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ABSTRACT

Using Tax Deductions to Promote Lifelong Learning: Real and Shifting Responses*

Policymakers are concerned about potential underinvestment in lifelong learning. In this paper we study to what extent a tax deduction helps to stimulate post-initial training. Specifically, we employ a regression kink and regression discontinuity design as jumps in tax bracket rates generate exogenous variation in the effective costs of lifelong learning. Using high quality data on tax returns of the universe of Dutch taxpayers, we find that the tax deduction has heterogeneous effects on lifelong learning. Low-income singles show no response. For high-income singles we find an effect of 10% on the probability to use the tax deduction. Furthermore, ignoring shifting of expenses between partners leads to spurious large estimates for primary earners and spurious negative estimates for secondary earners.

JEL Classification: C21, H20, J24
Keywords: lifelong learning, tax deduction, RKD, RDD

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1 Introduction

Lifelong learning is high on the policy agenda. Societal and technological changes increase the need to invest in lifelong learning. For example, effective retirement ages in developed economies have risen dramatically over the past decade.[1] Also, technological change and globalization seem to reduce the lifespans of sectors, firms and products (Goos et al., 2014; Michaels et al., 2014). As a result, individuals are more likely to switch jobs and careers during their (prolonged) working life, and are more likely to switch tasks within a given job. In the face of these changes, maintaining and investing in human capital during working life becomes increasingly important. At the same time, policymakers worry that individuals and/or their employers underinvest in lifelong learning, due to e.g. hold-up problems (Malcomson, 1997, 1999).[2] Although it is difficult to determine empirically whether there is underinvestment in lifelong learning in general, policymakers seem particularly worried about certain subgroups of the population that have a distaste for formal learning, such as lower educated individuals (see e.g. the Adult Education Survey) and that work in sectors that seem particularly 'at risk' by technological change and globalization.

Policymakers therefore try to mitigate potential underinvestment in lifelong learning. Governments provide financial support to employees or their employers that undertake lifelong learning, they regulate and fund post-initial education and training, inform employees and their employers about the possibilities for lifelong learning and scrutinize their labor market regulations for adverse side effects. Recently, a literature has emerged that investigates the effectiveness of different policy measures. However, so far only direct financial support measures have been investigated systematically and even then the empirical evidence on the effectiveness of this type of policy remains scarce. On the prospects for tax incentives to stimulate lifelong learning we know very little.

In this paper we study whether a tax deduction for post-initial education can stimulate investment in lifelong learning. Specifically, we consider the effect of a tax deduction in the Netherlands, where individuals can deduct their expenditures on post-initial work-related training and education from their pre-tax personal income. Jumps in marginal tax rates provide exogenous variation in the financial incentives to undertake

[1] The Netherlands is no exception and the current 30-year olds are expected to retire beyond their 70th birthday.

[2] Though studies have also identified factors that may mitigate this hold-up problem, like reciprocity and smart contract designs (Leuven et al., 2005; Hoffman and Burks, 2013).

lifelong learning. We study the effect of this exogenous variation on the probability of filing lifelong learning expenditures and on the amount of lifelong learning expenditures, for different subgroups and at different points in the income distribution.

We employ a regression kink and a regression discontinuity design to estimate the causal impact of the tax deduction on lifelong learning expenditures. The Dutch income tax system features two discontinuous jumps in the marginal tax rate. Moving from the left to the right of the discontinuity, the upward jump in the marginal tax rate implies a lower effective cost for lifelong learning to the right of the discontinuity. We prefer the regression kink design, which we can apply to singles, as the necessary conditions are met for this group. For couples however, we observe bunching at the kink, which we address by estimating a so-called donut regression discontinuity.

In the empirical analysis we use a high quality administrative dataset of tax returns on the universe of Dutch taxpayers for the years 2006–2013. This dataset provides information on all relevant earnings activities of the Dutch population, and also contains all the information on tax deductions. A particularly unique feature of the dataset is that it contains information on the amount spent by each fiscal partner, and on the amount filed by each partner after they potentially shift part of the expenditures to the partner with the highest marginal rate.

Our main findings are as follows. First, for singles we find heterogeneous effects of the tax deduction on the probability to file lifelong learning expenditures and on the amount of lifelong learning expenditures.[3] The effect at the kink at a relatively low level of income (approximately 18 thousand euro) is essentially zero. The effect at the kink at a relatively high level of income (approximately 55 thousand euro) is bigger: the probability to file expenditures on post-initial training increases by 10%. Second, for couples, for individuals that earn more than their partner (primary earners) we initially find large effects on the probability to file lifelong learning expenditures and the average amount filed. For individuals that earn less than their partner (secondary earners) we initially find counterintuitive negative effects. However, we show that these results are biased due to the shifting of the lifelong learning expenditures between partners. Third, when we consider the actual individual lifelong learning expenditures of each partner, and leave out the bins with excessive mass close to the tax bracket thresholds, we indeed find smaller effects for primary earners, and the effect becomes close to zero for secondary earners.

[3]Our sample of singles includes both singles without children and 'singles' with children (single parents). What is important for our analysis is that singles have no fiscal partner.

Our analysis makes a number of contributions to the literature. First, we contribute to the very small literature on the causal effects of tax incentives for lifelong learning. We build on the analysis by Leuven and Oosterbeek (2012), but make substantial improvements. The authors use a sample of about 100 thousand Dutch tax returns, of which only a subsample of individuals is close to the relevant tax bracket thresholds. Our paper uses about 10 million tax returns. Furthermore, we estimate separate regressions for singles and primary earners (in couples), and take manipulation of the running variable into account. Finally, for couples, we have the amount of lifelong learning expenditures before and after fiscal partners shift their lifelong learning expenditures, whereas Leuven and Oosterbeek (2012) only had access to data on final lifelong learning expenditures filed. Our analysis shows that ignoring shifting of expenses between partners leads to spurious large estimates for primary earners and spurious negative estimates for secondary earners. The only other paper, to the best of our knowledge, to directly study the effectiveness of tax stimuli for lifelong learning is by the same authors. In this paper Leuven and Oosterbeek (2004) focus on a tax incentive for lifelong learning directed at employers instead of employees. Specifically, they find that a tax advantage for training activities for workers over the age of 40 only shifted training expenses from employees just before 40 to those just over 40, with little to no effect on overall training expenses.

Second, we contribute to the general literature on the causal impact of financial incentives on lifelong learning. These papers typically find positive but limited responses to these subsidies. For example, Schwerdt et al. (2012) investigates a general voucher program in Switzerland, Hidalgo et al. (2014) look at a voucher program for specific sectors in The Netherlands and Görlitz and Tamm (2016) analyze a large co-financing instrument in Germany. In all cases, employees could pick a short training program at lower than regular costs. Training participation was increased by these subsidies between 13 to 20 percentage points. Interestingly however, no wage or employment effects were found for those lucky enough to obtain the subsidy. Furthermore, Schwerdt et al. (2012) also considers heterogeneous treatment effects and finds that lower educated individuals seem to benefit somewhat more by participating in additional training in terms of higher wages. Other papers in this literature investigate policies in which employers receive (part of) the subsidy directly (Görlitz, 2010; Abramovsky et al., 2011; Van der Steeg and van Elk, 2015).

Also, the results of our paper are related to a relatively new literature on the causal

effects of tax incentives for initial education, most often used for the education of the children of relevant taxpayers (Dynarski and Scott-Clayton, 2016). In countries with many private schools tuition expenses can be substantial and sometimes the tax authorities are subsidizing these expenditures directly. Also savings for future college tuition expenditures are in certain cases deductible. These tax subsidies are both meant to increase private school and college attendance, and to give income support to low- and middle income families with kids. A few papers have been able to identify causal effects on higher education participation and these papers found small effects of these tax subsidies at best. Bulman and Hoxby (2015) find negligible effects on several outcomes in higher education of three tax credits for households who pay tuition and fees. Hoxby and Bulman (2016) argue that this might be due to the price inelasticity of marginal households, but that limited knowledge about the deduction and the delay in receiving the financial benefit also matter.

In our conclusion we try to explain the heterogeneous effects of the tax deduction on different income groups. We argue that frictions or a lack of salience of the tax deduction are unlikely to play a major role in the heterogeneous effect on lifelong learning as there are substantial number of tax payers that file small amounts around both kinks. A more plausible explanation for the heterogeneous effects would be that for low-income individuals there are substantial other than financial costs to post-initial education, like time constraints and psychic costs. Moreover, low-income individuals may be more myopic or are perhaps more likely to underestimate the gains of lifelong learning.

The outline of the paper is as follows. Section 2 gives a brief description of relevant elements of the Dutch income tax system and the tax deduction for lifelong learning. Section 3 outlines a stylized life-cycle model that makes predictions about the relationship between the tax deduction and marginal tax rates and investments in lifelong learning, which motivates the setup of our empirical analysis. Section 4 discusses our empirical methodology. A description of the data set, including descriptive statistics, is given in Section 5. Section 6 presents the main results as well as a number of robustness checks. Section 7 discusses our findings and concludes.

2 The tax deduction for lifelong learning

We exploit differences in marginal tax rates to identify the effect of the tax deduction on lifelong learning expenditures. In this section we discuss how the tax deduction for lifelong learning works and outline the relevant characteristics of the Dutch income tax system for our sample period (2006 – 2013).

The tax deduction for lifelong learning is an income tax deduction for expenditures on post-initial schooling. Out-of-pocket expenses can be deducted from taxable income. The resulting financial gain of the tax deduction is equal to the expenditures (minus a threshold) multiplied by the marginal income tax rate. The marginal income tax rate is a step-wise increasing function of individual taxable income. Table 1 shows the marginal tax rates and tax brackets for the period 2006 – 2013. The difference between the tax rates in the first and second bracket fluctuates somewhat around 8 percentage points over the period 2006 to 2012. The marginal tax rate for the first bracket was increased sharply in 2013. The difference between the tax rates in the third and fourth bracket is 10 percentage points throughout the entire time period. The beginning and end of the tax brackets have changed very little, they are indexed with inflation, except in 2013, when the end of the first bracket increased somewhat, while the end of the second and third brackets decreased somewhat. The change in the tax rates and tax brackets in 2013 are two reasons why we exclude 2013 from our main analyses, in addition to the changes in the deduction for lifelong learning expenditures in 2013 discussed below.

Lifelong learning expenditures are only deductible if the goal is to stimulate human capital formation or to improve one's labour market position. This includes for example tuition fees, books, necessary clothing and depreciation on a computer when the computer is necessary for a work-related course. Living and travel expenses are excluded, and expenditures on courses for strictly personal development, 'hobbies' and on materials used for full self-tuition are excluded as well. Furthermore, untaxed benefits for lifelong learning, such as a study grant from the government or a private institution, or a reimbursement from an employer for training expenses, should be subtracted from the deducted amount. Over the period 2006 – 2012, a threshold of 500 euro applied to all deductible lifelong learning expenditures in a given year. The maximum deductible amount each year was (and is) 15,000 euro.

The deductible for lifelong learning expenditures changed quite substantially in 2013. First, the threshold was reduced from 500 euro to 250 euro. Second, the de-

Table 1: Marginal tax rates and income brackets: 2006 - 2013

	First bracket	Second bracket	Difference	Third bracket	Fourth bracket	Difference
Bracket tax rate (%)						
2006	34.15	41.45	7.30	42.00	52.00	10.00
2007	33.65	41.40	7.75	42.00	52.00	10.00
2008	33.60	41.85	8.25	42.00	52.00	10.00
2009	33.50	42.00	8.50	42.00	52.00	10.00
2010	33.45	41.95	8.50	42.00	52.00	10.00
2011	33.00	41.95	8.95	42.00	52.00	10.00
2012	33.10	41.95	8.85	42.00	52.00	10.00
2013	37.00	42.00	5.00	42.00	52.00	10.00
Top of the tax bracket (euro)						
2006	17,046	30,631		52,228	∞	
2007	17,319	31,122		53,064	∞	
2008	17,579	31,589		53,860	∞	
2009	17,878	32,127		54,776	∞	
2010	18,218	32,738		54,367	∞	
2011	18,628	33,436		55,694	∞	
2012	18,945	33,863		56,491	∞	
2013	19,645	33,363		55,991	∞	

ductible became limited to tuition fees and compulsory additional learning tools, such as books and protection materials. This meant for example that the depreciation of a computer was no longer deductible. These changes provide another reason why we limit ourselves to the 2006 – 2012 period in our main analyses.

While training expenditures are typically individual expenditures, partners can choose whether they deduct the expenditures from their own taxable income or whether they transfer the expenditures to their partner who can then subtract it from his or her taxable income. To minimize the household tax burden, partners typically shift the tax deductions to the partner that has the higher marginal tax rate (see Section 5). The threshold of 500 euro must first be applied to each partner's personal expenditures before the expenditures can be shifted between partners. For couples we use data on personal or 'own' expenditures and data on declared expenditures to show the importance of accounting for the shifting behaviour.

3 Theoretical framework

Following Leuven and Oosterbeek (2012), we illustrate the basic mechanism via which a tax deduction for lifelong learning expenditures in combination with differences in marginal tax rates affects the investment in lifelong learning in a stylized life-cycle model.

Lifetime utility depends on consumption in period 1 and 2: $U(C_1, C_2)$. We assume that the utility function is additively separable in period 1 utility and period 2 utility, and period 2 utility is discounted by a factor $1/(1+\delta)$, where δ is the subjective discount rate:

$$U(C_1, C_2) = U(C_1) + \frac{1}{1+\delta} U(C_2). \tag{1}$$

Consumption in period 1 depends on gross income w_1, lifelong learning expenditures L, the tax rate τ_1 and savings S:

$$C_1 = (1-\tau_1)(w_1 - L) - S, \tag{2}$$

noting that lifelong learning expenditures are deducted from gross income rather than net income. Also note that for simplicity we assume that agents face a flat tax system. Consumption in period 2 then depends on gross income w_2, the return on lifelong learning expenditures, the tax rate τ_2 and the return on period 1 savings:

$$C_2 = (1-\tau_2)(w_2 + f(L)) + (1+r)S, \tag{3}$$

where $f(L)$ is the return on lifelong expenditures in terms of a higher gross period 2 income, for which we assume $f(0) = 0$, $f' > 0$ and $f'' < 0$, and r is the return on savings.

Maximizing lifetime utility with respect to lifelong learning expenditures and savings gives, respectively:

$$\frac{\partial U(.)}{\partial L} = 0 \Rightarrow U'_{C_1}(-(1-\tau_1)) + \frac{1}{1+\delta} U'_{C_2}(1-\tau_2) f'(L), \tag{4}$$

$$\frac{\partial U(.)}{\partial S} = 0 \Rightarrow U'_{C_1}(-1) + \frac{1}{1+\delta} U'_{C_2}(1+r). \tag{5}$$

Solving for L then gives the implicit function:

$$f'(L) = \frac{(1-\tau_1)}{(1-\tau_2)}\frac{(1+r)}{(1+\delta)}. \tag{6}$$

In the empirical application below we will compare individuals with a lower τ_1, with a taxable income just below a tax bracket threshold, with individuals with a higher τ_1, with a taxable income just above a tax bracket threshold. Equation (6) shows that *ceteris paribus*, individuals with a higher τ_1 will invest more in lifelong learning than individuals with a lower τ_1. Indeed, when τ_1 is higher, the right hand side of (6) is lower. Hence, at the optimum, $f'(L)$ will be lower as well, and given that $f''(L) < 0$, this implies that L should be higher. Intuitively, the investment cost of lifelong learning is lower when τ_1 is higher. In the appendix we show that ceteris is indeed very close to paribus, as individuals just below and above income tax bracket thresholds are very similar in observable characteristics (and hence in r and δ in terms of our simple stylized model), and also face very similar tax rates τ_2 in years after the lifelong learning investment.[4]

4 Empirical methodology

We apply a different empirical methodology for singles and couples. The tax deduction introduces a kink in the effective costs of lifelong learning expenditures. Therefore we prefer to use a regression kink design, provided that the conditions for using a regression kink design hold.[5] A crucial condition for a regression kink design is that there is no bunching around the kink. Below we show that this condition holds for singles, but not for couples. As discussed in Section 2, couples can shift their lifelong learning expenditures between partners. Couples who minimize their joint tax burden will generally shift deductibles to the partner with the highest marginal tax rate, which will typically be the highest earning partner, until marginal tax rates are equal. This means that the highest earner often ends up close to the beginning of a tax bracket. This creates bunching at the kink, which invalidates the assumptions underlying the

[4]Note that when $\tau_1 = \tau_2$, lifelong learning expenditures do not depend on marginal tax rates (Boskin, 1975; Eaton and Rosen, 1980; Leuven and Oosterbeek, 2012). However, below we show that this does not hold for large parts of the individuals in the sample. Indeed, the analysis rests on the fact that τ_1 is different just below and above tax bracket thresholds, whereas τ_2 is very similar.

