Intertemporal Income Shifting: Tax Avoidance, Evasion, or a Real Response? Evidence from an Uruguayan Tax Reform

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Abstract

This paper provides empirical evidence on intertemporal income shifting during the implementation of a major tax reform in Uruguay. We exploit VAT and income tax returns for the universe of individuals that declare activity as liberal professionals (e.g. lawyers, public notaries, architects, engineers and accountants). Using a difference-in-difference approach, we document large shifting responses of personal business income in the month before the reform became effective. After controlling for fixed effects, amounts between 28,810 (approx. 1,215 USD) and 443,700 (approx. 18,715 USD) Uruguayan pesos are shifted. Considering under- and over-reported income during the year 2007, we estimate that the share of income shifted ranges between 33.5% and 48% conditional on total income. This implies that the remaining 66.5% and 52% can be attributed to real additional activity driven by the reform. Furthermore, we document salience effects, as architects and engineers, public notaries, and lawyers respond much stronger, especially if they perform their activity in the capital city. Eventually, we estimate the ETI considering the entire period and the period excluding the year of the reform, which confirms the Kreiner et al. (2016) finding about the importance of intertemporal income shifting in the estimates of the short-run ETI.

JEL Classifications: H26; H24; H20
Keywords: income shifting, tax evasion, emerging economies

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1 Introduction

This paper provides novel empirical evidence on intertemporal income shifting and other short- and long-run behavioral responses to tax reforms. We analyze a major change in the Uruguayan tax system implemented in 2007. Intertemporal income shifting, in general, refers to the case when taxable income is shifted between fiscal years in order to reduce the total tax burden. For example, individuals face incentives to delay (advance) the declaration of income generated in one year if tax rates are expected to decrease (increase) in the future.[1] Given the complexity of most tax reforms, the salience effects regarding shifting incentives are an important issue to consider. Goolsbee (2000), Kreiner et al. (2014) and Kreiner et al. (2016) show that, even in relative terms, the rich tend to exploit this possibility to reduce the tax burden more than the poor. Therefore, studying income shifting is not only important in order to understand the revenue implications, but also to evaluate the possible unintended distributional effects of tax reforms. Our study contributes to this debate.

Furthermore, Slemrod (1995) and Kreiner et al. (2016) show that it is important to take potential income shifting into account to get unbiased estimates of behavioral responses to taxation. Estimates of the elasticity of taxable income can be biased in the short run if taxable income has been shifted rather than adjusted. Our setting allows us to disentangle income shifting from real responses. Furthermore, we document short-term real responses which emerge from the tax reform itself. Important changes in the tax law might create substantial extra activity around the reform for lawyers, accountants, notaries, and other tax related professions.

The Uruguayan context offers an interesting case to study intertemporal income shifting. A center-left coalition took power in Uruguay for the first time in democratic history in 2005. During the electoral campaign, the president elected, Tabaré Vázquez, campaigned on a platform of structural reforms, with special emphasis on a more equitable tax system. The tax reform which we study was considered to be the main structural reform in this government term. The proposal of the reform was launched in 2005 and discussed in the parliament during 2006. The final law was passed just before the end of the year on December 28^{th}. The reform became effective six month after on the 1^{st} of July of 2007. The most salient characteristic of the reform was the introduction of a dual income tax (*Impuesto a las Rentas de las Personas Fï¿½sicas*, IRPF) with a flat tax on capital income and a progressive schedule for labor income. Previously, a wage and pensions tax[2] was levied according to very low tax rates (from 0 to 6%). Under the new income tax, labor income is taxed with a progressive tax schedule, consisting of six rates ranging from 0 to 25%.[3] The pre-announced date of tax changes creates a time notch (jump in tax liabilities for taxpayers) which we exploit for identification.

We use a unique data-set to investigate income shifting. Our administrative data contains VAT and income tax returns at the individual level. We observe this information for the universe

[1] See Bianchi et al. (2001) and Martinez et al. (2018) as examples of labor supply responses during tax holidays in Iceland and Switzerland, respectively.

[2] *Impuesto a las retribuciones personales* (IRP)

[3] See Section 2 for further details.

of individuals who declared activity as liberal professionals (e.g. lawyers, public notaries, architects, engineers, accountants, etc.) before and after the reform for each bimester between 2006 and 2009. This provides six annual data-points and allows to analyze income shifting towards May/June of 2007, just before the new tax reform took effect.

The change in labor taxation was particularly relevant for liberal professionals. Before the reform, the income generated by these liberal professions was not subject to the pre-existing wage tax to the same extent as it was for the rest of wage earners. Professionals only paid the wage tax based on a fixed presumptive income, generally, much lower than actual income.[4] Under the new tax system, the income generated by these professionals was considered as labor income and started to be taxed according to the new progressive scheme. Therefore, the introduction of the dual income tax generates a large increase in the tax burden for this collective. In 2007 the average tax rate, on average, was 7.6%, varying from 0 to 22.7%. In our empirical analysis, we exploit these unequal tax burden changes, since individuals with a higher post-reform tax burden have stronger incentives to advance income to the pre-reform period relative to those with no or little changes in the amount of taxes paid.

Our study contributes to the knowledge of behavioral responses to tax reforms and, in particular, to the growing but still scarce literature on intertemporal income shifting and tax evasion behavior in emerging economies. Starting with Slemrod (1995), only a few papers have studied this issue. The most related studies to our paper are Sammartino and Weiner (1997), Goolsbee (2000), le Maire and Schjerning (2013) Kreiner et al. (2014) and Kreiner et al. (2016). Apart from being the first focusing on an emerging economy, we improve the previous literature of intertemporal income shifting in several aspects. First, our data allows us to implement a standard event-study approach based on a difference-in-difference setting and to prove the identifying assumptions of this method. Second, analyzing heterogeneous effects is important as it sheds light on the salience of this particular mechanism of tax evasion and potential distributional consequences.

To identify the intertemporal shifting behavior, we split the universe of individuals among those who were severely affected by the reform and those who were not. The split is based on the sum of their reported income in 2007, with richer individual facing higher post-reform average tax rates compared to the pre-reform tax burden, while low-income professionals face no change. We apply an event-study (generalized difference-in-differences) approach to get a causal estimate of the magnitude of the effect. Our data allows us to show that, apart from the time around the reform, both groups were following parallel trends. We observe a clear spike in the professional income reported by medium-high and high income individuals just the bimonth before the reform came in force (May-June of 2007). The average income reported by individuals above the 75^{th} in this bi-month was 99% bigger as the average reported income in 2007. This difference vary from 46% for those individuals between 76^{th} and 80^{th} percentiles and 142% for those individuals with more incentives to shift income (above 95^{th} percentile). We find that between 34 and 48% of the excess income before the reform can clearly be attributed

[4] See Llambi et al. (2016) and World-Bank (2008) for a discussion of this.

to income shifting. We document that the other half arises due to real increases responses generated by the reform. In a case study, we show that notaries were dealing with exceptionally high numbers of cases just before the reform became effective. Furthermore, we observe heterogeneous behavior among professions, standing out the amounts of income shifted by architects and engineers, public notaries and lawyers.

