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WIDER Development Conference

Public economics for development

5-6 July 2017 | Maputo, Mozambique

This is a draft version of a conference paper submitted for presentation at UNU-WIDER's conference, held in Maputo on 5-6 July 2017. This is not a formal publication of UNU-WIDER and may reflect work-in-progress.

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The Response of Salaried Workers to the Personal Income Tax: Evidence from a Regression Discontinuity Design in Argentina ^{*†}

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Abstract

This paper exploits a novel natural experiment to identify labor supply responses to the personal income tax. In August 2013, the President of Argentina passed an Executive Order that exempted from the income tax all wage earners with gross monthly earnings between January and August 2013 below \$AR 15,000, regardless of subsequent earnings. This resulted in a large and salient discontinuity in tax liabilities for upper earning workers above and below 15k that were otherwise very similar. Using a regression discontinuity design and administrative employer-employee data, we estimate a precisely measured zero change in earnings of salaried workers after the reform. Being more internally valid, this result challenges previous estimates of reported income elasticities and the response of wage earners to tax cuts.

1 Introduction

The response of wage earners to taxes and tax reforms has long been of interest to economists and policymakers. The magnitude of this response is of critical importance in the formulation of tax and transfer policies, and for welfare analysis. However, the empirical literature has not yet reached a consensus on the magnitude of the elasticity of earnings with respect to

^{*}We would like to thank Emmanuel Saez, Pat Kline, David Card, Hilary Hoynes, Alex Gelber, Danny Yagan, Alan Auerbach, and Enrico Moretti for very helpful comments and discussions. We are especially grateful to Jose Anchorena, Diego Schleser, Daniela Guariniello, Moira Ohaco from the MTEySS of Argentina for granting us access to the data and processing the codes making this work possible. The views expressed are those of the authors alone and do not necessarily reflect the views of the MTEySS.

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tax rates. The empirical estimates are not fully compelling and range from no effect to very sizeable responses.

In this article, we exploit a unique natural experiment that took place in Argentina in the year 2013 to estimate earnings supply responses of salaried workers to the personal income tax which overcomes identification difficulties that have plagued previous work. Argentina has a progressive income tax schedule with seven brackets that has been fixed in nominal terms since the year 2000. During this period, the country suffered an accumulated inflation of approximately 1385% and nominal wages followed inflation over time. As a result, a lot of people started paying the income tax in the last 15 years, and the system lost a lot of progressivity since inflation reduced the significance of taxable thresholds.¹ To alleviate the increasing tax burden on wage earners, the president implemented in 2013 a permanent and large tax break for a group of workers based on prior earnings. This unexpected reform was announced through an Executive Order in August 2013 and had the following features: (i) wage earners whose highest gross monthly salary accrued between January-August 2013 was below AR\$ 15,000 were fully exempt from the income tax starting in September 2013, regardless of subsequent earnings; (ii) wage earners whose highest gross monthly salary accrued between January-August 2013 was between AR\$ 15,001 and AR\$ 25,000 received a 20% increase in personal exemptions; (iii) workers earning +AR\$ 25,001 between January-August 2013 continued paying the income tax normally. This tax break was repealed by the new administration in February 2016.

As a result, in September 2013, about 1.5 million of wage earners suddenly stopped paying the income tax regardless of subsequent earnings for two and a half years. This reform implied that very similar workers ended up with very different tax liabilities from September 2013 onwards, depending on whether their earnings from January to August 2013 were above or below 15k or 25k. Thus, the reform effectively created groups of workers who coexist in the same labor market but face sharply different tax liabilities. Comparing workers below and above these cutoffs using a regression discontinuity (RD) design offers a unique opportunity to estimate the impact of a large and salient tax cut on earnings and labor supply. We use administrative employer-employee data provided by the Ministry of Labor, Employment and Social Security, the labor agency in Argentina. The data include all private and public wage earners registered in the social security of Argentina.

Three main results are presented in the analysis. First, the first stage shows a large discontinuity in tax liabilities for upper earning workers above and below 15k after the reform. Second, we show that there is no discontinuity in the distribution of gross earnings

¹In a companion paper we estimate the elasticity of earnings supply in Argentina using the “bracket creep” design by Saez (2003) as a natural experiment. The idea of bracket creep is that a taxpayer near the top-end of a bracket is likely to creep to the next bracket even if her income did not change in real terms.

between January and August 2013 around 15k or 25k. This suggests that individuals could not game the law by underreporting earnings after the law was enacted to take advantage of the tax break. This finding is crucial for the validity of the subsequent RD analysis. Third, we find no evidence of earning responses to the tax cut along the intensive margin. Many robustness checks confirm this result. Anecdotal evidence suggests that the reform and its implementation were indeed very salient. The zero response of wage earners strikes us as remarkable given the size and saliency of the tax cut. This finding could imply low efficiency costs of income taxes for upper wage earners.

This paper complements a large empirical literature estimating the responses of reported income to the personal income tax (see Saez, Slemrod, and Giertz 2012a for a recent survey). Most of the existing work in this literature, however, is based on developed countries. This paper, therefore, represents an effort at analyzing tax-driven responses of wage earners in a developing country context. Moreover, a variety of estimation methods have been employed, including difference-in-differences based on repeated cross sections, share analysis, panel-based difference-in-differences, and instrumental variables. But none of them used a regression discontinuity design, as we do, which is known to have stronger internal validity. Finally, this paper is also connected to a recent strand of literature that has challenged conventional wisdom by finding precisely measured zero effects of different taxes on economic outcomes. For example, using a cohort-based reform in Greece, Saez, Matsaganis, and Tsakloglou (2012b) find no responses of labor supply to payroll taxes along the extensive and intensive margins around a discontinuity, suggesting low efficiency costs of payroll taxes. Bastani and Selin (2014) obtain a precise zero response of wage earners to a large kink point of the Swedish tax schedule using the bunching method. In a different context, Yagan (2015) estimates that the 2003 dividend tax cut in the U.S. caused zero change in corporate investment and employee compensation. This paper contributes to this literature by documenting that in contrast to numerous other tax reforms studied, a large and salient tax cut had no detectable near-term impact on the earnings of salaried workers.

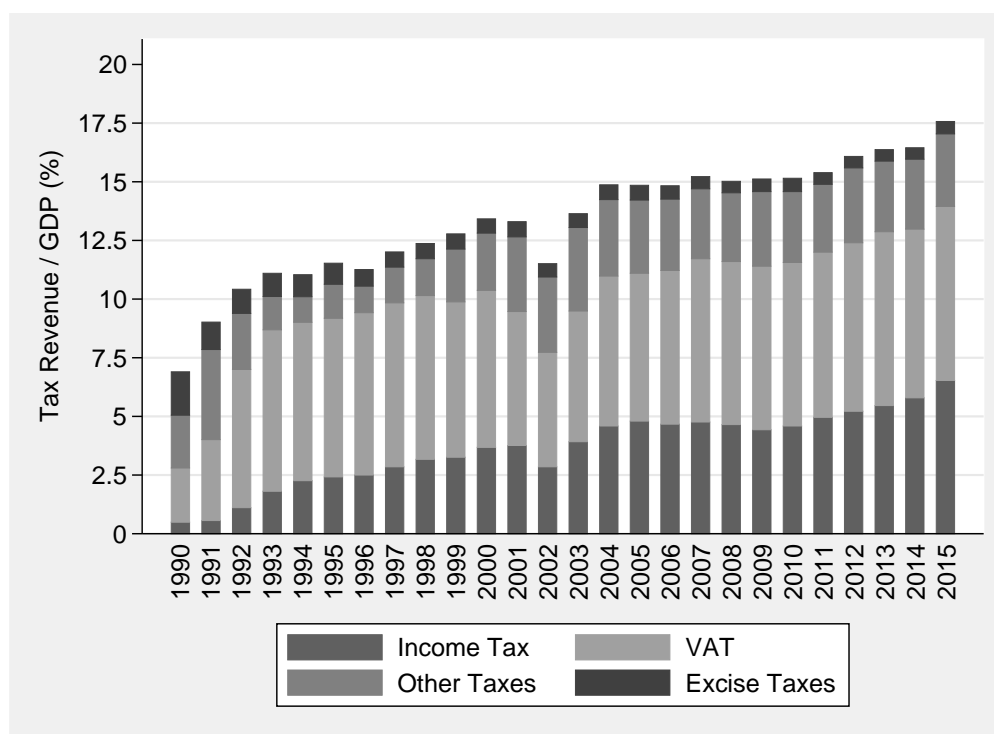
The article is organized as follows. Section 2 describes the institutional details and the conceptual framework. Section 3 introduces the administrative data and summary statistics. Section 4 presents the empirical strategy and results. Section 5 concludes.

2 Institutional Setting and Conceptual Framework

2.1 Overview of the Argentine tax system

Argentina levies taxes at the federal, provincial, and municipal level. The federal tax system is based on the following main taxes: corporate and personal income tax, payroll tax, value added tax, import and export taxes, tax on financial transactions, and net worth tax. The fiscal pressure (total revenue/GDP) has increased substantially in the last years, from 20% in 2001 to 34% in 2016.² Figure 1 shows the evolution and composition of tax revenues. In 2015, tax revenues represented 17.5% of GDP. The VAT was the most important tax (42%), followed in the second place by the income tax (38%). Interestingly, the income tax has become a very important source of revenue in the last 25 years.

Figure 1: Evolution and Composition of Tax Revenues in Argentina, 1990-2015



Source: Own elaboration based on 2015 statistical yearbook of the national tax authority (AFIP).

Argentina has an individual personal income tax (PIT) schedule with seven brackets and progressive marginal tax rates ranging from 9 to 35 percent.³ This schedule is depicted in

²This is mainly explained by social security (30%), income tax (24%), customs duties (17%), tax to financial transactions (17%), and VAT (19%).

³Since December 2016 the PIT has eight brackets and MTRs ranging from 5 to 31 percent. The self-employed are taxed under a simplified regime called *Monotributo*.

Table 1. In practice, employers must withhold income taxes at source from their employees' monthly paychecks.⁴ The amount to withhold depends on the employee's total taxable income. When computing tax liabilities, employees are entitled to deduct social security contributions, family allowances, personal exemptions (spouse and dependents), and other minor deductions declared by employees.⁵ In Argentina, the law requires every individual to file a tax return at the end of the fiscal year, except if the employer has fully withheld taxes or employment income is below the minimum non taxable threshold.

Table 1: Personal Income Tax Schedule in Argentina

Annual Taxable Income		Annual Payment		
From AR\$	To AR\$	AR\$	+ $x\%$	over AR\$
0	10,000	-	9	0
10,000	20,000	900	14	10,000
20,000	30,000	2,300	19	20,000
30,000	60,000	4,200	23	30,000
60,000	90,000	11,100	27	60,000
90,000	120,000	19,200	31	90,000
120,000		28,500	35	120,000

Note: This table shows the personal income tax schedule in Argentina. Taxable income refers to income net of personal exemptions and general deductions. Taxable thresholds have been fixed in nominal terms since the year 2000.

The PIT starts being levied at relatively high income levels, as is the case in many developing countries. In August 2013, a single worker with no children and gross annual earnings below AR\$ 108,676 was not levied income tax.⁶ For the same date, average gross annual earnings for a private salaried worker were AR\$ 107,783 and the monthly minimum wage was set at AR\$ 3,300, corresponding to a gross yearly income of AR\$ 42,900, well below the first income tax bracket. This example shows that in Argentina the PIT is borne by relatively high-earning individuals.

2.2 The reform (decree 1242/2013)

Four facts have characterized the evolution of the PIT in the last years: (i) the PIT schedule remained fixed in nominal terms since the year 2000 (see Table 1) (ii) Argentina had an

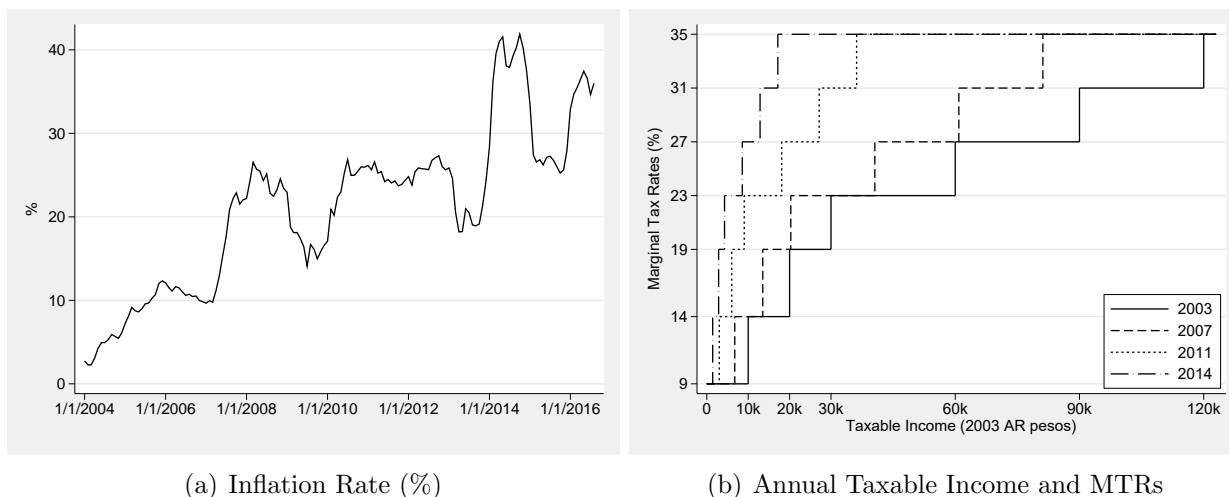
⁴In the case of employees working for multiple employers, the employer that pays the highest salary is in charge of withholding income taxes from all the sources.

⁵These additional deductions include prepaid medical care fees, life insurance, medical expenses, mortgage interests, donations, funeral expenses, domestic services. Contrary to developed countries, these itemized deductions are typically capped and represent on average only 5% of gross income.

⁶This is equivalent to USD 19,406 using an exchange rate of 5.6.

accumulated inflation of about 1385% between 2002 and 2015; (iii) nominal wages followed inflation over time; and (iv) personal exemptions were adjusted irregularly and usually behind the average increase in earnings. Taken together, these facts suggest that a lot of people started paying taxes in this period because inflation reduced the significance of the taxable threshold as shown in Figure 2.