[5]See e.g. Card et al. (2015), Card et al. (2015) and Landais (2015) for an introduction to the regression kink design methodology.

regression kink design. For couples we therefore do not use a regression kink design. Instead, we use a so-called donut regression discontinuity design.[6] In the donut regression discontinuity design we drop observations from income bins around the kink for which we observe excess mass. The size of the donut in our preferred specification (1,000 euro on either side of the kink) is so large that for the large majority of the sample to the right of the kink included in the regression there is a fixed difference or discontinuity (as opposed to a kink) in the financial gain from the tax deduction. Therefore, we apply a donut regression discontinuity design for couples.

4.1 Singles: regression kink design

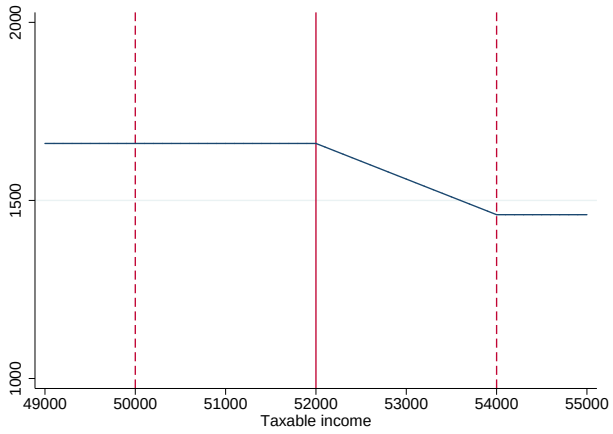
For singles we exploit the differences in the marginal tax rates in a regression kink design to identify the causal effect of the tax deduction on lifelong learning expenditures. The idea is that the outcome variable is a continuous function of income in the absence of the tax deduction, but that the tax deduction in combination with a discontinuity in the marginal tax rate creates an exogenous kink in the effective costs of lifelong learning which potentially results in a kink in the use of and expenditures on lifelong learning as well.

Figure 1 illustrates the kink when going from the third to the fourth bracket, located at a taxable income of 52,000 euro. Suppose that an individual has 2,500 euro lifelong learning expenditures. The marginal tax rate to the left of the kink is 42%. The effective costs of the lifelong learning expenditures then are $(1-0.42)*(2,500-500)+500=1,660$ euro. When the individual has taxable income (before the tax deduction is applied) in the fourth tax bracket, the effective costs of lifelong learning expenditures are lower. For example, at 1,000 euro to the right of the threshold, the effective costs of lifelong learning are $(1-0.52)*(2,500-1,500)+(1-0.42)*(1,500-500)+500=1,560$ euro, or 6% less than on the left-hand side of the threshold. Finally, for individuals with a taxable income 2,000 euro to the right of the threshold and beyond, the effective costs of lifelong learning are $(1-0.52)*(2,500-500)+500=1,460$ euro, or 12% less than on the left-hand side of the threshold. This suggests running a regression kink design using observations up to the point where the financial gain flattens out.

We estimate the effect of the tax deduction on i) the probablity of filing lifelong

[6] See e.g. Imbens and Lemieux (2008); Lee and Lemieux (2010) for an introduction to the regression discontinuity design methodology, and Barreca et al. (2011, 2016); Hoxby and Bulman (2016) for an introduction to and applications of the donut regression discontinuity design methodology.

Figure 1: Effective costs of lifelong learning for gross costs of 2,500 euro



learning expenditures, and ii) the amount of lifelong learning expenditures filed (including the zeros), using the following linear model:[7]

$$Y_{it} = \alpha + \beta R_{it} + \delta 1(R_{it} > 0) * R_{it} + \gamma X_{it} + \eta_t + \epsilon_{it}, \tag{7}$$

where i denotes the individual and t denotes calender year. R_{it} is (recentered) taxable income before deducting lifelong learning expenditures, the parameter δ measures the treatment effect, the change in the slope at the kink. X_{it} are a set of demographic control variables, η_t are year fixed effects and ϵ_{it} is the error term. To account for correlation in the error term at a level higher than the individual we cluster our standard errors at income groups of 100 euro (Bertrand et al., 2004; Donald and Lang, 2007).[8]

4.2 Couples: donut regression discontinuity design

Couples can manipulate their taxable income by shifting deductibles between fiscal partners, including but not limited to the deduction for lifelong learning expenses. In the empirical analyses we show that we indeed observe bunching at the cutoff for couples.[9] To mitigate this problem we apply so-called donut regression discontinuity

[7]For the probability of filing lifelong learning expenditures this is a linear probability model (Angrist and Pischke, 2009).

[8]Standard errors are very similar when we do not use cluster-robust standard errors, as we show in the results section.

[9]Recall that we measure income before the deduction for lifelong learning expenditures is subtracted. Hence, lifelong learning expenditures do not cause the bunching we observe in the data. The bunching is caused by other deductibles that can be shifted between partners and that have already

regressions, where we drop selective observations around the cutoff. We present results for various sizes of the donut hole, including no donut hole as in the standard regression discontinuity setup.

As discussed above, by applying a large donut hole in our previous specification, we are basically left with a discontinuity in the effective costs of schooling between those on the left and right hand side of the donut hole. This means that for couples the "treatment effect" is measured for a discontinuity, where we compare those to the right of the donut hole with those to the left. We therefore estimate the following regression discontinuity model excluding the observations close to the threshold:

$$Y_{it} = \alpha + \beta R_{it} + \gamma 1(R_{it} > 0) R_{it} + \delta 1(R_{it} > 0) + \phi X_{it} + \eta_t + \epsilon_{it}, \tag{8}$$

where most terms are defined as above. The treatment effect δ however, is now measured by the change in the *intercept* to the right of the threshold. Also for the donut regression discontinuity design we use cluster-robust standard errors, clustered at income groups of 100 euro.

5 Data

For the empirical analysis we use the universe of Dutch tax payers, available via the remote access server of Statistics Netherlands. We have data for the period 2006 – 2013, but we focus on the period 2006 – 2012. During the period 2006 – 2012 the tax deduction for lifelong learning expenditures remained largely unchanged.

We make the following selections. We drop all individuals younger than 25 years of age or older than 60 years of age. Furthermore, we drop individuals who are enrolled at a full-time higher education institution. Students can use the tax deduction for other reasons than lifelong learning expenditures. We also exclude individuals on retirement benefits, on other types of social insurance and individuals without income, because their demographic characteristics are quite different from the rest of the sample. Finally, for couples we only keep those where both partners are still in the sample after we made the selections above.

As dependent variables we consider the take-up rate of the lifelong learning tax

been deducted from the income definition that we use. Specifically, our running variable is taxable individual income plus the deduction for lifelong learning expenditures. Individual gross incomes show no bunching around the kinks, see the results section below.

deduction and the deducted amount. We subtract the threshold of 500 euro from the deducted amount before we calculate the take-up rate (dummy) and the deducted amount.

Couples can shift the deductible amount from one partner to the other. When the marginal tax rates differ, the household will be better off financially when the partner with the lower marginal tax rate shifts the lifelong learning expenditures to the partner with the higher marginal tax rate. Indeed, this is what most couples do, see Table 2. Close to 83% of people with a lower marginal tax rate than their partner shift the lifelong learning expenditures to the partner with a higher marginal tax rate. Therefore, for couples it is important to distinguish between what we denote as the own deducted amount and the declared amount, where the latter includes the amount (above the threshold) coming from or going to the other partner (hence the declared amount can be higher or lower than the own amount).[10]

We study two discontinuities in marginal tax rates: 1) the increase in the marginal tax rate when we move from the first to the second tax bracket, which we indicate with 'kink 1', and 2) the increase in the marginal tax rate when we move from the third to the fourth tax bracket, which we indicate with 'kink 2'.

Descriptive statistics for singles are given in Table 3. In the first column we present descriptive statistics for the sample around kink 1. Specifically, these are statistics for the sample in our preferred specification with individuals from −1,330 to +1,330 euro around kink 1. 2.9% of this sample deducts lifelong learning expenditures, and the average amount deducted is almost 40 euro (including the zeros, the average amount is 1,330 euro per person that uses the deduction). 66% of the sample around kink 1 are female, they are on average 40 years of age, have 0.8 children on average and 15% of them has at least one parent born outside the Netherlands ('Foreign'). We have about 660,000 observations in this sample. The second column gives the descriptive statistics for the sample around kink 2 for our preferred specification with a bandwidth of 2,000 euros around the kink. The take-up rate is higher for this group, 3.9%, and the average amount is also higher at around 81 euro (including the zeros, the average amount is 2,091 euro). There are fewer females in the sample around kink 2, 32%, on average they are somewhat older, have fewer children and are less likely to be from foreign parents. This sample is smaller, with close to 200,000 observations. These individuals are already relatively high in the income distribution (approximately 10% of

[10]Typically the declared amount will be higher than the own amount for primary earners and lower than the own amount for secondary earners.

Table 2: Shifting of lifelong learning expenditures in couples (in %)

Marginal tax rate relative to partner	No shifting	Partial shifting	Full shifting	Total
Higher	89.7	8.8	1.6	100
Equivalent	54.0	22.2	23.7	100
Lower	7.6	9.6	82.8	100

Notes: Own calculations based on register data from Statistics Netherlands.

Table 3: Descriptive statistics for singles

	Kink 1	Kink 2
Outcome variables		
Deductible	0.0292	0.0390
	(0.1684)	(0.1936)
Deductible amount	39.2106	81.3248
	(346.5883)	(800.5169)
Control variables		
Female	0.6565	0.3194
	(0.4749)	(0.4662)
Age	39.9325	43.5710
	(9.8179)	(9.1946)
Number of children	0.8397	0.4886
	(0.9849)	(0.8523)
Foreign	0.1470	0.0583
	(0.3542)	(0.2343)
Observations	663,368	197,584

Notes: Sample period 2006–2012. Standard deviations reported in parentheses. Descriptives are presented for the preferred sample using a bandwidth of 1,330 euros for kink 1 and 2,000 euros for kink 2.

Table 4: Descriptive statistics for couples

	Kink 1		Kink 2	
	Primary earner	Secondary earner	Primary earner	Secondary earner
Outcome variables				
Declared deductible	0.0260	0.0138	0.0381	0.0130
	(0.1591)	(0.1168)	(0.1914)	(0.1131)
Declared deducted amount	31.3919	12.8519	62.2872	16.1188
	(276.3430)	(168.7083)	(503.0561)	(229.1265)
Own deductible	0.0180	0.0191	0.0213	0.0284
	(21.8619)	(0.1368)	(0.1444)	(0.1662)
Own deducted amount	21.8619	22.3547	36.7184	41.6877
	(168.7083)	(233.5227)	(417.4154)	(367.8090)
Control variables				
Female	0.2787	0.7255	0.1118	0.8868
	(0.4483)	(0.4463)	(0.3152)	(0.3169)
Age	38.7043	37.6005	44.9257	43.2654
	(8.5814)	(8.4261)	(8.0111)	(8.0296)
Number of children	1.3111	1.3111	1.4321	1.4321
	(1.0226)	(1.0226)	(1.0761)	(1.0761)
Foreign	0.1184	0.1207	0.0265	0.036
	(0.3231)	(0.3258)	(0.1605)	(0.1864)
Observations	498,627	498,627	756,617	756,617

Notes: Sample period 2006–2012. Standard deviations reported in parentheses. Descriptives are presented for the baseline sample with a 1000 euro donut hole.

the population with income has income in the fourth (top) bracket in the Netherlands).

Descriptive statistics for couples are given in Table 4. We now present statistics for the preferred sample using a bandwidth of 5,000 euro to the left and right of the kink and applying a donut hole of 1,000 eurs to the left and to the right of the kink. We present descriptives separately for primary and secondary earners. 2.6% of primary earners around kink 1 declares lifelong learning expenditures, and on average they declare 31 euro (1,208 euro per declaring person). The percentage of primary earners declaring own lifelong learning expenditures is substantially lower at 1.8%, and also the average amount is substantially lower at 21.9 euro (1,217 euro per declaring person). Turning to the demographic control variables, only 28% of these primary earners around kink 1 are female, the average age is close to 39 years of age, they have 1.3 children on average and only one in ten has foreign parents.

Secondary earners around kink 1 are less likely to declare lifelong learning expenditures, only 1.4%, and on average they declare 13 euro (929 euro per declaring person). However, the percentage of secondary earners declaring own lifelong learning expenditures is actually somewhat higher than for primary earners, 1.9%, and also the average amount is somewhat higher at 22.4 euro (1,171 euro per declaring person). Secondary earners are more likely to be female, they are on average about a year younger than the primary earners, have the same number of children and are about equally likely to have foreign parents. We have about half a million couples in our preferred sample for kink 1.

Moving to kink 2, we observe a much higher share of primary earners declaring lifelong learning expenditures, 3.8%, at an average amount of 62 euro (1,635 euro per declaring person). However, they are much less likely to declare own lifelong learning expenditures, 2.1%, and also the average own amount of 36.7 euro is much smaller (1,722 euro per declaring person). The large majority of these primary earners are male, they are older than at kink 1, have about the same number of children and are much less likely to have foreign parents. For secondary earners we again see a much lower share declaring lifelong learning expenditures, 1.3%, with an average amount of 16 euro (1,244 euro per declaring person). However, the share of secondary earners declaring own lifelong learning expenditures is again higher than for primary earners, 2.8%, with an average amount of 42 euro (1,466 euro per declaring person). These secondary earners are predominantly female, are one and a half year younger than the primary earners on average, have the same number of children, and are also not very

likely to have foreign parents. For couples around kink 2 we have about three quarters of a million observations.

Finally, in the stylized life-cycle model of Section 3 we assume that individuals differ in their initial marginal tax rate, but that subsequent marginal tax rates are similar. Figures A1a to A1d in the appendix show the marginal tax rate for individuals to the left and to the right of the kink in 2006 in subsequent years, for each sample separately. These figures show that marginal tax rates converge rapidly after 2006, and differences between marginal tax rates become small (in the order of 1%) in just 2 to 3 years and remain small thereafter.

6 Results

6.1 Singles

First we consider the results for singles.[11] Figure 2a and 2b present graphical evidence for kink 1 and 2 respectively, on bunching (or heaping), and hence the potential role of manipulation of the running variable. On the horizontal axis we have taxable income plus the declared lifelong learning expenditures (potentially zero) relative to the kink, using bins of 100 euro. On the vertical axis we have the density. At both kinks there is no clear evidence of bunching, if anything there appears to be some excess mass only at the first bins of 100 euro next to the kink.[12] This suggests that singles essentially do not manipulate their income relative to these kinks.[13] In addition, as discussed in our theoretical model in Section 3, we need that marginal tax rates after investing in lifelong learning are similar for those with initial tax rates above and below the kink. Figures A1a and A1b in the appendix show for the 2006 sample that tax rates in later years are very similar.

[11] Singles includes both singles without children and lone parents.

[12] Following McCrary (2008) and Cattaneo et al. (2017), we study the excess mass using a density test. For kink 2 this gives a p-value for the null hypotheses of no excess mass of 0.21, 0.41 and 0.71 using the conventional, undersmoothed and robust-bias corrected of the Stata package *rddensity*. The conventional approach may be asymptotically biased. The undersmoothed and robust-bias corrected approaches try to correct for this bias in different ways. See Cattaneo et al. (2016, 2017) for more detail. For kink 1 the p-values for the different methods are 0.07, 0.07 and 0.02 (the latter suggests that there might be some excess mass at kink 1, but Figure 2a shows that the excess mass is small and very local). Furthermore, there are no discontinuities in the demographic control variables around kink 1 or 2 for singles, see Figure A4.

[13] Empirical studies looking at bunching at tax bracket thresholds typically find little evidence of bunching, at least for wage earners, see e.g. Kleven (2016) for an overview.