Regarding the elasticity of taxable income (ETI), our results confirm the study of Kreiner et al. (2016). We estimate the ETI using two different time periods: i) the entire period (2006-2009); ii) excluding the period in which the intertemporal income shifting occurred (year 2007). From the entire sample, we estimate a positive ETI of 0.128 that vary from 0 to 0.246 through professions. Removing the year 2007, short-run elasticities fall to levels not significantly different from zero. These results suggest that most of the variation used to estimate the short-run ETI comes from the intertemporal income shifting between periods around the tax reform.

This paper is organized as follows. Section 2 describes the main features of the tax reform. The data and some stylized facts are presented in Section 3. Section 4 explains our identification strategy. Section 5 presents the main results. We discuss the implications for the estimation of taxable income thereafter, before we conclude in Section 7.

2 The 2007 tax reform in Uruguay

Previous to the reform of 2007, the Uruguayan tax system was very complex, composed by a large number of inefficient taxes. The tax system consisted of more than 30 taxes, however, most of public revenues were concentrated in very few of them. Value added tax, an excise tax on specific products[5] and a corporate tax on benefits[6] collected more than 83% of total tax revenues in 2006 (excluding payroll and local taxes).

The new government launched the tax reform with three main objectives. First, to generate a more equitable tax system, relating the tax burden to the taxpayer's ability to pay. Second, to eliminate inefficiencies of the tax system by abolishing 14 taxes, and finally, to stimulate productive investment and employment. The reform included changes in direct, indirect and payroll taxation and also introduced some technological innovations.[7]

[5] *Impuesto especï¿½fico interno* - (IMESI), was a tax on several goods as tobacco, electricity, gasoline, vehicles, drinks, sugar and cosmetics.

[6] *Impuesto a la renta de industria y comercio* - (IRIC).

[7] The main elements can be summarized as follows: a) the introduction a personal income tax (IRPF) that substitute several taxes (specific to certain types of income); b) the unification of corporate income taxes on agriculture and other economic activities (*Impuesto a las Rentas Agropecuarias* - IRA and *Impuesto a las Rentas de Industria y Comercio* - IRIC) into a single tax. The new tax (IRAE), with a flat rate of 25%, reduced in 5 p.p. respect to the previous corporate tax rates and coincide with the top marginal rate in the IRPF; c) a reduction VAT rates, both basic and minimum VAT rates were reduced by 1 and 4 p.p. respectively (from 23% to 22% and from 14% to 10%); d) several goods and services, previously exempted, were included in the new tax base (e.g. financial services and tobacco products at basic rate and, health services, public transportation, and the first sale of real estate properties at minimum rate); e) the consolidation of the employer's social security contribution into a single 7.5% general rate and the elimination of several sectoral exemptions; f) the simplification of the tax system eliminating several taxes, including taxes on corporate income (IRA) and wages (IRP), the tax used to finance social security (*Impuesto de Contribucidn al Financiamiento de la Seguridad Social* - (COFIS)) and the tax on health services (*Impuesto Especï¿½fico*

The most important change for our study is the introduction of a personal income tax on all domestic sources of income. This tax replaced a pre-existing wage tax (IRP) and implemented a progressive tax schedule with six income tax brackets and rates ranging from 0 to 25% (see Table 1). Deductions were allowed for social security contributions, fixed health allowances for pensioners, and fixed deductions for children. Capital income is taxed at a flat rate of 12%.[8]

Table 1: *Tax Brackets and Rates (2007)*

tax brackets	tax rate (%)
0 to 60 BPC	0
60 to 120 BPC	10
120 to 180 BPC	15
180 to 600 BPC	20
600 to 1200 BPC	22
above 1200 BPC	25

Notes: Semi-annual tax brackets (july-December 2007). The value of Base de Prestaciones Contributivas (BPC) in the second semester of 2007 was $U 1,636 (aprox. USD 72). For the year 2008 the tax brackets of this schedule was double (and the BPC in 2008 was $U 1,775). Source: *Direcciï¿½n General Impositiva* (DGI) .

This change in (labor) income taxation was particularly relevant for liberal professionals. Before the reform, the income generated by these liberal professions was not subject to the IRP as for the rest of wage earners. As we mentioned above, they previously paid the tax (IRP) only based on a fix presumptive income, generally, much lower than actual income. Under the new tax system, the income generated by these professionals is considered as labor income and started to be taxed according to the new progressive scheme. The tax reform also included a special treatment for this kind of income: a liberal professional can deduct 30% of the income generated by his professional activities.[9]

This created a huge variation in the average tax rates in 2007 (the year of the reform) over total labor income: The average ATR was 7.6%, varying from 0 to 22.7%. We exploit this variation in our difference-in-difference setting, as individuals ending up in higher brackets after the reform had larger incentives to advance their income from personal businesses. An individual with income from professional activities at the lower bound of the 75-percentile (90-percentile) faces an average tax rate of approximately 12.7% (15.4%) under the new tax system. If she would have shifted that income to the pre-period, her average tax rate would have been as low as 4%, implying a 3.2 (3.8) times lower tax burden. An individual at the median of the distribution faces only an average tax rate of 7.4% after the reform and the same average tax rate as the rich individual before. Therefore, his tax burden increases only by a factor of 1.8. We exploit this variation

a los Servicios de Salud - (IMESSA)). For more details on the reform see Llambi et al. (2016) and World-Bank (2008).

[8]The nonresidents′ income, generated in Uruguay, is taxed also at a flat rate of 12%.

[9]In addition, they also were entitled to more deductions (i.e. contributions to professional associations, social security contributions, kids and other contributions) subject to a scale with five brackets and rates varying between 10% and 25%. According to World-Bank (2008) estimates, more than 60% of liberal professionals paid more in income tax after than before the tax reform.

of the after-reform tax burden for identification.