Figure 2: Inflation and Marginal Tax Rates in Argentina



Note: Panel (a) displays the inflation rate from The Billion Prices Project at MIT (Cavallo and Bertolotto, 2016). Panel (b) illustrates how inflation reduces the significance of taxable thresholds.

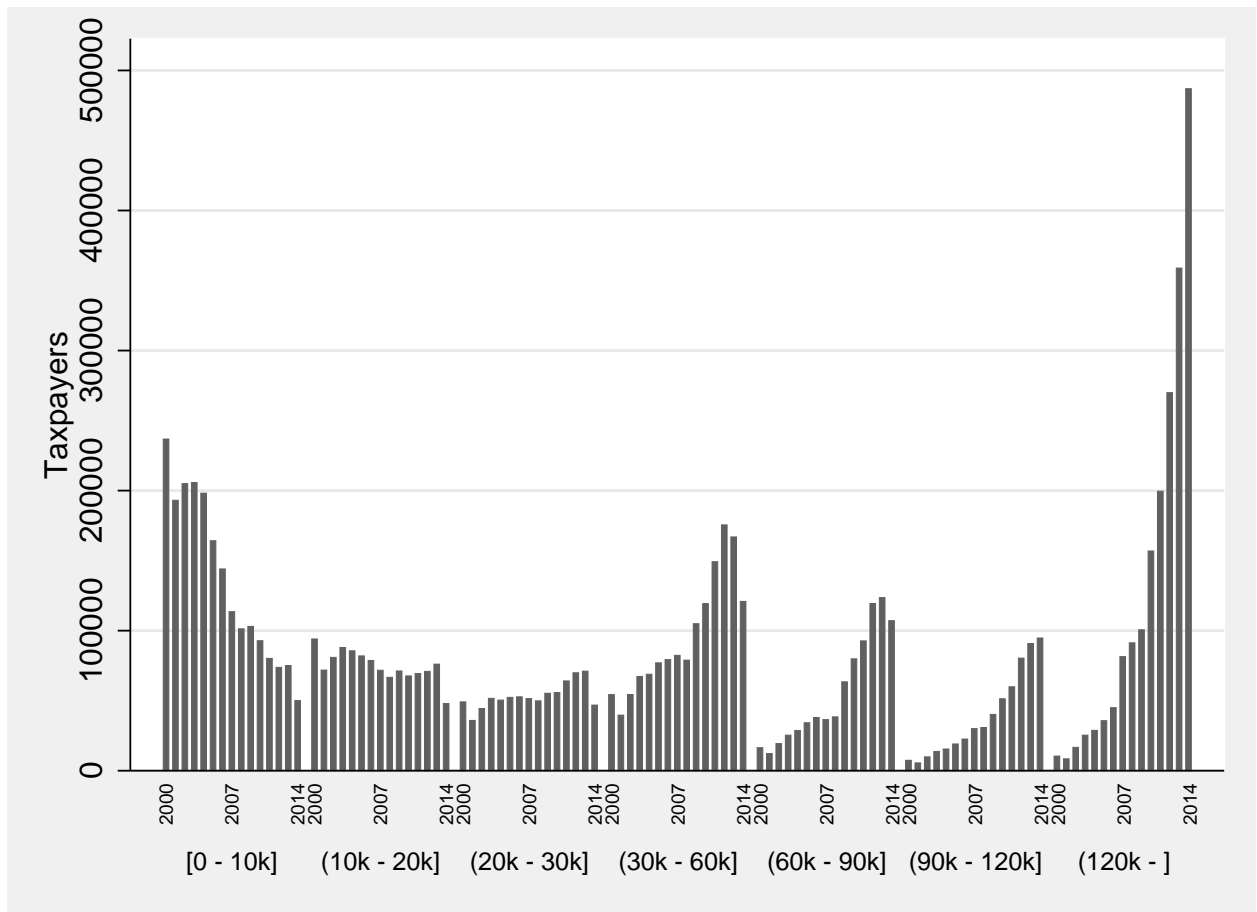
This observation is confirmed in Figure 3. The figure plots the number of taxpayers who filed a tax return from 2000 to 2014. The graph is divided into the 7 brackets of Table 1. The numbers in the figure do not include wage earners subject to tax withholding since they are not mandated to file a tax return.⁷ From this figure we learn two things. First, more people pay the income tax nowadays. Second, the top bracket has become the most popular. This implies that it is more likely for workers to pay the income tax and, once they start paying taxes, to “creep” very quickly to the top bracket. Therefore, the PIT lost a lot of progressivity in the last 15 years as workers with very different earnings could be taxed at the top marginal tax rate.

To alleviate the increasing burden of the income tax on wage earners, a series of reforms were implemented in 2013, 2015, and 2016. The timeline and relevant details of each of these reforms are summarized in Figure 4. In 2013 the president implemented a large and salient tax cut based on prior earnings that affected differentially what would otherwise be comparable groups of workers.⁸ This unexpected reform was announced through an

⁷In fact, this information is not publicly available.

⁸Importantly, legislative elections were held in Argentina on October 27th, 2013. Some people claim that

Figure 3: Number of taxpayers filing tax returns by tax brackets, 2000-2014

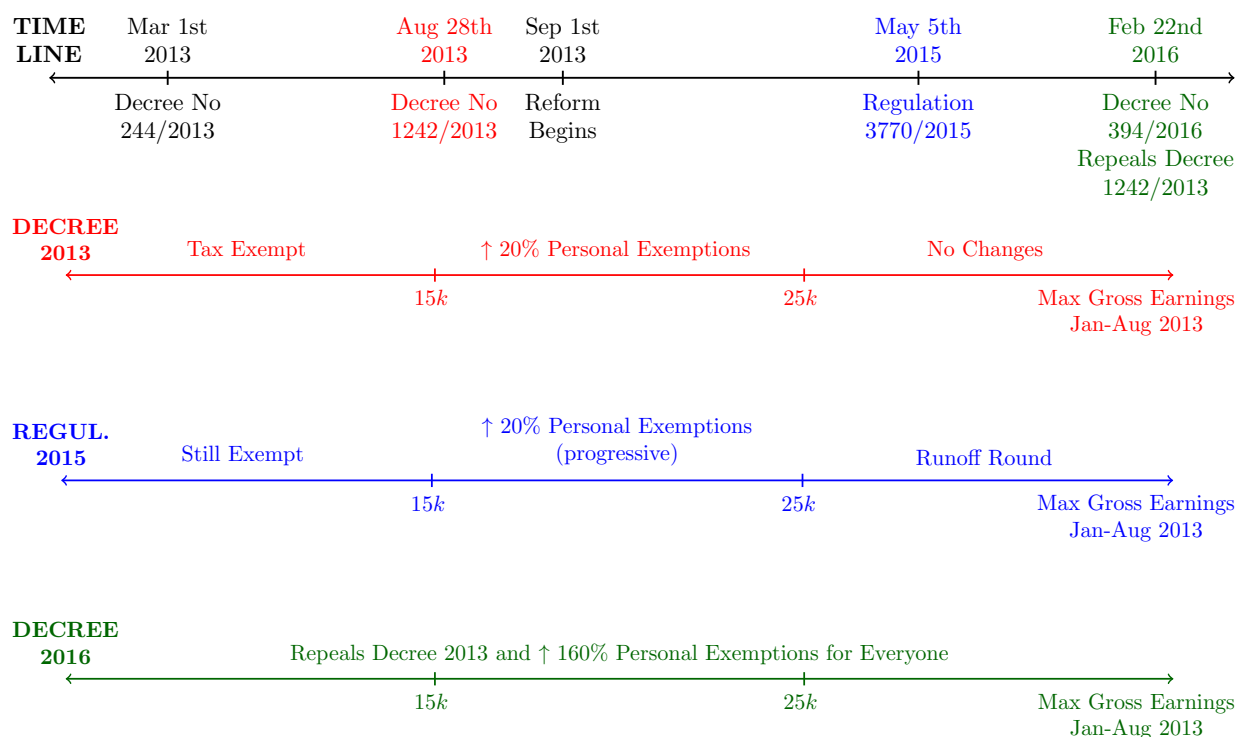


Note: this figure shows the number of taxpayers that are mandated to file a tax return by the end of the fiscal year. These numbers do not include wage earners subject to tax withholding since they are not mandated to file a tax return. Source: Own elaboration based on statistical yearbooks of the national tax authority (AFIP).

Executive Order on August 28th, 2013 (Decree No. 1242/2013) and broke up the universe of salaried workers into the following three groups: (i) wage earners whose highest gross monthly salary accrued between January and August 2013 was below AR\$ 15,000 were fully exempt from the income tax starting in September 2013, regardless of subsequent earnings; (ii) wage earners whose highest gross monthly salary accrued between January and August 2013 was between AR\$ 15,001 and AR\$ 25,000 received a 20% increase in personal exemptions (spouse and dependents); (iii) workers earning more than AR\$ 25,001 between January and August 2013 continued paying the income tax normally.

the tax cut was a political movement of Fernandez administration to improve her public image after being defeated in the midterm elections held on August 11th, 2013.

Figure 4: Timeline and Reforms



Notes: This figure displays the chronology of the events and the main details of each reform. The tax break was announced on August 28th, 2013, and was implemented beginning on September 1st, 2013. All the reforms were based on the highest gross monthly salary earned between January and August 2013, regardless of subsequent earnings.

The rule applied to all regular earnings irrespective of type, that is, it was calculated by adding together earnings from regular payments, overtime, bonuses, and so on, earned in a given month. In the case of employees working for multiple employers, the rule applied to the sum of earnings across all employers.⁹ In the case of workers entering the labor force, the rule was based on whether their *initial* gross monthly salary was above or below the 15k and 25k cutoffs.

The decree was published on August 28th, 2013, and entered into effect on September 1st, 2013. According to the director of the national tax authority (AFIP), 1.4 million workers stopped paying the income tax and the reform represented a fiscal cost of AR\$ 4,495 million in 2013.

In May 2015, the president passed a new decree based on the same rule, that is, using

⁹Note that income taxes are based on incomes net of all social security contributions. However, since payroll taxes remained unchanged at roughly 17% they do not add differential tax wedges between workers and hence do not need to be incorporated in the analysis.

the highest monthly earnings accrued between January and August 2013. In this case, the decree only increased personal exemptions by 20% for the group of workers with earnings between 15k and 25k. Finally, in February 2016 the new administration put an end to the tax break and increased personal exemptions for everyone by 160%.

The reform of 2013 implied that very similar workers ended up with very different tax liabilities from September 2013 onwards, depending on whether their earnings from January to August 2013 were above or below 15k or 25k. Comparing workers below and above these cutoffs using a regression discontinuity design offers a unique opportunity to estimate the impact of a large and salient tax cut on earnings and labor supply.

Critically for the analysis, the reform was indeed very salient. For example, it appeared on the front page of the main newspapers in Argentina.¹⁰ Moreover, employers in charge of withholding the income tax at source were required by the Executive Order to notify the benefit to affected employees by including on their paychecks the concept of ‘Benefit Decree PEN 1242/2013’. For example, Figure 5 shows the paycheck from a wage earner working in the private sector who was affected by the reform. The paycheck corresponds to September 2015, two years after the reform. The blue box shows that gross earnings before taxes and social security contributions were AR\$ 15,699.6. This is the number that we observe in the data. The red box shows the concepts related to the income tax. The first line shows that this worker should have been withheld AR\$ 4,487.4 due to the income tax, but this amount is exactly offset in the following line due to Decree No. 1242/2013. With such a tax liability, the marginal tax rate for this worker should have been 31% instead of 0%. Exempted taxes represented 28.6 percent of this worker’s gross monthly salary.

2.3 Conceptual framework

In this section we develop a simple graphical framework to understand the theoretical predictions of the reform on the labor supply of wage earners. Gross earnings z are defined as earnings before employee payroll and income taxes. Net earnings c are defined as earnings net of employee payroll taxes and income taxes. Earnings include the regular wages and salaries and overtime pay, but not bonuses for vacations or 13th month salary.

In Figure 6 we depict the effect of the reform on the individual budget constraint set and utility maximizing choices in the (c, z) space. Utility increases with disposable income c (as disposable income funds consumption) and decreases with z (as labor supply is costly). To

¹⁰For instance, see Diario La Nacion (<http://servicios.lanacion.com.ar/archivo/2013/08/28/005/DT>) and Diario Clarin (<http://tapas.clarin.com/tapa.html#20130828>)

Figure 5: Paycheck of a wage earner affected by the tax cut

TTTTTTTTT Y ASOCIADOS SA		CUIT N° 30-XXXXXXXX-3		
AV.PASEO XXXXX ZZZ CABA - Capital Federal				
APELLIDO Y NOMBRE		C.U.I.L		LEGAJO
ZZZZZZZZ YYYYYYY		20-XX.XXX.XX-8		285
SECCION OF.CENTRAL CATEGORIA Empleado CALIFICACION PROFESIONAL Empleado	FECHA DE INGRESO	REMUNERACION ASIGNADA	RECIBON°	
	01/12/2014	13.719,60	6346	
	PERIODO DE PAGO: SEPTIEMBRE 2015			
CONTRATACION: a tiempo completo indeterminado				
CONCEPTO	UNIDADES	REMUNERACIONES SUJETAS A RETENCION	REMUNERACIONES EXENTAS	DESCUENTOS
0100 SUELDO BASICO		13.719,60		
0120 Almuerzos.Art9	22,00	1.980,00		
0401 JUBILACION 11%				1.726,96
0402 LEY 19032				470,99
0405 OBRA SOCIAL				470,99
6980 RETENCION GANANCIAS				4.487,40
6999 Beneficio Decreto PEN 1242/13				-4.487,40
9999 REDONDEO			0,34	
		15.699,60	0,34	2.668,94
LUGAR Y FECHA DE PAGO: CAPITAL FEDERAL, 05/10/2015 O.S.: ●.S. Comisarios Navales		FORMA DE PAGO: Cuenta Bancaria		TOTAL NETO → 13.031,00

Notes: This figure displays the paycheck of a wage earner affected by the reform. The blue box shows gross earnings before taxes and social security contributions. The red box shows the concepts related to the income tax.

