework

2.1 Theoretical considerations

The tax liability of taxpayers is determined by gross income and deductions[2]. Hence, a taxpayer faces the following tax burden T[3]:

$$T = \tau\left(\Pi^{total} - Deductions\right) \tag{1}$$

where $\tau(\cdot)$ is a function for the underlying income tax schedule and Π^{total} the gross income of the taxpayer.

Taxpayers can reduce their tax burden T by either claiming additional deductions or reducing their gross income Π^{total}. Reducing (reported) gross income Π^{total} by one unit reduces the tax burden T by the same amount as claiming one unit of additional deductions.

Both, gross income and deductions, can be adjusted by behavioral responses or artificial manipulation. Taxpayers can react on the incentives for additional expenses provided by deductions and allowances or simply misreport. Generally, deductions are more likely subject to manipulation as they are directly filed to fiscal authorities by the taxpayer. In contrast, allowances are third-party reported by the employer to circumvent manipulation by increasing the burden of manipulation. However, when employees collude with their employer or the employer foregoes cross-checking, allowances can also be manipulated (see Paetzold & Winner (2016)). The same holds true for the manipulation of gross income for wage earners, where the leeway of manipulation is considered to be small. For self-employed, there exists no third-party reporting of gross income. The resulting

[2]Wage-earners can also claim deductions in form of allowances. Basically, an allowance is a deduction already considered at the monthly wage pay-out instead in the income tax return at the end of the year, but not affecting the yearly tax burden. Since the focus of this study is on self-employed, allowances are not further discussed.

[3]Tax credits would also reduce the the tax burden. However, tax credits are usually general lump-sum reductions of the tax burden which cannot be adjusted by the taxpayer and will therefore not be further discussed.

possibilities of strategical gross income reporting may therefore be an explanation for the elasticity of taxable income of self-employed which often exceeds that of taxpayers with third-party reported income.

Gross income of non-wage taxpayers is defined as the difference between earnings and expenses. For entrepreneurs, this is the profit of their business. Profit can be manipulated by decreasing earnings, increasing expenses or both. This can be either done virtually by exploiting the discontinuity of the tax year or by real adjustment. To exploit the discontinuity created by the tax year, taxpayers can employ intertemporal shifting of part of their earnings and antedating expenses for the next year. Doing so, leads to a potential decrease of tax revenue[4], but is not affecting general welfare as it is only a pure reporting effect. However, real adjustment raises welfare implications as the underlying production function is affected. Real adjustment can lead to lower earnings and higher expenses leading to an less efficient outcome.

Adjustment of deductions and allowances

Wage-earners can decrease their tax burden throughout the year by claiming allowances at their employer. The employer considers allowances in the calculation of the monthly paid out wage. Alternatively, wage earner can abstain from constantly claiming individual tax benefits and claim the tax benefit with deductions filed with the income tax return.

For self-employed deductions are the only possibility to claim individual tax benefits. Hence, they can claim these individual tax benefits only ex post.

Adjustment of gross profit

Unlike deductions, gross profit of self-employed can in principal be adjusted at any time throughout the year. However, because of uncertainty it is always best for self-employed to adjust gross profit at the end of the year which is shown in the following.

Timing. Gross profit is of a self-employed individual is determined by earnings minus expenditures:

$$\Pi = S - C - K \tag{2}$$

where C denotes costs of variable inputs (e.g. goods to be sold) and K other costs such as rent or wages which are fixed at least in the short run. Hence, in the short run gross profit can only be adjusted by sales S and variable inputs C.

[4]The tax liability is only reduced if next year's profit is lower as this year's profit because only then a lower marginal tax rate is applicable. If all profits in the future are higher than in the current year, the earning shifted will at least be taxed at the same marginal tax rate as in this year.

Gross profit Π is the sum of monthly profits π_m:

$$\Pi = \sum_{m=1}^{12} \pi_m = \sum_{m=1}^{12} s_m - \sum_{m=1}^{12} c_m \ - K \tag{3}$$

Lower case symbols represent monthly values. The taxpayer has no exact knowledge about future monthly realizations, but forms expectations a priori. Therefore, the expectation of annual gross profit Π in month m is given by

$$\mathbb{E}\left(\Pi|m\right) = \sum_{i=1}^{m-1} \pi_i + \sum_{j=m}^{12} \mathbb{E}\left(\pi_j\right) \qquad m \in [1..12] \tag{4}$$

Expected future realizations of outcomes are subject to uncertainty. We denote the uncertainty of expected annual profits $\mathbb{E}\Pi_m$ by σ^2 which decreases over the year (with increasing m). By assuming that uncertainty of expected future monthly profits σ_m is constant for all m,[5] so $\sigma_m = \frac{\sigma^2}{12}$, the taxpayer faces in month m uncertainty for gross profit:

$$\sigma^2|m = \sigma^2 \left(1 - \frac{m}{12}\right) \tag{5}$$

The taxpayer can adjust business activity of the firm to reduce profits for lowering her personal tax burden to the desired level of $\Pi^* < \Pi$. Adjustments create costs a:

$$a\left(\sigma^2\right) = \sigma^2 x + y(\Pi - \Pi^*) \tag{6}$$

Adjustment costs a are influenced by two factors, namely costs x which are increasing with uncertainty and time-independent costs y which encompass implementation costs and potential fines in case of illegal adjustments.

The optimal amount of adjustment is determined by the tax savings which must be greater than the adjustment costs:

$$\tau\left(\Pi\right) - \tau\left(\Pi^*\right) \geq a(\sigma^2) \tag{7}$$

With respect to timing, equation 7 is optimized when uncertainty is the lowest. From equation 5 follows that uncertainty is lowest when m is highest. Hence, to reduce adjustments costs, the taxpayer will conduct adjustments at the end of the year.

Channels. In principal, the taxpayer can conduct real adjustments of gross profits by increasing inputs and decreasing sales or conduct intertemporal shifting of business activity between tax years. In the following, these two channels are discussed in detail.

[5] This assumption does not affect the predictions but decrease complexity of the model.

For the firm it makes sense to shift a part p of firm profits Π to next year when

$$\tau\left(\mathbb{E}\left(\Pi^{f}\right)+p\Pi\right)+\delta\left(p\Pi\right)\leq\tau\left((1-p)\Pi\right) \tag{8}$$

where $\mathbb{E}\left(\Pi^{f}\right)$ denotes expected profit in next year and $\delta(p\Pi)$ encompass shifting costs such as adjustment costs with $\delta'(\cdot)>0<\delta''(\cdot)$.

Profit is shifted until the following condition is fulfilled:

$$\tau'\left(\mathbb{E}\left(\Pi^{f}\right)+p\Pi\right)+\delta'\left(p\Pi\right)=-\tau'\left((1-p)\Pi\right) \tag{9}$$

In case of zero shifting costs and sufficiently low expected next year profit, the share of profit shifted equals the share of profit beyond the kink point Π'. Therefore, the maximum share of profit shifted is $p=\frac{\Pi-\Pi'}{\Pi}$. However, p is decreasing in shifting costs $\delta(\cdot)$ and expected profit in next year $\mathbb{E}\left(\Pi^{f}\right)$.

Intuitively, a firm-owner decides to shift part of this profit if she faces sufficiently low shifting costs and expects future profits not significantly above the kink point. In practice, intertemporal shifting leads to a drop in business activity at the end of the current year which is followed by an increase in the next year. The underlying mechanism is either an adjustment in accounting or in real business activity. Intertemporal shifting by means of accounting can be accomplished by antedating invoicing customers.[6] Especially for private customers, getting invoiced later leads to a liquidity advantage at no cost. The adjustment can also be realised by shifting business (e.g. some projects) from the current year to the next year. However, real adjustment potentially creates substantial transactions costs especially with regard to coordination with customers and labour input planning. Therefore, we expect that the main mechanism in use is account adjustments.

