Unemployment insurance design and its effects: evidence from the Uruguayan case[1]

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1. Introduction

Abundant empirical evidence both for developed and developing countries finds that the design of the unemployment insurance program may have important consequences on labor market outcomes. In particular, the design of UI system can affect both unemployment duration and employment outcomes. On the unemployment duration side, job search models show that higher benefits and longer benefit duration may lead to longer unemployment spells (Mortensen, 1977; Devine and Kiefer, 1991; Meyer, 199), as beneficiaries of the UI have higher reservation wages and make less effort in the search process (because the opportunity cost of search is lower).

On the effects of UI on subsequent employment outcomes, two channels can be identified. If UI benefits increase reservation wages, one would expect UI beneficiaries to earn higher wages after they are reemployed. Also, unemployment may operate as a subsidy, allowing the unemployed people to wait until they receive an offer more suitable for their skills. This outcome favours post-unemployment job stability, improving the efficiency of the matching process (Marimon and Zilibotti, 1999). Among the more important empirical contributions related to measuring the effects of potential benefit duration on unemployment duration are Card and Levine (2000), Hunt (1995), Katz and Meyer (1990), Van Ours and Vodopivec (2005).

In Uruguay, important modifications to the unemployment insurance program were introduced in February 2009. First, the scheme of benefits for those unemployed as a result of being laid off changed significantly: instead of being an equal sum for every month, the new system establishes a decreasing scheme for benefits. Secondly, the duration of benefits was reduced from six to four months for workers in the modality of suspension, meaning workers that were temporally dismissed, with the

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promise of rehiring. Thirdly, workers aged 50 or more can now keep receiving UI beneifits for six additional months, for a total of 12 months..

Our objective is to analyze the effects of these changes in the Uruguay's unemployment insurance system (UI) on outcomes, such as unemployment duration and earnings losses. One drawback of our analysis is that the new program has only recently been implemented. This implies that we can not provide evidence on long-term outcomes. Nevertheless, we provide rigorous evidence on short-term effects of this policy change.

We base our estimates in this study on a sample constructed from administrative records of the UI system and from labour histories from the social security system, and use alternative methodologies to assess potential impacts. For the first and second changes, we use propensity score (comparing UI beneficiaries before and after the change in the system) and difference-in-differences estimators (comparing UI beneficiaries with workers out of the labour force but not into UI, before and after the change). For the third change, effects are estimated using regression discontinuity design.

The paper is organized as follows: in the following section we analyze the Uruguayan UI system, describing its recent changes and providing some basic statistics. Then, we present our empirical strategy and describe our data. The following section contains our main results.

2. The Uruguayan unemployment insurance

2. 1 Overview of the system and recent changes

The institution in charge of the administration of the UI in Uruguay is *Banco de Previsión Social* (BPS), although its design is mainly responsibility of the Ministry of Labor. The origins of the Uruguayan unemployment insurance can be traced to 1919, when an insurance program for public workers was created. In 1958, an unemployment insurance program very similar to the actual one was created. It was modified later on in 1962 and in 1982. This last version of the program (created by decree-law 15.180 in 1981 and decrees 14/982 and 280/982) operated until 2009, when the program went through important modifications (law 18399). Both regimes are summarized in table 1, and described in the following paragraphs.

Table 1. Characteristics of unemployment insurance system in Urugay		
	Old Regime	New Regime (February 2009)
Causes for entering the program	- job loss: dismissed workers - job suspension: total suspension of activities - -job reduction (25% or higher reduction in days/hours of labor)	Similar to the old system
Elegibility conditions	-having worked in the formal sector at least six months in the previous year an being involuntarily unemployed	Similar to the old system
Benefit amount	Lump sum: - 50% of the average wage of the last six months or subsidy equivalent to 12 days of labor for day laborers (job loss or suspension) -difference between 50% of their average wage during the previous six months, and the salary they continue to get from their employees (job reduction) -Minimum: half BPC / Maximum: 8 BPC	Job loss: decreasing scheme (as % of average wage of last 6 months): 1st month: 66% , 2nd month: 57%, 3rd month: 50%, 4th month: 45%, 5th month: 42%, 6th month: 40%. For day laborers: equivalent to 16 days of labor in the 1st month, 14 in the 2nd, 12 in the 3rd, 11 in the 4th, 10 in the 5th and 9 in the 6th. Job suspension or job reduction: similar to the old system -Minimum: 1 BPC/ Maximum: similar to the old system (adjusted to the new decreasing scheme in the case of job loss)
Incidence of family composition	-additional 20% for married or with family workers	Similar to the old system
Waiting period to reenter	-1 year since last benefited from UI	Similar to the old system
Benefit duration	-6 months -72 days of labor (day laborers)	-6 months in the modality of job loss or job reduction (or 72 days of labor) - 4 months in the modality of suspension (or 48 labor days) -can be extended to one year for workers older than 50 -can be extended to 8 months for job loss in cases of economic recession
Method of indexation	The amount is not indexed. Maximum and minimum payments are set in terms of BPC, which is indexed to the consumption price index or to the average wage index	Similar to the old system
Claiming period	Within 30 days after last day of work	No restriction
Link to active policies	Can have training. Weak link	Attempts to reinforce the link
Monitoring system or punitive sanctions	-Control for not holding other formal job -No control for job seeking/ No punitive sanctions	-Compatibility with keeping a secondary formal job The rest is similar to the old system

Sources: authors' elaboration based on decree-law 15180 and law 18399

There are three possible reasons or causes for entering the program: job loss (being fired), job suspension (total suspension of activities) and job reduction (when days of work or hours of work suffer from a reduction of at least 25%). The modality of job suspension allows firms to lay off workers when facing demand fluctuations, and recall them back when UI benefits are exhausted. [2]

Originally, the program covered private and rural workers, excluding domestic workers and workers from the financial system.[3] To have this subsidy, workers should have worked at least six months in the previous year, and they should have been involuntarily unemployed. Unemployment insurance lasted for six months or the equivalent to 72 days of labor for day laborers. The subsidy was 50% of the average wage of the last six months, or a monthly subsidy equivalent to 12 working days (calculated as the total amount received during the six previous months divided by 150). That amount could never be less than half the minimum wage.[4] In the case of job reduction, the amount of the benefit is the difference between 50% of their average wage during the previous six months, and the salary they continue to get from their employees.