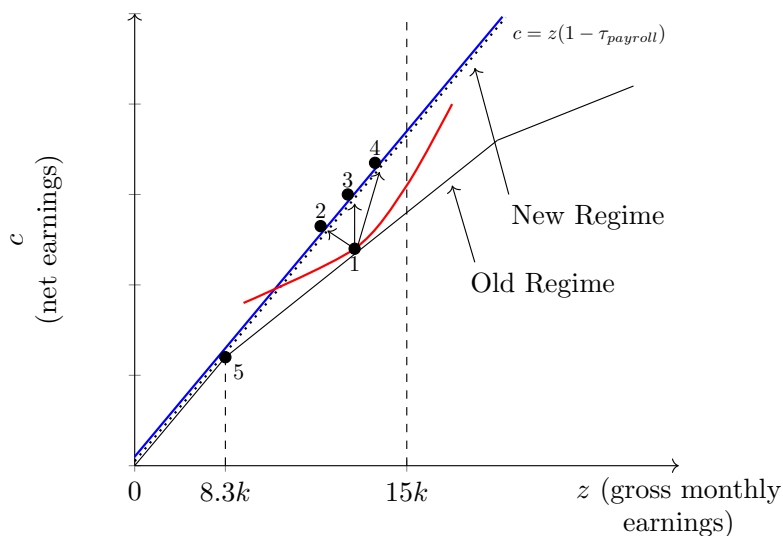
simplify the analysis, we focus on a single worker without any children.¹¹ Before the reform, a worker with these characteristics and gross monthly earnings greater than AR\$ 8,360 was subject to the income tax.¹² This first kink is shown in the figure at 8.3k. Without loss of generality, we also assume that the first tax bracket goes beyond the 15k cutoff.¹³

¹¹In section 4.2 below we show that is the group that faced the largest incentive to adjust their labor supply after the reform.

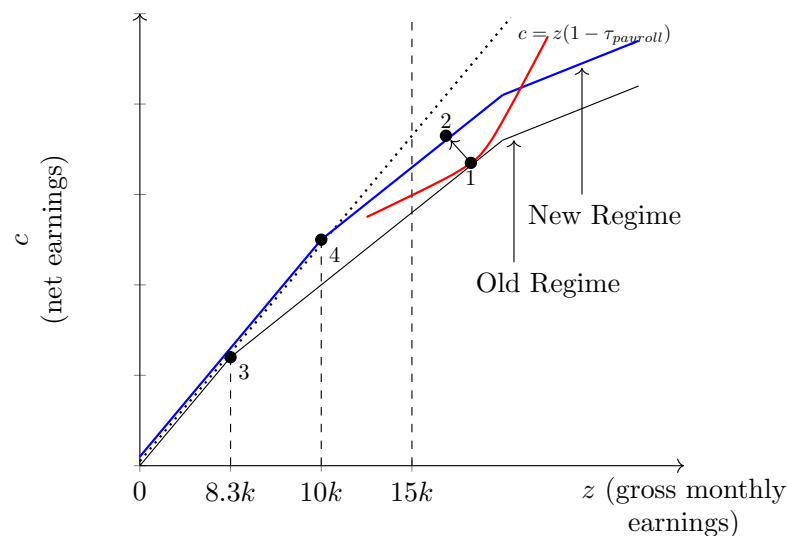
¹²The minimum non taxable income for a married worker with two children was AR\$ 11,563 right before the reform.

¹³In Figure 10 below we overlap the tax schedule and corresponding marginal tax rates to the distribution of gross earnings in 2013.

Figure 6: Conceptual Framework. Single worker without children



(a) Case 1: $\max\{\text{earnings}|\text{Jan to Aug 2013}\} \leq 15k$



(b) Case 2: $15k < \max\{\text{earnings}|\text{Jan to Aug 2013}\} \leq 25k$

Notes: The figure displays the effects of the 2013 income tax reform in Argentina on the monthly budget constraint of single salaried workers with no children. The x-axis represents gross monthly earnings (including employee payroll taxes). The y-axis represents net monthly earnings (earnings net of both payroll and income taxes). The black solid line is the old regime budget and the blue solid line is the new regime budget. The first kink denoted by $8.3k$ corresponds to AR\$ 8,360 as of August 2013. The second kink denoted by $10k$ corresponds to AR\$ 10,032 starting in September 2013. Panel (a) shows the effect of the reform for workers that were fully exempt. Panel (b) shows the effect of the reform for workers that received a 20% increase in personal exemptions.

Figure 6 panel (a) shows the predicted effects of the reform for individuals whose highest gross monthly salary accrued between January and August 2013 was less than AR\$ 15,000. These wage earners were fully exempt from the income tax from September 2013 onwards, regardless of subsequent earnings. Along the intensive margin, workers below $8.3k$ were not paying income taxes before the reform and thus are unaffected. Workers with pre-reform earnings between $8.3k$ and $15k$ experience a decrease in marginal income tax rates from $\tau > 0$ to $\tau = 0$ so that their net-of-income-tax rate increases from $1 - \tau$ to 1. Their budget set shifts upwards from the black solid line to the blue solid line. This creates substitution and income effects.

The substitution effect pushes individuals to work more hours increasing gross earnings. Intuitively, individuals have incentives to work more hours, accept promotions, or job offers at a different place, because they can keep the full payment. However, holding everything else constant, workers maximizing utility in $z \in (8.3k, 15k]$ will get a higher take-home pay now. Thus, the income effect pushes individuals to work less hours reducing gross earnings. Hence, a worker maximizing utility at point 1 could end up in points like 2, 3, or 4. Thus, the effect of the tax break on earnings for this group of workers is ambiguous. Finally, note that workers bunching at the first kink $8.3k$ (i.e. maximizing at point 5) experience a substitution effect that will push them to work more hours (or report higher earnings). This implies that after the reform we should expect bunching at the first kink (if any) to decrease substantially.

Figure 6 panel (b) shows the predicted effects of the reform for individuals whose highest gross monthly salary accrued between January and August 2013 was between AR\$ 15,001 and AR\$ 25,000. In this case, the reform increased the minimum non taxable income 20% from $8.3k$ to $10k$, hence shifting outward the first kink point in the budget set.¹⁴ Workers with pre-reform earnings between $15k$ and $25k$ experience no changes in marginal income tax rates and therefore the substitution effect is zero. However, holding everything else constant, workers maximizing utility in $z \in (15k, 25k]$ will get a higher take-home pay now. Thus, income effect reduces hours of work and hence gross earnings. For example, a worker maximizing utility at point 1 would go to a point like 2. Finally, note that the first kink moved from $8.3k$ to $10k$ (point 3 to 4). However, this change should not matter for the analysis as, by definition, this group of workers were making more than $15k$ before the reform.

Finally, workers whose highest gross monthly salary accrued between January and August 2013 was greater than AR\$ 25,001 were not affected by the reform.¹⁵

¹⁴The 20% increase in personal exemptions corresponds to deductions for spouse, children, and a special deduction for wage earners.

¹⁵In fact, this group of workers experience an increase in average tax rates due to inflation and the “bracket

Note that this simple conceptual framework does not capture the response of salaried workers to other dimensions. For instance, from the point of view of horizontal equity, one could argue that the unfairness of the reform for those workers to the right of 15k could have led them to drop out of the formal sector to fully evade taxes. In that case, we should expect a higher fraction of workers with missing earnings slightly to the right of 15k after the reform.

Finally, it is worth noting that in practice wage earners typically do not have a lot of flexibility in choosing the number of working hours. Nonetheless, one can argue that there are some groups that could have more flexibility than others. For example, workers in the private sector, prime-age workers, workers covered by collective bargaining agreements, female workers, and workers in specific sectors such as manufacturing or professional services. Hence, it will be important to study potential heterogeneities in the empirical analysis below.

3 Data and Summary Statistics

For the empirical analysis, we use administrative data from the Social Security (“Sistema Integrado Previsional Argentino”, SIPA) provided by the Ministry of Labor, Employment and Social Security (MTEySS), the labor agency in Argentina, which manages payroll taxes and benefits for private and public sector employees. These are social security records covering the whole universe of registered wage earners. These data are third-party reported by employers through Form 931. We use a particular version of SIPA database, which follows the jobs (worker in a firm) providing the level of earnings for that job at a monthly level. From this source we can follow the full working history of workers, month by month, from January 1995 to December 2016. This allowed us to generate variables related to the jobs before and after the tax reform, and to identify declared re-employment jobs. For the analysis, we will focus on the period 2012-2016.

In March 2013, the year of the reform, the data included around 400 thousands private firms and more than 6 million private salaried workers (9 million total). The data have two types of identifiers: CUIL, which identifies workers, and CUIT, which identifies the firm(s) where they work. Another variables contained in the data are: gross monthly salary, age, gender, indicator for private employee, 4-digit ISIC sector code of the firm, geographic location, labor union status, type of contract (permanent, temporary, full-time, part-time).

This source of administrative data has advantages and disadvantages with respect to income tax return data. The main advantage is that social security data include both

creep”. In this case, the substitution effect will reduce hours of work and hence gross earnings. But income effect will push them to work more hours.

workers paying the income tax and not paying the income tax. This feature is crucial for the analysis which requires to follow workers that were fully exempt after the reform, and this is the reason why we chose SIPA. Ideally, one would also want to observe the marital status and number of dependents in every year and calculate the response of salaried workers for single and married workers separately. Such administrative data are typically available in income tax return data, but this is not the case for the SIPA database.¹⁶ Finally, it is worth mentioning that in the SIPA database it is not possible to decompose the gross salary into its different components such as bonuses, overtime pay, vacations, and 13th salary. Income tax data typically allow to decompose taxable income into different margins.¹⁷

Table 2: Summary Statistics of Registered Wage Earners in Argentina, 2013

	Group 1: 8.3k-15k (1)	Group 2: 15k-25k (2)	Group 3: 25k-40k (3)	Group 4: 14k-16k (4)	All (5)
Salaried workers (%)	0.262	0.114	0.041	0.044	1
Decile of max earnings Jan-Aug 2013	7-8	9	10	8-9	1-10
Average age	41.4	43.7	44.6	43	40.4
Public worker (%)	0.332	0.359	0.315	0.345	0.287
Collective Barg. Agreement (%)	0.490	0.499	0.542	0.497	0.497
Female (%)	0.389	0.333	0.279	0.355	0.395
Average gross earnings Aug 2012	7,576	11,769	16,772	9,768	7,379
Average gross earnings Aug 2013	9,540	15,124	22,229	12,432	9,108
Average gross earnings Aug 2014	13,228	20,489	29,914	16,949	12,749
Average gross earnings Aug 2015	17,973	27,626	39,949	22,977	17,414
Number of jobs	1.02	1.08	1.09	1.06	0.95
Multiple jobs (%)	0.066	0.109	0.131	0.091	0.052
Number of workers	2,763,269	1,205,096	431,908	462,911	10,543,800

Note: This table displays summary statistics for private and public registered wage earners.

Groups 1 through 4 are defined based on the highest gross monthly salary between January and August 2013.

Table 2 reports some summary statistics for all private and public wage earners, and for four groups of workers defined based on earnings between January and August 2013: (1) workers between 8.3k and 15k;¹⁸ (2) workers between 15k and 25k; (3) workers between 25k and 40k; (4) workers between 14k and 16k. About 26% of total wage earners went from the income tax paying zone to the non-paying zone in August 2013, and about 11% of total wage earners qualified for a partial tax cut due to the 20% increase in personal

¹⁶One alternative is to match the SIPA database with ADP demographic records from ANSES. We are working to make this happen.

¹⁷In the near future we expect to incorporate the number of days worked per month.

¹⁸In August 2013, the monthly minimum non taxable income for a single worker without children was AR\$ 8,360 gross and for a married worker with two kids was AR\$ 11,563 gross.

exemptions.¹⁹ These two groups of workers belong to the 7th, 8th, and 9th deciles. Hence, the reform studied mainly affected upper earning workers.

Narrowing the attention to the group of workers located around 15k, which is the main discontinuity introduced by the reform, we can see that they are prime-age workers, 34% work in the public sector, half of them are covered by a collective bargaining agreement, 35% are female workers, and around 9% have more than one job. It is worth noting that in August 2013 average earnings for this group were AR\$ 12,432, well below the cutoff that determined who was exempt from that point onwards.

4 Empirical Strategy and Results

To analyze the response of individuals to the income tax, one could estimate a regression of the change in reported income on the change in the net-of-tax rate. This regression is clearly endogenous because the marginal tax rate is a function of taxable income.²⁰ Hence, the literature has typically relied on exogenous variation provided by tax reforms and a variety of (imperfect) estimation techniques to identify the elasticity of income to taxes (see Saez et al. 2012a for a recent survey). In this paper, we use a regression discontinuity design (RDD) which is known to be more internally valid and thus overcomes identification difficulties that have plagued previous work.

As the August 2013 reform was based on gross monthly earnings accrued between January and August of that year, the strategy is to compare labor market outcomes after the reform based on these earnings. The reform created a sharp discontinuity on tax liabilities depending on whether wage earners were below or above the 15k and 25k cutoffs. This feature leads naturally to a regression discontinuity design. The basic idea is to compare wage earners just above and just below the thresholds (15k and 25k) to infer the causal effect of the tax cut. This design is appealing because it is relatively simple and transparent. Therefore, we will identify tax effects by running regressions of the form:

$$Y_i = \alpha + \beta \cdot 1(R_i \leq c) + \sum_{k=1}^K \gamma_{0k} \cdot (R_i - c)^k + \sum_{k=1}^K \gamma_{1k} \cdot 1(R_i > c)(R_i - c)^k + e_i \quad (1)$$

where Y_i denotes gross earnings for worker i in any month after the reform, R_i is the running

¹⁹In practice, the number of workers that effectively went from paying the income tax to being tax exempt is lower because personal deductions vary by marital status and number of dependents.