The taxpayer can reduce business activity when facing an increasing marginal tax burden for its projects. The firm has to fulfill the following condition (assuming zero input costs):

$$\Pi-\tau\left(\Pi\right)\geq0 \tag{10}$$

Hence, the profit of the firm needs to exceed associated profit tax. Therefore, in an optimum, marginal profit must be equal marginal tax burden:

$$\Pi'\geq\tau'\left(\Pi\right) \tag{11}$$

With $\tau(\cdot)$ increasing in Π, at some level of Π conducting some of the projects becomes not lucrative any more and firms stop doing business. In particular, projects with least profitability will be neglected first as they are not profitable after an increase in taxation any more.

[6] Antedating invoicing is not generally illegal. Especially for firms with "Ist-Besteuerung" it is not forbidden to bill customers later. See: `https://www.usp.gv.at/Portal.Node/usp/public/content/steuern_und_finanzen/umsatzsteuer/zeitpunkt_entstehen_steuerschuld/40816.html`

Firms can respond to an increase in marginal taxation in two ways. First, they can reject projects which do not fulfill equation 11. In case they start rejecting projects in December, this may effectively result in a prolongation of Christmas holidays. Second, firms can reduce their activity on the paper only, meaning that they still conduct additional projects, but off-sheets, i.e. on the informal market. When considering the prosperous. When considering the prosperous shadow economy in Austria (see, e.g., (Schneider & Enste 2013)), this is an viable option.

Independent of the underlying response, business activity is be reduced when the marginal tax burden increases. Hence, we expect a decline in sales at the end of the year for firms sufficiently close to a tax threshold. Also, we expect for all firms a reduction in sales after crossing the tax threshold as they concentrate on projects with higher profitability.

2.2 Empirical strategy

To empirically assess the adjustments of taxpayers, bunching analysis to identify regions containing taxpayers with high proportions of adjusters is combined with event study analysis.

Bunching analysis

For the bunching estimations, the framework developed by Chetty et al. (2011) is employed. The underlying idea is to investigate the distribution of the reported taxable income near kink points with discontinuous increases in the marginal tax rate. The response is then identified by constructing a counterfactual distribution assuming no kink points. For the bunching estimator, the realized distribution is compared with the hypothetical counterfactual distribution.

In more technical detail, the counterfactual distribution is constructed by dividing the reported values into equal-sized bins and fitting a polynomial of high order for this distribution. For the estimation of the polynomial, all bins are used as datapoints. For the bunching region in the interval [-R, R] around the kink point, additional dummies are included to capture the specific bunching effect. The underlying regression is the following:

$$C_j = \sum_{i=0}^{q} \beta_i^0 \left(Z_j\right)^i + \sum_{i=-R}^{R} \gamma_i^0 \cdot \mathbb{1}\left[Z_j = i\right] + \epsilon_j^o \tag{12}$$

where C_j denotes the number of firm-owners in bin j, Z_j is the income relative to the kink in equal-sized intervals, q represents the order of the polynomial and R is the width of the bunching region.

After estimating equation 12, C_j is predicted while setting $\gamma_i^0 = 0$ to derive our counterfactual distribution. The difference between the realized distribution and the generated counterfactual distribution represents the excess mass. The excess mass encompasses all taxpayers who would

	Sum of gross income (GI) from seven legal categories
-	Income related deductions
=	Adjusted gross income (AGI)
-	Deductions and allowances
=	Taxable income (TI)
·	Tax formula
=	Tax liability
-	Tax credits
=	Tax due (T)

Table 1: Calculation scheme for personal income tax, simplified.

have reported different taxable incomes in absence of the increase of the marginal tax rate at the kink point. Based on this values, the elasticity of taxable income can be computed.

Gross profit adjustments

To assess the adjustment of gross profit, an event study analysis is conducted. Following **?**, deviations in monthly profit of taxpayers in the bunching region is assessed. This is implemented by using both within and between variation of taxpayers. Therefore, monthly profits of a taxpayer who bunches in a certain year is compared with monthly profits of that taxpayers in non-bunching years as well as with other taxpayers who are not bunching in the same year.

The event study approach takes into account that taxpayers may end up multiple times in the bunching region.

Formally, the underlying model of the event study is:

$$ln\pi_m = \gamma_i - b \sum_{i=b}^{B-t} e_{tp,t+i} + \sum_{j=-b+1}^{a-1} \gamma_j e_{tp,t-j} + \gamma_a \sum_{k=a}^{t-A} e_{tp,t-k} + \mu_{tp} + \mu_t + \epsilon_{tp,t}$$

The binary variable $e_{tp,t}$ captures the event of being in the bunching region and are unity when taxpayer tp reports in period t a taxable income in the bunching region. The relevant coefficients are the γ_i's which indicate the change in monthly profit in a certain month in percentage when the taxpayer reports income in the bunching region. To capture events outside the event window $A \leq t \leq B$, these events are summed up. We take into account both taxpayer-specific fixed effects μ_{tp} as well as time-fixed effects μ_t to capture unobserved characteristics.

3 Institutional background

All individuals in Austria are subject to personal income taxation. The simplified scheme for the calculation of the tax liability is shown in Table 1.

Gross income. The gross income is calculated by adding up all incomes an individual accrues. Incomes are classified into seven legal categories. Income which cannot be classified into one of the seven categories is not subject to income taxation. Capital income derived from interest, shares and other capital assets are subject to a 25% withholding tax. Losses accrued in one of the seven legal categories can be compensated with other categories.

Adjusted gross income. For some of the seven legal categories specific income related deductions are applicable which lower gross income.

Taxable income. After substracting general deductions and allowances, taxable income is established. Taxable income is the relevant indicator for taxpayers when targeting a tax-optimal outcome.

Tax liability. The tax liability is calculated by applying the progressive income tax schedule as outlined in Figure 1. The tax schedule consists of four tax brackets with increasing marginal tax rates applicable in each income bracket.[7] This creates four kink points. The tax schedule was slightly amended in 2009 by increasing tax bracket limits and decreasing marginal tax rates. The general outline of the schedule, especially the extraordinary increase in the marginal tax rate between from the first to the second tax bracket, remained unchanged.

Tax due. There exists some tax credits for certain subgroups of taxpayers, e.g. single-parents, leading to a final reduction in tax liability.

4 Data and Summary Statistics

For the analysis, income tax return data of self-employed are combined with firm-level VAT data of their non-incorporated businesses. The datasets are provided and administered by the Austrian Federal Statistical Office and contain the full population of self-employed taxpayers with small- and medium sized firms with annual turnover between 30,000 EUR and 1.2 million EUR for the years 2005-2013. Hence, the dataset contains all individuals in Austria with income from self-employment and information on 9X per cent non-incorporated firms in Austria during this period.

The firm VAT data entails both annual VAT declarations and monthly VAT advance payment returns. Taxpayers are obliged by law to file annual VAT declarations as well as in-year VAT advance payment returns. The majority of firms (XX per cent in the sample) have to file their VAT data on a monthly basis. For small firms, there exists the option to file VAT advance payment

[7] The marginal tax rates are applicable without rounding decimal places.