Married workers or workers responsible for other people received an additional 20% (so they may end up receiving a total of 60% of their previous wage). The worker cannot re-enter the insurance program until a year has passed since the last time he received the benefit. Although the worker may receive the benefit for a maximum of six months, the Executive Power can extend this period, in a rather discretional way. This extension is supposed not the surpass 18 months, although this has been violated in some occasions. The general rule is that if the worker does not return to his job after six months, it can be considered that he has been fired the facto, and he has the right to get severance payment.

UI beneficiaries loose the benefit if he gets another job, rejects a job offer or gets a pension. The first requirement implies that workers receiving the unemployment insurance could not have a job that implies a contribution to the social security system, although if they are working in the informal sector this may not be detected. The system

[2] Under the old regime, the Executive Power (EP) could establish an unemployment subsidy, total or partial, in special cases of unemployment. This includes highly specialized workers, or workers belonging to certain occupations or industries. The amount is established by the EP, but can not be higher than 80% of the workers' previous wage. This possibility is kept under the new regime (law 18399).

[3] Rural workers can be beneficiaries of this program since 2001 (decree 211/01), although the requirements to become beneficiaries are stronger for them (Amarante and Bucheli, 2008).

[4] There is an upper limit for the benefit, equivalent to eight BPC (*base de prestaciones contributivas*).

does not include the monitoring of unemployed workers or the existence of punitive sanctions.

UI beneficiaries may receive training, financed by the *Fondo de Reconversión Laboral* (FRL), which was especially created with this objective. These services have traditionally been in charge of the Ministry of Labor *(Direccción Nacional de Empleo*), although nowadays they are being redesigned.

All the programs that are under the administration of BPS (contributory and non contributory pensions, as well as other social programs) are financed by funds coming from contributions both from employers and employees, and from general taxes. As argued in Amarante and Bucheli (2008), the fact that the program does not have its specific funds makes it difficult to analyze its financial results.

Before the modification of the unemployment insurance program, Amarante and Bucheli (2008) reviewed the literature on the Uruguayan program, analyzed the problems of the existing insurance and suggested possible improvements. Among the weak points of the program, they highlight the low proportion of covered workers. Information from household surveys indicates that during the period between 1991and 2005 the program covered a maximum of 6.2% of unemployed. A more disaggregated analysis presented by these authors shows that around 48% of unemployed in 2005 were not covered by the insurance, because they were looking for their first job or re-entering the labor market after a long absence.

Another important explanation for this low coverage was the high incidence of informality among workers, as detailed above. According to household survey information, almost 25% of unemployed in 2005 had lost their previous job within the prior six months, but that job was informal (Amarante and Bucheli, 2008).

More difficulties in the functioning of the UI arise because of the lack of monitoring of the requirements (specifically not to have an informal job and to be actively searching for one). The program does not include any incentive or specific support for job search. Active actions directed towards this objective have been scarce and the evaluations of these initiatives indicate were not satisfactory.

The existence of discretional extensions for the benefit, although giving the program more flexibility, was considered a weakness. The use of the program as a subsidy for firms whose activity presented important seasonal features was also a non desirable practice. The lack of coordination with other active labor market policies was another feature of the old program. There was no association between labor

intermediation services and training services, and neither of these programs interacts with the unemployment insurance program. This lack of coordination takes place at the level of the design of policies, and also at the informational level, as records from different data sources are not connected. For a discussion of these aspects, see Rodríguez (2005) and Bucheli and Amábile (2008).

Important modifications to the unemployment insurance program were introduced with the approval of law 15.180, implemented in February 2009. The most relevant one has to do with the amount of the benefits for those unemployed in the modality of job loss: instead of being an equal sum for every month, the new system establishes a decreasing scheme for benefits (see table 6). This implies an average benefit of 66% of his previous salary during the first month (instead of 50% as before). This modification is aimed at fostering job search among beneficiaries. The minimum amount of the subsidy is duplicated, changing from half BPC (*base de prestaciones contributivas*) to one BPC. The maximum benefit is kept equal on average, but adapted to the new decreasing scheme. The Executive Power, through the Ministry of Labor, may extend the duration of the unemployment subsidy, for those who were dismissed (job loss), up to a maximum of eight months, when the economy is going through a recession. This happens when GDP falls during two consecutive quarters. The normal duration of the unemployment benefit will be restored three months later than GDP has increased during two quarters.

For those UI beneficiaries for the reason of suspension, the duration of the program was reduced to four months (or 48 labor days). During this time, they continue to get 50% of their average wage of the previous six months (or 12 labor days). In 2009, workers in this modality represent around 25% of unemployment insurance beneficiaries. Nevertheless, the norm establishes that the period can be extended if firms provide an adequate justification. There is an intention to promote a more rational use of this modality of suspension. More requirements are set for firms to apply, and also a public list with the name of the firms and frequency of use of this modality of the unemployment insurance is kept by the Ministry of Labor.

Beneficiaries under the modality of job reduction the difference between 50% of their average wage during the previous six months, and the salary they continue to get from their employees (as they keep doing some job). Unemployment duration is also up to six months for them, so the program is basically the same for them.

Another important change refers to workers aged 50 or more, who can now keep the subsidy for six additional months. During this last additional six months, they receive the same amount of benefit than during the sixth month (40%). This change tries to address the difficulties that this group of workers finds when trying to re-enter the labor market. They represent approximately 15% of total beneficiaries.

The new regulations also attempts to coordinate UI with active labor market policies. UI beneficiaries in the job loss modality may loose their UI benefits if they do not participate in training courses offered by the Ministry of Labor. This offense is not considered in subsequent applications to the UI program.