²⁰Another two threats typically considered by the literature are mean reversion and heterogenous income trend.

variable defined as

$$R_i \equiv \max\{Y_i \text{ in January to August 2013}\} \quad (2)$$

and $c = 15k, 25k$ are the cutoffs of interest. The coefficient of interest capturing the effect of the discontinuity at $c = 15k$ is β . A simple way to illustrate the RD is to plot average outcome Y_i by disjoint bins of the running variable R_i and draw a polynomial fit below and above the cutoffs. Intuitively, the treatment may be as good as randomly assigned for individuals in the neighborhood of $R_i = c$, so comparing treated and non-treated workers reveals a treatment effect (i.e. the effect of a large tax cut on earnings labor supply). The outcomes considered in the analysis below include: average gross earnings, percentiles of earnings, fraction of workers with multiple jobs, fraction of workers with missing earnings, percentage change in gross earnings, probability that the increase in earnings is greater than inflation.

4.1 Identification Checks

A fundamental RD identifying assumption is that $1(R_i \leq c)$ must be as good as randomly assigned in the neighborhood of $R_i = c$. This may be violated if individuals can exactly control the value of R_i and therefore the location relative to the threshold. If individuals are strategically locating above or below the threshold to benefit from the tax cut, we would expect bunching on whichever side of the discontinuity is preferable (in this case the left side).

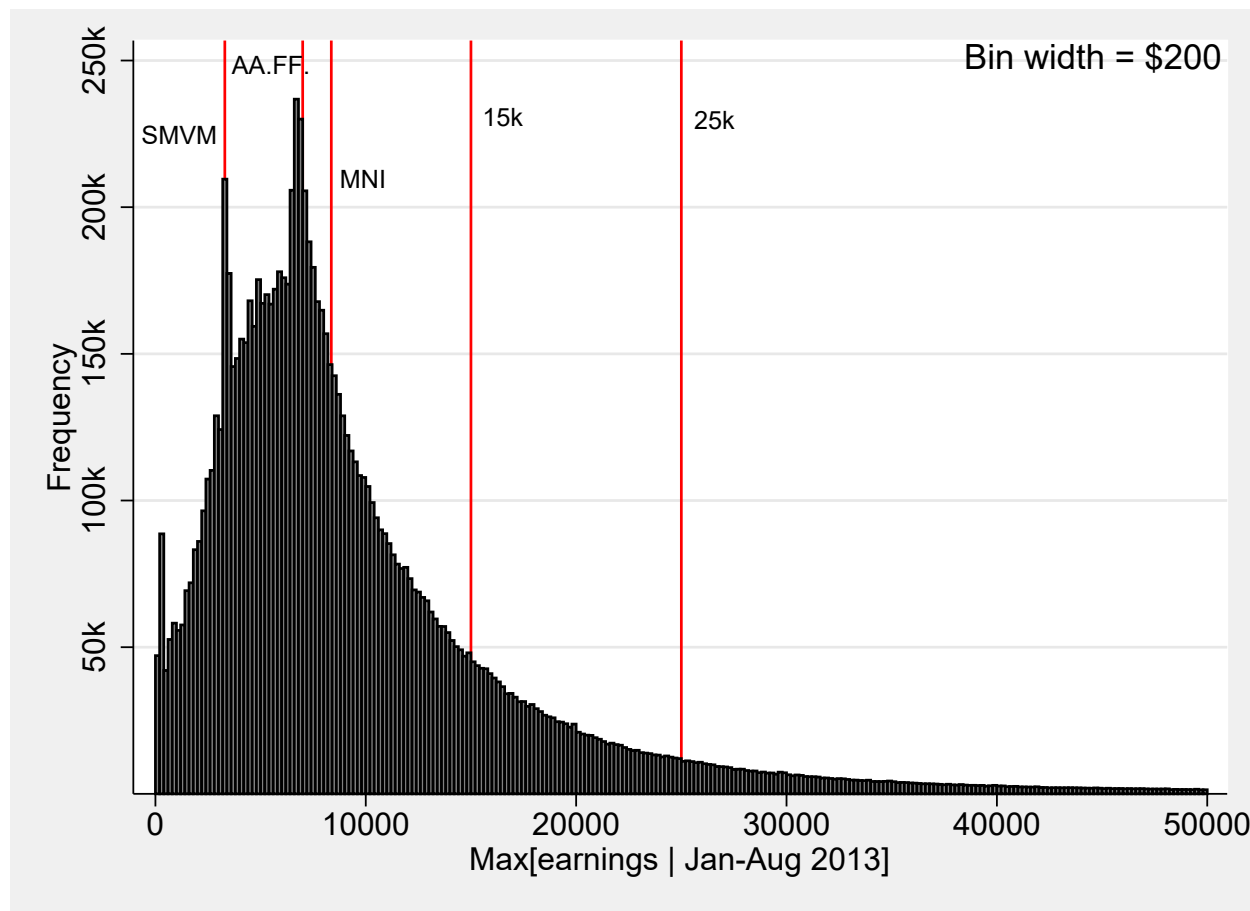
Figure 7 presents a visual test for this threat. The figure plots the distribution of the highest gross monthly salary between January and August 2013. Reassuringly, wage earners did not sort in the neighborhood of the thresholds. Specifically, we observe no spike in the number of wage earners just below 15k and 25k. Another important observation is that wage earners do not seem to bunch at the first kink point of the income tax denoted by MNI in the figure. The absence of bunching at the first kink already suggests that the overall response of salaried workers to the income tax ought to be small in Argentina.²¹ However, the earnings distribution does show bunching at 7k due to the family allowance program (AA.FF.).²² This bunching suggests that wage earners do have some space or flexibility to

²¹This result is at odd with empirical findings in other countries such as the U.S. where Saez (2010) finds evidence of bunching at the threshold of the first income tax bracket where tax liability starts (but no evidence of bunching at any other kink point). However, it is worth noting that bunching at the first kink was particularly strong in the 1960s when the tax schedule was stable and very simple. Hence, the result for Argentina could be partly explained by the context of high inflation and regular adjustment of nominal labor incomes.

²²This is a transfer that the government gives to individuals and families. It includes a monthly transfer per child, and non-regular transfers for marriage, pregnancy, maternity, and birth. The transfer decreases

adjust their monthly earnings. In this case, to avoid losing the cash transfer.

Figure 7: Density of $\max\{earnings | \text{Jan to Aug 2013}\}$ around 15k and 25k



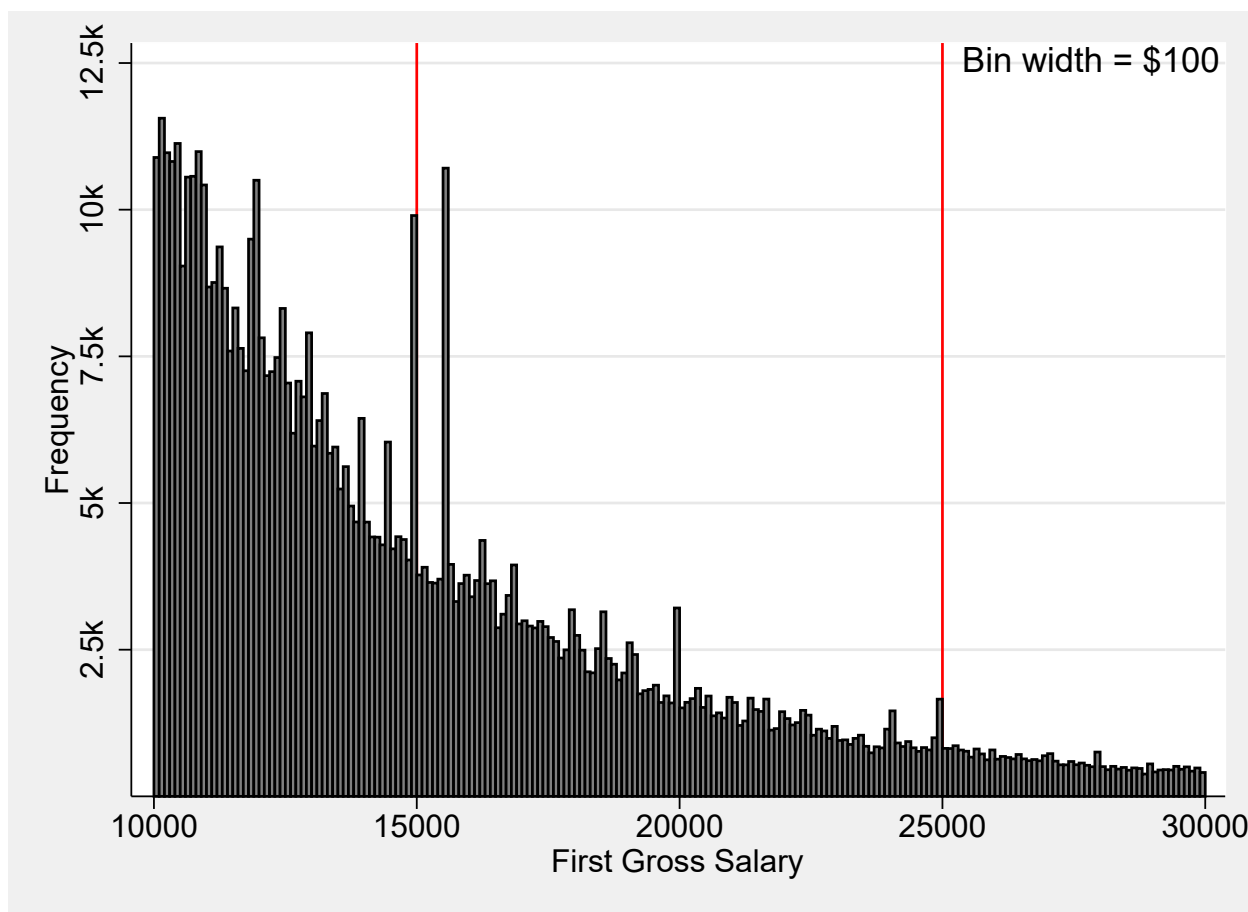
Note: this figure displays the distribution of the highest gross monthly salary between January and August 2013. This is the running variable to be used in the RD analysis. The vertical lines from left to right denote the minimum wage (SMVM), the income cap of the family allowance program (AA.FF.), the minimum non taxable income for single workers (MNI), and the two key thresholds, AR\$ 15,000 and AR\$ 25,000.

Note, however, that in the case of workers joining the labor force, there is some space for them to manipulate the running variable. Recall that for this group of workers the tax cut was based on whether their *initial* gross monthly salary was above or below the 15k and 25k cutoffs. This rule created incentives to collude with new employers by asking them to declare to the social security an initial salary below 15k. This hypothesis is visually confirmed in Figure 8 where there is a clear spike in the number of wage earners just below 15k. Since

with family earnings in three brackets and individuals lose all the benefits if they individually earn more than a specific threshold. In 2013 this cap was set at AR\$ 7,000. The other spike of the graph corresponds to the minimum wage of AR\$ 3,300 denoted by SMVM.

the RD cannot be implemented in this case, in the rest of the paper we will omit this group of workers from the analysis.

Figure 8: Density of Initial Gross Monthly Salary for New Workers around 15k and 25k

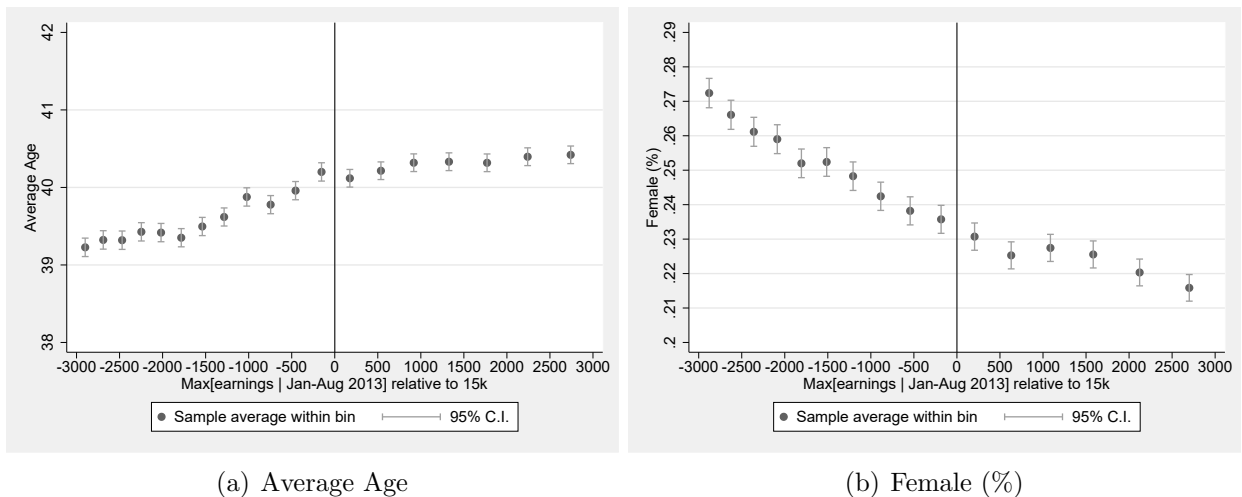


Note: this figure displays the distribution of the initial gross monthly salary for workers joining the labor force. The vertical lines denote the two key thresholds, AR\$ 15,000 and AR\$ 25,000.

Likewise, another requirement for identification is that the workers just below and just above the cutoffs are comparable. If people are not sorting in the neighborhood of the threshold, we would expect distributions of observed characteristics X_i to be smooth. This motivates a check for whether there is a discontinuity in average X_i at $R_i = c$. In Figure 9 we show, however, that there is no discontinuity in the age and gender of wage earners around the 15k cutoff.

The graphical evidence presented suggests that incumbent workers are comparable around the cutoffs and that they could not game the law by underreporting earnings after the law was enacted to take advantage of the tax cut. This finding is crucial for the validity of the subsequent RD analysis.

Figure 9: Covariate Balance: Age and Gender Composition around the 15k cutoff



Note: Panel (a) displays the average age of workers (as of August 2013) by bins of the running variable. Panel (b) displays the fraction of female workers by bins of the running variable. Both graphs display no discontinuity at AR\$ 15,000 showing that there is no systematic difference in observable variables between wage earners just above and just below the cutoff, a requirement for the RD to be valid.