3 Data and stylized facts

We have access to a high quality administrative data-set from the Uruguayan Tax Administration (*Direcciï¿½n General Impositiva*). Our empirical analysis is based on VAT and income tax returns for the universe of contributors for the most relevant liberal professions in Uruguay in the period 2006-2009. The data-set contains bi-monthly VAT payments at the individual level, desegregated at 5 digits of the International Standard Industrial Classification of All Economic Activities (ISIC). Concretely, we have information for accountants, architects and engineers, public notaries, lawyers and other minor professions.[10] We are able to match the VAT tax returns (pre- and post-reform) with the annual income tax returns (post-reform) for all tax-payers.[11]

In order to avoid noise in our data, we exclude individuals who carry out activities as a liberal professional very sporadically and focus on individuals which report this activity in every bimester throughout our period of study, i.e. individuals presenting VAT returns in all 24 bimonths of our period. We also exclude individuals who pay, after the reform, by their own choice or by obligation of law, the corporate tax instead of personal income tax.[12] In total, our sample consists of 11,477 taxpayers. This accounts for almost 50 % of the individuals affiliated to their respective professional associations in 2007.[13] Among the main professions are public notaries (2,741), lawyers (2,390), architects and engineers (2,248) and accountants (2,171).

For our sample, the average annual labor income reported in 2008 was 386,186 $U (Uruguayan pesos, approx. 17,900 USD), corresponding the 68% to income from the liberal activity of the profession.[14] In the same year, the annual average wage in the country was 140,700 $U (approx. 6,716 USD). This illustrates that on average our sample covers taxpayers located in the upper part of the complete income distribution in Uruguay. Our empirical analysis is based on the amount of declared VAT by the individuals in our sample. In contrast to income, this information is available at the bi-month level. Note that the VAT declared is just a percentage of the income which is subject to the personal income tax. All these amounts correspond to 22% (VAT rate in 2008) of the gross income that should be considered to calculate the income tax base. The median implied income from the VAT declared in 2008 is approximately 162,330 $U. The top-10 percentile of our professionals declared more than 651,000 $U and the top-5 percentile includes professional income above 957,300 $U. Taking into account the new tax schedule (see Table 1) and the maximum tax rate before the reform (4%) highlight the strong incentives for

[10] We have to exclude medical doctors from our analysis. Health services, previous the reform, were exempted in the VAT and also were subject to another specific tax (IMESSA).

[11] Income tax returns are available for the second semester of 2007 and onwards at yearly frequency.

[12] These individuals represent around 6% of the universe of individuals of our data-set. Including these taxpayers into our sample has only marginal effects on the results.

[13] Not all the affiliated professionals in their respective associations carry out a liberal activity. Many of the professionals are affiliated for other purposes, for instance, for paying for a special retirement plan.

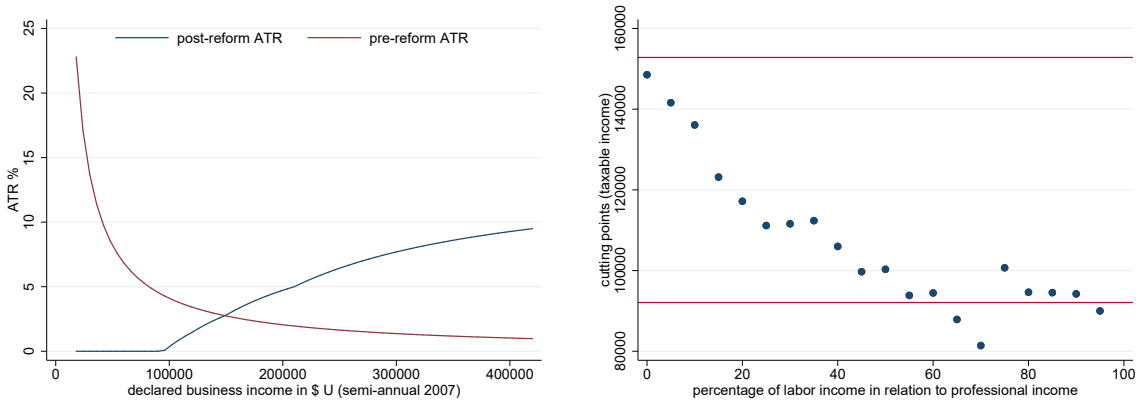
[14] We use the year 2008 for these comparisons due to the fact that this is the first year, after the reform, for which we have information for the entire year.

income shifting.

4 Identification

Our identification strategy is based on an event study approach around the time of the reform. We identify income shifting by comparing individuals in high percentiles of the income distribution to individuals in lower parts of the distribution. Only the former will have an incentive to shift income as they will end up with higher average tax rates under the new progressive tax system than before. Liberal professionals in lower income percentiles serve as the control group. In order to see the incentives faced by taxpayers across the income distribution, we simulate the

Figure 1: *Average tax rates and cutting points*



(a) Average tax rate before and after the reform

(b) Cutting points

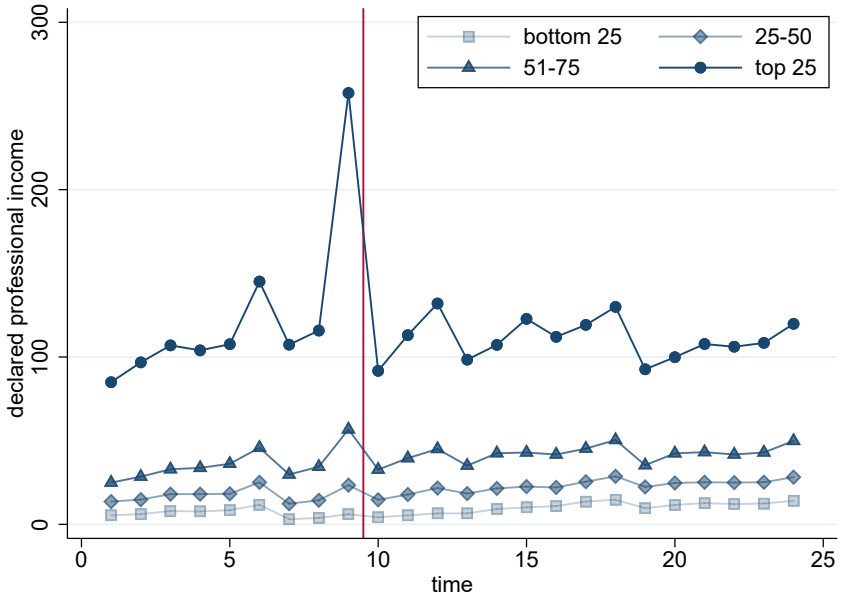
Notes: We use as a reference the 3^{th} category of the CJPPU in order to calculate the IRP pre-reform. The figure shows an individual that only reported income from professional activities. The figure shows business income cutting points (in $U) according to the composition of their total income between labor income and income from professional activities. Exchange rate average May-June 2007: 1 US$ ≅ $U 23.75.