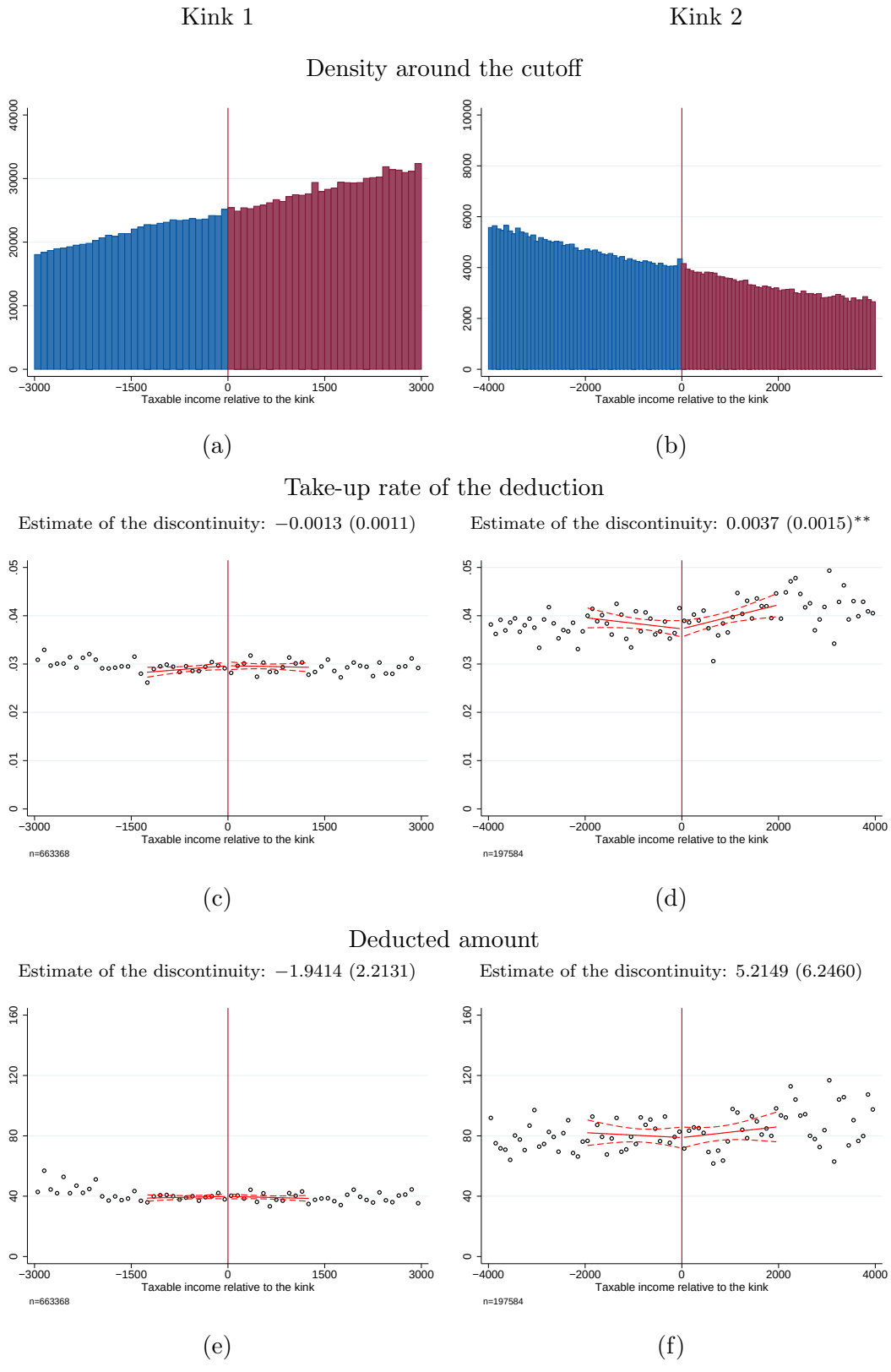
Figure 2c and 2d show the take-up rate of the deductible for schooling expenditures (in excess of the minimum expenditure threshold) for kink 1 and 2, respectively. We present averages per bin by income. The solid red lines gives the predicted take-up rate, using a linear regression without demographic control variables, allowing for a different slope to the right of the kink (regression kink design). The dashed red lines give the corresponding 95% confidence intervals.

Above the graph we report the corresponding coefficient for the change in the slope on the right-hand side. The graph and the estimated coefficient suggest zero effect for kink 1, but a positive and statistically significant effect for kink 2. Figure 2e and 2f plot the declared amount of schooling expenditures for singles around kink 1 and kink 2 (above the threshold, and including the zeros). Again, there is no apparent kink in the relation between the declared amount and taxable income at kink 1, but there is an apparent kink in the relation between the declared amount and taxable income at kink 2. Furthermore, for kink 2, we also see a 'flattening out' of the effect on the take-up rate and the deducted amount, which is consistent with the flattening out of the financial gain to the right of the kink (see Section 4).

However, this is not controlling for demographic characteristics. Our simple theoretical model suggests that it could be important to control for observable characteristics, as it takes into account possible differences between individuals with different marginal tax rates. In Panel A in Table 5, we present regression results for the regression-kink coefficient (change in the slope) without and with demographic control variables and for different bandwidths. Column (1) gives the results for the probability of using the lifelong learning deduction without demographic control variables. For all bandwidths we find a small and statistically insignificant effect. The results are very similar when we include demographic control variables in column (2). Our preferred specification includes demographic control variables and uses a bandwidth of 1,330 euro. Here we find an effect of -0.0006. The running variable is in thousands of euro, hence the interpretation is that the additional financial gain of having an income 1,000 euro to the right of the kink, leads to a (counterintuitive) drop in the take-up rate of the lifelong learning deduction of -0.06 percentage points, but as noted above the effect is not statistically significantly different from zero. Our preferred bandwidth is 1,330 euro because this is the average amount of schooling expenditures deducted at 1,330 euro to the right of the kink, which is where the kink ends on average.[14] Also for the

[14]Figure A8 in the appendix shows that the average amount of schooling expenditures is rather stable over income bins. We do not exploit this 'second kink' to the right of kink 1, where the

Figure 2: Probability to use the deductible, the deducted amount and density around the cutoff for singles



Notes: Own calculations based on register data from Statistics Netherlands. The regression lines are linear functions without any control variables, with a separate intercept and slope on the right-hand side of the kink. Estimates for kink 1 include observations from minus 1,330 to plus 1,330 euro relative to the kink. Estimates for kink 2 include observations from minus 2000 to plus 2000 euro relative to the kink.

Table 5: Treatment effect estimates for singles on the probability to use the deductible and the deducted amount (euros) using different bandwidths around the kink

	(1)	(2)	(3)	(4)	(5)
	Use of the deductible		Deducted amount		
	No controls	Controls	No controls	Controls	Observations
Panel A. Kink 1					
Bandwidth					
500	0.0003	0.0007	−7.9404	−7.4324	247,482
	(0.0060)	(0.0062)	(10.4830)	(10.5913)	
1,000	0.0006	0.0007	−2.2945	−2.3580	496,957
	(0.0015)	(0.0016)	(3.5096)	(3.5187)	
1,330	−0.0014	−0.0014	−2.4042	−2.4376	662,848
	(0.0012)	(0.0012)	(2.4114)	(2.3543)	
1,500	−0.0006	−0.0006	−1.4232	−1.5225	749,526
	(0.0011)	(0.0011)	(2.0498)	(2.0209)	
2,000	−0.0003	−0.0002	−0.7834	−0.6823	999,693
	(0.0006)	(0.0006)	(1.5569)	(1.5807)	
Panel B. Kink 2					
Bandwidth					
1,000	−0.0021	−0.0012	−7.7869	−5.0908	99,566
	(0.0033)	(0.0031)	(12.3768)	(12.1285)	
1,500	0.0024	0.0024	4.5190	4.8451	148,526
	(0.0021)	(0.0020)	(6.5772)	(6.5462)	
2,000	0.0038***	0.0038***	5.5721	5.8728	197,584
	(0.0011)	(0.0010)	(3.9432)	(3.8610)	
2,500	0.0031***	0.0032***	7.8314**	8.0554**	246,949
	(0.0009)	(0.0009)	(3.3579)	(3.3800)	

Notes: Sample period 2006–2012. Cluster-robust standard errors clustered by income bins of 100 euro in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include year fixed effects. The regressions with controls include gender, ethnicity, age, age^2 and the number of children in the household as demographic controls. Full estimation results for our preferred specification with a bandwidth of 1,330 euro for Kink 1 and 2,000 euro for Kink 2 are reported in Table A2 in the appendix. Results without clustering standard errors are reported in Table A3 in the appendix.

deducted amount we find a small and insignificant (negative) effect, with and without demographic control variables, see column (3) and (4) respectively.

Panel B in Table 5 gives the regression results for the regression-kink coefficient for kink 2, again without and with demographic control variables and for different bandwidths. For kink 2 our preferred bandwidth is 2,000 euro, which is very close to the average lifelong learning expenditures deducted to the right of the kink of 2,060 euro at 2,060 euro.[15] For this bandwidth we find a statistically significant positive effect of 0.38 percentage points, where again the running variable is measured in 1,000 euro. A bandwidth that is somewhat smaller or larger results in a somewhat lower coefficient, but not statistically significantly different from our preferred bandwidth.

We can convert our preferred estimate to an elasticity of the probability of (deducting) lifelong learning expenditures with respect to the effective costs of lifelong learning expenditures. Consider an individual that has 2,500 euro in lifelong learning expenditures, or 2,000 euro above the threshold (which is close to the average around kink 2). Furthermore, suppose that this individual has an income that is 1,000 euro to the right of the kink, which is in the middle of the region where the financial gain increases. For this individual we predict an increase in the take-up rate of 0.38 percentage points, or about +10% relative to the baseline of 3.8 percentage points left of the kink. To the left of the kink the effective costs of 2,000 euro lifelong learning expenditures are $(1 - 0.42) * (2,500 - 500) + 500 = 1,660$ euro. 1,000 euro to the right of the kink the effective costs of lifelong learning are $(1 - 0.52) * (2,500 - 1,500) + (1 - 0.42) * (1,500 - 500) + 500 = 1,560$ euro, or about -6% relative to the effective costs left of the kink. The elasticity of the take-up rate of (deducting) lifelong learning expenditures with respect to the effective costs of lifelong learning expenditures is then $+10\%/(-6\%) \approx -1.7$ with a 95% confidence interval of $[-0.8, -2.5]$.

The regression results for the average deducted amount for different bandwidths for kink 2 are given in columns (3) and (4) of panel B, without and with demopgrahic control variables respectively. Again, accounting for demographic control variables hardly affects the results. For our preferred bandwidth of 2,000 euro, and including demographic control variables, we find a positive coefficient of 5.9 euro. However, this

financial gain is no longer increasing on average, because the exact location of this 'second kink' depends on the individual amount of lifelong learning expenditures, which varies across individuals with the same income.

[15] Again we do not analyze the 'second kink' where the average financial gain is no longer increasing.

coefficient is not statistically significant. Again, we can convert the estimate to an elasticity. For an individual that has an income 1,000 euro to the right of the kink we predict an increase in (deducted) lifelong learning expenditures of 5.9 euro, or about +7% relative to the baseline of 79 euro to the left of the kink. Relating this to the drop in the effective costs of lifelong learning expenditures of −6%, the elasticity of (deducted) lifelong learning expenditures with respect to the effective costs of lifelong learning expenditures in then $+7\%/(-6\%) \approx -1.2$ with a 95% confidence interval of $[-2.8, 0.4]$.

6.2 Couples

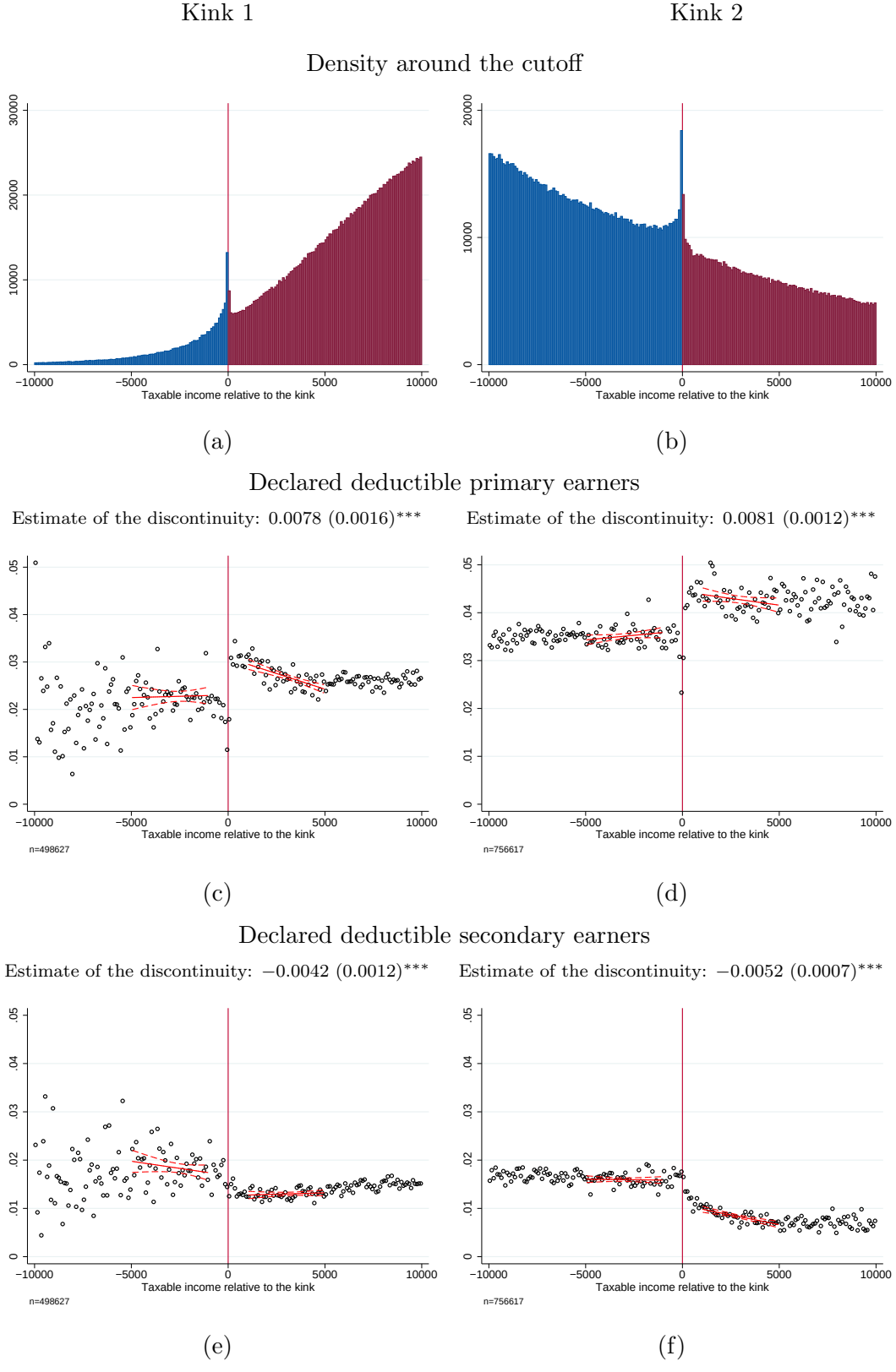
Next, we consider the effects for couples. Within couples, we study the effects for the partners with the highest gross income in the household or 'primary earners' and the effects for the partners with the lowest gross income in the household or 'secondary earners'. Furthermore, we present results for the declared amount and the own amount. Because partners can shift the own schooling expenditures from one partner to the other when they file their taxes, the effect on the declared amount and own amount can differ. Indeed, we show that this makes a big difference, and this underscores the value of the rich data that we use in the analysis.

Figure 3a and 3b present graphical evidence on the role of bunching of taxable income plus the lifelong learning deduction for primary earners around kink 1 and kink 2, respectively. The figures provides clear evidence of bunching, and hence of manipulation of the running variable near the kinks.[16] Indeed, by shifting deductibles (other than the lifelong learning expenditures deduction) from the secondary earner to the primary earner, couples can reduce the tax burden of the household, up to the point where the marginal tax rate of the primary earner is no longer higher than the marginal tax rate of the secondary earner.[17] This bunching will generate a bias in the estimate when couples that are more likely to use the lifelong learning tax deduction are also more likely to manipulate their income, which is likely to be the case. This

[16] The p-values for the McCrary density tests of no excess mass are all below 0.0001.