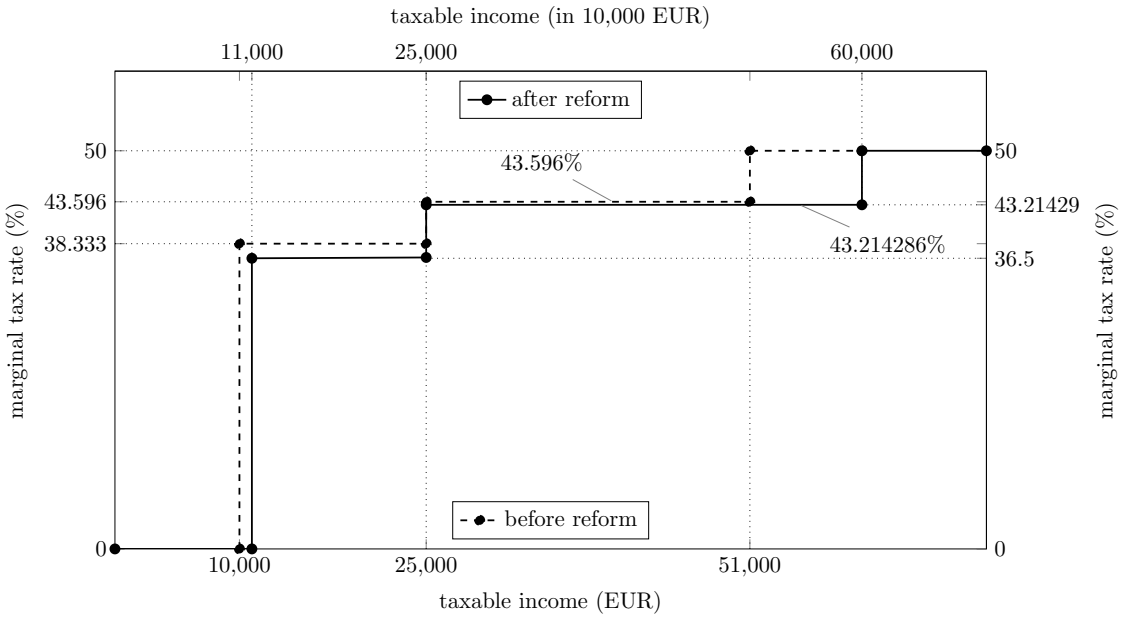

Figure 1: Personal income tax schedule in Austria before (see x-axis at the bottom and y-axis at the left) and after (see x-axis at the top and y-axis at the right) the reform in 2009.

returns on a less frequent basis[8], however, hardly any taxpayers uses this option. The sample is restricted to firm-year observation with VAT advance payment returns available in all months. By imposing this restriction primarily business which stopped operating throughout the year are excluded from the analysis.

The information on sales and inputs entailed in the VAT data allows to calculate monthly gross profits.[9] This calculations allow an in-year business assessment.

Income tax returns of taxpayers have to be filed only once a year. The income tax returns contain detailed information on total gross income, claimed deductions and allowances as well as additional firm information on an annual basis. Taxpayers receive income from different income categories, e.g. rent (XX per cent of taxpayers) or wage income (YY per cent of all owners). Also, taxpayers may run multiple businesses (X per cent of taxpayers).

The analysis is further restricted on businesses operating as sole-proprietorships, i.e. non-incorporated firms with a single owner. Doing so ensures the exclusion of all sort of interaction

[8]All firms with an annual turnover beyond 30,000 EUR are obliged to participate in the VAT system. If they participate in the VAT system, they have to file VAT advance payments in-year. The frequency of filing requirements depends on annual turnover: Firms below 100,000 EUR annual turnover can file their VAT advance payments on a quarterly basis, firms beyond this threshold have to file it on a monthly basis. However, firms below 100,000 EUR annual turnover can opt-in for monthly filing which the vast majority of firms do.

[9]Gross profit calculated using VAT data are only capturing flexible inputs, but not costs for fixed inputs such as labour costs and rents.

effects in taxable income adjustment in cases two or more taxpayers are cooperating. Further, taxpayers with firms subject to special tax rulings are excluded.[10] For the remaining firms, the VAT data is linked to their owners using anonymized identifies which allow unambiguous matching. This leads to more than 720,000 firm-year observations of almost 200,000 taxpayers which reported more than 8.6 million monthly VAT advance payment returns. Table 2 holds the summary statistics for the most important variables.

Table 2: Summary statistics sample

Variable	# obs	mean	S.D.	min	max
Taxable income	696,448	15090.31	94940.53	-67,501.72	292,781.00
Annual turnover	723,835	285,822.00	452,778.00	6,156.00	1,632,032.00
Monthly turnover	8,705,813	28,817.25	68,931.46	0	158,166.90
Monthly VAT-inputs	8,705,813	3394,531.00	12740.63	0	22,273.68
Employees	503,686	3.72	5.98	0	21
Deductions & exemptions	593,557	2522.09	36,457.00	0	34,160.32

5 Empirical Analysis

5.1 Bunching

We start by analyzing the distribution of taxable income before and after the tax reform in figure 2. The dashed line indicates the marginal tax rates applicable as well as the kink points. The distribution is right-skewed before and after the reform.[11] While the distribution is smooth at other kink points, a substantial spike is observable at the first kink point. This pattern holds true before and after the reform.

We investigate the bunching pattern at the first kink point in more detail. All years are pooled and the distribution is centered at the first kink point by calculating the distance between each observation and the bracket cutoff. Observations are then grouped into bins of 100 EUR, with positive (negative) values denoting being above (below) the kink point.

Figure 3 presents a histogram of the bin counts around the first kink point (blue line). By zooming in, the spike in the distribution becomes even more pronounced. To analyze the size of the spike, a counterfactual distribution is calculated using a polynomial (red line). The underlying polynomial is of degree 7 and calculated by excluding the bunching window of 7 bins to the left and the right of the kink point. The excess mass serves as statistic for the size of the spike. The calculated excess mass is 1.60 and highly statistically significant (standard error 0.1837). This translates

[10] Between 2005 and 2012, firms active in the accomodation and food service industry could opt for a special lump-sum taxation instead of regular taxation.

[11] Note that the higher number of observations after the reform results both from an increase in income tax payers and a longer time horizon (2005 to 2008 vs. 2009 to 2013).

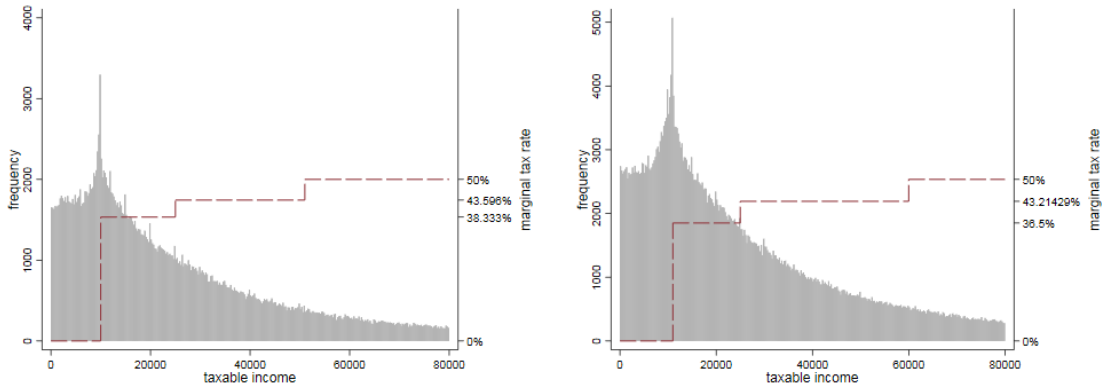

Figure 2: Distribution of taxable income before (left panel) and after the tax reform (right panel). Bin size is 250 EUR. The dashed red line represents the marginal tax rate.

into an additional mass of 160 per cent of the mass in this area in the counterfactual distribution. The resulting elasticity of taxable income, calculated in line with Chetty et al. (2011), is 0.016. The dimension of this elasticity is in line with previous studies using the bunching methodology to determine the elasticity of taxable income (**CITE**).