average tax rate after and before the reform using pre- and post-reform tax rules.[15] Panel (a) of Figure 1 shows the post-reform ATR (blue) and pre-reform ATR (red). Note that the pre-reform tax was regressive as the average tax rate is a convex function of income. The reason for this is that the tax base was not real income, but rather a presumptive, profession specific, income (i.e. a profession specific lump-sum tax). Whenever the blue line is above the red line, individuals would save on their tax bill by shifting income to the pre-reform period. This graph shows two important features: First, the higher the declared business income, the larger the discrepancy between the two. Second, below a specific crossing point, this is reversed. This implies that taxpayers in the lower part of the income distribution faced higher average tax rates before than after the reform. Note that they did not had incentives to delay income since they paid the profession specific lump-sum tax independent of the actual level of income. This exercise shows that a taxpayer earning 148,544 $U (approx. 6,250 US$ in semi-annual terms) would be indifferent between the pre- and post-reform situation. This level of income corresponds approxi-

[15] We use as a reference an individual in the 3^{th} category of the *Caja de Jubilaciones y Pensiones de Profesionales Universitarios* (CJPPU) to calculate the IRP pre-reform and that only reported income from professional activities.

mately to the the 60th percentile of the distribution of average income in 2007. However, many individuals earn a mix of professional business income and labor income. As labor income increases, the pre-reform function shifts downwards and the post-reform function upwards. This implies that the point at which an individual would be indifferent between declaring in either of the two periods shifts to the left. Panel (b) of Figure 1 shows all simulated cutting points by adding labor income as a fraction of business income to the individual. For example, the left-most dot corresponds to the case of zero labor income (148,544 $U) as shown in Panel (a) and is located just bellow the 60th percentile of the income distribution as indicated by the red line. Adding labor income shifts the cutting point downwards. For individuals which earn the same fraction of business income as labor income the indifference cutting point is located just below the 40th percentile as indicated by the lower red line. In order to avoid to miss-classify taxpayers between treatment and control groups, we exclude taxpayers which belong to the 40th - 60th percentiles interval in all periods post-reform.

Figure 2: *Income shifting across the income distribution.*



Notes: Data binned at the bimester level. From dark-blue to light blue (top to bottom): Individuals in the top 25%, the 75th percentile to the median, median to the 25th percentile, and the bottom 25% measured in 2007 income from professional activities obtained from declared VAT.

Figure 2 shows binned data for each bimester between January 2006 and December 2009 in different parts of the income distribution, measured in 2007. The reform was implemented between the third and fourth bimester in 2007 as indicated by the vertical line. The spike just before the reform at $t = 9$ is large for the top quartile, but much less pronounced between the median and the 75-percentile and disappears below the median. This reassures our definition of treatment and control as explained before. Furthermore, Figure 2 shows that trends between the groups look relatively similar, but within-year fluctuations seem to be more pronounced in the top of the income distribution. In a first step, we smooth these trends by regressing income on group-specific annual trends.

In the empirical specification we start to consider individuals above the 75th percentile as treated and change the definition of treatment to higher percentiles in order to study if the effects increases with income.

We proceed with an event study approach by estimating a generalized difference-in-difference model:

$$income_{i,y,m} = \sum_{y \neq 2006} \sum_{m=1}^{6} \beta \cdot treat_i \cdot t_{y,m} + \delta_{y,m} + \gamma_i + \varepsilon \tag{1}$$

where $treat$ is our treatment indicator. We use all bi-month of 2006 as the baseline and estimate deviations from each bi-month of this year. More specifically, the coefficient of each bi-month is estimated relative to the same bi-month in 2006. We document the coefficients for the entire fiscal year 2007, i.e. $t = 7$ to $t = 12$. We sum up negative and positive deviations from zero within this year. Assuming that income can only be shifted within 2007, the sum of all negative coefficients is the under-reported income due to the tax reform. The sum of all positive deviations is the excess income. This, however, can be due to two effects. First, the tax reform might create additional real activity, in particular for liberal professionals such as (tax) lawyers, notaries, etc. Second, in the case of income shifting, it must include the amount under-reported in the same year.

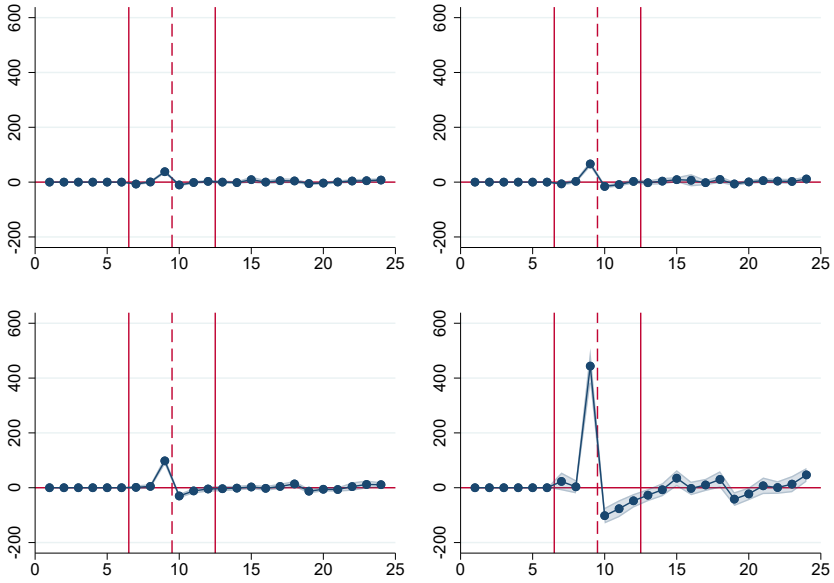
The estimated coefficients for bi-month which are not affected by the reform allow us to analyze post-trends over time. All models include a full set of individual (tax payer) and time (bi-month) fixed effects. The outcome variable is income declared in thousand of Uruguayan Peso. We take out group specific annual trends before running the difference in difference model.

5 Results

5.1 Difference-in-differences: Baseline

We start the discussion of our results by presenting results from the difference-in-difference specification according to Equation 1. We split our treatment group into cells of 5 percentiles to analyze the magnitude of the effect across the income distribution. Each estimation is based on the observations within the 81st-85th, 86th to 90th, 91st-95th and the top 5 percentiles for the treatment group. Figure 3 shows the estimated coefficients for all periods. Solid vertical lines indicate the year of the reform and the dashed line the period when the new fiscal system became effective, $t = 9$ being the last bi-month before the change in the tax system occurred. Important for our identification is that we do not observe trends out of the window of opportunity for income shifting. The graphs show that trends after the reform year revert to zero and we do not find substantial differences between the treatment and control group in any subsequent period across our four specifications. The most striking result of our results is the clear spike in declared income in $t = 9$, just before the tax system changed. For $t = 10$ to $t = 12$ we find negative effects, which reflect the fact that part of this income has been shifted to the prior period.