[17] The RD plots of the demographic control variables for primary earners also show discontinuous jumps around kink 1 and kink 2, see Figure A5 in the appendix, again suggesting manipulation of the running variable. Figure A9 in the appendix shows that there is no bunching around the kink if we use gross income instead of taxable income, the income before applying any of the deductibles. Figure A10 confirms that there are also no discontinuities in observable characteristics of primary earners at the kink if we use gross income instead of taxable income. This shows that the bunching that we find in taxable income is due to shifting of deductibles.

Figure 3: Density around the cutoff and declared deductible



Notes: Own calculations based on register data from Statistics Netherlands. The regression lines are linear functions without any control variables, with a separate intercept and slope on the right-hand side of the kink and using a donut hole of 1000 euro on either side of the kink. The estimate of the discontinuity without demographic control variables is presented above each figure.

is why we apply a donut hole to the sample included in the estimates in our preferred specification. Furthermore, to have enough observations we include households with a running variable plus and minus 5 thousand euro of the kink. For the large majority of the sample to the right of the kink there is a fixed difference between the financial gain on the left-hand and on the right-hand side, i.e. a discontinuity rather than a kink, and hence we estimate the effect using a donut regression discontinuity design.[18]

Figure 3c shows the take-up rate of the declared deduction by primary earners at kink 1, which includes any lifelong learning expenditures that are shifted from the secondary earner to the primary earner. There is a clear upward jump in the take-up rate. Also for kink 2, we observe a significant upward jump in the take-up rate, see Figure 3d.[19] Taken at face value, this would suggest a very large positive effect on the take-up of lifelong learning of the tax deduction. However, for secondary earners we then observe a counterintuitive decline in the take-up rate of the deduction for lifelong learning expenditures to the right of kink, both for kink 1 and 2, see Figure 3e and 3f respectively.

However, by using the declared schooling expenditures, the treatment effect consists of the effect on the own lifelong learning expenditures by primary earners and the shifting of lifelong learning expenditures from the secondary earner to the primary earner. The second effect does not reflect an actual increase in lifelong learning expenditures, but rather a mere shift in the deducted amount between partners. Therefore, next we consider the effect on the *own* (declared) lifelong learning expenditures.[20]

Figure 4a and 4b display much smaller jumps in the take-up rate of *own* lifelong learning expenditures of primary earners at kink 1 and 2 than for the take-up rate of *declared* lifelong learning expenditures. In Table 6 we present regression results. Column (1) shows the coefficient on the discontinuity, assuming the same linear relation between the take-up rate and income on the left-hand and right-hand side of the kink. Column (2) adds a quadratic term and Column (3) allows for a different linear relation on the right-hand side between the take-up rate and income. Columns (4)-(6)

[18] Similar to singles, figures A1c and A1d in the appendix show that marginal tax rates after filing life-long learning expenditures are very similar for those above and below the kink.

[19] There is also a clear upward jump in the average amount deducted for kink 1 and 2, see Figure A2 in the appendix.

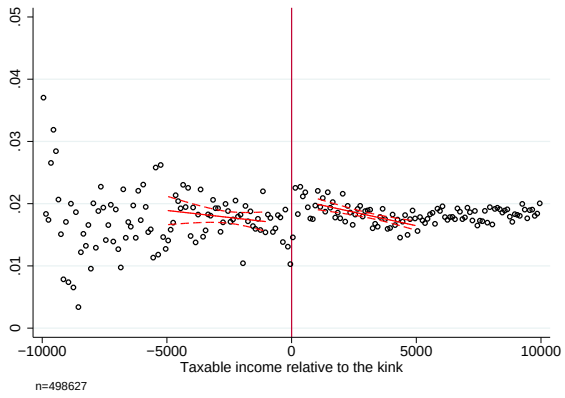
[20] We still need to apply a donut-RD design though, because manipulation of the income variable still affects the composition of primary earners close to the kink. Note that the density of primary earners by taxable income (including the declared lifelong learning expenditures) is still the same, see Figure 3a and 3b, hence we only present graphs for the take-up rate and amount of own lifelong learning expenditures.

Figure 4: Own use of the deductible and own amount for primary earners

Kink 1 Kink 2

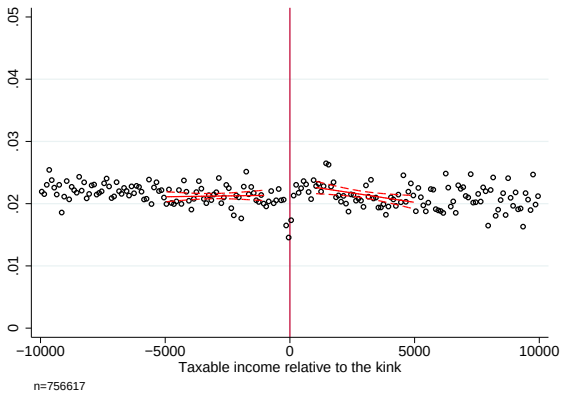
Own deductible

Estimate of the discontinuity: 0.0042 (0.0013)***



(a)

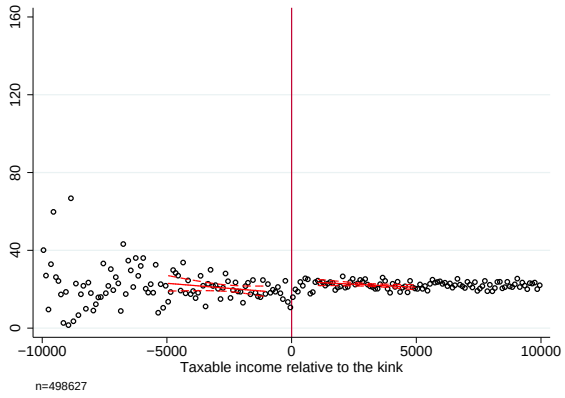
Estimate of the discontinuity: 0.0018 (0.0009)**



(b)

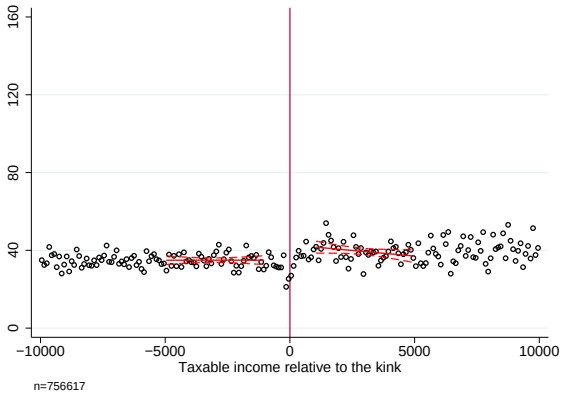
Own deducted amount

Estimate of the discontinuity: 6.3545 (2.3944)***



(c)

Estimate of the discontinuity: 7.8845 (2.7079)***



(d)

Notes: Own calculations based on register data from Statistics Netherlands. The regression lines are linear functions without any control variables, with a separate intercept and slope on the right-hand side of the kink taking into account a donut hole of 1,000 euro. The estimate of the discontinuity at the cutoff presented above each figure takes into account the donut hole.

Table 6: Treatment effect estimates for primary earners on the probability to use the deductible and the deducted amount (euros) using different donut holes

	Without controls			With controls			Obs.
	(1)	(2)	(3)	(4)	(5)	(6)	
	Linear	Quadratic	Local linear	Linear	Quadratic	Local linear	
Kink 1							
Panel A – Take-up rate of the deduction							
Donut 1500 euro	0.0041***	0.0040**	0.0037**	0.0032**	0.0040**	0.0037**	444,991
	(0.0014)	(0.0018)	(0.0018)	(0.0014)	(0.0017)	(0.0017)	
Donut 1000 euro	0.0049***	0.0045***	0.0042***	0.0042***	0.0046***	0.0042***	498,627
	(0.0012)	(0.0015)	(0.0015)	(0.0012)	(0.0015)	(0.0015)	
Donut 500 euro	0.0042***	0.0038***	0.0038***	0.0038***	0.0041***	0.0039***	553,066
	(0.0009)	(0.0010)	(0.0009)	(0.0009)	(0.0010)	(0.0009)	
Donut 0 euro	0.0050***	0.0053***	0.0053***	0.0051***	0.0057***	0.0057***	624,570
	(0.0013)	(0.0015)	(0.0014)	(0.0015)	(0.0016)	(0.0015)	
Panel B – Deducted amount							
Donut 1500 euro	5.4107**	5.2795*	5.5700**	4.1866**	5.3381*	5.5644**	444,991
	(2.1359)	(2.8945)	(2.8332)	(2.1575)	(2.9072)	(2.8542)	
Donut 1000 euro	5.6843***	6.0792***	6.2702***	4.8075***	6.2164***	6.3304***	498,627
	(1.8753)	(2.8135)	(2.8308)	(1.8799)	(2.8115)	(2.8373)	
Donut 500 euro	4.4841***	4.5806***	4.7594***	3.9581***	4.8480***	4.9424***	553,066
	(1.3746)	(1.7221)	(1.6641)	(1.3673)	(1.7095)	(1.6607)	
Donut 0 euro	4.9564***	5.7033***	5.9056***	4.9354**	6.2277***	6.3219***	624,570
	(2.8674)	(3.1811)	(2.7430)	(3.1465)	(3.3984)	(2.8847)	
Kink 2							
Panel C – Take-up rate of the deduction							
Donut 1500 euro	−0.0002	0.0001	0.0002	0.0011	0.0013	0.0014	660,928
	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0015)	
Donut 1000 euro	0.0014	0.0018*	0.0018*	0.0026**	0.0029***	0.0030***	756,617
	(0.0011)	(0.0011)	(0.0010)	(0.0011)	(0.0010)	(0.0010)	
Donut 500 euro	0.0019**	0.0022***	0.0022***	0.0032***	0.0034***	0.0034***	854,511
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	
Donut 0 euro	0.0023**	0.0088***	0.0023**	0.0038**	0.0037**	0.0036**	970,301
	(0.0011)	(0.0011)	(0.0011)	(0.0016)	(0.0016)	(0.0015)	
Panel D – Deducted amount							
Donut 1500 euro	4.1094	4.8658	4.9106	6.6603*	7.3894**	7.4165**	660,928
	(3.5941)	(3.5063)	(3.4895)	(3.5560)	(3.4786)	(3.4682)	
Donut 1000 euro	7.2399***	7.9263***	7.9087***	9.6271***	10.2659***	10.2346***	756,617
	(2.7686)	(2.7847)	(2.8005)	(2.7557)	(2.7823)	(2.8003)	
Donut 500 euro	6.3917***	6.7515***	6.6859***	8.8987***	9.1924***	9.1108***	854,511
	(1.9854)	(2.0319)	(2.0471)	(1.9828)	(2.0335)	(2.0461)	
Donut 0 euro	6.3236**	6.1236**	5.8874**	9.2013***	8.7722***	8.4473***	970,301
	(2.4934)	(2.4747)	(2.3347)	(3.3595)	(3.2780)	(3.0388)	

Notes: Sample period 2006–2012. Cluster-robust standard errors clustered by income bins of 100 euro in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include year fixed effects. Columns (1)-(3) are without demographic control variables, columns (4)-(6) are with demographic control variables. Columns (1) and (4) assume a linear relation between taxable income and the dependent variable and allow for a discontinuity in the intercept. Columns (2) and (5) assume a quadratic relation between taxable income and the dependent variable and allow for a discontinuity in the intercept. Columns (3) and (6) assume a linear relation between taxable income and the dependent variable and allow for a discontinuity in the intercept and in the linear relation between taxable income and the dependent variable. Full estimation results for the preferred specification (column 6) with a donut hole of 1,000 euro can be found in Table A4 in the appendix. Results without clustering standard errors are reported in Table A5 in the appendix.

correspond to Columns (1)-(3) but add demographic control variables. The effects on the own take-up rate are still positive and also statistically significantly different from zero in our preferred specification, Column (6) using a donut hole of 1,000 euro. Panel A shows that for kink 1 the treatment effect is +0.42 percentage points (+23.3%), and Panel B shows that for kink 2 the treatment effect is +0.30 percentage points (+7.9%). Again we can convert this into an elasticity of (declared own) lifelong learning expenditures with respect to the effective costs of lifelong learning expenditures. At kink 2, the effective costs are 11% lower on the right of the kink than on the left of the kink.[21] This would suggest an elasticity at kink 2 of $+7.9/(-11) \approx -0.7$.

Figure 4c and 4d show the effect on the average own amount deducted for primary earners around kink 1 and 2, respectively. These figures also suggest a much smaller effect than on the declared amount (compare with Figure A2 in the appendix), but still a positive and significant effect. Regression results are given in Table 6, Panel C and D for kink 1 and 2 respectively. For our preferred specification, the treatment effect for kink 1 is +6.3 euro (+28,8%) and for kink 2 it is +10.2 euro (+16.4%). At kink 2, the corresponding elasticity of (declared own) lifelong learning with respect to the effective costs is $+16.4/(-11) \approx -1.5$.

We also considered the treatment effect on the own lifelong learning expenditures of secondary earners. The figures and regression table can be found in the appendix, see Figure A3 and Table A1. For both kinks we find a very small and statistically insignificant effect, as opposed to the statistically significant negative effects for the declared deduction.

Overall, we have the most confidence in the estimates for singles, where we do not have manipulation of the running variable. For singles, at kink 1 in the tax system we find essentially no effect on the take-up of the lifelong learning deduction nor on the average amount deducted. At kink 2 we find a positive and statistically significant effect on the take-up rate and a positive and borderline significant effect on the average amount deducted. The corresponding elasticity of the take-up rate and average deducted amount with respect to the effective costs of lifelong learning at the point estimate is −1.7 and −1.2, respectively. For primary earners we find an elasticity of the take-up rate of *own* lifelong learning expenditures and the average *own* amount of lifelong learning expenditures with respect to the effective costs of lifelong learning

[21] The effective costs on the left-hand side are $(1 - 0.42) * (2,225 - 500) + 500 = 1,500$ euro, where 2,225 are the average own lifelong learning expenditures around kink 2. The effective costs on the right-hand side are $(1 - 0.52) * (2,225 - 500) + 500 = 1,328$ euro.

at the point estimate of -0.7 and -1.5, respectively. We find very small and statistically insignificant effects for the take-up and average amount of *own* lifelong learning expenditures by secondary earners. The effects on the take-up and average amount of *declared* lifelong learning expenditures for primary earners are much larger and are negative for secondary earners. However, shifting between partners is behind these spurious large and counterintuitive results.

7 Discussion and conclusion

In this paper we have studied the effectiveness of a tax deduction for lifelong learning expenditures in terms of the take-up rate of lifelong learning expenditures and the average amount of lifelong learning expenditures. For singles, which is our preferred group because they cannot manipulate the running variable, we find heterogeneous effects of the tax deduction. In the high-income group the take-up rate of lifelong learning expenditures increases by 10%. The additional effect of the tax deduction at a relatively low level of income is essentially zero however. Furthermore, the confidence intervals are tight, hence we can rule out large positive treatment effects. Note that as we look at filed expenditures, the estimated effect is likely to be an upper bound of the effect on actual lifelong learning expenditures made. The higher marginal tax rate to the right of the discontinuity also gives a larger financial incentive to file the expenditures to the right of the discontinuity, for a given level of expenditures made.

For couples, we initially find large positive treatment effects for the take-up rate and amount of the *declared* deduction for primary earners, and counterintuitive negative and statistically significant treatment effects for secondary earners. However, this is due to shifting of the lifelong learning expenditures from secondary earners to primary earners. Indeed, when we consider the take-up rate of *own* lifelong learning expenditures instead, we find smaller effects for primary earners and a negligible effect for secondary earners. However, manipulation of the running variable in couples is still problematic, and our 'solution' of applying donut-RD regressions, where we leave out the bins with excess mass close to the discontinuity, has the downside of comparing groups to the left and the right of the discontinuity that are increasingly dissimilar. Hence, we prefer the estimates for singles to learn about the causal effect of the tax deduction.