Other modifications to the UI system include the compatibility of the unemployment insurance with other activity. Under the previous regulation, if the worker had two jobs, both covered by the unemployment insurance, and he lost one, he could not receive the benefit. This was modified, and in the new system the worker is able to receive the benefit if he looses is main job, but keeps the secondary one.

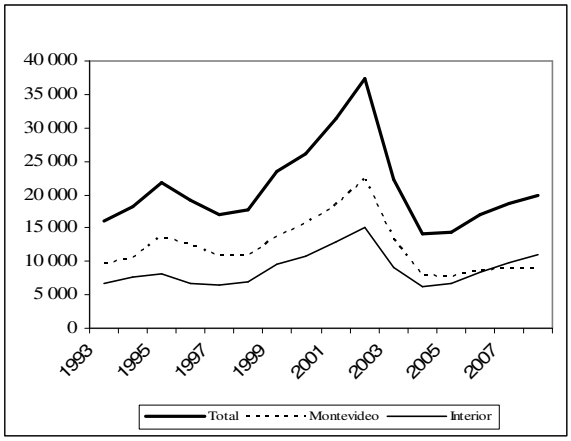
In the old regime, if the worker applied for the unemployment insurance 30 days later than his last day of work, he lost any right to receive the benefit. In the new regime, he only looses the benefits for that month(s).

In the new regime, there also exists the possibility of interruption, as the benefits are paid for calendar days. The beneficiary may interrupt his UI benefits in case he gets a temporary job, for a short time, and he then return to the insurance system.

2.2 Basic statistics

The number of beneficiaries of the UI shows some oscilations until 1999 and an important increase during the economic crises. Average beneficiaries in 2002 more than doubled those of 1998 (37302 versus 17652) (**Graph 1**).

Graph 1. Beneficiaries of the unemployment insurance. 1993-2009.



Source: BPS statistical yearbook

Data from BPS allows analyzing the profile of UI beneficiaries. Most of them are (70% in 2008). At the beginning of the period beneficiaries from Montevideo represented almost 60% of total beneficiaries, but by 2008 they were just 45% of total beneficiaries. Beneficiaries are concentrated in central ages. During the last years, efforts were made, in terms of more requirements, to dissuade firms from using the suspension modality. Whereas in 2001 63% of benefits corresponded to this modality, in 2008 the figure was around 34%. Finally, most of the beneficiaries have family dependents (Table 2).

Table 2. Characteristics of unemployment insurance beneficiaries

	1992	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	100	100	100	100	100	100	100	100	100	100	100	100
Men	66.9	69.8	68.3	67.9	66.7	65.7	63.0	65.1	66.9	70.1	70.1	70.0
Women	33.1	30.2	31.7	32.1	33.3	34.3	37.0	34.9	33.1	29.9	29.9	30.0
Montevideo	55.3	63.1	59.6	60.7	59.8	57.8	54.5	51.2	49.4	45.6	43.5	43.8
Rest of the country	44.7	36.9	40.4	39.3	40.2	42.2	45.5	48.8	50.6	54.4	56.5	56.2
Younger than 20	3.0	3.4	2.1	2.0	1.6	1.4	1.5	2.1	2.1	2.1	2.4	2.1
20-29	33.0	31.7	33.6	27.6	30.1	28.9	31.7	26.6	27.0	33.2	29.5	32.6
30-39	26.1	27.4	22.1	26.0	27.2	21.1	27.1	29.9	29.1	20.2	25.0	29.6
40-49	20.5	19.9	17.4	18.2	19.3	21.4	21.8	21.1	20.7	19.7	19.6	19.6
50-59	12.2	12.7	12.7	13.4	12.9	13.0	12.4	12.0	12.3	12.4	12.4	13.0
60 and more	2.6	2.8	2.5	2.5	2.8	2.8	2.8	2.8	2.8	3.0	3.0	3.1
Job loss	43.4	41.6	43.0	37.2	32.9	45.1	57.3	60.0	62.2	67.8	65.5	62.1
Suspension	55.2	57.9	56.9	62.8	58.5	46.4	35.3	31.3	29.7	23.9	25.6	33.3
Job reduction	1.4	0.5	0.1	0.0	8.6	8.4	7.5	8.8	8.0	8.3	8.5	4.6

With family	67.7	62.9	64.1	64.6	64.5	65.9	65.6	65.7	63.3	62.0	63.1	63.4
Without family	32.3	37.1	35.9	35.4	35.5	34.1	34.4	34.3	36.7	38.0	36.9	36.6

Source: authors' calculations based on BPS statistical yearbook

The program is small in terms of the resources involved. It represents around 2% of total BPS expenditures, and it also represents less than 1% of GDP. Its financial importance increased in 2002, during the economic crises (Table 3).

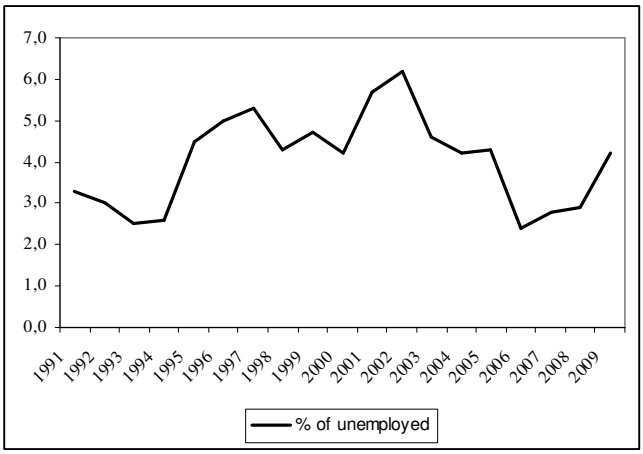
Table 3. Amount of UI benefits. 1993-2009.