Figure 3: *Dif-in-dif results within percentile-ranges*



Notes: Dif-in-dif estimates from equation 1 within 5-percentile ranges. The dependent variable is declared income (in thousands of Uruguayan Pesos) by a liberal professional.

The magnitude of coefficients increases substantially by the level of after-reform income. While we find evidence throughout the income distribution in all sub-samples, the magnitude for the lower brackets decrease substantially.

The estimates in Table 2 confirm our visual analysis. After controlling for trends and fixed effects, we find that individuals with professional income above the 75th percentile have substantial perturbations in their income across periods in the year of the reform. The top part of the table shows the point estimates of the graph above. We sum all positive and negative coefficients in 2007. Relative to the mean reported income in the respective percentile, the under-reported (over-reported) income ranges from 20% (58%) for the lowest income percentile in the treatment group to 73% (151%) for the top 5 of the income distribution. Under- and over-reporting increases more than proportionally with respect to income, and all effects result to be much stronger for the upper parts of the income distribution.

We observe that the under-reported income is not completely equal to the over-reported income. In other words, the total does not sum up to zero. We test this formally and cannot reject the null at any part of the income distribution. While the under-reported amount can clearly be assigned to income shifting, the difference to the over-reported amount arises due to other, secondary effects. The share shifted (i.e. under-reported income as a fraction of over-reported income) ranges from 33.5% for the lowest percentile to 48% for the highest group. This implies that between approximately 66.5% and 52%, conditional on the level of income, can be attributed to real additional activity driven by the reform.

Table 2: *Dif-in-dif results within percentile brackets*

	(1) 76-80pc	(2) 81-85pc	(3) 86-90pc	(4) 91-95pc	(5) 96-100pc
$\beta_{t=7}$	-4.032**	-6.933***	-6.267*	1.361	22.98
	(1.836)	(2.165)	(3.546)	(3.852)	(16.68)
$\beta_{t=8}$	2.600	0.499	2.886	4.940	3.489
	(2.147)	(2.589)	(3.619)	(4.173)	(12.41)
$\beta_{t=9}$	28.81***	38.05***	66.40***	98.03***	443.7***
	(3.030)	(3.512)	(5.337)	(7.162)	(33.22)
$\beta_{t=10}$	-8.309***	-10.17***	-15.69***	-30.00***	-101.8***
	(2.086)	(2.471)	(3.693)	(4.158)	(14.67)
$\beta_{t=11}$	0.918	-1.398	-8.916**	-11.56**	-76.53***
	(2.202)	(2.645)	(3.577)	(4.840)	(15.90)
$\beta_{t=12}$	4.459*	2.745	2.634	-4.563	-47.70***
	(2.381)	(2.952)	(4.175)	(5.127)	(12.71)
excess income	36.79	41.29	71.92	104.3	470.2
under-reported income	12.34	18.50	30.87	46.13	226.1
H_0: excess-under-reported income = 0	0.00467	0.0285	0.0153	0.00159	3.38e-05
share shifted	0.335	0.448	0.429	0.442	0.481
# taxpayers	5,165	5,165	5,165	5,165	5,164
- # treated	574	574	574	574	573
mean rep. income (2007)	63.01	76.64	96.80	134.2	311.1

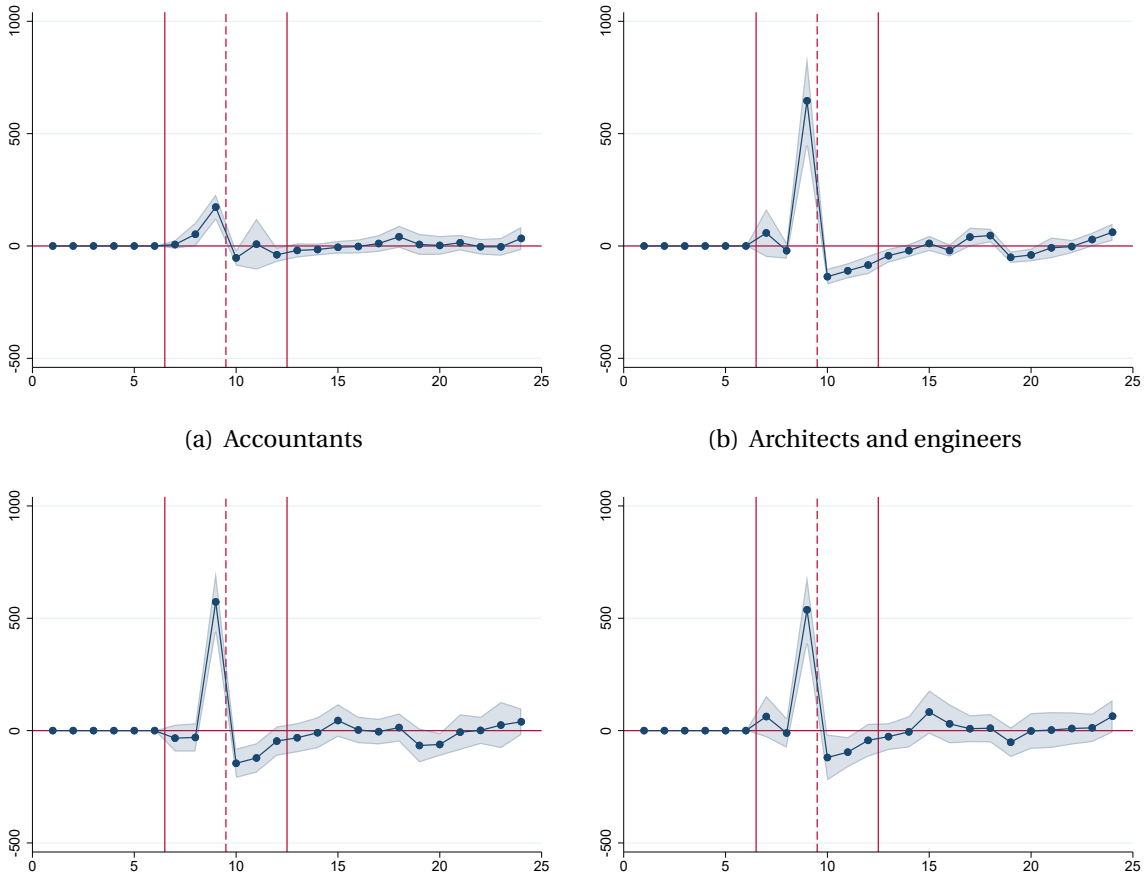
Notes: Each coefficient is the dif-in-dif result from equation 1. The dependent variable is declared income (in thousands of Uruguayan Pesos) by a liberal professional. Treated are individuals with income after the reform within the 76-80-percentile bracket and control below the median. Model (2) treats individuals in the 81-85 bracket (3) the 86-90, (4) the 91 to 95 bracket and (5) the top 5 bracket. Robust standard errors, clustered at the tax payer level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