5.2 Deductions

Above we found evidence for substantial bunching behavior. We now want to explain underlying mechanisms leading to bunching. Previous research (e.g. Doerrenberg, Peichl & Siegloch (2017), Schaechtele (2018)) show that deductions are a major driver for bunching patterns. Hence, we start by analyzing the role of deductions in more details.

As figure 1 shows, the marginal tax rate increases from 0 to 36.5 respectively 38.333 per cent. This implies that while each additional unit of income is taxed at this rate, each unit of additional deductions claimed reduces the tax burden by 0.365 respectively 0.38333. Effectively, the incentive to claim deductions at all becomes effective at the first kink point.

Figure 4 plots deductions claimed in accordance to gross income (before any deductions). Strikingly, a discontinuity at the first kink point of the income tax schedule is revealed. While the mean in deductions for the bin just below the threshold is 665 EUR, the mean in deduction for the bin just above the threshold is 990 EUR. This reflects an increase in deductions claimed of about 50 per cent.

To comprehend the change in deduction claiming behavior, we investigate taxpayers crossing the first kink point during our sample period. Therefore, we employ an event study approach where we define the event as crossing the first bracket cutoff for the first time. We focus on itemized

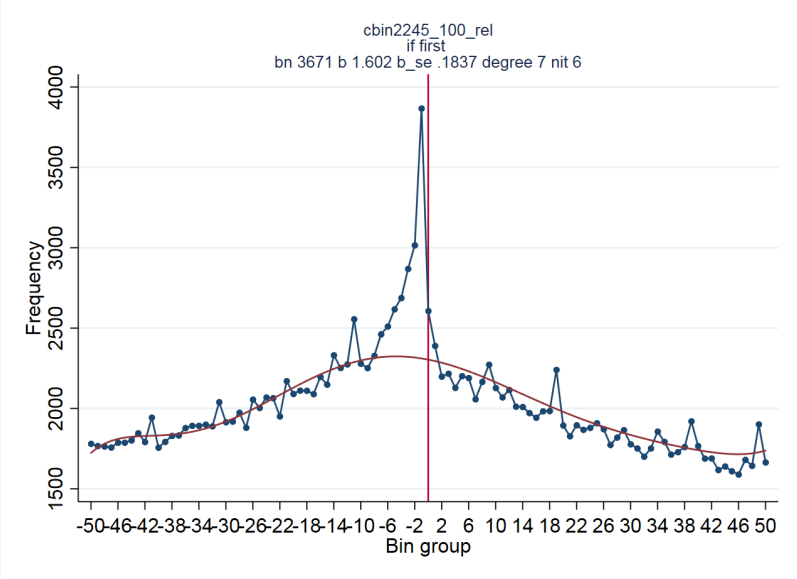

Figure 3: Distribution around the first kink of the income tax schedule (before and after reform). The bin group represents the distance to the threshold in bins of 100 EUR where positive (negative) values indicate taxable incomes beyond (below) the threshold. The counterfactual distribution is calculated using a polynomial of degree 7 and excluding 7 bins to the left and to the right of the kink.

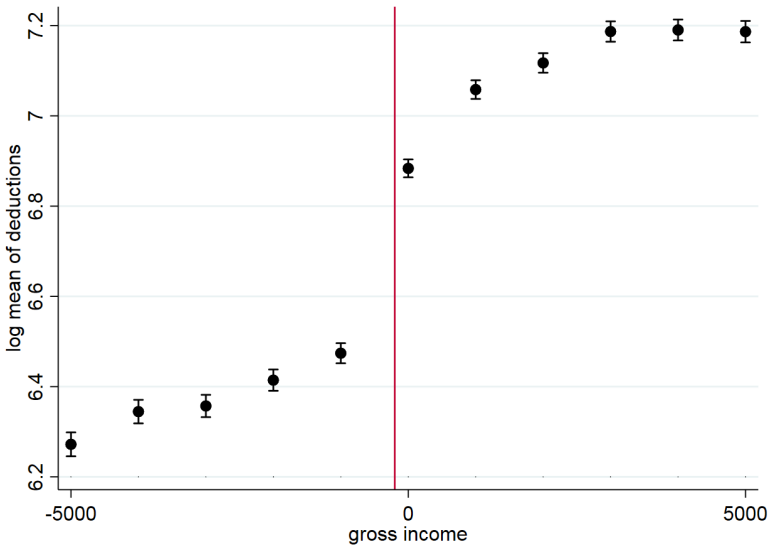

Figure 4: Development of deductions claimed by taxpayers according to their gross income. Taxpayers are grouped in bins of 1000 EUR relative to the first kink point. Deductions are log-transformed to cope with outliers. Taxpayers with zero deductions claimed included by using hyperbolic sine transformation ($deduction + \sqrt{deduction^2 + 1}$).

deductions for two reasons. First, itemized deductions are deductions taxpayers can easily adjust by increasing expenditures. Second, itemized deductions represent 80 to 90 per cent of all deductions claimed (see figure 10 in the Appendix).

Figure 5 shows the change of growth in deductions claimed over time. Deduction growth stays constant for years taxpayers report gross income below the first kink point. Once they cross the bracket cutoff ($t = 0$), taxpayers claim 62 per cent more deduction compared to last year. In the following year ($t = 1$), taxpayers claim 33 per cent less deductions compared to the last year. This speaks for antedating some deductible expenditures in the year the taxpayer crosses the bracket cutoff for the first time. In the following years, the new optimal amount of deductions seem to be reached with no changes in deductions from one year another any more.

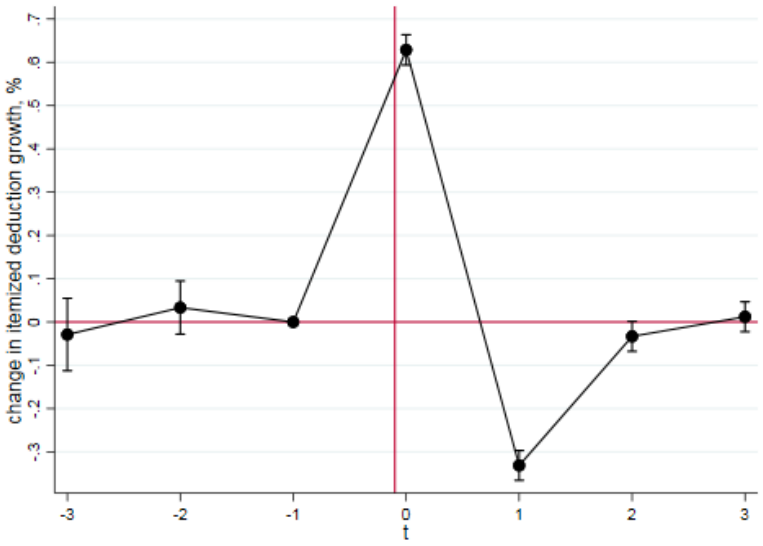

Figure 5: Development of claimed itemized deductions. The underlying event study focuses on the development of the change in claimed deductions from one year to the next year ($log(deductions_t) - log(deductions_{t-1})$). Taxpayers with zero deductions claimed included by using hyperbolic sine transformation ($deduction + \sqrt{(deduction^2 + 1)}$). The event is defined as taxpayer having gross income above the first kink point for the first time. Taxpayers always or never reporting gross income above the first kink point are excluded.