	Total benefit payments (constant terms)	Benefit payments/BPS expenditure	Benefit payments/GDP
1993	100.0	2.2%	0.2%
1994	108.0	2.2%	0.2%
1995	128.9	2.6%	0.2%
1996	118.6	2.3%	0.2%
1997	109.6	2.1%	0.2%
1998	110.6	2.0%	0.2%
1999	161.6	2.8%	0.2%
2000	169.6	3.0%	0.2%
2001	197.2	3.6%	0.3%
2002	211.9	4.3%	0.3%
2003	114.9	2.7%	0.2%
2004	69.3	1.6%	0.2%
2005	67.3	1.5%	0.1%
2006	81.5	1.7%	0.2%
2007	96.4	2.0%	0.2%
2008	105.8	2.4%	0.3%

Source: authors' calculations based on BPS statistical yearbook

The program's coverage can be analyzed based on data from the household survey. This survey asks unemployed if they receive the unemployment insurance. The percentage of unemployed receiving the benefit has been between 2,4 and 6,2 during the last two decades. The higher coverage of 6,2% of unemployed corresponds to the worst moment of the economic crisis in Uruguay (2002) (Graph 2). It must be remarked that some workers that receive the unemployment insurance under the modality of suspension, are considered as employed by the household survey, and so are not included in this figures.

Graph 2. Percentage of unemployed covered by the UI



Source: authors' calculations based on household survey

Coverage is higher among unemployed men than women, and is also higher for those unemployed living in Montevideo, as well as for household heads. Coverage is also higher for more educated unemployed (secondary complete and tertiary complete), and for those unemployed belonging to the highest quintiles of (per capita) household income distribution (Table 4).

Table 4. % of unemployed with unemployment insurance	
Total	4,2
Men	7,1
Women	2,3
Montevideo	4,6
Rest of the country	3,8
Household head	9,7
Spouse	3,1
Son/Daughter	2,4
Other	2,5
Primary or less	3,4
Incomplete sec.	3,6
Complete sec.	8,8
Teachers/Professors	3,6
Tertiary inc.	5,1
Tertiary complete	7,9
Less than 25	1,6
25-34	5,7
35 and more	6,6
Quintile 1	2,1
Quintile 2	2,5
Quintile 3	6,6
Quintile 4	6,1
Quintile 5	7,4

Source: authors' calculations based on household survey

A more in depth analysis of the information from the household survey indicates that private formal workers represent around 40% of total employed by the end of the period. These are the workers that can eventually apply for the UI benefit, and their importance has increased in the period. The rest of the workers are not covered by the program because they are not formal private workers (Table 5).

Table 5. Distribution of workers by categories.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Private workers	54,5	52,1	52	52,6	54,5	54,2	54,8	55,2	56,1
Financial and dom. service	*9,8*	*10*	*10*	*9,3*	*9,1*	*8,9*	*8,8*	*8,6*	*8,5*
Rest of formal workers	*35*	*32,7*	*31,3*	*31,8*	*34,1*	*36,1*	*36,9*	*38,2*	*40*
Rest of informal workers	*9,6*	*9,4*	*10,6*	*11,5*	*11,3*	*9,2*	*9,1*	*8,4*	*7,6*
Public workers	16,6	17,9	18,1	17,7	16,6	15,6	14,9	14,9	14,3
Employer	3,9	3,7	3,4	3,5	3,9	4,7	4,8	4,8	4,8
Self employed (without inv.)	8,8	10,3	9,8	9,2	8,3	6,5	4,9	4,1	3,6
Self employed (with inv.)	14,6	14,4	15,3	15,2	15,2	16,5	18,4	19,1	19,1
Other	1,6	1,7	1,5	1,8	1,5	2,4	2,2	2	2,1
Total	100	100	100	100	100	100	100	100	100

Source: authors' calculations based on household survey

3. Empirical strategy and data description

Recent changes in the design of the Uruguayan UI have implied modifications that may alter various labor market outcomes. In particular, we want to assess the impacts of the following modifications:

- the duration of UI was reduced from six to four months in the case of workers in the modality of suspension
- the scheme of payments was changed for workers in the modality of job loss. Instead of a lump sum during six months, a decreasing scheme of payments was installed
- the duration of the UI can be extended up to one year for workers 50 or older

Using unemployment insurance records and social security labor histories, and based on different evaluation strategies, we try to disentangle the effect of each of these changes.

3.1 Data and methodology

This impact evaluation of the unemployment insurance program is based on two data sets: administrative records from the unemployment insurance program and a sample of

longitudinal data on social security records. Each of these data sets is used under a different evaluation strategy. The main outcomes that we are analyzing are mean duration of unemployment and wage at reemployment.

To analyse the effects of the reduction in duration for temporary laid off workers (modality of suspension) we rely on propensity scores estimations (PS, comparing UI beneficiaries before and after the change in the system). The effects of the change in benefits scheme for permanently laid off workers propensity score and difference in difference estimations (DD, comparing UI beneficiaries with workers out of the labour force but not into UI, before and after the change) were undertaken. For the extension of UI duration for older workers, effects are estimated using regression discontinuity design, considering workers aged 47 to 53 (RDD).

Unemployment data covers the universe of all unemployed workers who entered the program15 months before and 15 months after the modification of the program. This data comes from the administrative records of *Banco de Previsión Social,* and includes information on sex, date of birth and sector of activity, as well as the exact amount of money they received and the months they were in the program. We use this data to compare similar workers before and after changes in the UI were implemented, as discussed below. For these workers, we have all their labor history until April 2010, so we can know if they returned to work once the UI expired, and in case they did, they wage at reemployment.

Data on social security records, which is described in section X, is used to construct control groups of workers who were out of the formal labor force but not covered by the UI. The following table describes the evaluation strategy used to analyze each change, detailing the treatment and control groups in each case.