5.2 Heterogeneous Effects: Results by professions

Our data allows us to estimate heterogeneous effects across different professions. Doing so sheds light on the mechanism behind the observed shifting behavior and to explain the above mentioned effect of larger over- than under-reporting. We restrict both, treatment and control to the respective sub-sample of individuals but use the original income distribution to calculate percentiles.[16]

Figure 4 confirms these results for the top bracket of the income distribution (top 5%). We find large and significant effects across all four main professions included in our data. Effects for accountants are much smaller than for architects, notaries, and lawyers. This is true for both, under-reporting after the implantation and over-reporting before. Nevertheless, the results confirm the previous finding that under-reporting cannot explain the entire additional amount before the tax change.

Figure 4: *Effect across Professions (Top 5%)*



(a) Accountants

(b) Architects and engineers

(c) Notaries

(d) Lawyers

Notes: Each coefficient is the dif-in-dif result from equation 1. The dependent variable is declared income (in thousands of Uruguayan Pesos) by a liberal professional. Each panel shows results for a sub-sample within a specific profession. Treated are individuals within the top 5 percentile of 2007 income. 95% (cluster robust) confidence bands are indicated around the point estimates.

Table 3 shows detailed results for the sub-sample of accountants, architects and engineers,

[16] We do so because the income distribution varies substantially across professions. This implies that profession specific percentiles would represent very different levels of income.

notaries, and lawyers. This table confirms the effects documented before across professions. Architects and engineers, especially those in the top five, shift the largest amount of income with estimates ranging from 47 thousand U$ over-reported and 8 thousand U$ under-reported in the 76th - 80th percentile to 704 thousand $U (353) for the top 5 of the income distribution. Public notaries and lawyers follow this group with slightly different values. The lowest distortions are again found in the group of accountants.

The ratio between under-reporting and excess income is relatively stable across all professions. On average, around 50% (the ratio of negative to positive values) can be clearly attributed to income shifting. This share is slightly lower for accountants, and higher for notaries in the top part of the income distribution with a maximum share of 66%. The remaining part might arise due to secondary effects, such as professionals cleaning up their books before the reform, or real responses due to additional activity created by the reform itself.

5.3 Mechanisms: Notaries as a case study

Ideally we want to show how the excess income is affected by real economic activity. While it is difficult to come up with measures of real activity for each category of professionals, notaries offer an exception here. The tax reform, implemented in 2007, affected the tax treatment of the real estate market which is one of the most important markets for the activity carried out by notaries. The main changes in the tax law which affected this specific market are that 1) after the reform, the income tax starts to tax capital gains from housing; 2) the new tax introduced an exemption from paying the tax on capital gains from selling the primary housing under some conditions[17]; 3) the first sale of real estate, that was exempted from paying VAT, after the reform, began to pay the minimum VAT tax rate (10 %). This last point is particularly important as it creates incentives to advance selling houses before the implementation of the tax reform.

We collected data of housing transactions at the daily level and aggregate the information to the same bi-month as our main data. Figure 5 shows the raw series in comparison to the binned income of public notaries in the left panel (a). While both series are on a different scale (transactions left, income right), this graph shows that both variables evolve very similar over time. The right panel (b) estimates the model with respect to the base bi-month, but without taking into account the second difference as we do not observe housing transactions by income categories (i.e. we can not separate treatment and control in this case).

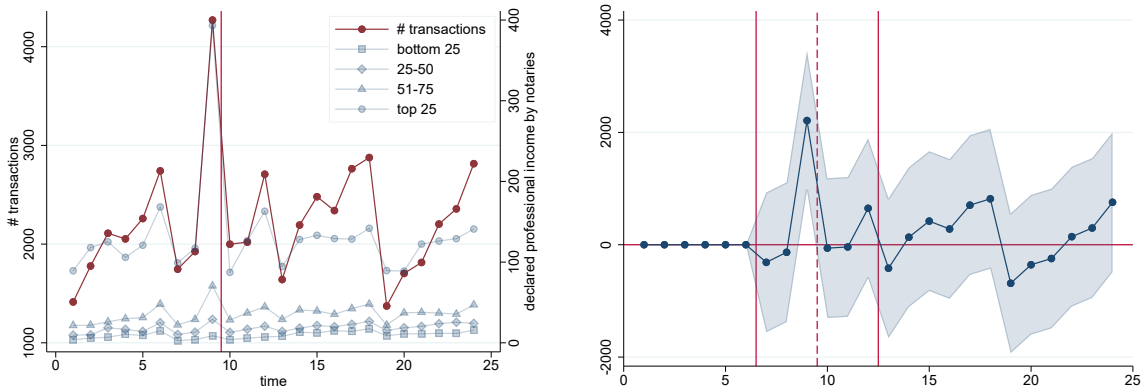
A clear spike, similar to the income estimates, appears in the bi-month just before the tax system changed. This confirms our conjecture of a mixed effect. The amount under-reported by notaries, as documented in Table 3, accounts for half of the excess amount. The difference between the amount over-reported, which can be attributed to income shifting and is equal to the amount under-reported, is due to real activity created by the reform. In this case addi-

[17] only if the following conditions were simultaneously met: i) the sold price do not exceeds 1.200.000 *unidades indexadas* (approx. 84.000 US$ at that moment); ii) the owner invest at least 50 % to buy a new house in a period of 12 months months (before and after of the realization of the capital gain); iii) the price of the new housing do not exceeds 1.800.000 *unidades indexadas* (approx. 126.000 US$ at that moment).