4.2 First Stage

In the present context of the reform studied, the first stage requires the tax burden to change sharply around the discontinuity. To empirically test the first-stage effects in a regression framework, we would ideally need microdata on workers' income tax liabilities. Unfortunately, this information is not available in the Social Security database. In this section, we present instead suggestive evidence that the first stage ought to be large by running a simulation.²³

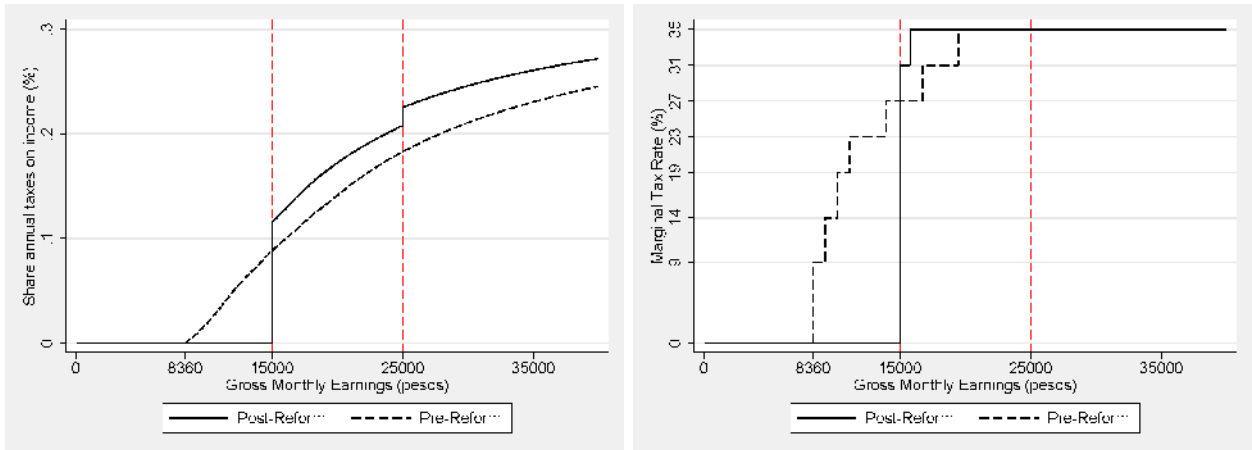
To compute the theoretical first stage, we take the empirical distribution of gross monthly earnings in August 2013 and simulate the income tax liability pre and post reform for two types of workers: single workers without children and married workers with two children. To go from pre-reform gross earnings to taxable earnings, we subtract 17% of Social Security contributions and personal exemptions using the values reported in the law, and we multiply by 13 to annualize taxable incomes (12 salaries and the Christmas bonus). For post-reform taxable incomes, the process is similar but we use updated values for personal exemptions and we consider an inflation of 34% (the interannual change of average earnings). Finally,

²³One partial solution would be to match the social security data with administrative data of family relationships from ANSES. This would allow to identify single workers and married workers with or without children, which is a key step in going from gross to taxable income. This would allow to compute an empirical first stage. We are making progress to make this possible.

we take pre- and post-reform annual taxable incomes to Table 1 in order to compute the income tax and corresponding marginal tax rate.

The results from this exercise are reported in Figure 10 and 11. Panel (a) plots the participation of taxes in net annual earnings against gross monthly earnings. Panel (b) plots the marginal tax rates that workers would face at different parts of the income distribution before and after the reform. For example, Figure 10 (a) shows that single workers earning slightly less than 15k pesos went from paying around 10 percent of annual earnings in taxes before the reform to zero taxes after the reform. Moreover, in panel (b) the marginal tax rate faced by these workers goes from 27% to 0%.²⁴ For workers slightly above 15k, the tax liability and marginal tax rate increased as a consequence of inflation and the “bracket creep”. Hence, without loss of generality, this example illustrates how the reform effectively created two groups of workers that coexist in the same labor market but face sharply different tax liabilities.

Figure 10: First stage (simulation) - Single workers without children



(a) Share of tax liability on annual earnings

(b) Marginal tax rate

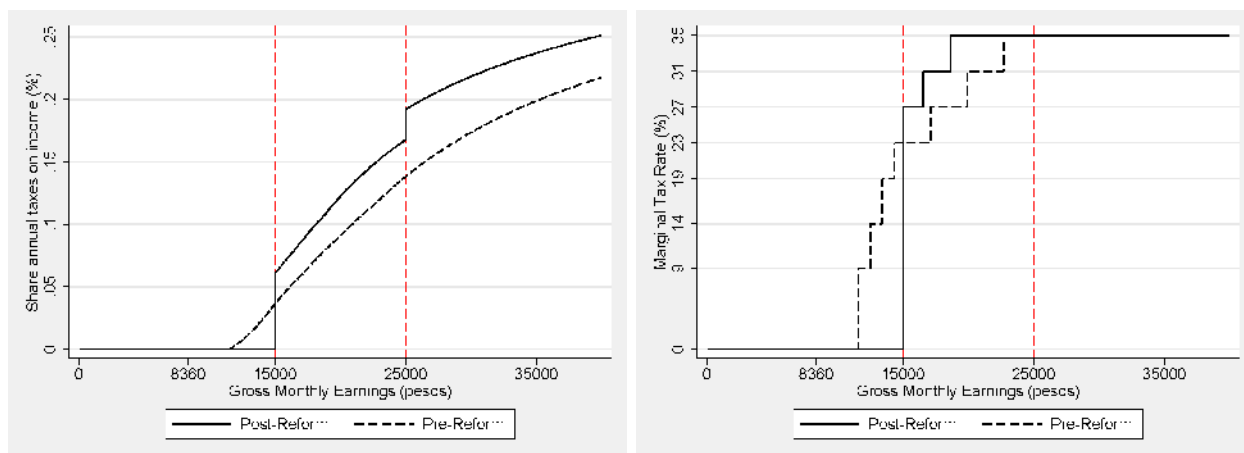
Note: This figure compares the simulated tax burden and marginal tax rates before and after the reform. Taxable income is computed by multiplying by 13 (12 months plus 13th salary) and $1 - \tau_{payroll} = 0.83$ (where $\tau_{payroll} = 17\%$) and subtracting personal exemptions of AR\$ 8,360 from gross earnings. The marginal tax rate and annual tax liability are obtained from the PIT schedule in Table 1.

The main takeaways from Figure 10 and 11 are that: (i) the tax cut reduced substantially the tax liability of salaried workers with pre-reform earnings of AR\$ 15,000 or less; (ii) workers with gross monthly earnings around 15k faced roughly the same marginal tax rate

²⁴As of August 2013 workers with a gross monthly wage of AR\$ 8,000 were not subject to the income tax because their income was below the non taxable income cap of AR\$ 8,360.

before the reform, yet were treated very differently; (iii) the incentives of the tax cut operated more strongly for single workers without children.

Figure 11: First stage (simulation) - Married workers with 2 children



(a) Share of tax liability on annual earnings

(b) Marginal tax rate

Note: See Figure 10. Personal exemptions in this case are AR\$ 11,563.

4.3 Second Stage

Individuals can respond to taxation through many margins such as hours of work, intensity of work, career choices, form and timing of compensation, tax avoidance, or tax evasion. In this paper, we mainly focus on a broader concept of income, gross monthly earnings, which capture some of these margins of response. The data also allow to study labor supply decisions along other dimensions such as multiple jobs, probability of becoming an informal worker, overtime pay, number of days worked per month.²⁵

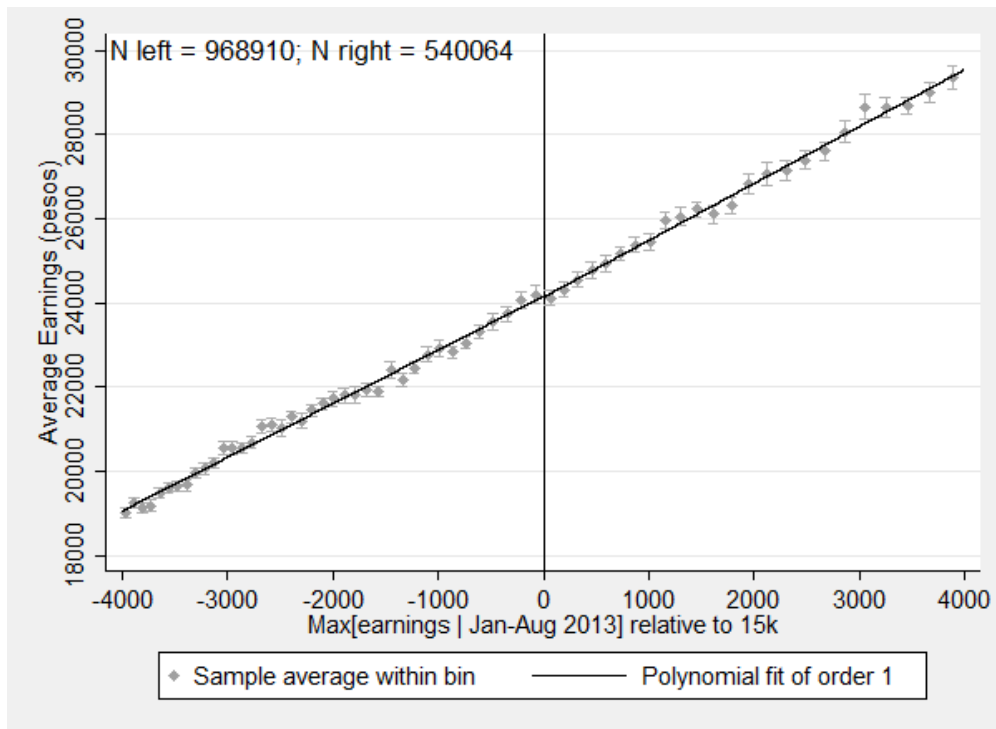
Figure 12 displays average gross monthly earnings by bins of the running variable for the pool of workers in October 2015.²⁶ The running variable, defined as $R_i \equiv \max\{Y_i \text{ in Jan-Aug 2013}\}$, is recentered such that zero represents the 15k cutoff. From this figure it can be seen that two years after the reform was passed, there is no visible discontinuity at the cutoff of interest, suggesting that upper wage earners did not respond to the tax cut.

The granularity of the data allows us to zoom in closer to the cutoff, and also analyze different months and years. In Figure 13 we repeat the analysis for one year before the reform,

²⁵Overtime pay and days worked are not available yet, but our hope is to incorporate these variables into the analysis soon.

²⁶All the figures and point estimates in the paper were done using `rdplot` and `rdrobust` routines. See Calonico, Cattaneo, and Titiunik (2015).

Figure 12: Average gross earnings around 15k, October 2015



Note: This graph plots average gross monthly earnings by bins of the running variable, R_i . The graph was done with `rdplot` routine using a local linear regression and a uniform kernel. The vertical spikes denote 95% confidence intervals.

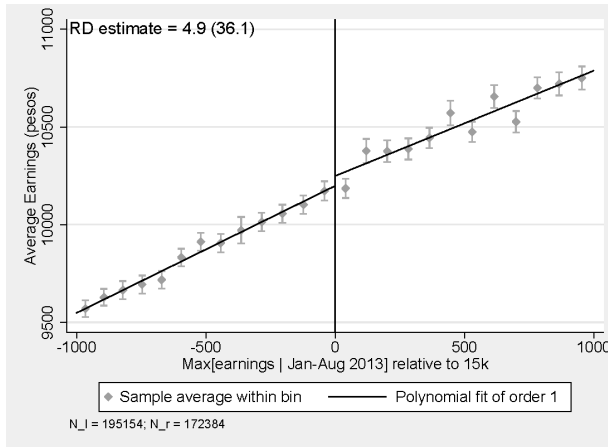
two months after the reform, one year after the reform, and two years after the reform, and a bandwidth of $\pm\$ 1,000$. Reassuringly, Panel (a) shows that there is no discontinuity in gross earnings in October 2012, this is before the reform came into force. Most importantly, Panels (c) and (d) show again that there is no discontinuity at 15k.²⁷ The results for the other cutoff at 25k do not show any response either and are presented in Figure A4.

Table 3 presents the corresponding RD estimates and standard errors. This table confirms a precisely measured zero response of wage earners to a large and salient income tax cut. This finding constitutes the main result of the paper.

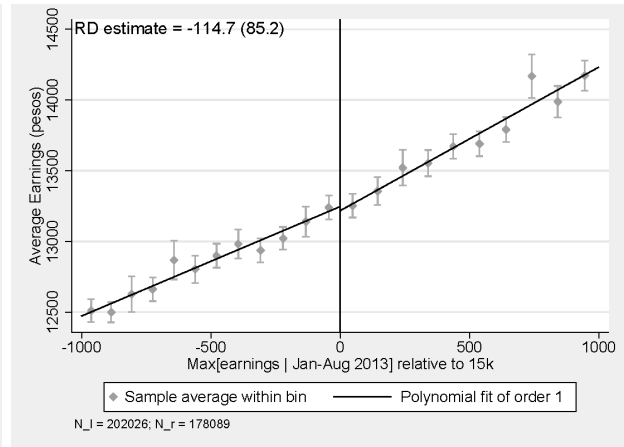
In Figure 14 we focus the attention to other margins of labor supply. In the conceptual framework we argued that the reform could have annoyed and discouraged workers to the right of 15k for being treated unfairly when compared to those to the left of 15k. This could have led them to switch to the informal sector to fully avoid the income tax. A proxy of this

²⁷Figure A1 in the appendix overlaps these results in order to hold the scale constant. Figure A2 shows no effect for the percentage change in gross earnings from August 2013 to August 2015. Figure A3 shows no discontinuity in the probability that the increase in earnings from 2013 to 2015 was greater than inflation.