One question that remains is why a substantial tax incentive for lifelong learning

has no impact on lifelong learning expenditures of low-income singles. One explanation for why the effect is so small might have to do with frictions or salience (Ladner et al., 2009; Chetty et al., 2013). People may encounter friction costs when filing lifelong learning expenditures (e.g. keeping the receipts). However, people also report very small expenditures on lifelong learning expenditures, see Figure A7 in the appendix, and the proportion is similar for low- and high-income groups, suggesting that these friction costs are very small. In general frictions are thus unlikely to play a major role in our analysis.

Another explanation might be that the tax deduction is not very salient - individuals might not know enough about its existence and eligibility. Indeed, Figure A7 shows that some individuals file expenditures below the threshold (500 euro in 2012, 250 euro in 2013), for which there is no financial gain. This suggests that not all individuals are fully aware of the details of the tax system. However, at the same time, we observe clear bunching above the threshold, and apparently at least part of the filers is quite aware of the rules of the tax deduction, and is also quick to respond to the change in the threshold from 2012 to 2013.

Similar to other policies that aim to stimulate lifelong learning, we find that the deadweight loss is quite high for a tax deduction. Especially for the group of low-income individuals, this might have to do with other costs associated with post-initial education. Opportunity costs of substantial post-initial training are high, time constraints are considerable, especially when young children are present, many people - particularly lower educated individuals - dislike formal learning and hence experience psychic costs, and some people may be myopic or more generally underestimate the gains of lifelong learning (see for example Heckman et al. (2006)).

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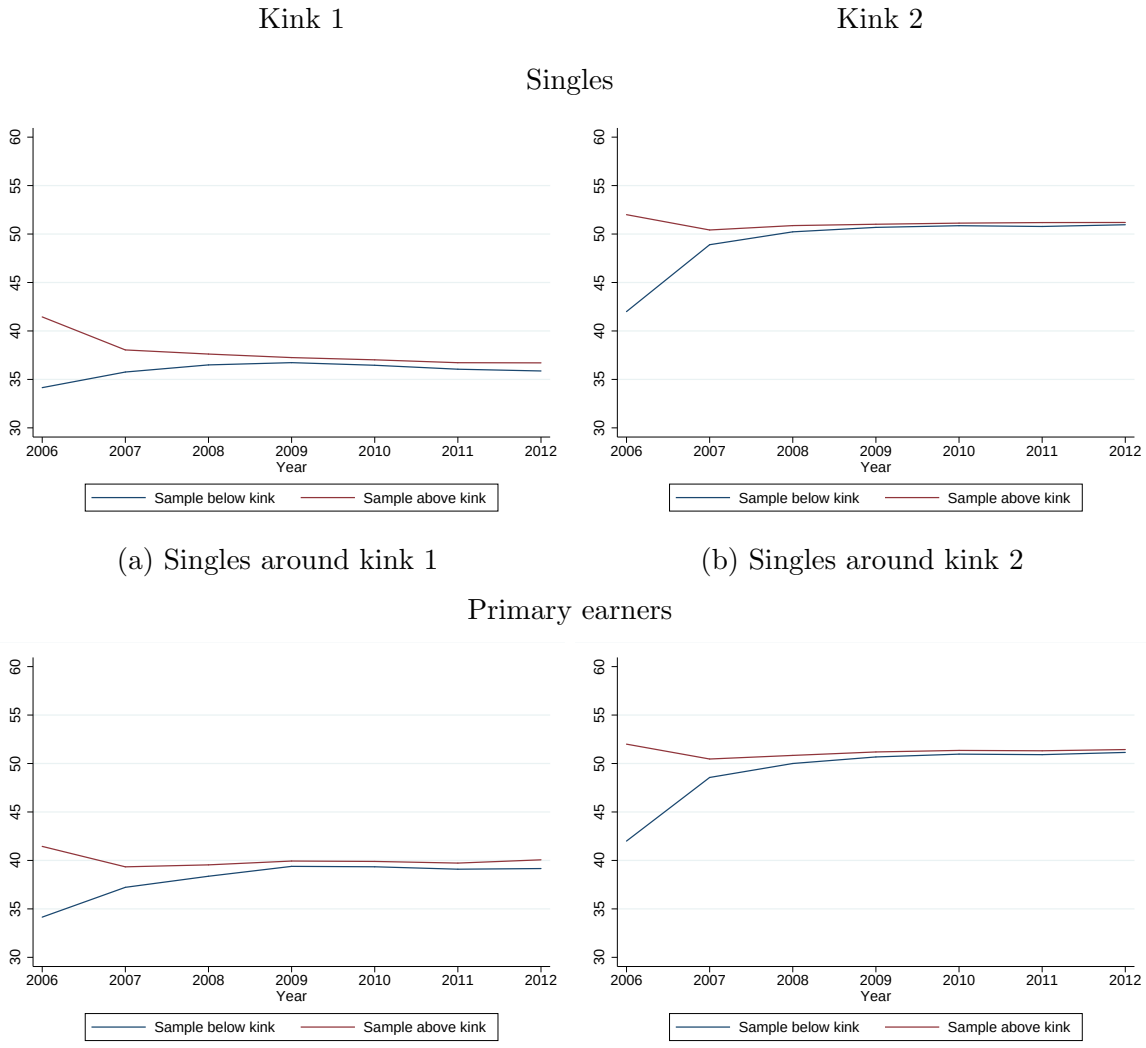
Appendix

Figure A1: Average marginal tax rates in subsequent years for the sample around the kink in 2006



(a) Singles around kink 1

(b) Singles around kink 2

(c) Primary earners around kink 1

(d) Primary earners around kink 2

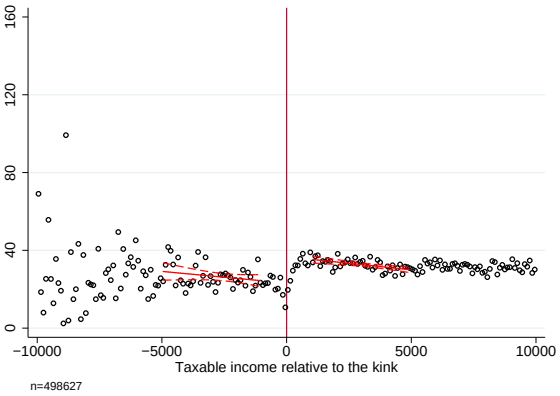
Notes: Own calculations based on register data from Statistics Netherlands.

Figure A2: Declared deducted amount for primary and secondary earners

Kink 1 Kink 2

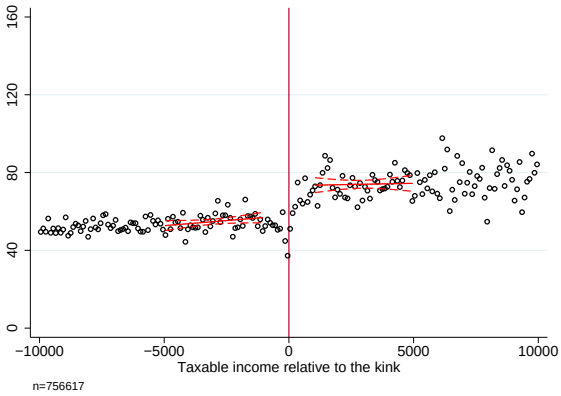
Primary earners

Estimate of the discontinuity: 13.5425 (2.7925)***



(a)

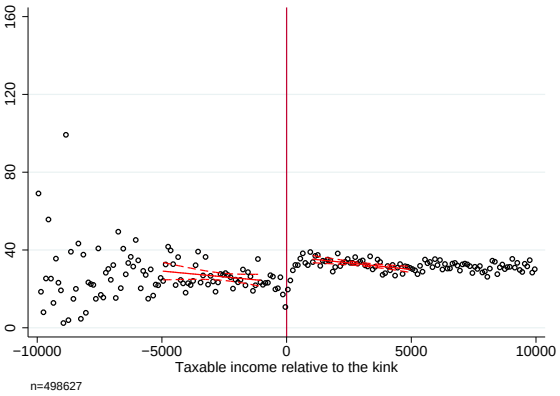
Estimate of the discontinuity: 15.3107 (3.2629)***



(b)

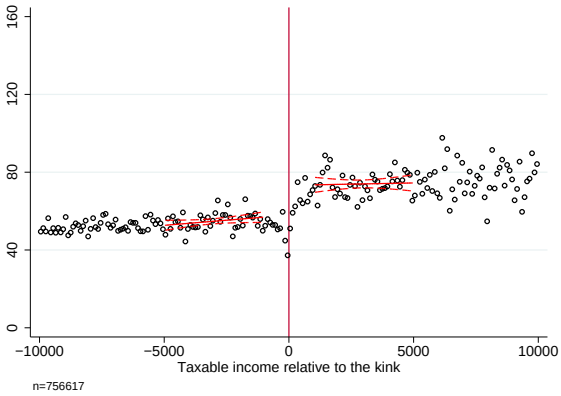
Secondary earners

Estimate of the discontinuity: -7.4534 (1.7046)***



(c)

Estimate of the discontinuity: -8.7024 (1.4860)***



(d)

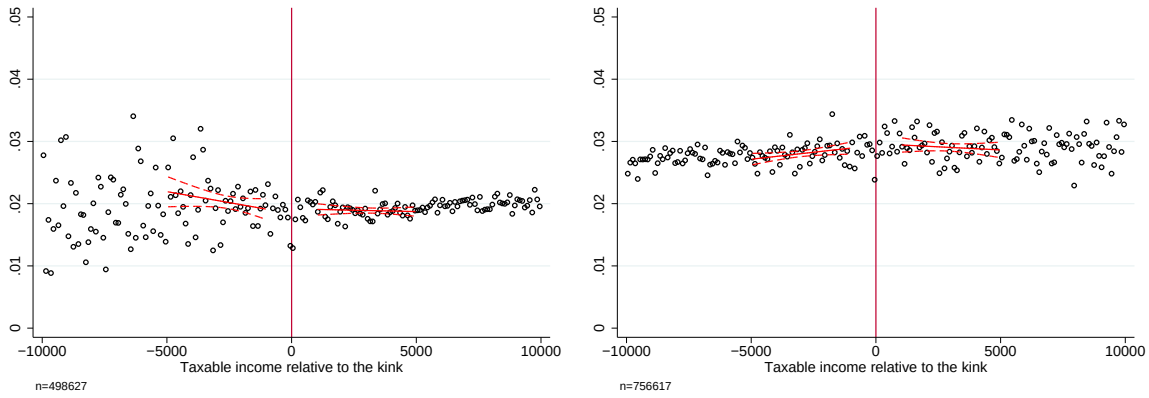
Notes: Own calculations based on register data from Statistics Netherlands. The regression lines are linear functions without any control variables, with a separate intercept and slope on the right-hand side of the kink taking into account a donut hole of 1,000 euro. The estimate of the discontinuity at the cutoff presented above each figure takes into account the donut hole.

Figure A3: Own use of the deductible and own amount for secondary earners

Kink 1 Kink 2

Own deductible

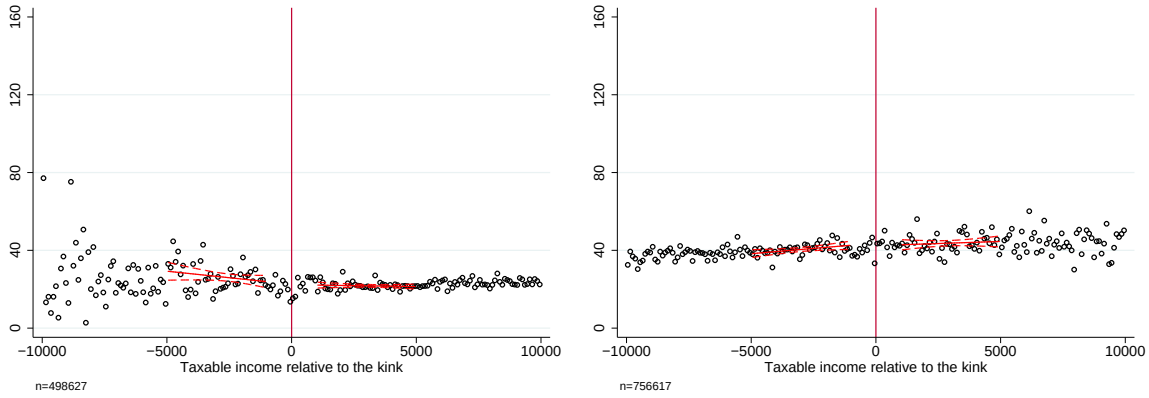
Estimate of the discontinuity: 0.0008 (0.0014) Estimate of the discontinuity: 0.0003 (0.0010)



(a) (b)

Own deducted amount

Estimate of the discontinuity: −.2612 (2.360) Estimate of the discontinuity: −1.3002 (2.3858)



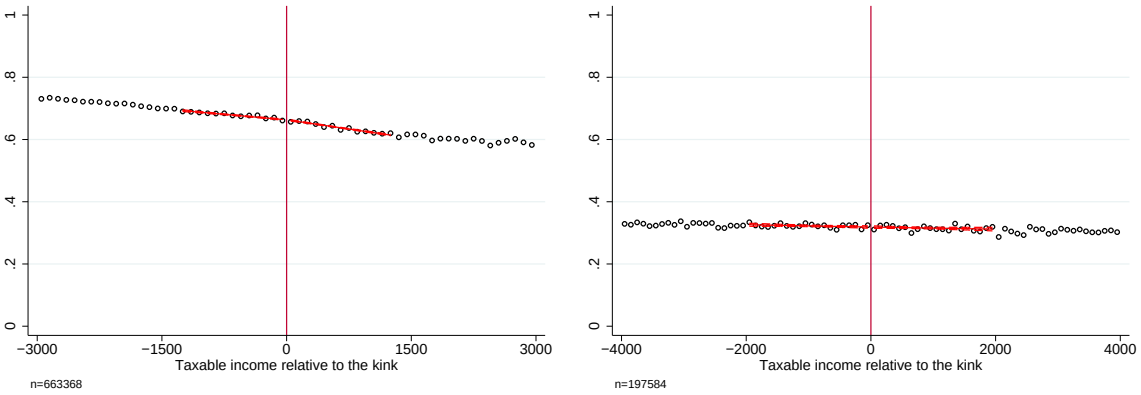
(c) (d)

Notes: Own calculations based on register data from Statistics Netherlands. The regression lines are linear functions without any control variables, with a separate intercept and slope on the right-hand side of the kink taking into account a donut hole of 1,000 euro. The estimate of the discontinuity at the cutoff presented above each figure takes into account the donut hole.

Figure A4: RKD plots for control variables for singles

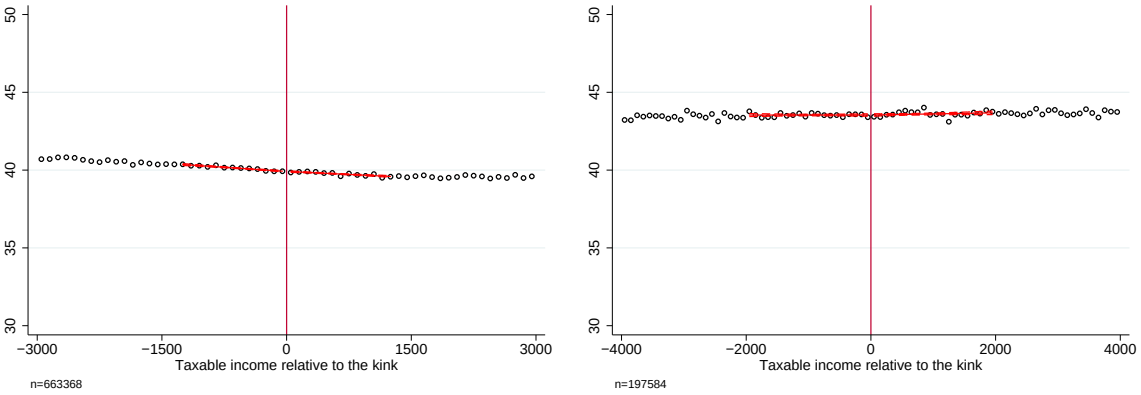
Kink 1 Kink 2

Female



(a) (b)

Age



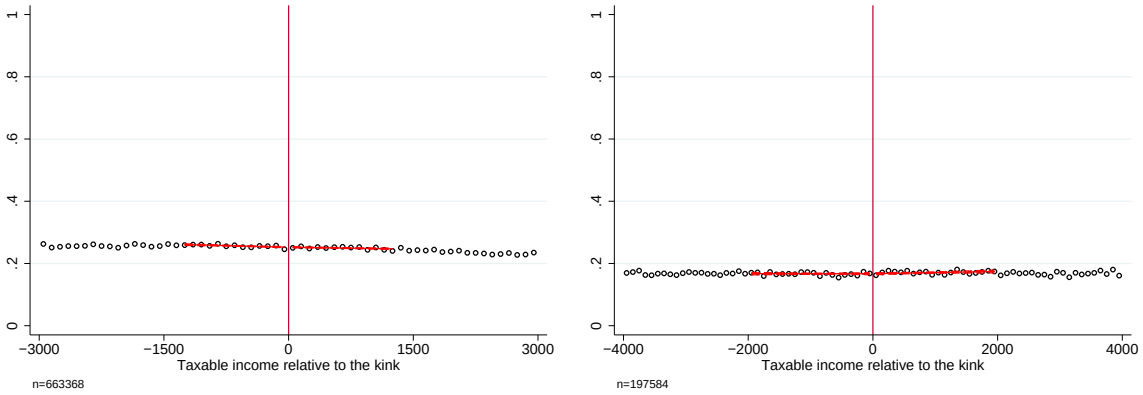
(c) (d)

Notes: the regression lines are linear functions without any control variables.