Taxpayers change their deduction claiming behavior once they occur income subject to a marginal tax rate. The increase in deductions claimed are significant. The distribution of taxable income is affected by this discontinuity of deductions claimed.

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This structural change at the kink point leads to additional excess mass. Effectively, the change

in the deduction claiming behaviour of taxpayers lead to an overlap in the distribution of taxable income: In the bunching region, there exist taxpayers with similar taxable income, but different underlying combinations of gross income and deductions.

5.3 Income adjustment

Above we showed that deductions are playing a crucial rule in explaining the bunching pattern. However, figure 6 shows that there is also bunching at the first kink point when looking at gross income before deductions. The estimated excess mass is with 0.64 smaller than for taxable income, but also statistically highly significant (standard error 0.22). This implies that about 39 per cent of the observations in the realized distribution at the threshold can be classified as bunchers.

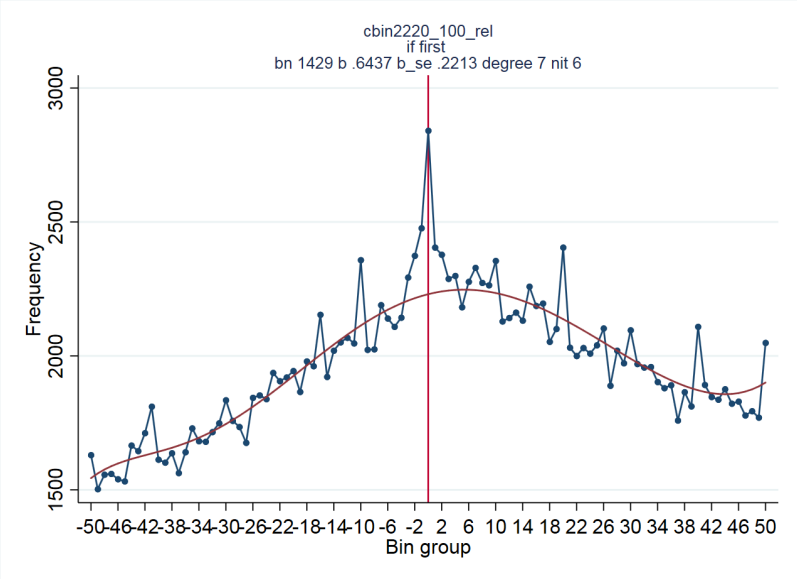

Figure 6: Distribution around the first kink of the income tax schedule (before and after reform). The bin group represents the distance to the threshold in bins of 100 EUR where positive (negative) values indicate taxable incomes beyond (below) the threshold. The counterfactual distribution is calculated using a polynomial of degree 7 and excluding 7 bins to the left and to the right of the kink.

The excess mass at the first kink point in the distribution of gross income can only be caused by income adjustment. Taxpayers in the excess mass are aiming to end up just below the threshold to save taxes. Figure 7 depicts the gross profit margin relative to the first kink point. The gross profit margin is defined as the ratio of gross profit (sales minus inputs subject to VAT) to sales. At the threshold, there seems to be a slight decline in the gross profit margin which may indicate that firms there are less profitable than in neighboring regions.

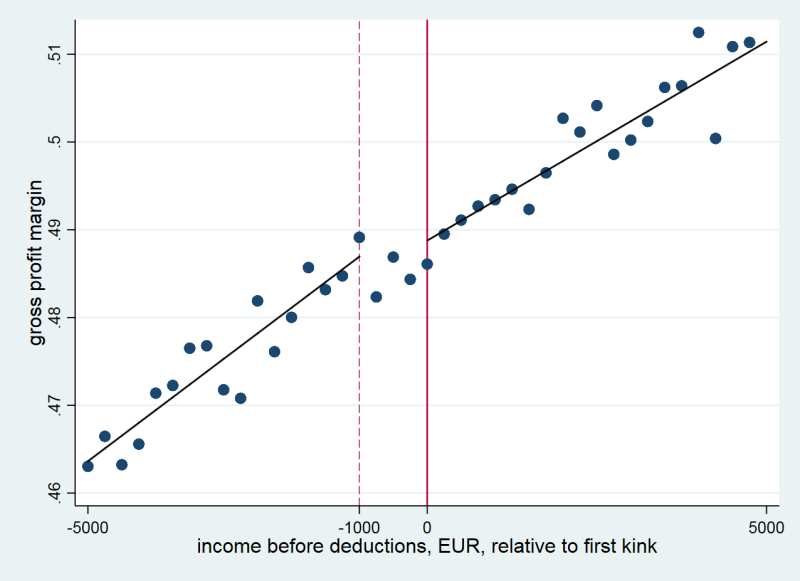

Figure 7: Development of gross profit margin in relation to gross income, centered at first kink point. Gross profit margin is defined as gross profit (sales minus inputs subject to VAT) divided by sales. Bin size is 250 EUR. Lines are fitted for values below the kink point and above the kink point separately.

Next, we are looking in the development of gross profit into more detail. As outlined in section 2, taxpayers are expected to adjust their profits not before the end of the year. Hence, we look into monthly gross profits of firms owned by taxpayers who bunch with their gross income and the development of gross profit around the end of the year. We implement an event study approach, where the event is defined as taxpayer reporting gross income in the region [-200, 0] EUR to the first kink point. This region covers the majority of the excess mass.

Figure 8 presents the month-to-month development of monthly gross profits. December is defined as period $t = 0$. Before and after December, firms owned by bunching firm-owners exhibit no statistically significant difference in monthly gross profit. However, in December a highly significant reduction of 2.23 per cent in monthly profits is observable. The underlying population for this estimate consists of bunchers and non-bunchers. When taking into account that the excess mass of bunchers represents only 39.16 per cent of the underlying populuation, the reduction in monthly profits for firms owned by bunchers is 5.69 per cent (while for non-bunchers it is 0).

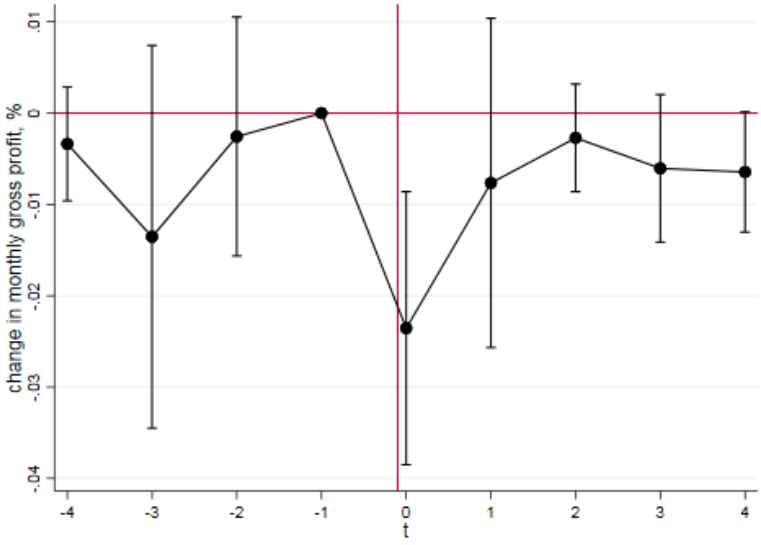

Figure 8: Event study results for the month-to-month development of gross profits per month around December ($t = 0$). The event is defined as taxpayer in the bunching window (region [-200, 0] below the first kink point). This panel shows deviations in the monthly reported gross profits defined as sales minus inputs subject to VAT reported in the respective month.