Table 6. Impact evaluation strategy

Modification	Strategy	Treatment and control groups	Data base
1. Reduction in duration (suspension)	1. 1 Propensity scores	T: unemployment beneficiaries suspension after the change C: unemployment beneficiaries suspension before the change	Both treatment and control groups come from the administrative records of the UI program
2. Change in benefits	2. 1 Propensity scores	T: unemployment beneficiaries (job loss) after the change C: unemployment beneficiaries (job loss) before the change	Both treatment and control groups come from the administrative records of the UI program

	2.2 Difference in difference	T: unemployment beneficiaries (job loss) before and after the change C. Out of the labor force, without insurance	Treatment comes from the administrative records of the UI program Control comes from the labor history, social security data
3. Increase in duration 50 or older	3.1 RD	T: 50-53 after the change C: 46-49 after the change	Both treatment and control groups come from the administrative records of the UI program

Source: authors' elaboration

One drawback of our data for both PS and DD strategies is that we are not considering the same length of time after being out of the labor force for all workers. In fact, for those workers who entered the UI program 15 months before the change, we have information for the 30 subsequent months, whereas for those workers who entered the UI program 10 months after the reform, we have information only on the 5 subsequent months. In other words, the probability that a worker gets a formal job is higher for those workers who entered the UI before the change, because we have a longer spell of time. To avoid this problem, we make both groups as comparable as possible, we recoded unemployment duration for the first group of workers, allowing the same window of time for them as that for the post reform group. For example, if a worker became unemployed one month before the reform, and he gets a formal job after 15 months, we consider he didn't get a formal job in the period (this universe is considered as sample 1). As a second strategy to limit problems derived from the observation of incomplete spells, we constructed another subsample, extracted from this one, which only considers workers with complete unemployment duration observed (sample 2).

4. Results

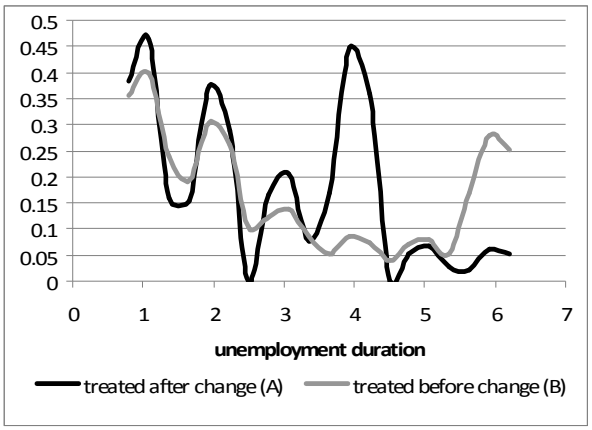
4.1 Reduction in duration for workers under suspension modality

We analyzed the impact of the reduction of duration of UI (from six to four months) for the workers under the modality of suspension on unemployment duration and earnings. We used a cohort design combined with propensity score matching to compare the outcomes of individuals who entered unemployment in the modality of suspension before and after the change.

Density functions of unemployment duration for treated individuals before and after the change differ considerably: as expected, the mode is in four months after the change (group A), and two modes, in two and in six months, appear when treated individuals before the change are considered (group B). These two groups are the ones being compared under the PS strategy. It must be remarked that although UI beneficiaries in the modality of suspension should return to their job after six or four months (old and new regime), the Executive Power has the possibility to extend the duration of the benefit (

Graph ***3***).

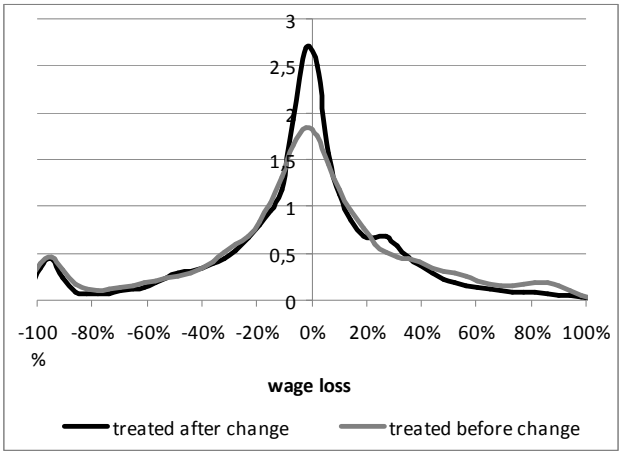
Graph 3. Density function of unemployment duration



Source: authors' calculation using a sample from administrative records from BPS

Density functions of a variable that measures changes in earnings differ between treated individuals before and after the change in the UI regime. Treated individuals after change present a clearer mode around zero, and less mass for higher order changes. (Graph 4). .

Graph 4. Density function of earnings' change



Source: authors' calculation using a sample from administrative records from BPS

Propensity score (PS) results on unemployment duration are presented in Table 6, for two types of propensity score estimators ((nearest neighbor matching and stratification matching). The variables used for the matching are age, age squared, sex and the interaction between sex and age.[5] When all the sample is considered, results indicate that there is a significant effect on unemployment duration, with the change in the UI design for workers in suspension modality causing a reduction in unemployment duration, indicating that the change was really enforced. The coefficients estimated imply a reduction of around 30% in duration of insured unemployment, consistent with the change from 6 to 4 months of duration. It reflects a merely mechanical change, as all workers in this modality remain as beneficiaries of the UI until the end of the period. Results are similar for both samples, and they are also very similar to the unadjusted mean difference.

Table 7. Mean unemployment duration and average treatment effect on the treated (ATT) of reduction in UI on unemployment duration (PS estimates). Temporary lay offs.

	Sample 1 (all)	Sample 2 (restricted)
Average duration		
Treatment group	2.68	2.67
Control group	2.99	2.99
Unadjusted difference (control vs treatment)	-0.31	-0.32
Average treatment effect on treated (ATT)		
Nearest neighbor matching	-0.300	-0.313
	(0.021) ***	(0.021) ***

[5] When earnings prior to the unemployment event was used in for the propensity score matching, the balance property was not satisfied.

Stratification matching	-0.302	-0.311
	(0.021)***	(0.020) ***
Nº of treated observations	11142	11021
Nº of control observations	14685	14627

Note: dependent variable: unemployment duration, in months. Standard errors in parenthesis.
*** significant at 1%.Source: authors' calculations using administrative records from BPS

Propensity score results on a dependent variable which measures the difference between pre and post unemployment earnings are presented in table X. The dependent variable is expressed as the percentage change of wages before and after the unemployment episode. In this case, results of PS are not statistically significant, for any of the estimators or samples considered. This indicates that these workers, who return to their previous job, do not experience significant changes in their earnings. This is not surprising, as they return to the same firm and job most of the times.