Figure A4: RKD plots for control variables for singles (cont.)

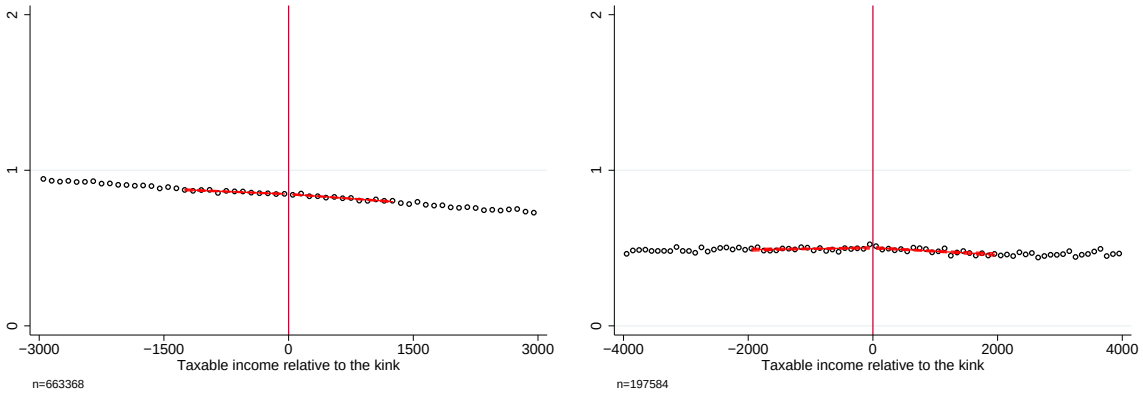
Kink 1 Kink 2

Foreign



(e) (f)

Number of children



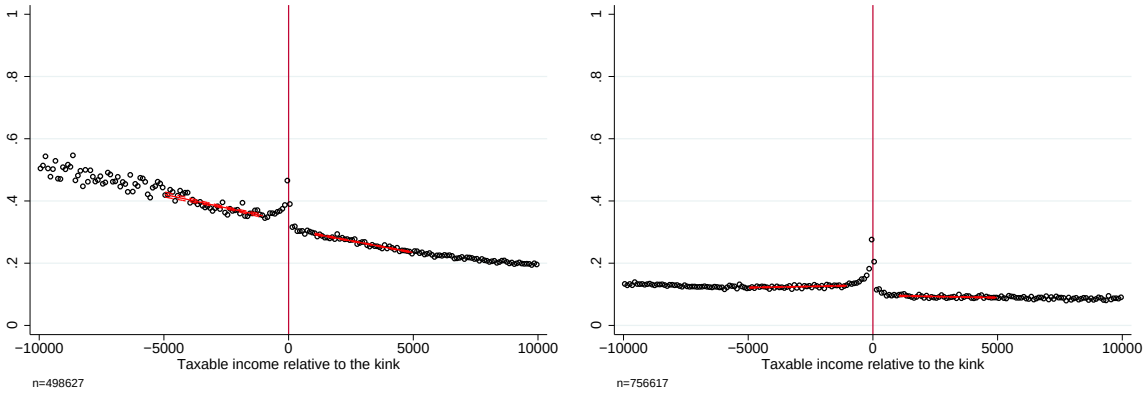
(g) (h)

Notes: the regression lines are linear functions without any control variables.

Figure A5: RD plots for control variables for the primary earner in a couple

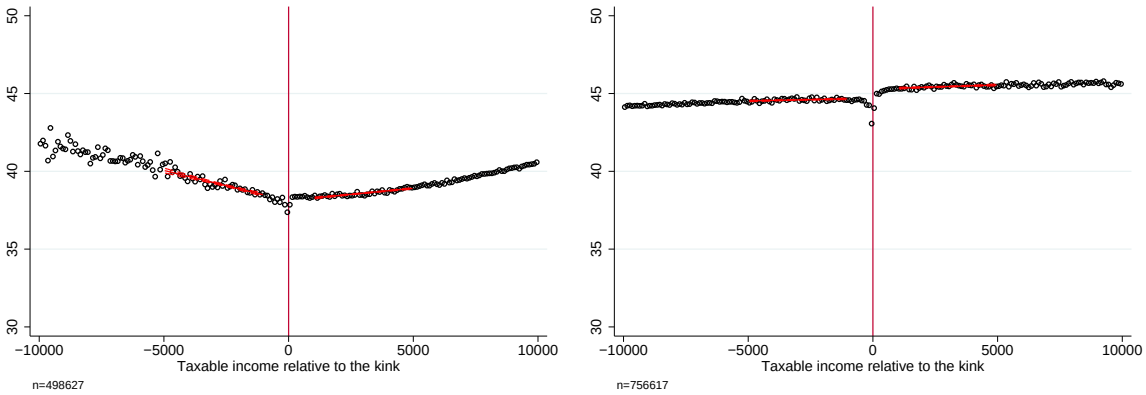
Kink 1 Kink 2

Female



(a) (b)

Age



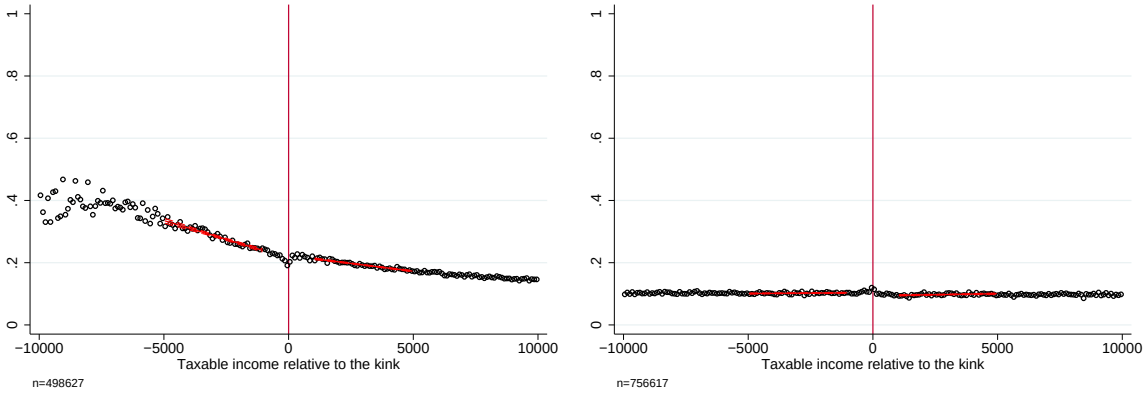
(c) (d)

Notes: the regression lines are linear functions without any control variables, taking into account a donut hole of 1,000 euro to the left and right of the kink.

Figure A5: RD plots for control variables for the primary earner in a couple (cont.)

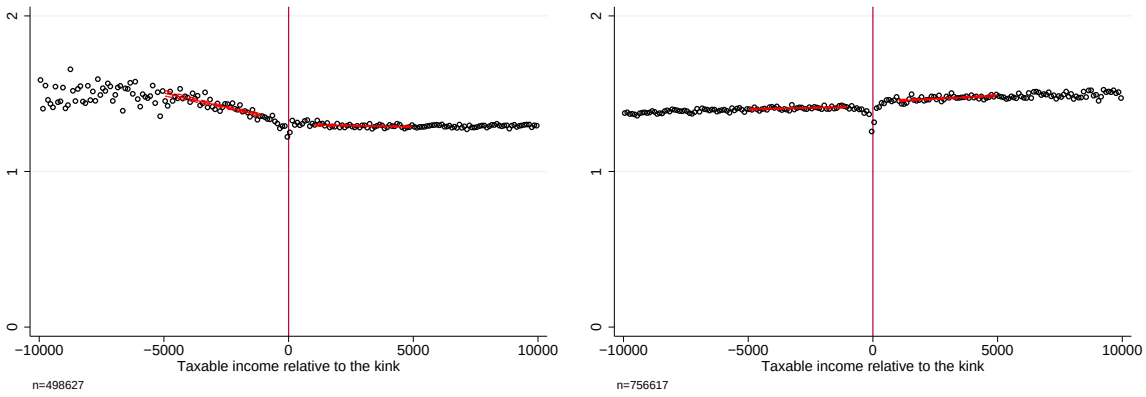
Kink 1 Kink 2

Foreign



(e) (f)

Number of children



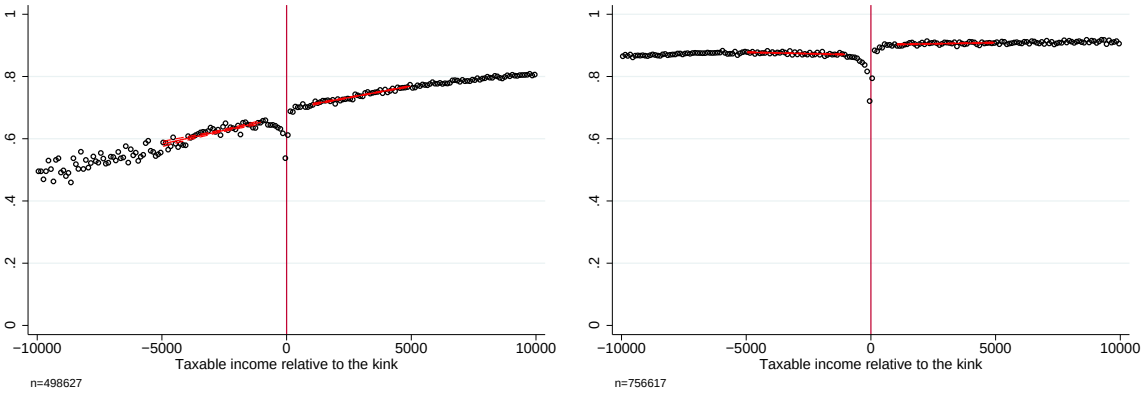
(g) (h)

Notes: the regression lines are linear functions without any control variables, taking into account a donut hole of 1,000 euro to the left and right of the kink.

Figure A6: RD plots for control variables for the secondary earner in a couple

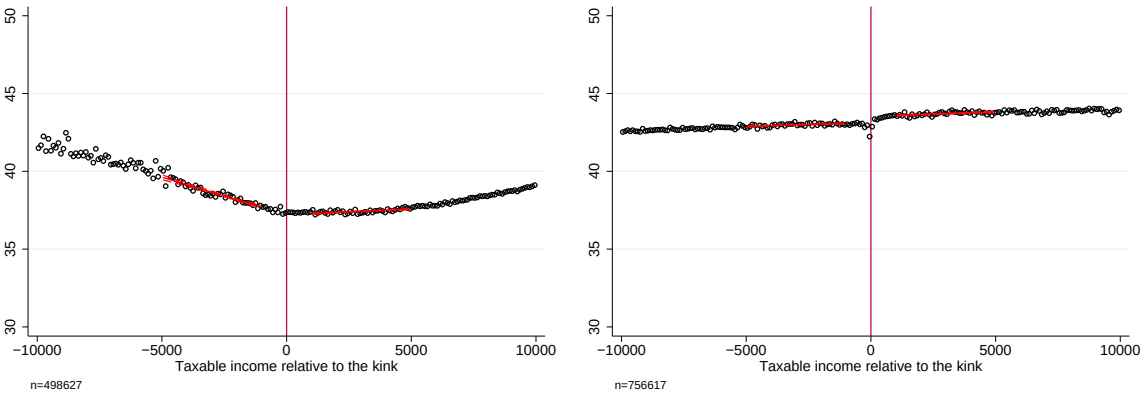
Kink 1 Kink 2

Female



(a) (b)

Age



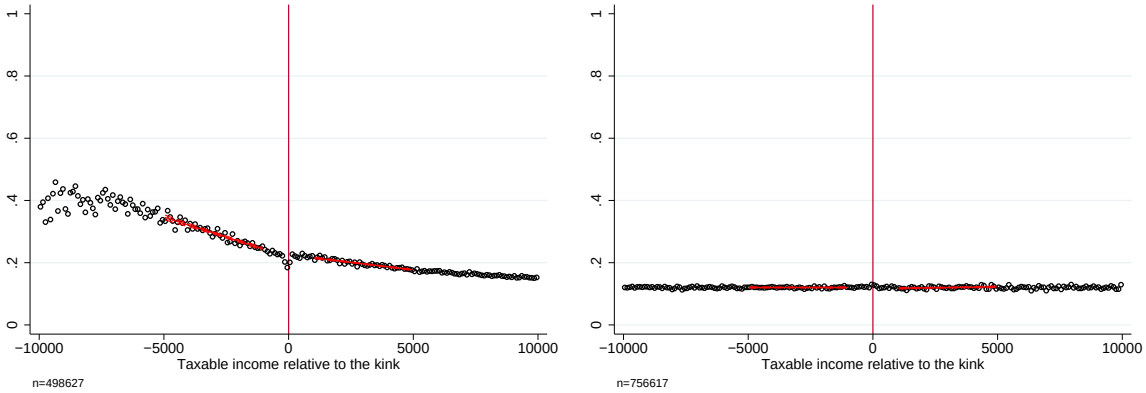
(c) (d)

Notes: the regression lines are linear functions without any control variables, taking into account a donut hole of 1,000 euro to the left and right of the kink.

Figure A6: RD plots for control variables for the secondary earner in a couple (cont.)

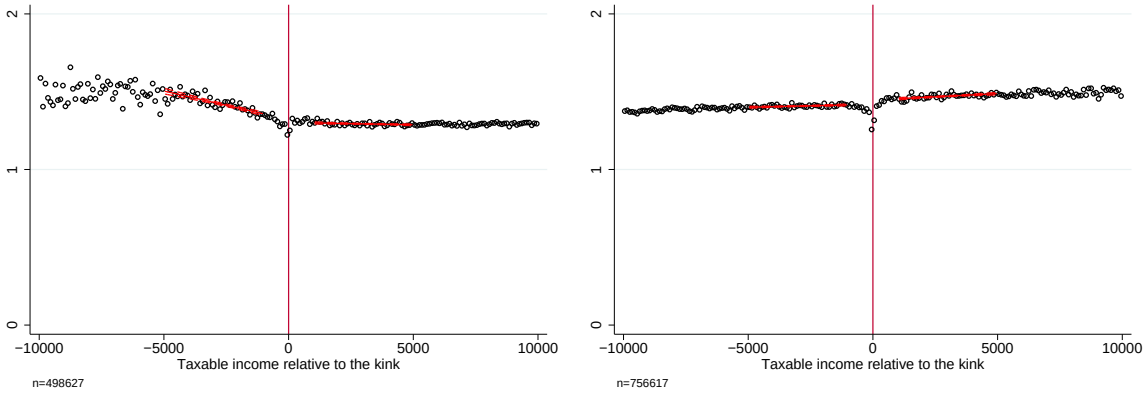
Kink 1 Kink 2

Foreign



(e) (f)

Number of children



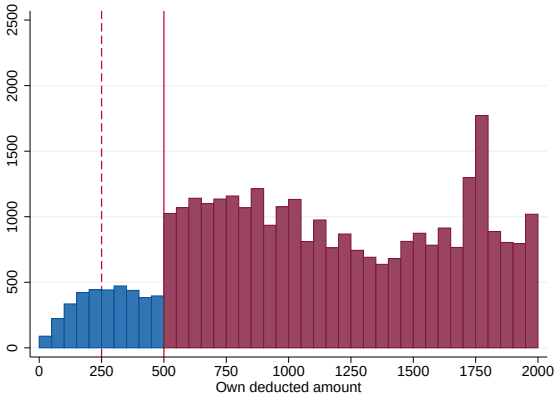
(g) (h)

Notes: the regression lines are linear functions without any control variables, taking into account a donut hole of 1,000 euro to the left and right of the kink.