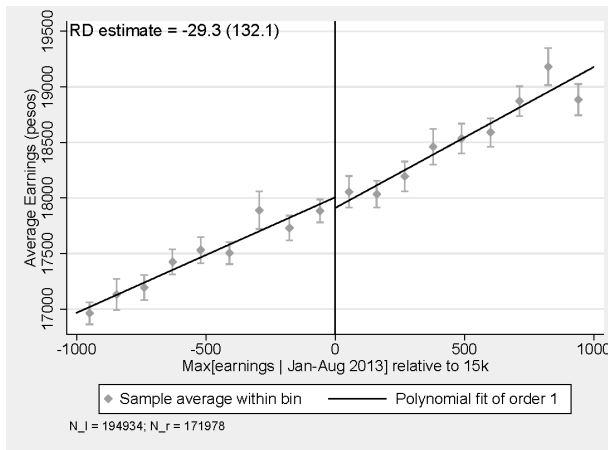
Figure 13: Average gross monthly earnings around 15k, October 2012-2015



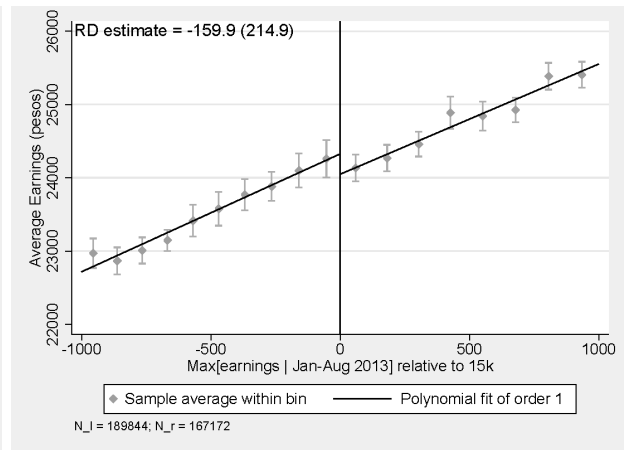
(a) October 2012



(b) October 2013



(c) October 2014



(d) October 2015

Note: This graph plots average gross monthly earnings by bins of the running variable, R_i . Panels (c) and (d) do not display a significant discontinuity at AR\$ 15,000 showing that there is no intensive labor supply response to the tax cut. The graphs were done with `rdplot` routine using local linear regressions and a uniform kernel.

response could be captured by the fraction of workers with missing earnings.²⁸ Panel (a), however, confirms that the fraction of workers with missing earnings is similar around the discontinuity of tax liabilities.

As a robustness check, it is worth studying heterogeneities in the universe of workers. Although there is no response for the pool of workers, it could be possible to find a response

²⁸In the data, earnings can be positive, zero, or missing. A zero means that the worker is on leave but still registered in the job. A missing value means that the worker left the formal sector. This does not necessarily imply that they become informal. They could be moving to another country, retiring, or passing away.

Table 3: RD estimates using local polynomial regression

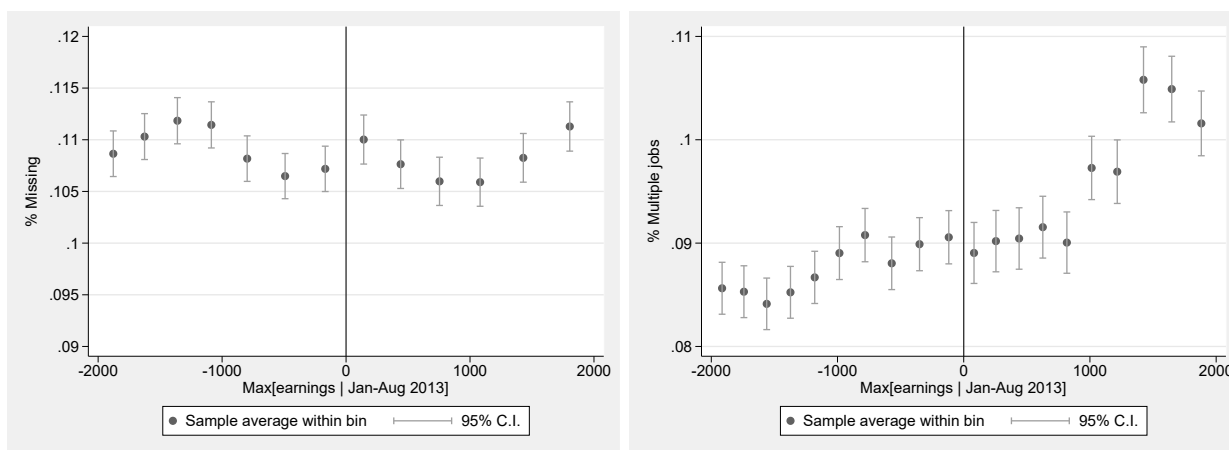
	Earnings 10/2012	Earnings 10/2013	Earnings 10/2014	Earnings 10/2015
	(1)	(2)	(3)	(4)
Panel A: RD around 15k				
RD estimate	4.9 (36.1)	-114.6 (85.2)	-29.3 (132.1)	-159.9 (214.9)
Obs	367,538	380,115	366,912	357,016
Obs to the left of c	195,154	202,026	194,934	189,844
Obs to the right of c	172,384	178,089	171,978	167,172
BW est. (h)	311.9	207.5	199.1	210.6
Panel B: RD around 25k				
RD estimate	-32.4 (127.2)	-271.8 (275.1)	-238.1 (470.1)	-299.7 (699.1)
Obs	149,002	149,211	144,331	140,050
Obs to the left of c	80,963	81,319	78,607	76,244
Obs to the right of c	68,039	67,892	65,724	63,806
BW est. (h)	344.1	260.7	353.2	423.6

Note: the dependent variables in each column are gross monthly earnings in October of 2012, 2013, 2014, and 2015. Standard errors reported between parentheses. Point estimates computed with `rdrobust` routine using local linear regressions and a uniform kernel.

for a subgroup that presumably has more flexibility in their labor supply choices. For example, private workers typically have more flexibility to adjust labor supply. Similarly, the literature has typically found larger responses of women to the income tax. Workers covered by labor unions could bargain working hours more easily. In Figure 15 we repeat the analysis for these subgroups of workers. Again, there is no visual evidence of a discontinuity at the cutoff.

We have also tried many other alternatives: (i) workers in small firms (10 or less employees), workers in large firms (200 or more employees); (ii) young workers (18-35), prime-age workers (36-55); (iii) sectors such as manufacturing, transport, financial, professional workers; (iv) workers in labor unions such as commerce, banks, truck drivers, metalworkers, oil workers; (v) percentiles 10, 50, 90, and 99 by bins of the running variable. In all these cases we restricted the sample to workers from the private sector. The graphs show no response and are reported in the appendix.

Figure 14: Other margins of response around 15k, October 2015



(a) Fraction with missing earnings

(b) Fraction with multiple jobs

Note: Panel (a) displays the fraction of workers with missing earnings by bins of the running variable. Panel (b) displays the fraction of workers with multiple jobs by bins of the running variable.

4.4 Discussion

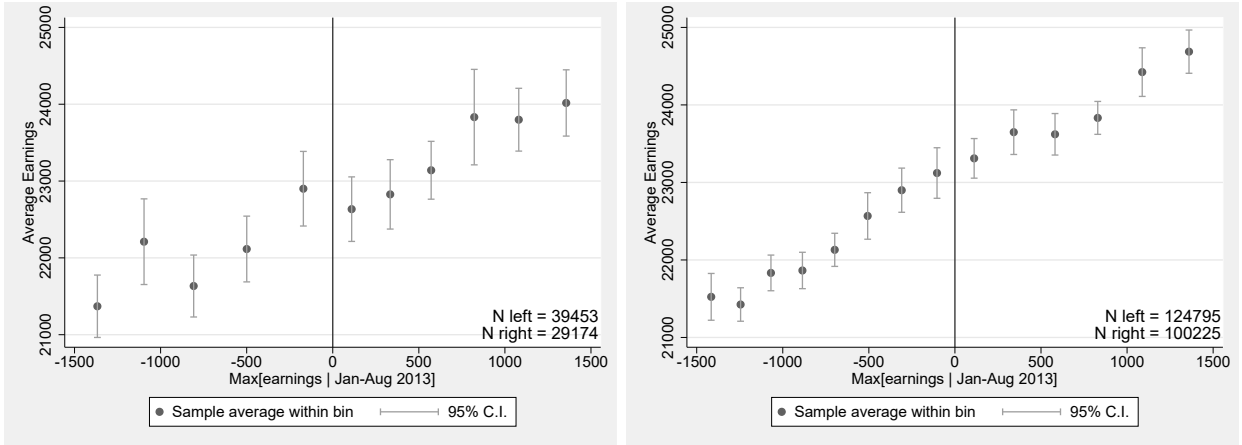
The results of this article are consistent with the paper by Saez (2010) who finds that labor supply responses in the U.S. are mostly concentrated among self-employed workers but not among wage earners, for which the implied elasticity is zero and precisely estimated. The result is also consistent with the paper by Saez et al. (2012b) for payroll taxes in Greece and Bastani and Selin (2014) for the income tax in Sweden. Chetty et al. (2011) also estimate very low elasticities for wage earners in Denmark.

One potential explanation could be that upper wage earners may have a very low intensive elasticity of earnings with respect to marginal tax rates. This is consistent with Zidar (2017) who finds that lower-income groups respond more to tax cuts and that the effect of tax cuts for the top 10% on employment growth is small. A second explanation is that wage earners face large adjustment costs to changing labor supply (such as finding a new job, adjusting hours of work, etc.), which create a slow dynamic response to the tax cut (Saez, 2010). A related explanation is that firms mediate tax responses of their employees and it is hard to coordinate adjustments in their labor supply when there is a mix of workers affected and not affected by the reform.²⁹ Finally, another explanation is that the substitution effect and the income effect are offsetting each other.

Given the relatively small elasticity of earnings to the income tax estimated in the

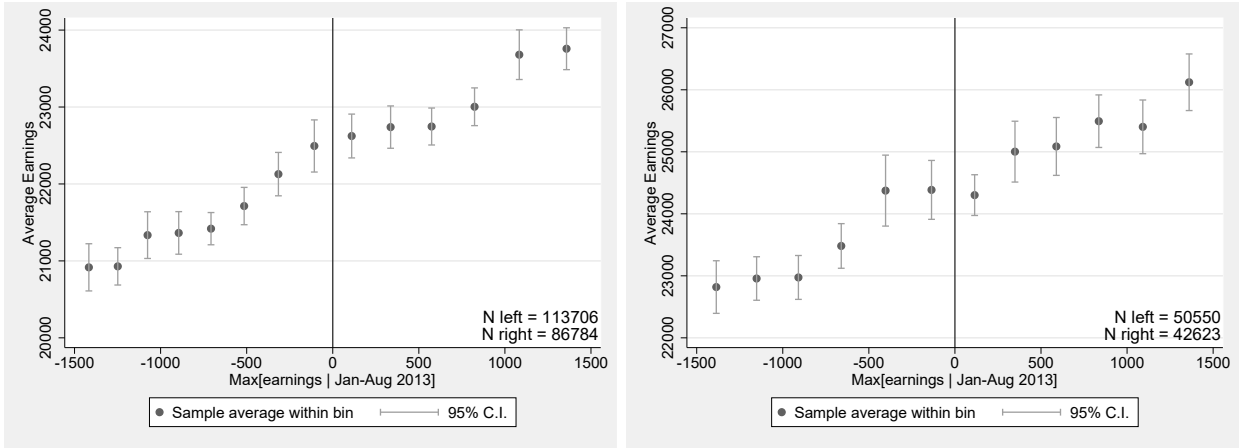
²⁹Note that the employer-employee structure of our data allows us to shed some light on this explanation. We are currently working on this channel.

Figure 15: Average gross monthly earnings around 15k, October 2015



(a) Female, private

(b) Male, private



(c) CBA, private

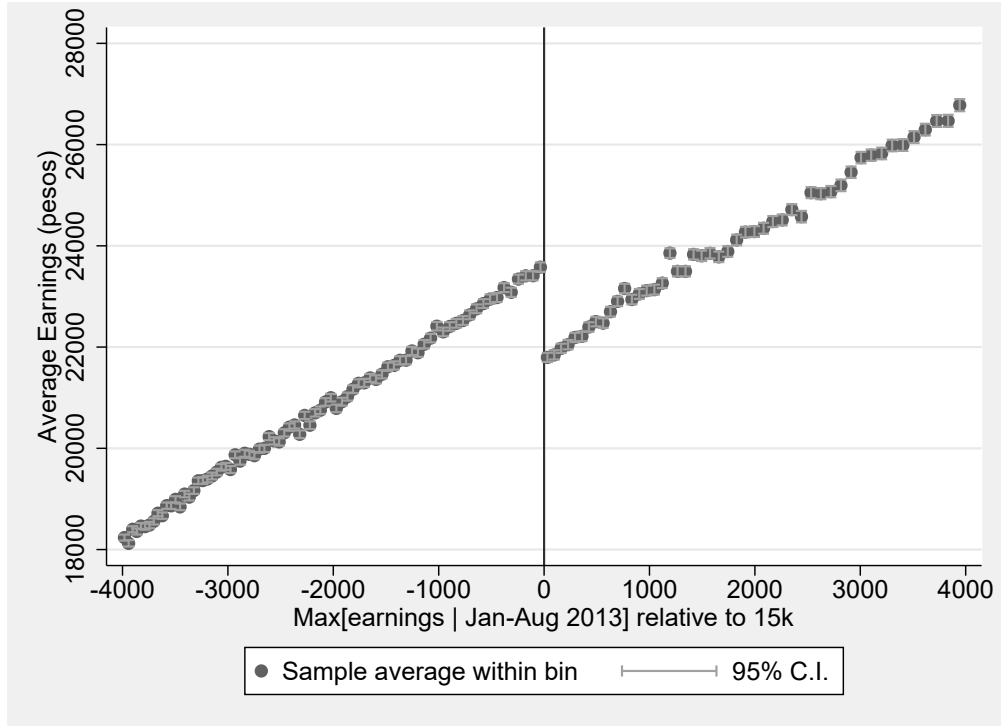
(d) Non-CBA, private

Note: This graph plots average gross monthly earnings by bins for private workers. Panels (a) and (b) plot average earnings by gender. Panels (c) and (d) plot average earnings for workers covered and not covered by collective bargaining agreements (CBA).

literature, one could argue that our graphs are indeed picking up that elasticity. To test this statement, we perform a thought experiment in which we simulate the response of wage earners to the tax cut using an elasticity of $e = 0.2$. To that end, we shift the earnings of all the workers to the left of 15k by $0.2 \times \Delta \log(1 - \tau_t)$, where $\tau_0 = 27\%$ and $\tau_1 = 0\%$. The result from this exercise is presented in Figure 16 and suggests that with a relatively small elasticity of $e = 0.2$ we should have seen a discrete jump of about AR\$ 2,000 at 15k.