Table 8. Mean earnings' change and average treatment effect on the treated (ATT) of reduction in UI on earnings change. (PS estimates). Temporary lay offs.

	Sample 1 (all)	Sample 2 (restricted)
Average duration		
Treatment group	-0.04	-0.04
Control group	-0.04	-0.04
Unadjusted difference (control vs treatment)	0	0
Average treatment effect on treated (ATT)		
Nearest neighbor matching	-0.001	-0.004
	(0.005)	(0.005)
Stratification matching	-0.001	-0.005
	(0.005)	(0.005)
Nº of treated observations	10415	10304
Nº of control observations	13426	13365

Note: dependent variable: earnings' change, in %. Standard errors in parenthesis.
*** significant at 1%.
Source: authors' calculations using administrative records from BPS

4.2Change in the scheme of benefits

To analyze the effects of the change in the scheme of benefits for permanently laid off workers, we used a cohort design and propensity score matching using individuals who entered the unemployment in the modality of job loss before an after the change in the scheme of UI payments.

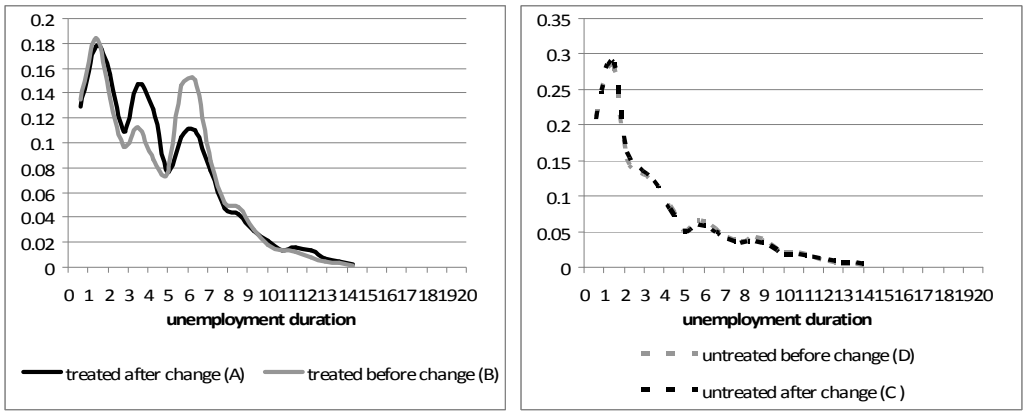
As a second strategy, difference in difference estimators were used, comparing UI beneficiaries before and after the change, with a control group of workers which lost their formal jobs but did not enter the UI program. The following equation was estimated:

$$Y_{it} = \alpha + \beta T_{i1} t + \rho T_{i1} + \eta t + \phi X_i + \varepsilon_{it} \qquad (3)$$

Where t is a time variable, being one after the moment of the modification of the unemployment program, and $T_1 = 1$ reflects the presence of the new UI program at t=1, whereas $T_1 = 0$ denotes lack of treatment at time t=1. The coefficient β, corresponding to the interaction between the treatment variable and the time variable, gives the average DD effect of the program. Months controls were included in the sepcification.

Density functions of unemployment duration for treated individuals (laid off workers under UI) before and after the change in the scheme of benefits (groups B and A respectively) show some changes, as the mode detected in the six months before the change vanishes after the change. The control sample of workers who did not enter the UI program, which were used for DD estimation (groups C and D, after and before the change respectively), present very similar density functions

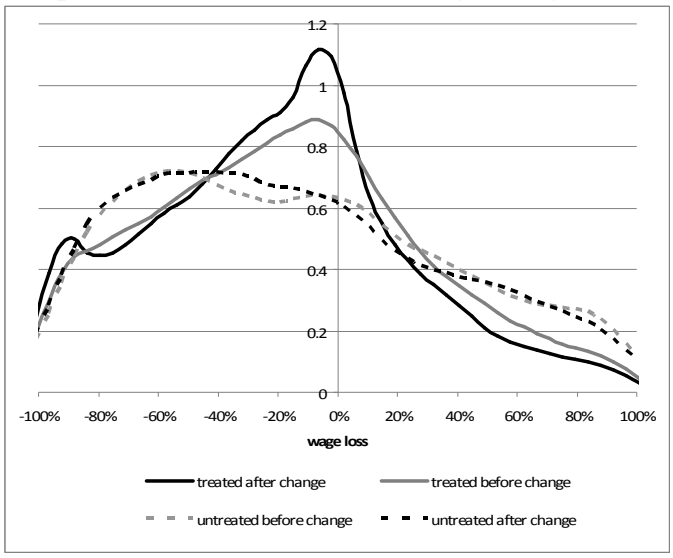
Graph 5. Density function of unemployment duration



Source: authors' calculation using a sample from administrative records from BPS

Density functions of changes in earnings differ between treated individuals before and after the change in the UI regime. Treated individuals after change present a clearer mode around zero, but considerably less mass for higher order changes. Density functions for untreated individuals before and after the change, the control groups for the DD strategy, are rather similar.

Graph 6. Density function of earnings change



Source: authors' calculation using a sample from administrative records from BPS

Propensity score matching between UI beneficiaries before and after the change in the scheme of benefits indicates that the average treatment effect on unemployment duration is negative, indicating that this change caused a reduction in unemployment duration (table X). The matching was done considering age, age squared, sex and the interaction between sex and age. The results could indicate that the reform produced a significant but very small reduction in the unemployment duration. To the extent that the dependent variable is measured in months, a coefficient of 0.06 represents a reduction of two days, a very small magnitude. Again, results are very similar to unadjusted difference in means.

Table 9. Mean unemployment duration and average treatment effect on the treated (ATT) of reduction in UI on unemployment duration (PS estimates). Permanent lay offs.