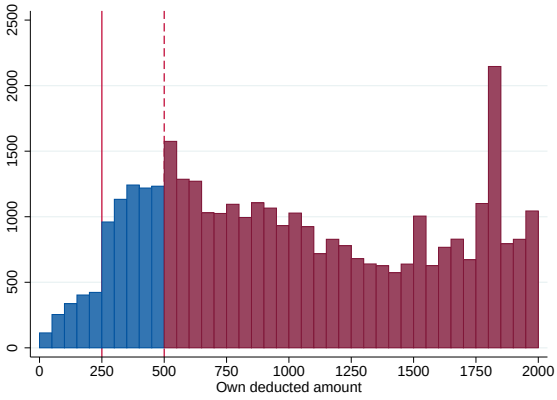
Figure A7: Own deducted amount in 2012 and 2013

2012 2013

Singles

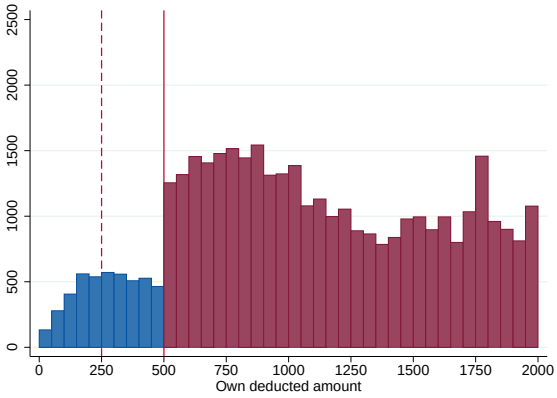


(a)

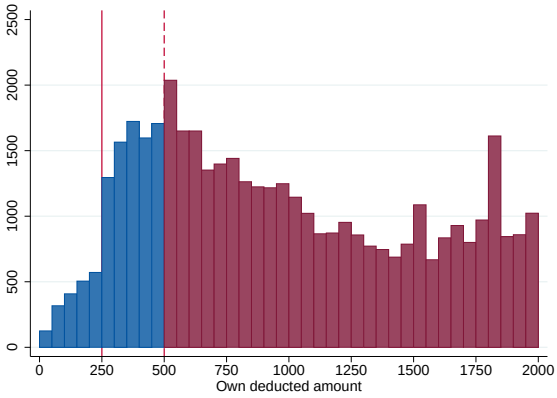


(b)

Primary earners

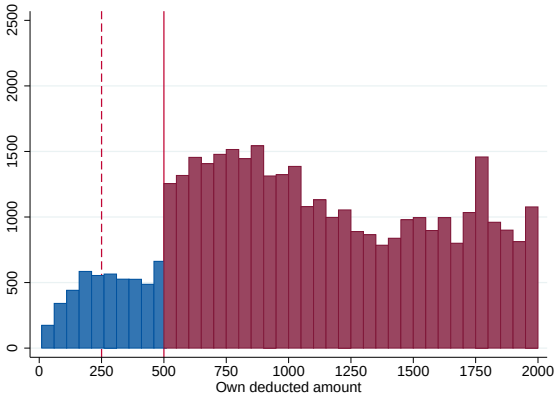


(c)

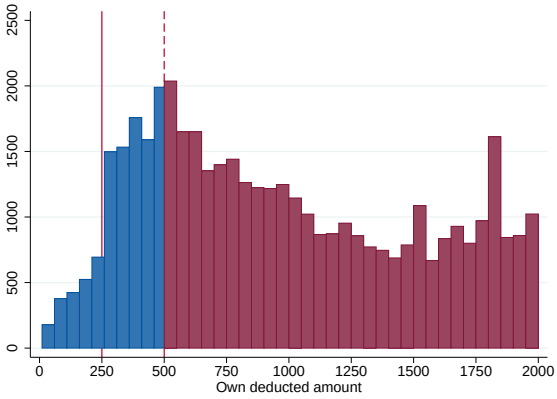


(d)

Secondary earners



(e)



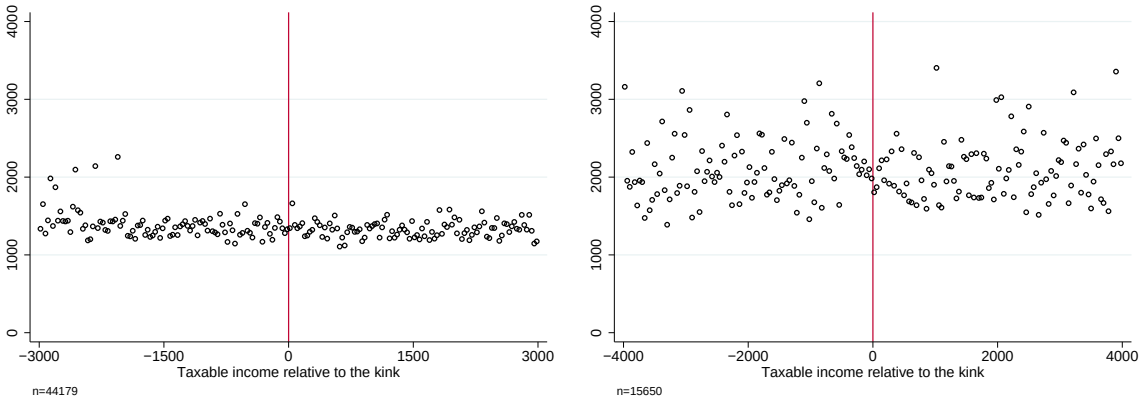
(f)

Notes: Own calculations based on register data from Statistics Netherlands.

Figure A8: Average deducted amount for those who take up the deduction

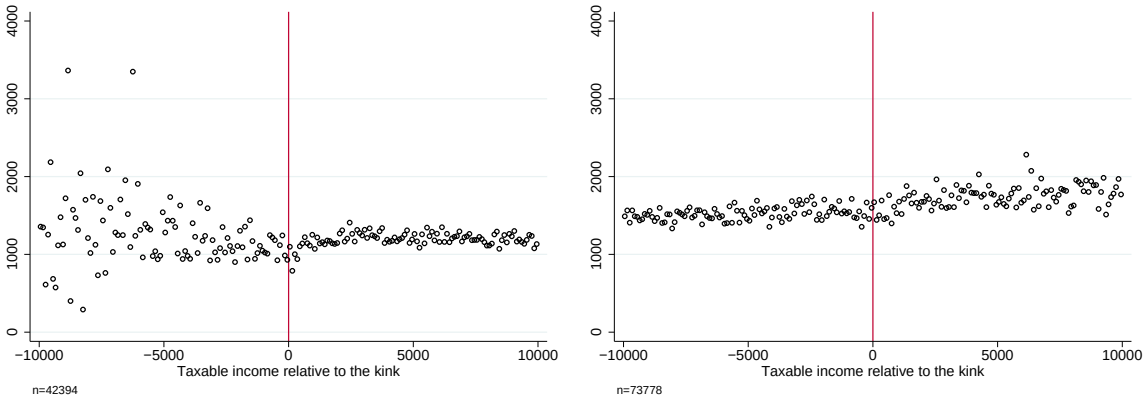
Kink 1 Kink 2

Singles



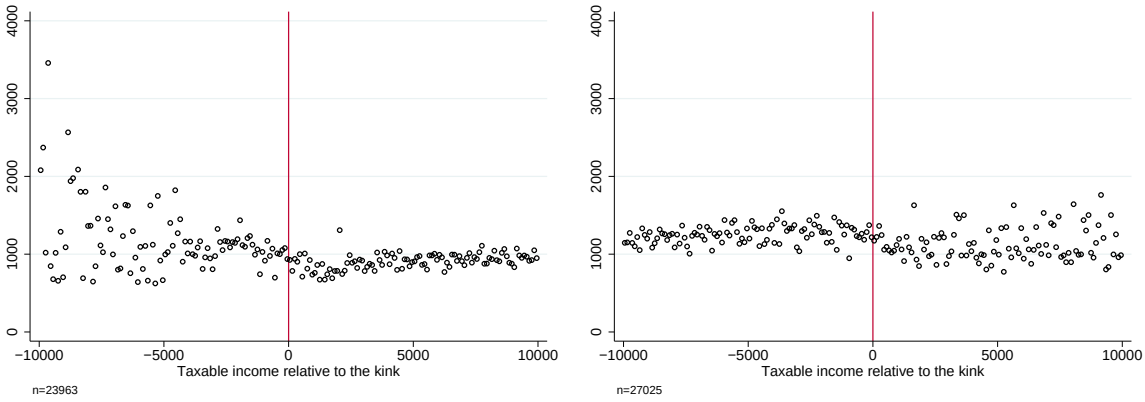
(a) (b)

Primary earners



(c) (d)

Secondary earners



(e) (f)

Notes: Own calculations based on register data from Statistics Netherlands.

Table A1: Treatment effect estimates secondary primary earners on the probability to use the deductible and the deducted amount (euros) using different donut holes

	Without controls			With controls			Obs.
	(1) Linear	(2) Quadratic	(3) Local linear	(4) Linear	(5) Quadratic	(6) Local linear	
Kink 1							
Panel A – Take-up rate of the deduction							
Donut 1500 euro	−0.0008	0.0012	0.0012	−0.0018	0.0013	0.0012	444,991
	(0.0011)	(0.0017)	(0.0017)	(0.0012)	(0.0017)	(0.0017)	
Donut 1000 euro	−0.0003	0.0010	0.0007	−0.0008	0.0012	0.0009	498,627
	(0.0010)	(0.0013)	(0.0013)	(0.0010)	(0.0014)	(0.0013)	
Donut 500 euro	0.0000	0.0008	0.0006	−0.0003	0.0011	0.0009	553,066
	(0.0008)	(0.0010)	(0.0010)	(0.0008)	(0.0010)	(0.0010)	
Donut 0 euro	0.0005	0.0013	0.0013	0.0007	0.0020	0.0019	624,570
	(0.0013)	(0.0014)	(0.0012)	(0.0016)	(0.0016)	(0.0014)	
Panel B – Deducted amount							
Donut 1500 euro	−2.6145	−0.9536	−1.0468	−3.8541*	−0.8615	−1.0158	444,991
	(2.2672)	(3.3447)	(3.2492)	(2.2766)	(3.3831)	(3.2931)	
Donut 1000 euro	−2.1589	−0.3692	−0.3626	−2.9122	0.0100	−0.0662	498,627
	(1.7964)	(2.4282)	(2.3334)	(1.8436)	(2.4664)	(2.3683)	
Donut 500 euro	0.2842	2.0511	1.8645	−0.0813	2.5715	2.2934	553,066
	(1.5644)	(1.8637)	(1.7838)	(1.6450)	(1.9031)	(1.8161)	
Donut 0 euro	1.1794	2.7829	2.6597	1.5290	3.8269	3.5936*	624,570
	(2.0516)	(2.1262)	(1.8443)	(2.4663)	(2.4987)	(2.1267)	
Kink 2							
Panel C – Take-up rate of the deduction							
Donut 1500 euro	−0.0016	−0.0008	−0.0008	−0.0006	0.0001	0.0001	660,928
	(0.0018)	(0.0016)	(0.0016)	(0.0017)	(0.0016)	(0.0015)	
Donut 1000 euro	−0.0001	0.0003	0.0002	0.0008	0.0012	0.0011	756,617
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	
Donut 500 euro	0.0005	0.0008	0.0008	0.0015	0.0018*	0.0017*	854,511
	(0.0010)	(0.0009)	(0.0009)	(0.0010)	(0.0009)	(0.0009)	
Donut 0 euro	0.0010	0.0012	0.0012	0.0021*	0.0022*	0.0022*	970,301
	(0.0009)	(0.0009)	(0.0009)	(0.0012)	(0.0012)	(0.0012)	
Panel D – Deducted amount							
Donut 1500 euro	−4.6525	−4.0725	−4.0050	−2.7501	−2.1733	−2.1232	660,928
	(3.2716)	(3.5188)	(3.4989)	(3.2642)	(3.5187)	(3.5050)	
Donut 1000 euro	−1.6134	−1.2323	−1.2399	0.1965	0.5499	0.5273	756,617
	(2.2687)	(2.3877)	(2.3788)	(2.2757)	(2.4061)	(2.4001)	
Donut 500 euro	0.3518	0.3819	0.2829	2.2895	2.2731	2.1584	854,511
	(1.7042)	(1.7657)	(1.7439)	(1.7508)	(1.8065)	(1.7786)	
Donut 0 euro	1.8676	1.9498	1.8870	4.0630*	3.9716*	3.8371*	970,301
	(1.6805)	(1.6670)	(1.6318)	(2.1608)	(2.0930)	(1.9981)	

Notes: Sample period 2006–2012. Cluster-robust standard errors clustered by income bins of 100 euro in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include year fixed effects. Columns (1)-(3) are without demographic control variables, columns (4)-(6) are with demographic control variables. Columns (1) and (4) assume a linear relation between taxable income and the dependent variable and allow for a discontinuity in the intercept. Columns (2) and (5) assume a quadratic relation between taxable income and the dependent variable and allow for a discontinuity in the intercept. Columns (3) and (6) assume a linear relation between taxable income and the dependent variable and allow for a discontinuity in the intercept and in the linear relation between taxable income and the dependent variable.

Table A2: Full estimation results for the preferred specification for singles

	(1)	(2)	(3)	(4)
	Kink 1 (bandwidth 1,330)		Kink 2 (bandwidth 2,000)	
	Deductible	Deducted amount	Deductible	Deducted amount
Above the kink x taxable income	−0.0014	−2.4376	0.0038***	5.8728
	(0.0012)	(2.3543)	(0.0010)	(3.8610)
Taxable income	0.0005	0.0336	−0.0011*	−1.6255
	(0.0007)	(1.2078)	(0.0006)	(2.3984)
Controls				
Age	−0.0062***	−9.2879***	−0.0028***	−19.7179***
	(0.0003)	(0.4486)	(0.0004)	(3.7302)
Age^2	0.0001***	0.0816***	0.0000***	0.1760***
	(0.0000)	(0.0050)	(0.0000)	(0.0402)
Female	0.0037***	−1.1878	0.0222***	34.9918***
	(0.0008)	(1.4376)	(0.0010)	(3.6599)
Foreign	0.0016***	2.6464**	0.0045***	24.0090***
	(0.0006)	(1.0514)	(0.0011)	(4.9127)
Number of children	−0.0035***	−5.8402***	−0.0021***	0.5144
	(0.0003)	(0.5918)	(0.0004)	(2.2350)
Constant	0.1846***	271.3887***	0.1175***	556.1877***
	(0.0065)	(10.0242)	(0.0097)	(83.2903)
Observations	662,848	662,848	197,584	197,584

Notes: Sample period 2006–2012. Cluster-robust standard errors clustered by income bins of 100 euro in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Year fixed effects included.

Table A3: Treatment effect estimates for singles on the probability to use the deductible and the deducted amount (euros) using different bandwidths around the kink without clustering standard errors

	(1)	(2)	(3)	(4)	(5)
	Use of the deductible		Deducted amount		
	No controls	Controls	No controls	Controls	Observations
Panel A. Kink 1					
Bandwidth					
500	0.0003	0.0007	−7.9404	−7.4324	247,482
	(0.0046)	(0.0046)	(9.3599)	(9.3302)	
1,000	0.0006	0.0007	−2.2945	−2.3580	496,957
	(0.0017)	(0.0016)	(3.4489)	(3.4383)	
1,33 0	−0.0014	−0.0014	−2.4042	−2.4376	662,848
	(0.0011)	(0.0011)	(2.2193)	(2.2130)	
1,500	−0.0006	−0.0006	−1.4232	−1.5225	749,526
	(0.0009)	(0.0009)	(1.8398)	(1.8341)	
2,000	−0.0003	−0.0002	−0.7834	−0.6823	999,693
	(0.0006)	(0.0006)	(1.2147)	(1.2108)	
Panel B. Kink 2					
Bandwidth					
1,000	−0.0021	−0.0012	−7.7869	−5.0908	99,566
	(0.0042)	(0.0042)	(16.2733)	(16.2806)	
1,500	0.0024	0.0024	4.5190	4.8451	148,526
	(0.0023)	(0.0023)	(9.2539)	(9.2401)	
2,000	0.0038**	0.0038**	5.5721	5.8728	197,584
	(0.0015)	(0.0015)	(6.2202)	(6.1994)	
2,500	0.0031***	0.0032***	7.8314*	8.0554*	246,949
	(0.0011)	(0.0011)	(4.6452)	(4.6343)	

Notes: Sample period 2006–2012. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include year fixed effects. The regressions with controls include gender, ethnicity, age, age^2 and the number of children in the household as demographic controls.