Figure 9 shows the development of annual growth in monthly gross profits. December is again defined as period $t = 0$. Growth in monthly gross profit is defined as the change in monthly profit in month t relative to $t-12$ (in the last year). We find no deviations in the months before and after the event, but a drop of 11.21 per cent in December gross profits. This implies that firms owned

by bunching taxpayers report less gross profit in December of the previous (non-bunching). When considering that this effect is created by 39.16 per cent of the underlying population, the actual reduction in December gross profit is 28.63 per cent.

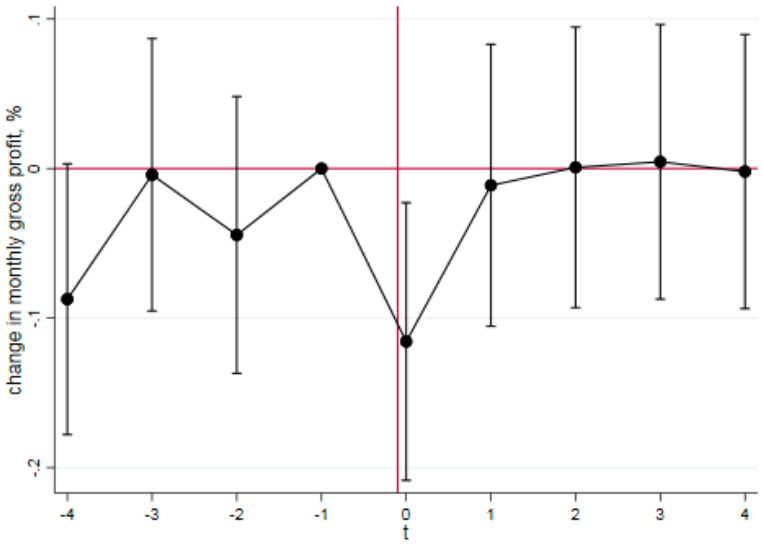

Figure 9: Event study results for the annual growth of gross profits per month around December ($t = 0$). The event is defined as taxpayer in the bunching window (region [-200, 0] below the first kink point). This panel shows deviations in the monthly reported gross profits compared to gross profits in the same month last year. Gross profit is defined as sales minus inputs subject to VAT reported in the respective month.

The event studies show a decline in gross profits in December which is not accompanied by other effects such as increases in January. This precludes intertemporal shifting from one calendar year to another.

6 Conclusion

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Appendix

Dataset

Table 3: Variables

Variable	Frequency of filing
Taxable income	annually
Turnover	annually and monthly
VAT inputs	annually and monthly
Deductions & exemptions	annually
Employees	annually (indirectly)

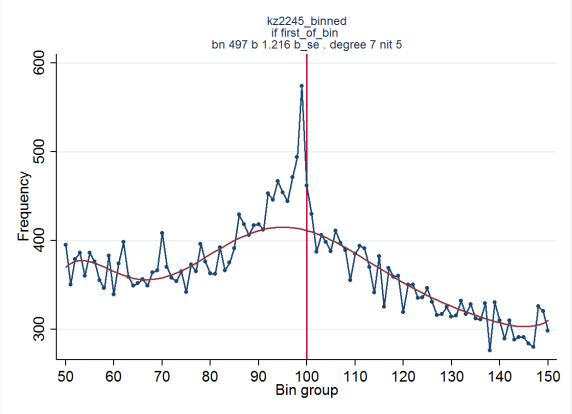
Income tax schedule

tax	**until 2008**			**since 2009**		
bracket	*low. lim.*	*up. lim.*	*MTR*	*lower limit*	*upper limit*	*MTR*
1	0	9.999	0%	0	10.999	0%
2	10.000	24.999	38.333%	11.000	24.999	36.5%
3	25.000	50.999	43.596%	25.000	59.999	43.214286%
4	51.000		50%	60.000		50%

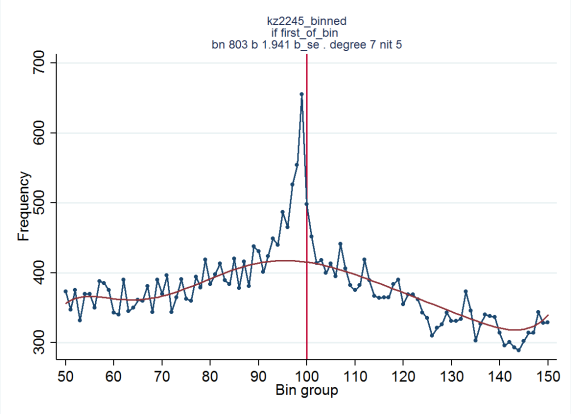
Table 4: Personal income tax schedule in Austria. Abbreviations employed: low. lim. = lower limit; up. lim. = upper limit; MTR: marginal tax rate. Source: Austrian Einkommensteuergesetz (EStG).

Bunching evidence by year

2005



2006



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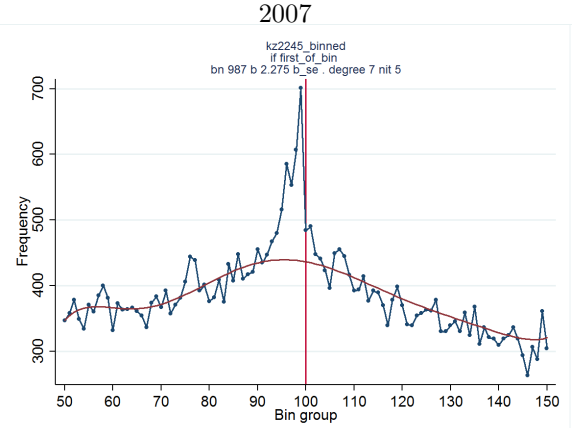
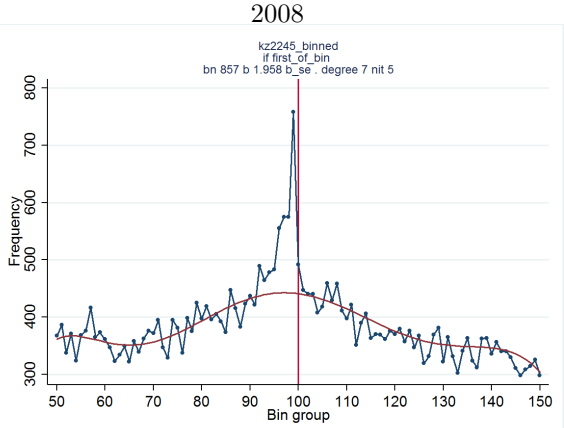


2008



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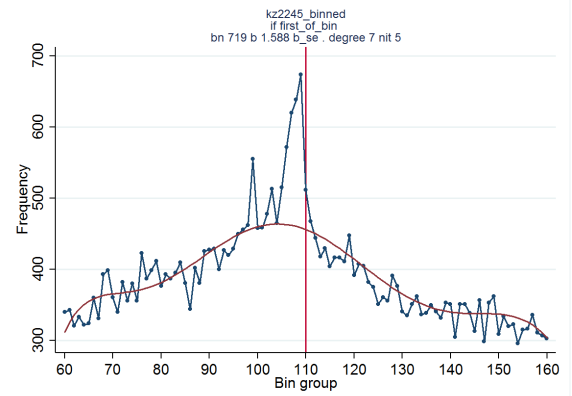
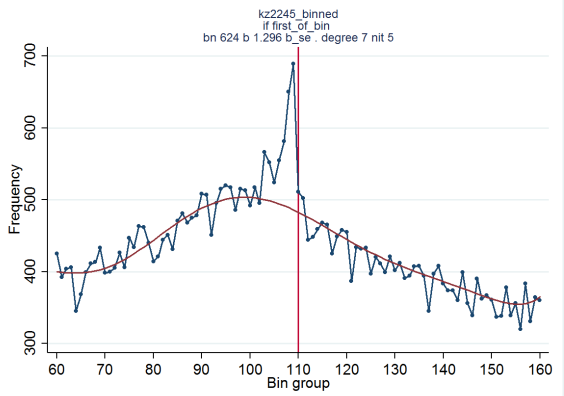