Putting together the evidence from Figure 10, Figure 12, Figure 16, and the paycheck example introduced in Figure 5, the zero result found in this paper strikes us as remarkable given the size and saliency of the tax cut. This finding could imply that the efficiency costs

Figure 16: Thought experiment: simulated response of workers, October 2015



Note: this is the simulated response of workers in a frictionless world with $e = 0.2$ and an inflation rate of 34% and 31% between 2013, 2014, 2015. Earnings to the left of 15k are shifted by $0.2 \times \Delta \log(1 - \tau_t)$, where $\tau_1 = 0\%$ and $\tau_0 = 27\%$.

of raising the personal income tax in Argentina are not large for upper wage earners. The fact that other developing countries have a similar income tax structure, the participation in total revenue is growing, and it is borne by relatively high income workers make the topic of this paper a very important avenue for future research. Granting access to administrative data is a key step to make this possible.

5 Final Remarks

Argentina implemented a large and salient income tax cut for wage earners in 2013 that lasted for two and a half years. This tax break was intended to improve the progressivity that the income tax lost during the 2000s due to the growing inflation. This paper used a regression discontinuity design and administrative data from Argentina to analyze earnings labor supply responses of salaried workers. In the first stage, we showed that the tax cut reduced substantially the tax liabilities and marginal tax rates of salaried workers around the discontinuity. In the second stage, we estimated a precisely measured zero effect of the

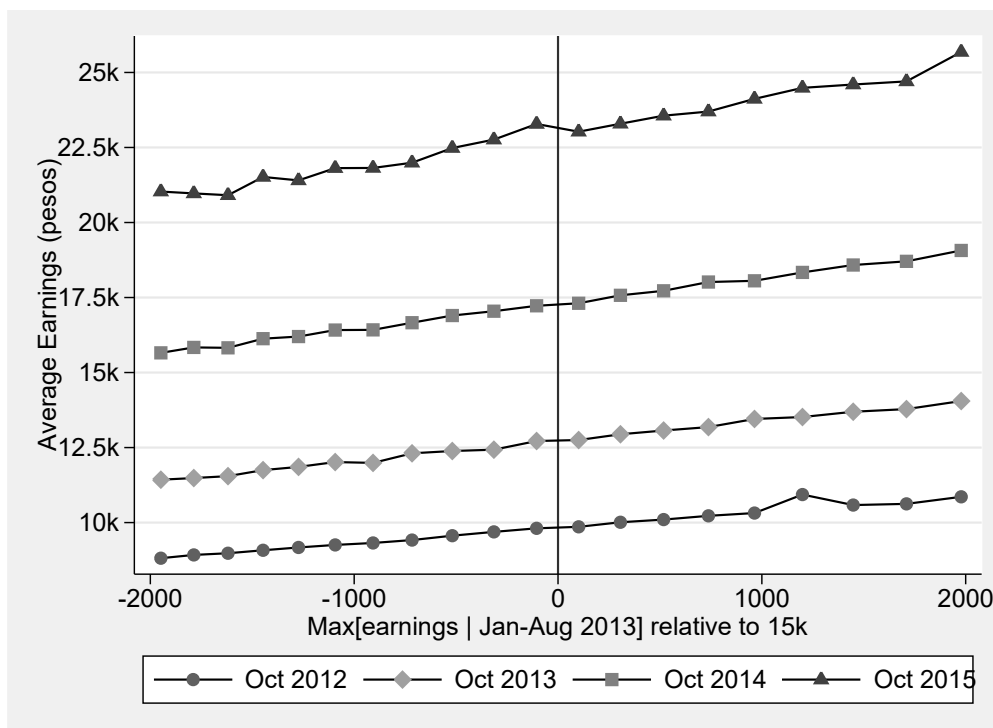
tax cut on labor earnings around the discontinuity two years after the reform. This finding suggests that upper wage earners (about decile 8) were not responsive to a large and salient tax cut. Anecdotal evidence from newspapers and paychecks confirm saliency and relevance of the reform. Our findings could imply that the costs of raising income taxes in developing countries are not large, at least for the intensive margin and upper income earners. External validity remains an open question.

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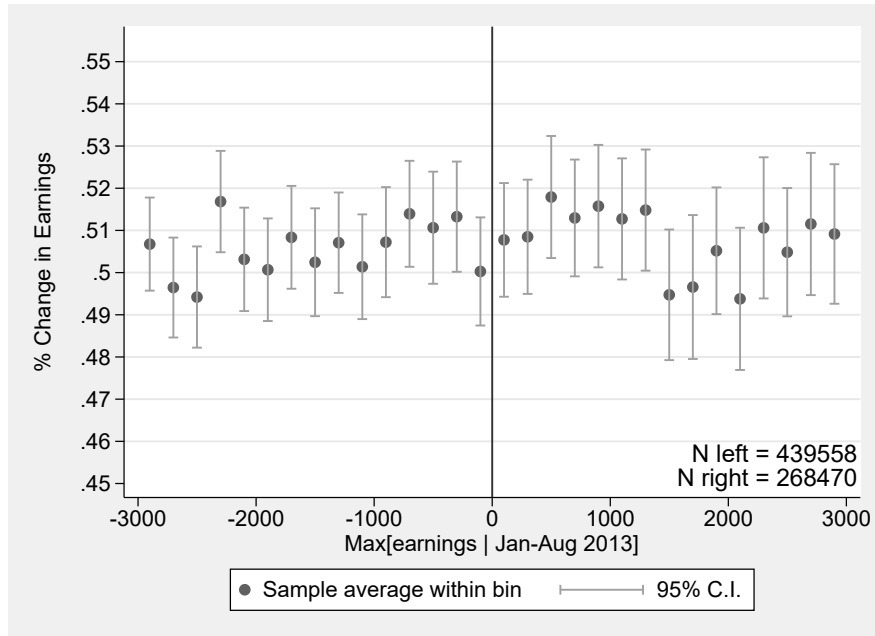
A Figures

Figure A1: Average gross earnings around 15k, October 2012-2015



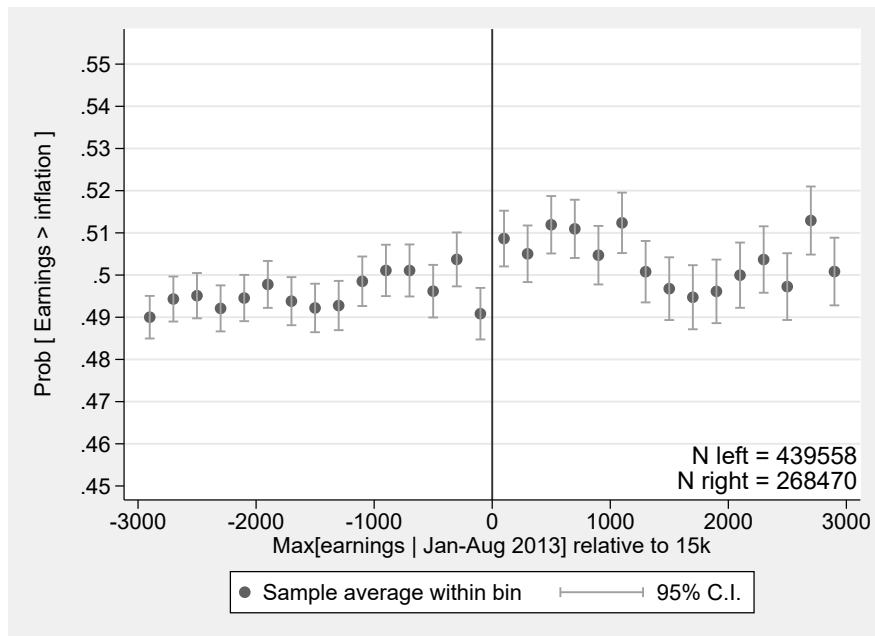
Note: This graph plots average gross monthly earnings by bins of the running variable, R_i , holding constant the mid point of each bin in 2015. There is no significant discontinuity at AR\$ 15,000 showing that there is no intensive labor supply response to the tax cut.

Figure A2: Percentage change in gross earnings August 2015-2013



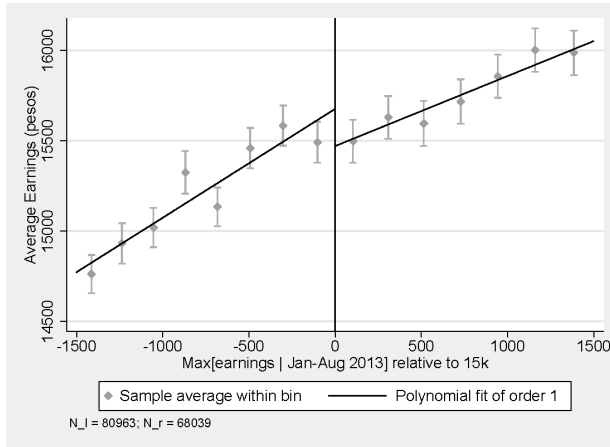
Note: This graph was computed for workers in the private sector.

Figure A3: Probability that the increase in earnings 2015-2013 is greater than inflation

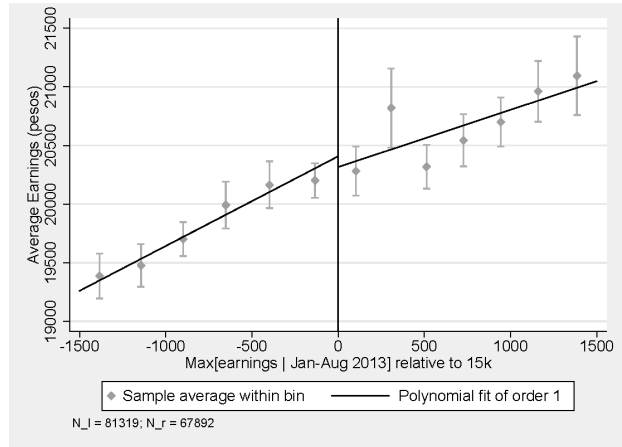


Note: This graph was computed for workers in the private sector.

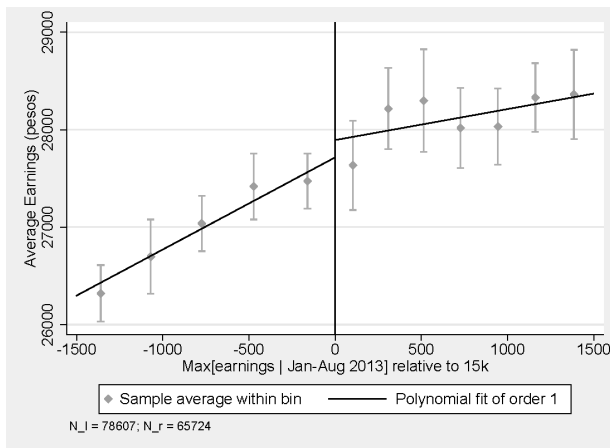
Figure A4: Average gross monthly earnings by bins of the running variable around 25k (RD)



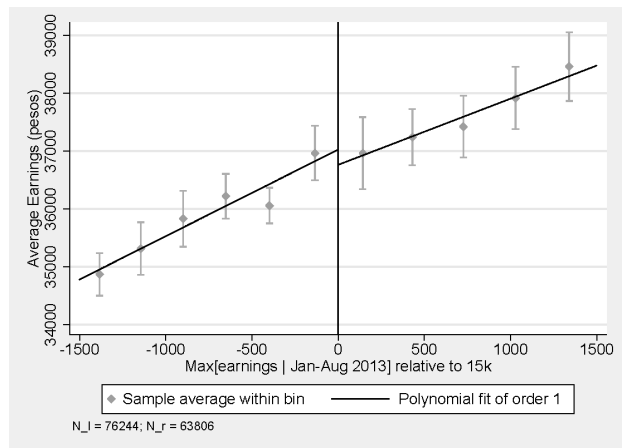
(a) October 2012



(b) October 2013



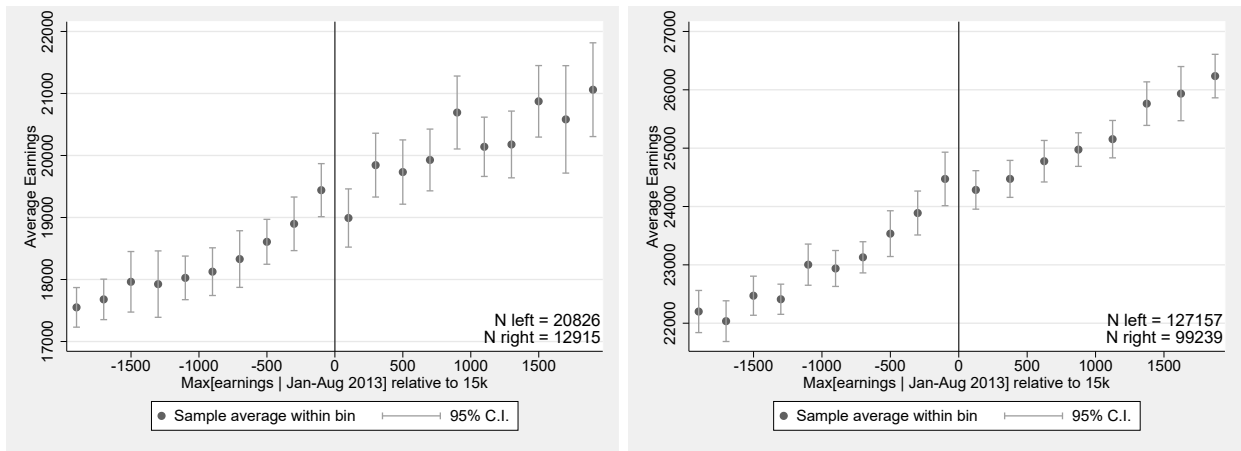
(c) October 2014



(d) October 2015

Note: This graph plots average gross monthly earnings by bins of the running variable, R_i . Panels (c) and (d) do not display a significant discontinuity at AR\$ 25,000 showing that there is no intensive labor supply response to the tax cut. The graphs were done with `rdplot` routine using local linear regressions and a uniform kernel.