Table A4: Full estimation results for the preferred specification for primary earners

	(1)	(2)	(3)	(4)
	Kink 1 (donut 1,000)		Kink 2 (donut 1,000)	
	Deductible	Deducted amount	Deductible	Deducted amount
Treatment effect	0.0042***	6.3304***	0.0030***	10.2346***
	(0.0015)	(2.0993)	(0.0010)	(2.8003)
Taxable income	−0.0000	−0.0013*	0.0000	0.0001
	(0.0000)	(0.0007)	(0.0000)	(0.0005)
Above the kink x taxable income	−0.0000	0.0009	−0.0000*	−0.0011
	(0.0000)	(0.0007)	(0.0000)	(0.0008)
Controls				
Age	−0.0015***	−2.0001***	−0.0020***	−6.2648***
	(0.0002)	(0.3381)	(0.0002)	(0.9853)
Age^2	0.0000***	0.0121***	0.0000***	0.0484***
	(0.0000)	(0.0038)	(0.0000)	(0.0106)
Female	0.0027***	3.0086***	0.0146***	22.4560***
	(0.0005)	(0.7358)	(0.0008)	(1.8493)
Foreign	0.0029***	2.2404**	0.0107***	21.2857***
	(0.0006)	(0.9969)	(0.0006)	(1.6838)
Number of children	−0.0008***	−1.2884***	−0.0018***	−4.7031***
	(0.0002)	(0.3526)	(0.0002)	(0.5201)
Constant	0.0591***	74.0780***	0.0850***	217.4642***
	(0.0042)	(7.4935)	(0.0052)	(22.1930)
Observations	498,627	498,627	756,617	756,617

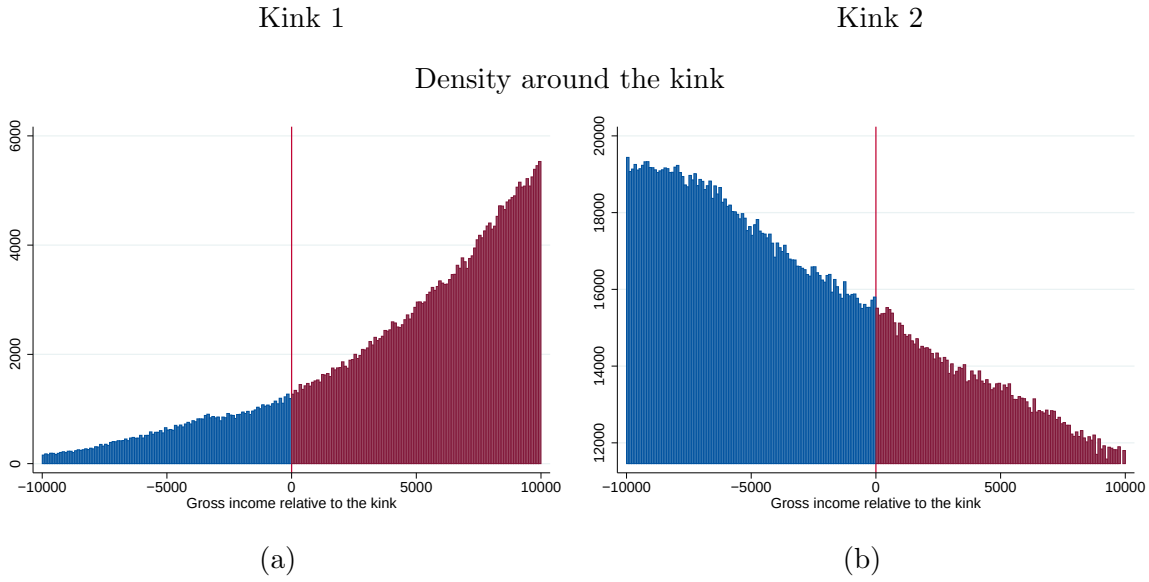
Notes: Sample period 2006–2012. Cluster-robust standard errors clustered by income bins of 100 euro in parentheses, *** p<0.01, ** p<0.05, * p<0.1.. Year fixed effects included.

Table A5: Treatment effect estimates for primary earners on the probability to use the deductible and the deducted amount (euros) using different donut holes without clustering standard errors

	Without controls			With controls			Obs.
	(1) Linear	(2) Quadratic	(3) Local linear	(4) Linear	(5) Quadratic	(6) Local linear	
Kink 1							
Panel A – Take-up rate of the deduction							
Donut 1500 euro	0.0041***	0.0040**	0.0037**	0.0032**	0.0040**	0.0037**	444,991
	(0.0014)	(0.0019)	(0.0019)	(0.0014)	(0.0019)	(0.0019)	
Donut 1000 euro	0.0049***	0.0045***	0.0042***	0.0042***	0.0046***	0.0042***	498,627
	(0.0011)	(0.0014)	(0.0013)	(0.0011)	(0.0014)	(0.0013)	
Donut 500 euro	0.0042***	0.0038***	0.0038***	0.0038***	0.0041***	0.0039***	553,066
	(0.0009)	(0.0010)	(0.0010)	(0.0009)	(0.0010)	(0.0010)	
Donut 0 euro	0.0050***	0.0053***	0.0053***	0.0051***	0.0057***	0.0057***	624,570
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	
Panel B – Deducted amount							
Donut 1500 euro	5.4107**	5.2795	5.5700	4.1866*	5.3381	5.5644	444,991
	(2.4923)	(3.4702)	(3.4619)	(2.4954)	(3.4673)	(3.4591)	
Donut 1000 euro	5.6843***	6.0792***	6.2702***	4.8075***	6.2164***	6.3304***	498,627
	(1.9149)	(2.3231)	(2.2676)	(1.9122)	(2.3207)	(2.2652)	
Donut 500 euro	4.4841***	4.5806***	4.7594***	3.9581***	4.8480***	4.9424***	553,066
	(1.5206)	(1.7295)	(1.6823)	(1.5197)	(1.7283)	(1.6812)	
Donut 0 euro	4.9564***	5.7033***	5.9056***	4.9354***	6.2277***	6.3219***	624,570
	(1.1217)	(1.1722)	(1.1383)	(1.1214)	(1.1742)	(1.1401)	
Kink 2							
Panel C – Take-up rate of the deduction							
Donut 1500 euro	−0.0002	0.0001	0.0002	0.0011	0.0013	0.0014	660,928
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	
Donut 1000 euro	0.0014	0.0018*	0.0018*	0.0026***	0.0029***	0.0030***	756,617
	(0.0009)	(0.0010)	(0.0010)	(0.0009)	(0.0009)	(0.0009)	
Donut 500 euro	0.0019***	0.0022***	0.0022***	0.0032***	0.0034***	0.0034***	854,511
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	
Donut 0 euro	0.0023***	0.0088***	0.0023***	0.0038***	0.0037***	0.0036***	970,301
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	
Panel D – Deducted amount							
Donut 1500 euro	4.1094	4.8658	4.9106	6.6603*	7.3894**	7.4165**	660,928
	(3.4039)	(3.5743)	(3.5732)	(3.4037)	(3.5741)	(3.45728)	
Donut 1000 euro	7.2399***	7.9263***	7.9087***	9.6271***	10.2659***	10.2346***	756,617
	(2.6620)	(2.7973)	(2.7972)	(2.6633)	(2.7978)	(2.7974)	
Donut 500 euro	6.3917***	6.7515***	6.6859***	8.8987***	9.1924***	9.1108***	854,511
	(2.0777)	(2.1523)	(2.1478)	(2.0810)	(2.1548)	(2.1500)	
Donut 0 euro	6.3236***	6.1236***	5.8874***	9.2013***	8.7722***	8.4473***	970,301
	(1.5485)	(1.5879)	(1.5832)	(1.5559)	(1.5934)	(1.5882)	

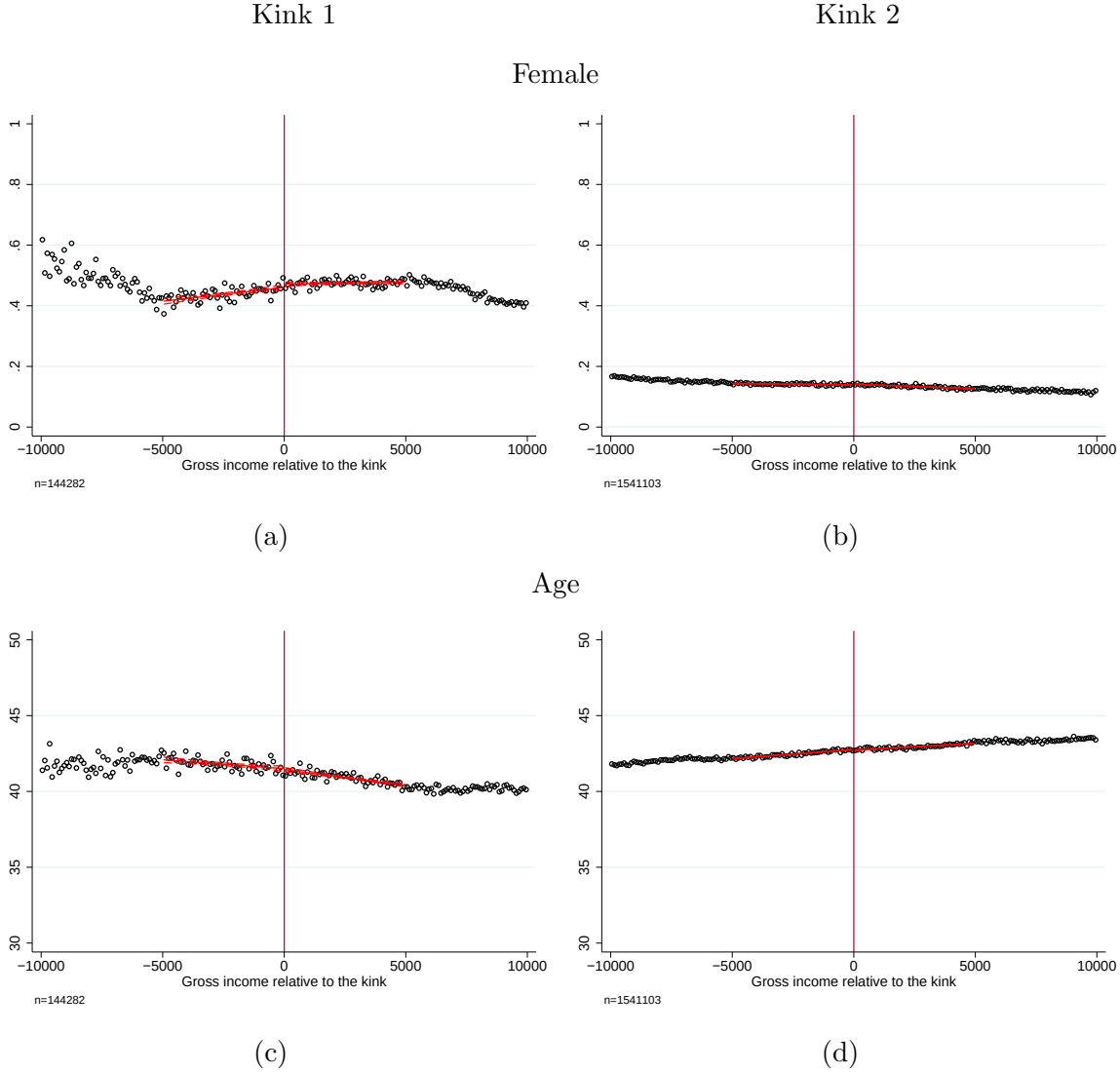
Notes: Sample period 2006–2012. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regressions include year fixed effects. Columns (1)-(3) are without demographic control variables, columns (4)-(6) are with demographic control variables. Columns (1) and (4) assume a linear relation between taxable income and the dependent variable and allow for a discontinuity in the intercept. Columns (2) and (5) assume a quadratic relation between taxable income and the dependent variable and allow for a discontinuity in the intercept. Columns (3) and (6) assume a linear relation between taxable income and the dependent variable and allow for a discontinuity in the intercept and in the linear relation between taxable income and the dependent variable.

Figure A9: Using gross income of the primary earner instead of taxable income shows no bunching around the kink



Notes: Own calculations based on register data from Statistics Netherlands.

Figure A10: Characteristics of primary earners with gross income relative to the kink

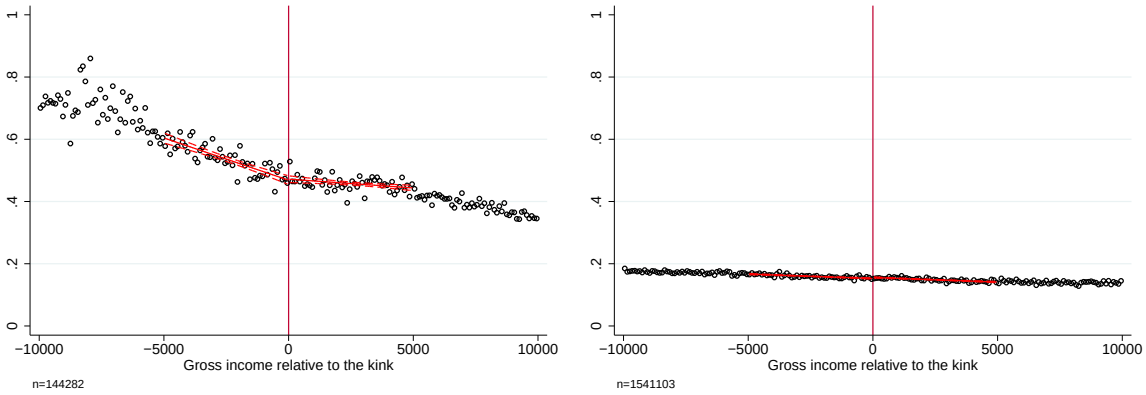


Notes: Own calculations based on register data from Statistics Netherlands.

Figure A10: Characteristics of primary earners with gross income relative to the kink (cont.)

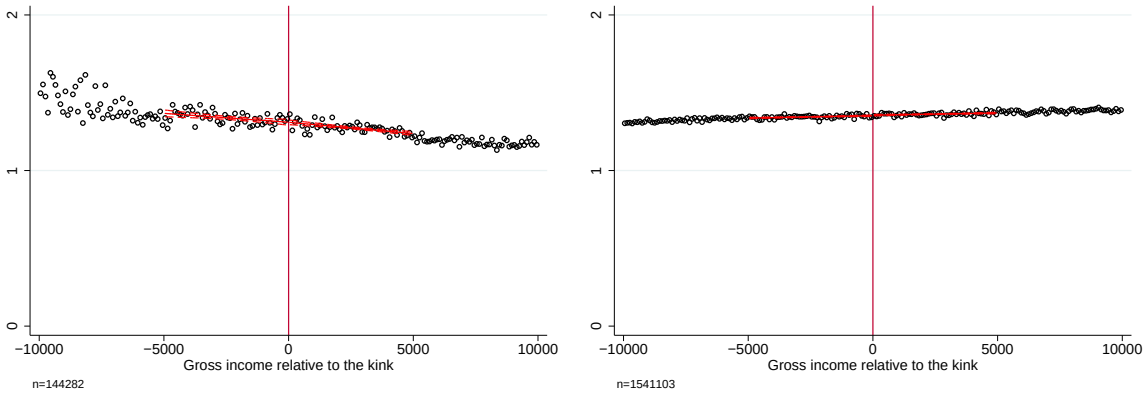
Kink 1 Kink 2

Foreign



(e) (f)

Number of children



(g) (h)

Notes: Own calculations based on register data from Statistics Netherlands.