2010



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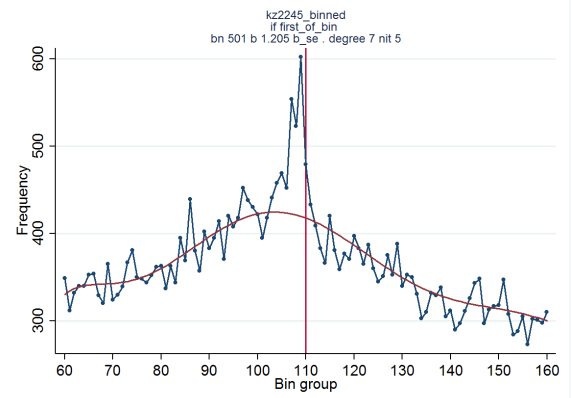

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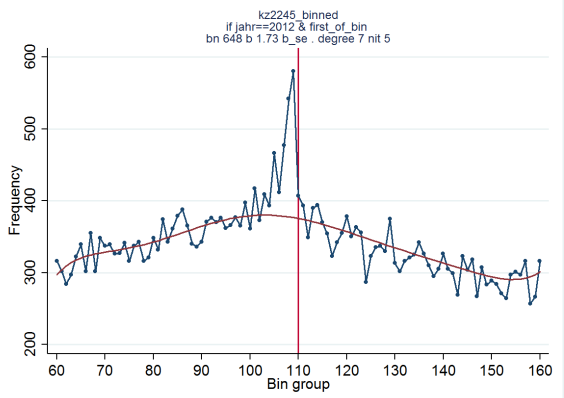

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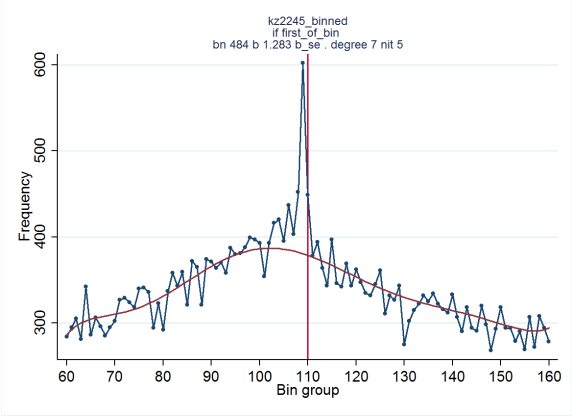

Bunching evidence by industry

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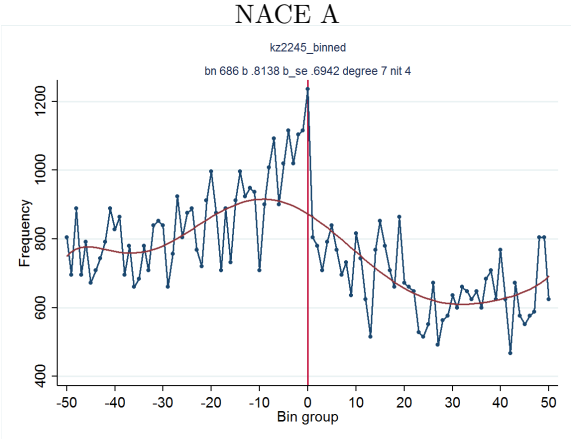

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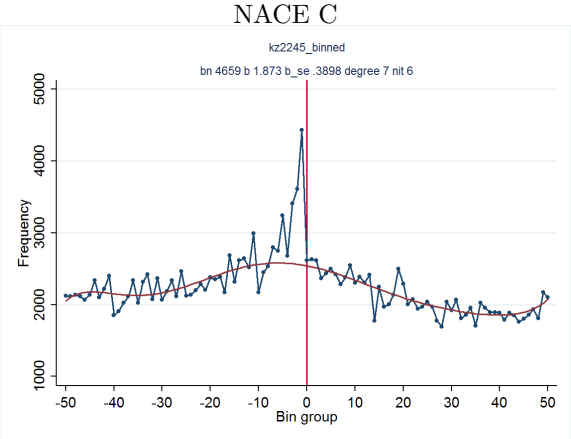

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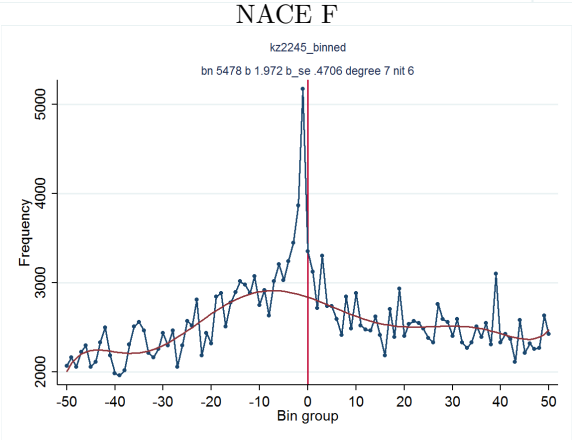

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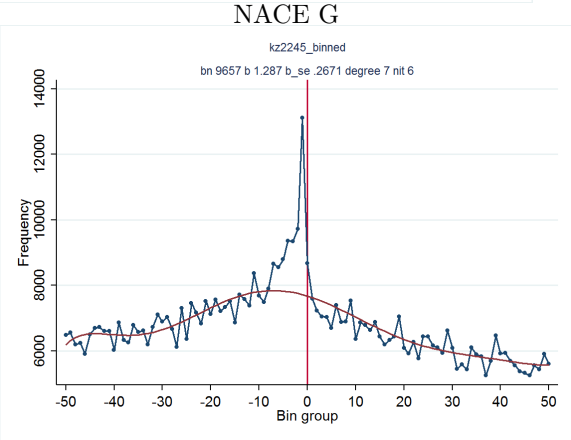

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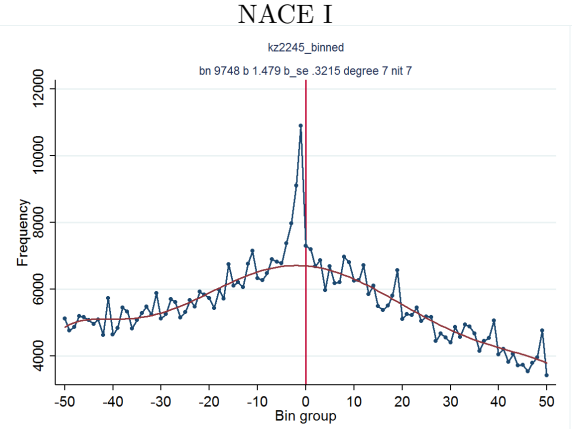

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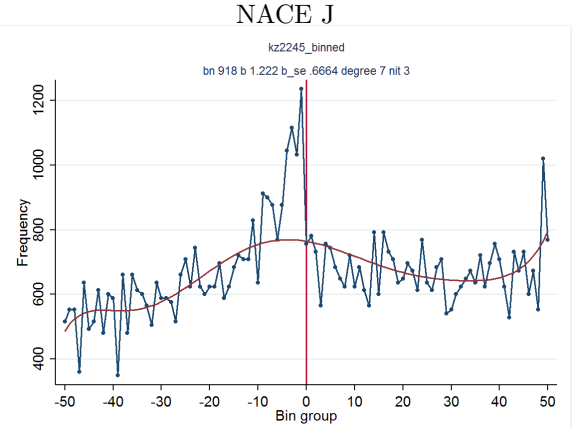