Figure A5: Average gross monthly earnings by firm size (15k)

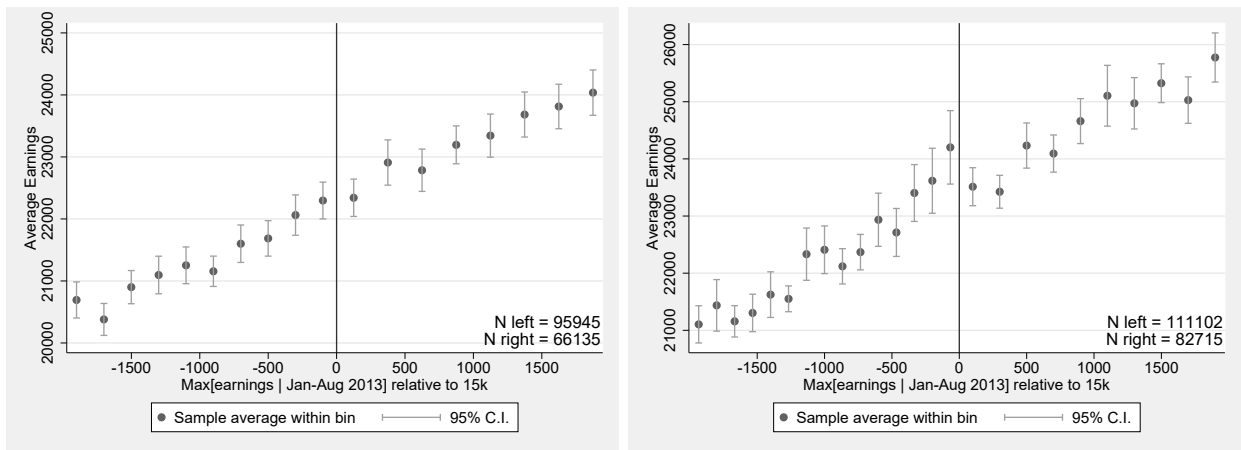


(a) Small firms

(b) Large firms

Note: This graph was computed for workers in the private sector. Small firms have 10 or less workers, large firms have 200 or more workers.

Figure A6: Average gross monthly earnings by age groups (15k)

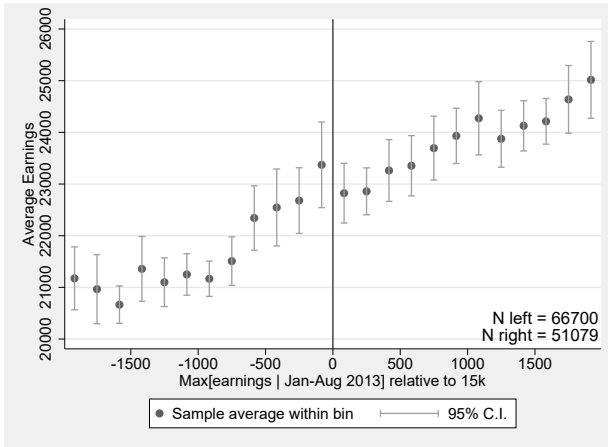


(a) Young

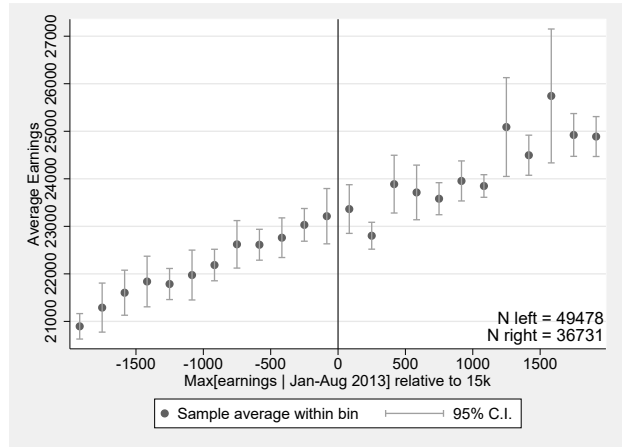
(b) Prime age

Note: This graph was computed for workers in the private sector. Young workers have 18-35 years, prime-age workers have 36-55 years old.

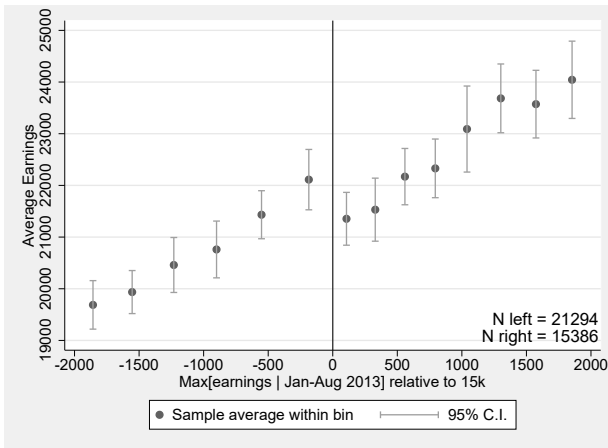
Figure A7: Average gross monthly earnings by sectors (15k)



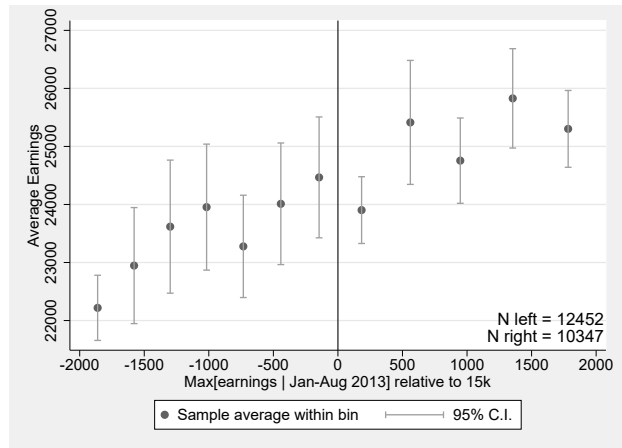
(a) Manufacturing



(b) Transport



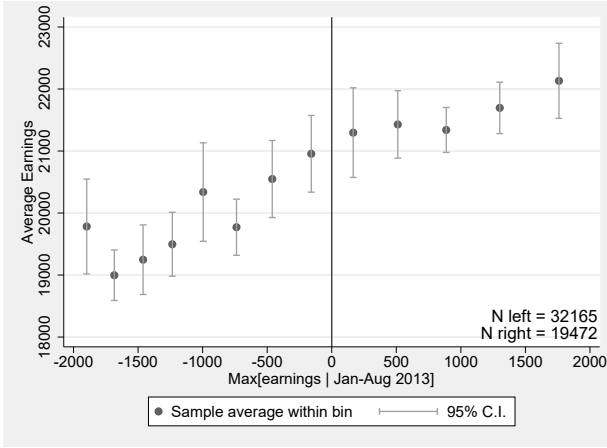
(c) Professionals



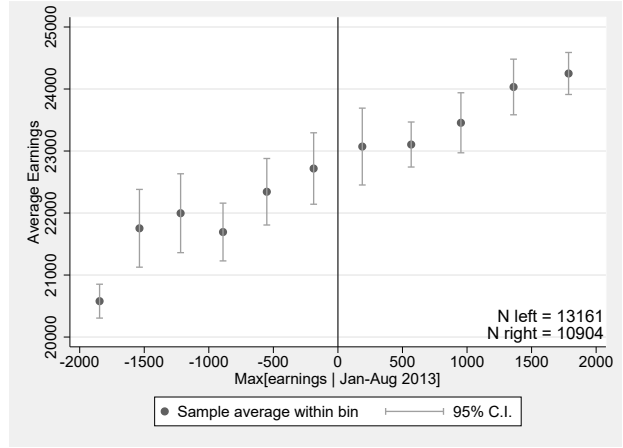
(d) Financial

Note: This graph was computed for workers in the private sector. Sectors are defines using the first digit of the ISIC code.

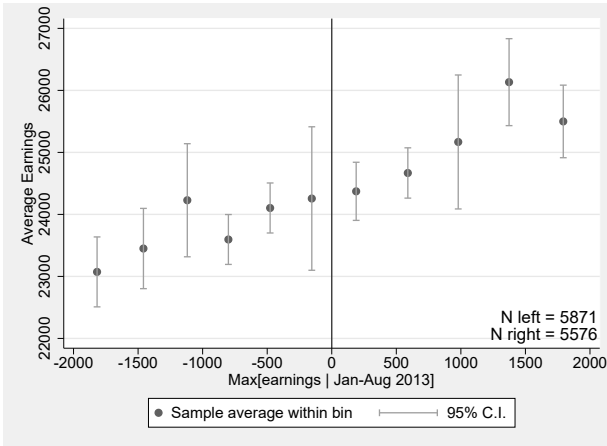
Figure A8: Average gross monthly earnings by labor unions (15k)



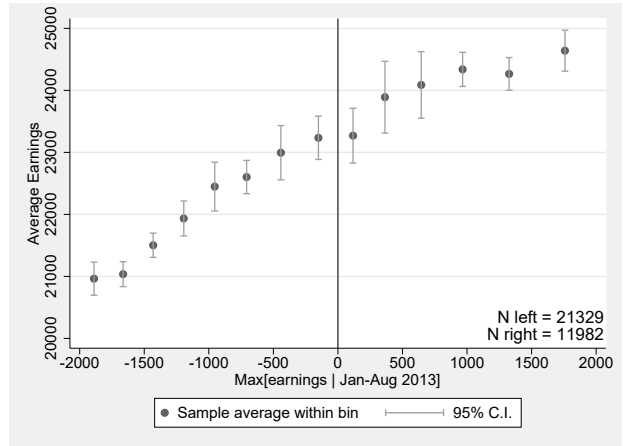
(a) Commerce



(b) Truck drivers



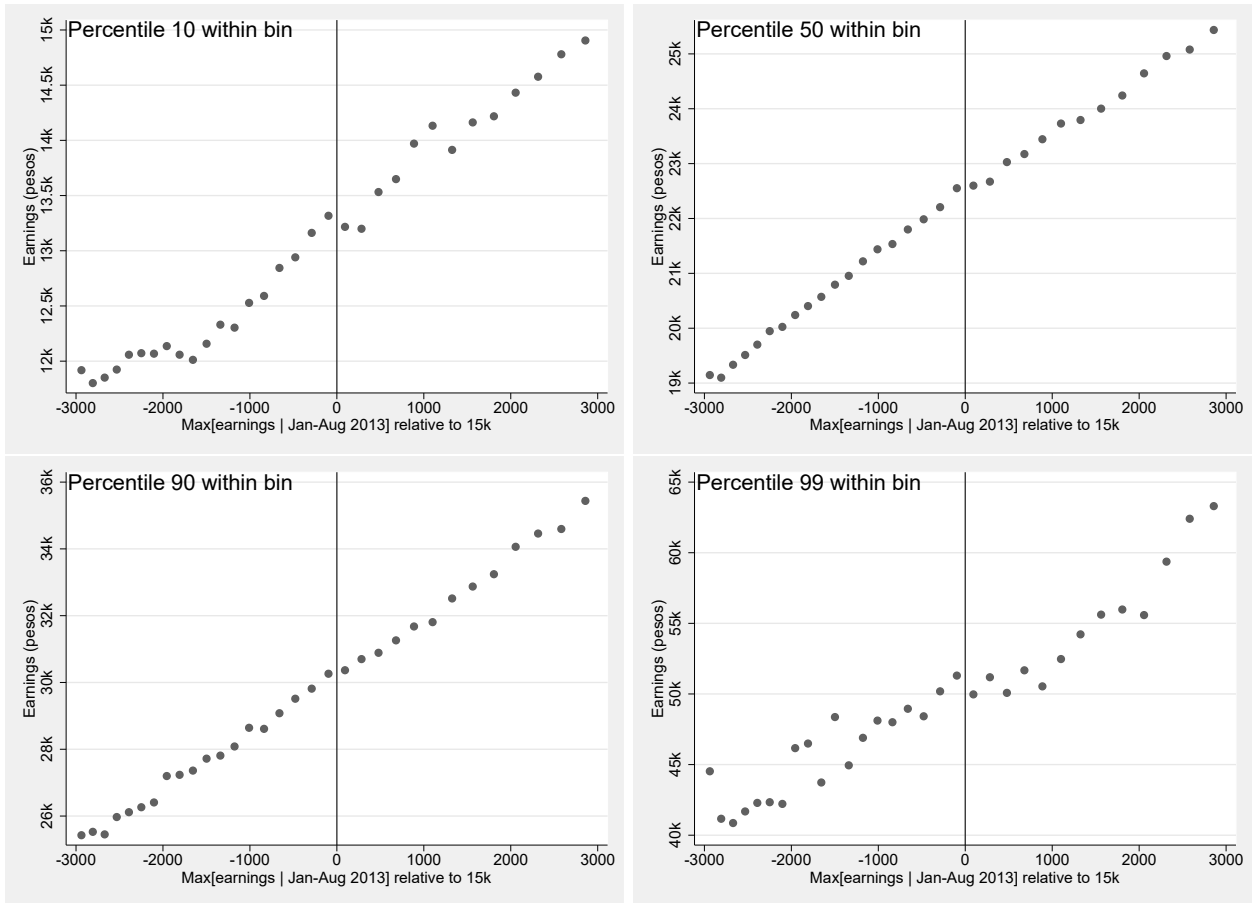
(c) Banks



(d) Public transport

Note: This graph was computed for workers in the private sector. The assignment of workers to labor unions is defined with the documentation of collective bargaining agreements.

Figure A9: Percentiles 10, 50, 90, 99 within each bin, October 2015 (15k)



Note: This graph was computed for workers in the private sector. To compute each percentile we first plot average earnings by bins of the running variable, and then we calculate the percentiles for each of these bins.