Table 3: *Heterogeneous effects: Professions*

	(1) 76-80pc	(2) 81-85pc	(3) 86-90pc	(4) 91-95pc	(5) 96-100pc
	Panel A: *Accountants*				
$\beta_{t=7}$	-7.563**	-7.188*	-0.650	12.36**	6.418
	(3.696)	(3.743)	(4.755)	(5.651)	(9.731)
$\beta_{t=8}$	-2.348	-2.324	-4.342	2.904	52.16*
	(4.016)	(3.912)	(5.328)	(8.840)	(26.61)
$\beta_{t=9}$	5.129	24.92***	36.54***	42.37***	173.1***
	(4.570)	(6.906)	(9.028)	(10.49)	(28.80)
$\beta_{t=10}$	1.513	-3.624	-10.57	-12.26	-53.11***
	(4.990)	(4.217)	(7.638)	(10.12)	(17.61)
$\beta_{t=11}$	4.412	3.750	-0.919	-7.194	8.069
	(4.317)	(4.879)	(7.636)	(9.695)	(57.83)
$\beta_{t=12}$	9.981**	6.703	8.268	6.856	-39.10**
	(4.631)	(4.202)	(7.995)	(10.66)	(16.21)
excess income	21.04	35.38	44.81	64.49	239.8
under-reported income	9.911	13.14	16.48	19.46	92.20
H_0: excess-under-reported income = 0	0.564	0.224	0.380	0.269	0.176
share	0.471	0.371	0.368	0.302	0.385
# taxpayers (# treated)	795 (108)	796 (109)	795 (108)	796 (109)	795 (108)
mean rep. income (2007)	73.29	86.93	109.8	140.9	283.6
	Panel B: *Architects and engineers*				
$\beta_{t=7}$	3.120	-8.289*	-11.95**	15.43	57.98
	(4.132)	(4.800)	(5.149)	(10.01)	(54.49)
$\beta_{t=8}$	7.476	3.071	11.61	0.744	-20.85
	(4.864)	(6.745)	(7.622)	(8.483)	(18.27)
$\beta_{t=9}$	34.42***	46.19***	65.01***	73.36***	646.1***
	(7.357)	(7.566)	(12.69)	(12.82)	(103.3)
$\beta_{t=10}$	-7.083	-13.43**	-21.42***	-11.10	-136.6***
	(5.208)	(6.176)	(5.720)	(9.701)	(17.75)
$\beta_{t=11}$	-1.381	-4.887	-6.311	-8.285	-110.5***
	(3.904)	(6.308)	(5.988)	(8.753)	(17.14)
$\beta_{t=12}$	1.900	0.954	6.247	1.070	-84.81***
	(4.438)	(7.136)	(7.673)	(10.70)	(20.49)
excess income	46.92	50.22	82.86	90.61	704
under-reported income	8.464	26.60	39.69	19.38	352.8
H_0: excess-under-reported income = 0	0.0207	0.375	0.0826	0.0570	0.00618
share	0.180	0.530	0.479	0.214	0.501
# taxpayers (# treated)	980 (113)	979 (112)	980 (113)	979 (112)	979 (112)
mean rep. income (2007)	64.94	79.01	96.86	133.6	289.3
	Panel C: *Notaries*				
$\beta_{t=7}$	-7.968*	-5.314	-10.34	-13.56	-33.41
	(4.462)	(4.887)	(7.497)	(9.173)	(30.43)
$\beta_{t=8}$	0.898	1.437	-2.261	-2.545	-30.27
	(4.983)	(5.734)	(8.464)	(11.75)	(31.99)
$\beta_{t=9}$	50.57***	58.14***	105.7***	158.4***	572.9***
	(7.074)	(7.807)	(11.26)	(18.62)	(69.57)
$\beta_{t=10}$	-12.79***	-19.87***	-28.71***	-59.11***	-145.5***
	(4.819)	(4.512)	(7.490)	(10.35)	(33.17)
$\beta_{t=11}$	-6.613	-6.520	-17.12**	-12.54	-121.7***
	(4.774)	(5.207)	(7.494)	(14.58)	(33.34)
$\beta_{t=12}$	4.977	2.859	0.499	-12.57	-46.58
	(6.221)	(6.890)	(9.197)	(14.88)	(33.23)
excess income	56.45	62.44	106.2	158.4	572.9
under-reported income	27.37	31.70	58.43	100.3	377.5
H_0: excess-under-reported income = 0	0.152	0.0899	0.130	0.260	0.125
share	0.485	0.508	0.550	0.634	0.659
# taxpayers (# treated)	1,243 (137)	1,243 (137)	1,243 (137)	1,243(137)	1,243 (137)
mean rep. income (2007)	59.67	73.80	94.82	139.6	368.2
	Panel D: *Lawyers*				
$\beta_{t=7}$	-0.581	-11.06*	-7.718	-3.232	62.64
	(4.581)	(5.663)	(12.03)	(9.120)	(47.06)
$\beta_{t=8}$	13.79**	-3.473	4.065	31.10**	-10.60
	(6.582)	(6.049)	(11.48)	(12.06)	(33.49)
$\beta_{t=9}$	42.21***	56.43***	81.71***	168.3***	537.6***
	(7.532)	(8.347)	(14.77)	(21.72)	(78.47)
$\beta_{t=10}$	-13.08***	-11.44*	-12.65	-45.99***	-119.6**
	(4.509)	(6.613)	(12.04)	(9.795)	(52.05)
$\beta_{t=11}$	-2.112	-4.242	-6.893	-32.18***	-95.87***
	(5.505)	(7.024)	(12.11)	(8.816)	(34.06)
$\beta_{t=12}$	0.629	-1.578	-10.83	-17.80	-43.15
	(6.048)	(7.568)	(12.21)	(11.08)	(37.20)
excess income	56.63	56.43	85.77	199.4	600.3
under-reported income	15.77	31.79	38.10	99.20	269.2
H_0: excess-under-reported income = 0	0.0352	0.329	0.427	0.00700	0.0522
share	0.279	0.563	0.444	0.497	0.448
# taxpayers (# treated)	1,186 (119)	1,187 (120)	1,186 (119)	1,187 (120)	1,186 (119)
mean rep. income (2007)	60.76	77.52	98.40	142.2	350.8

Figure 5: *House transactions*



(a) Raw data (b) Estimated coefficients

Notes: Each coefficient is the dif-in-dif result from equation 1. The dependent variable is the number of house transaction per bi-month.

tional real activity has been created due to the incentives to advance house transactions. The average number of transactions across all periods is approximately 2200 per bi-month. This number allows us to do some simple back-of-the-envelope calculations. Given the additional 2000 transaction before the reform, one can explain the missing part of the excess income found in the previous section. To sum up, half of the effect is due to income shifting as a means of tax evasion, and the other half can be attributed to real activity created by avoidance responses in other sectors linked to notaries.