	Sample 1 (all)	Sample 2 (restricted)
Average duration		
Treatment group	4.45	4.48
Control group	4.40	4.40
Unadjusted difference (control vs treatment)	-0.05	-0.08
Average treatment effect on treated (ATT)		
Nearest neighbor matching	-0,06	-0,078
	(0,02) ***	(0,029) ***
Stratification matching	-0,073	-0,078
	(0,029) ***	(0,028) ***
Nº of treated observations	49961	23567
Nº of control observations	35683	16356

Note: dependent variable: unemployment duration, in months. Standard errors in parenthesis.
*** significant at 1%.
Source: authors' calculations using administrative records from BPS

The change in the scheme of unemployment duration has also implied a reduction of average wage loss. On average, job loss is associated with a reduction of 20 percentage points of wages for workers that return to labor activity. The propensity score estimates show that after reform the performance would be slightly better, since the loss would be approximately three points lower.

Table 10. Mean earnings' change and average treatment effect on the treated (ATT) of reduction in UI on earnings change. (PS estimates). Permanent lay offs.

	Sample 1 (all)	Sample 2 (restricted)
Average duration		
Treatment group	-0.21	-0.21
Control group	-0.23	-0.17
Unadjusted difference (control vs treatment)	0.02	0.04
Nearest neighbor matching	0,028	-0,033
	(0,004) ***	(0,005) ***
Stratification matching	0,028	-0,033
	(0,004) ***	(0,005) ***
Nº of treated observations	25921	20934
Nº of control observations	21557	14348

Note: dependent variable: earnings' change, in percentage points. Standard errors in parenthesis.
*** significant at 1%.
Source: authors' calculations using administrative records from BPS

Difference-in-differences estimates confirm the previous results in relation with unemployment duration. In this case, treatment are permanent laid off workers covered by UI and the control group is unemployed workers not covered by UI, in both cases before and after the change in the regime. Our variable of interest, the interaction between the treatment and time variable, indicates that the change in UI benefits caused a decrease in unemployment duration of one week. The reduction is higher for men (gender=1) and for younger workers. Results also indicate a reduction of wage loss of around 5%. Similar results are obtained with the unrestricted sample (see table A.1).

Table 11. Differences in differences estimation. Effects of the change in UI benefits on unemployment duration and wage loss. Sample 2 (restricted)

	Coefficient	Std. Err.	T	P>t	Confidence interval

Unemployment duration						
Treatment	0,764	0,034	22,800	0,000***	0,698	0,830
Time	0,007	0,039	0,180	0,861	-0,070	0,083
treatment*t	-0,179	0,073	-2,460	0,014***	-0,321	-0,036
treatment*t*gender	-0,216	0,036	-6,030	0,000***	-0,286	-0,146
treatment*t*age	0,011	0,001	7,470	0,000***	0,008	0,013
Nº of treated obs. Before	16355					
Nº of treated obs. After	23568					
Nº of control obs. Before	8862					
Nº of control obs. After	8126					
Wage loss						
Treatment	0,083	0,007	11,710	0,000***	0,069	0,097
Time	-0,026	0,008	-3,200	0,001***	-0,042	-0,010
treatment*t	0,052	0,019	2,790	0,005***	0,015	0,088
treatment*t*gender	0,017	0,009	1,900	0,058**	-0,001	0,034
treatment*t*age	-0,001	0,000	-1,440	0,151	-0,001	0,000
Nº of treated obs. Before	14348					
Nº of treated obs. After	20934					
Nº of control obs. Before	5622					
Nº of control obs. After	5118					

Note: *** significant at 1%.
The estimation included months fixed effects controls.
Source: authors' calculations using administrative records from BPS

4. 3. The extension of benefits for older workers

One way to identify the causal effect of extending UI benefits is to compare workers aged 50 or over, whose UI duration was increased by two quarters, with workers who just fail the age of requirement. These two groups are basically similar, and the difference is that the extension in benefits was applied only to workers aged 50 or older at the moment of entering unemployment. So if there is a discontinuity in the outcome variable after the intervention, it is interpreted as a consequence of the change. Details on the methodology of RD are provided in annex 1. A similar strategy was proposed in Lavile (2008), although the increase in duration they analyzed was much more dramatic (3.5 years). As stated in that paper, this strategy could be invalidated if firms manipulate the UI system, offering workers not to lay them off until they are 50. In our case, this may be mitigated by the fact that we are taking the first immediate year after the modification, and that this change has not been in the public discussion of unemployment reforms, reducing the probabilities of manipulation.

For this analysis, we use information on individuals entering unemployment 15 months before and 15 months after the change in the UI system, so our data covers from November 2007 to April 2010 (the change was on the 1st February 2009). Regression discontinuity estimations consider as treated group those who entered UI system in February 2009 and after, and where aged 50-54 when becoming unemployed, and control group those aged 46-49 in the same period. This implies a total of 5072 unemployed workers, 49.4% of which are treated (aged 50 or more). In the previous period (before February 2009, the data set consists of 4095 workers, 53.8% aged 50 or more.

Mean unemployment duration is higher for individuals aged 50 or more both before and after the change in the duration of benefits. Nevertheless, after the change the difference in means is bigger (Table 12).