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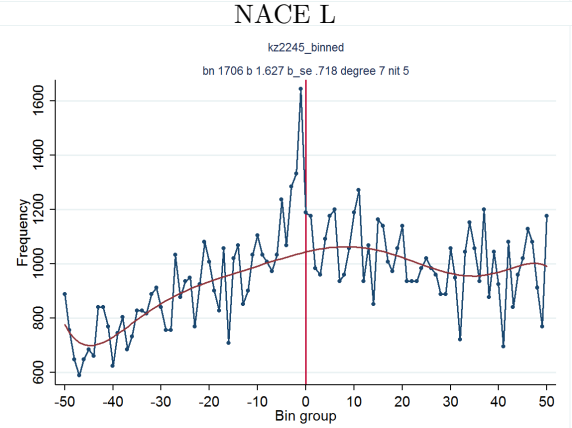

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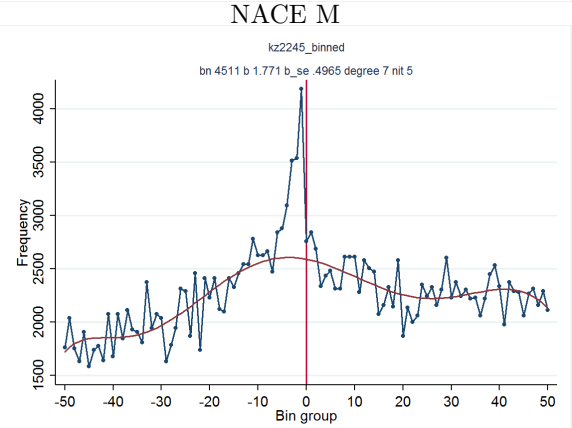

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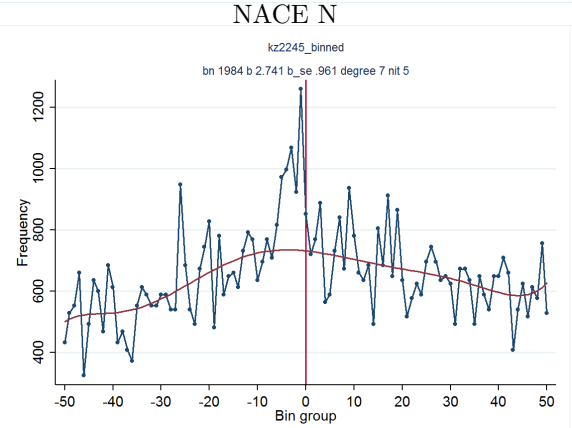

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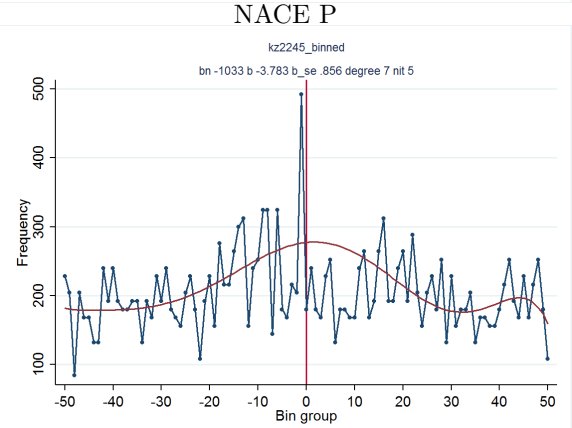

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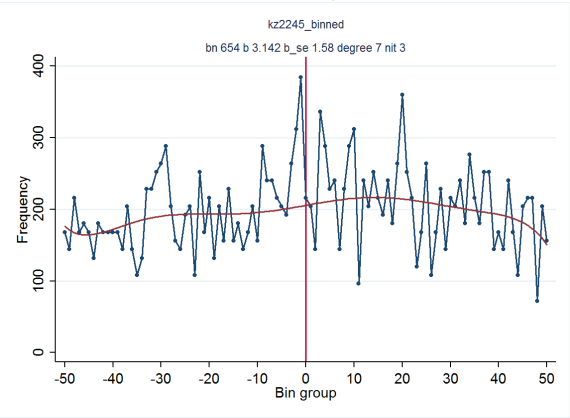

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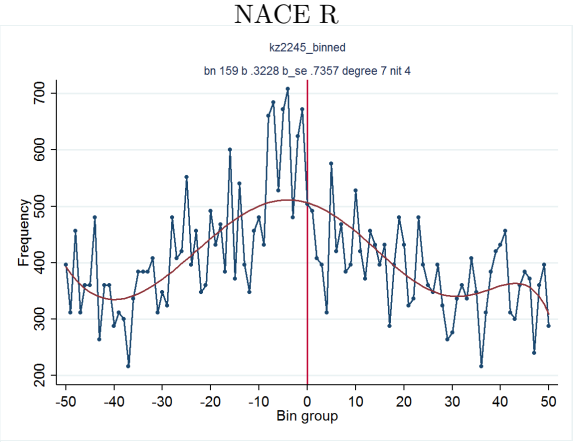

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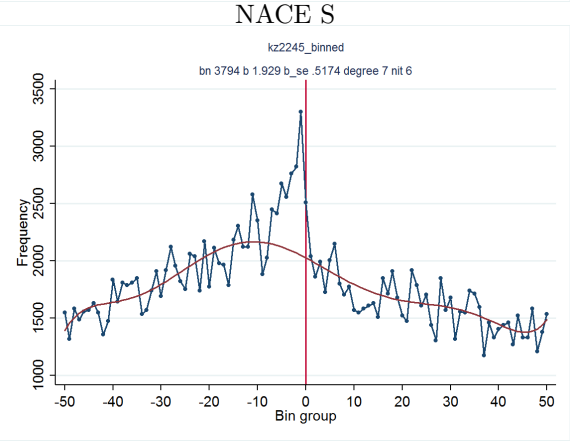

Deductions

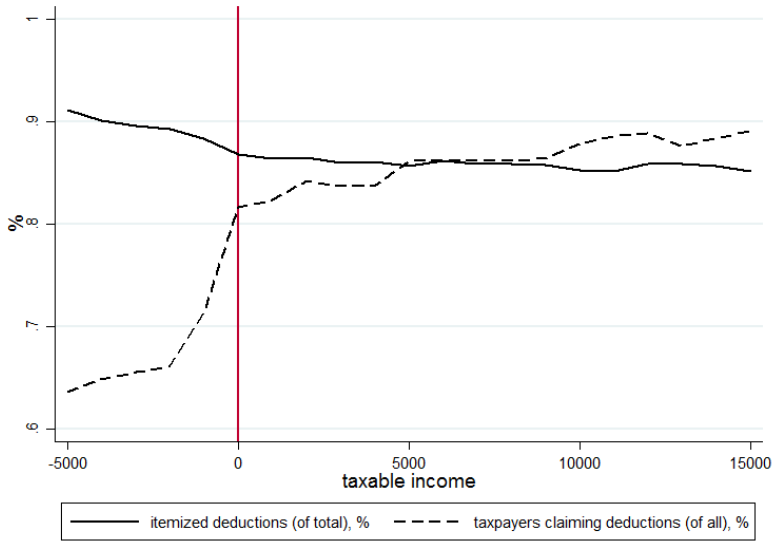

Figure 10: Importance of itemized deductions on total deductions claimed and share of taxpayers claiming deductions in accordance with taxable income (relative to first kink point in the tax schedule).