6 Implications for the elasticity of taxable income

Understanding how income taxation affects economic decisions of individuals is key for the optimal design of tax and transfer systems. The economic analysis of taxation is based mostly on the ETI to study individuals' responses to tax reforms. The concept of the ETI captures not only real responses (i.e. hours worked, individual effort, etc.) but also tax avoidance and evasion decisions. The ETI is a relevant concept in absence of fiscal externalities, in particular, intertemporal income shifting (see, Saez et al., 2012). As emphasized by Kreiner et al. (2016), intertemporal income shifting may have important implications for the estimation of the ETI. In particular, the existence of intertemporal income shifting might bias the short run estimated ETI upwards. In this section, we document this effect.

Following Kleven and Schultz (2014), we estimate a model in first differences:

$$\Delta ln(z_{i,t}) = \epsilon \Delta ln(1-\tau_{i,t}) + u_{i,t} \tag{2}$$

In this specification $z_{i,t}$ represents reported taxable income and $\tau_{i,t}$ is the marginal tax rate where, $\Delta ln(z_{i,t}) \equiv ln(\frac{z_{i,t+1}}{z_{i,t}})$ and $\Delta ln(1-\tau_{i,t}) \equiv ln(\frac{1-\tau_{i,t+1}}{1-\tau_{i,t}})$. Given that we are considering only four years to estimate the ETI, we do not consider individual characteristics in our first differ-

enced model.

Using Equation 6 to estimate the ETI by ordinary least squares (OLS) would result in biased estimates. Due to the progressivity of the income tax, a positive income shock mechanically increases the marginal tax rate and, then, reduces the net-of-tax-rate. This endogeneity generates a downward bias on the OLS estimates of the ETI. As in Gruber and Saez (2002), we deal with endogeneity of the OLS estimates using an instrumental variables strategy. In order to isolate the exogenous variation in the marginal tax rate induced by the tax reform (and leave aside possible behavioral responses) we compute marginal tax rate that taxpayers would have faced in period t if their income had been the same (in real terms) as in the year 2008.[18] Another empirical challenge when estimating the ETI is mean reversion of taxable income. As usual in the literature, we address the potential bias from mean reversion by controlling for base-year income. Following Gruber and Saez (2002) we include cubic splines in all our specifications.

We present short-run estimates of the ETI using our data from a balanced panel of taxpayers with semester frequency. First, we estimate the ETI for the entire period (2006-2009) and, then, in order to prevent that our estimates might be influenced by intertemporal income shifting, we recalculate the ETI excluding the two semesters of 2007. We report our results for all professionals and then disaggregated by profession. The first two rows in Table 4 report the OLS and two stage least squares (2SLS) estimates for the entire period. Rows three and four show the same specifications (OLS and 2SLS) excluding the two semesters of 2007. In all specifications we include time fixed effect as well as cubic splines of income at the beginning of the period.

The coefficients in the first row of Panel A in Table 4 are estimated by OLS. Estimates are negative in most of the samples and statistically significant for the entire sample and for public notaries. This negative OLS point estimate of the ETI is consistent with theory. In the second raw we estimate the same model using the predicted value of the net-of-the-tax-rate as suggested by Gruber and Saez (2002) as an instrument. In all cases the ETI is small but positive, except for accountants. Specifically, for the entire sample the point estimate is 0.128 and statistically significant at 1% level. The size of the ETI is in line with recent empirical findings for Uruguay by Bergolo et al. (2019).

In Panel B of Table 4 we disentangle the effect of the ETI due to real responses and the bias due to income shifting. Therefore, we re-estimate the ETI excluding both semesters of 2007 which were subject to income shifting as documented before. We find that in most cases the point estimate is positive, but substantially lower and in general insignificant (except for the category others) compared to the previous results. In this short-run analysis, our results indicate that income shifting between the second and first semester of 2007 was driving most of the estimated elasticity. This result is in line with Kreiner et al. (2016), who finds similar evidence for Denmark when results are corrected for intertemporal income shifting.

[18] Both Gruber and Saez (2002) and most of studies that uses this instrument adopt the base year to recalculate the predicted marginal tax rate. Conversely, we use one and two years ahead to impute the predicted marginal tax rate, given that in our study we analyze the introduction of the income tax and, then, we do not have income tax information before the reform.

Table 4: *Elasticity of Taxable Income*

	All	Lawers	Notaries	Architects & Engineers	Accountants	Other
	Panel A: *Period 2006-2009*					
OLS						
$\Delta ln(1-\tau_{i,t})$	-0.053*	0.014	-0.136**	-0.034	-0.072	0.065
	(0.030)	(0.080)	(0.063)	(0.057)	(0.052)	(0.052)
2SLS						
$\Delta ln(1-\tau_{i,t})$	0.128***	0.246**	0.0955	0.182***	-0.041	0.184**
	(0.039)	(0.111)	(0.080)	(0.070)	(0.073)	(0.072)
Observations	58,160	12,392	15,448	9,848	11,776	8,696
Number of id	7,270	1,549	1,931	1,231	1,472	1,087
F-test of excl. inst.	28,197	7,291	7,793	2,573	3,747	5,685
	Panel B: *Excluding 2007*					
OLS						
$\Delta ln(1-\tau_{i,t})$	-0.089***	-0.035	-0.207***	-0.046	-0.061	0.043
	(0.034)	(0.092)	(0.078)	(0.035)	(0.053)	(0.051)
2SLS						
$\Delta ln(1-\tau_{i,t})$	0.038	0.166	-0.058	0.022	-0.041	0.134**
	(0.040)	(0.120)	(0.088)	(0.041)	(0.071)	(0.068)
Observations	43,620	9,294	11,586	7,386	8,832	6,522
Number of id	7,270	1,549	1,931	1,231	1,472	1,087
F-test of excl. inst.	27,398	6,866	7,216	2,709	4,224	5,353

7 Conclusion

Using a unique data-set of Uruguayan professionals, we document substantial intertemporal shifting of personal business income. This contributes to the scarce but growing literature on income shifting as tax avoidance or tax evasion. Adding under- and over-reported income during the year 2007, we estimate that the share of income shifted ranges from 33.5% for the lowest percentile ($76th$)to 48% for the highest group (96^th), which implies that between approximately 66.5% and 52%, conditional on the level of income, can be attributed to real responses to the reform. In a case study, we show that public notaries were dealing with an exceptional increase in their activity before the reform has been implemented. We also show that architects, lawyers and public notaries respond much stronger and drive indeed most of the result. Furthermore, our ETI estimates suggest that most of the variation used to estimate the short-run ETI can be attributed to intertemporal income shifting around the tax reform. Finally, our results also point out that tax evasion through income shifting might be regressive, as professionals with higher average incomes engage more in this behavior.

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