Table 12. Mean unemployment duration (in months)

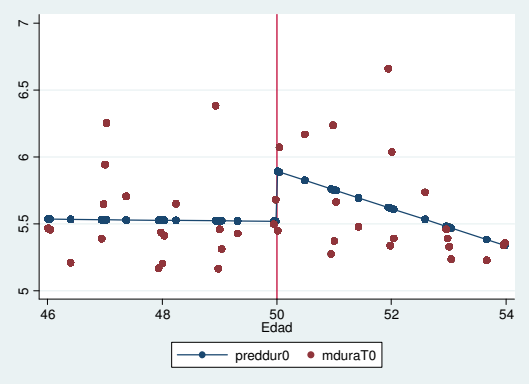
	Before	After	Total
46-49	5.48	3.72	4.54
50-54	5.68	4.58	5.05
46-54	5.57	4.16	4.79

Source: authors' calculations using administrative records from BPS

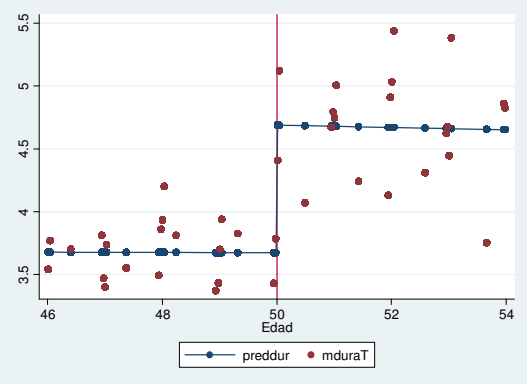
Average unemployment duration by age at entry into unemployment for considering all workers, women and men, before and after the change in the UI system, are reported in Graph 7. There seems to be a discontinuity in at age 50, both for men and women, before the change in the policy. When the previous period is considered, differences in unemployment duration at the 50 years threshold do not seem to exist, especially in the case of men.

Graph 7. The effects of the extension in UI on duration: age threshold

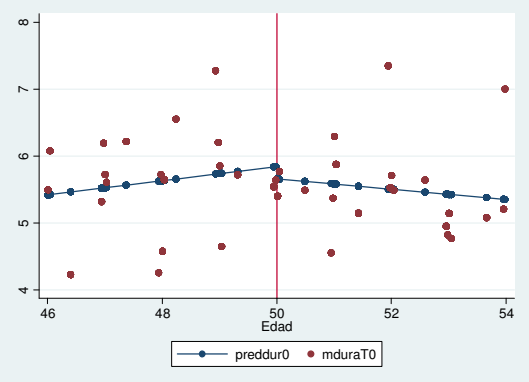
a) before



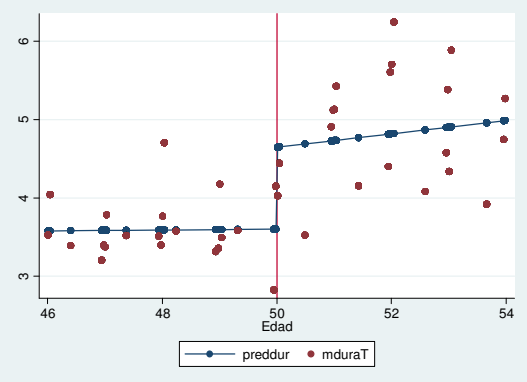
b) after



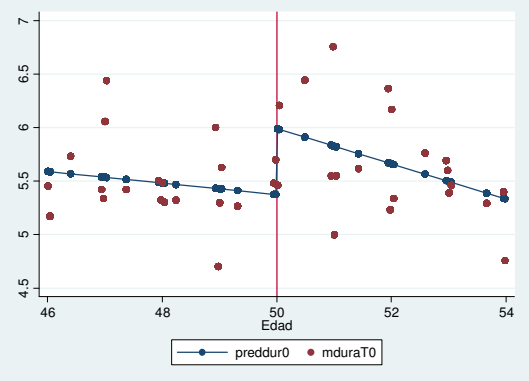
a) before (women)



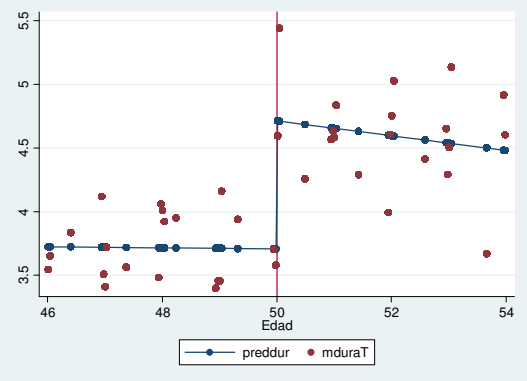
b) after (women)



a) before (men)



b) after (men)



Source: authors' elaboration using administrative records from BPS

Following the RD estimation strategy, we run the following linear regression:

$$Y_i = \alpha_0 + \alpha_1 T_i + \alpha_2 (A_i - A_0) + \alpha_3 T_i (A_i - A_0) + \varepsilon$$

Where Y_i is the outcome variable (duration of unemployment and wage at employment), T is the treatment variable and A is the assignment (or the forcing) variable, in our case reflecting age, with A_0=50. We also include quadratic and cubic expressions of A_i-A_0. The parameter α_1 measures the average causal effect of the extension on UI benefits on outcome variables., As shown by Table 13, our estimates indicate that average unemployment duration is almost 4 weeks longer for those aged 50-54 when compared to those aged 46-49. If the same regression is run with data from the period before the change was introduced, the treatment variable is only weakly significant in some of the specifications for all the workers. It is never significant for women, and it is significant, with a smaller coefficient and significance, for men.

Table 13. Effect of UI extension on unemployment duration (in months). 46-54

	Linear	Cuadratic	Cubic	Linear+sex control	Cuadratic+sex control	Cubic +sex control
After the change in UI duration						
All	0.92	0.935	0.904	0.921	0.936	0.905
	[0.1317]***	[0.1331]***	[0.1705]***	[0.1318]***	[0.1331]***	[0.1706]***
Nº obs.	7484	7484	7484	7484	7484	7484
Women	0.874	0.914	0.534			
	[0.2467]***	[0.2503]***	[0.3188]*			
Nº obs.	2437	2437	2437			
Men	0.943	0.943	1.086			
	[0.1549]***	[0.1560]***	[0.1998]***			
Nº obs.	5047	5047	5047			
Before the change in UI duration						
All	0.383	0.406	0.354	0.383	0.406	0.354
	[0.2257]*	[0.2289]*	[0.2871]	[0.2259]*	[0.2290]*	[0.2871]
Nº obs.	5904	5904	5904	5904	5904	5904
Women	-0.236	-0.22	-0.223			
	[0.4055]	[0.4116]	[0.4973]			
Nº obs.	1813	1813	1813			
Men	0.654	0.68	0.601			
	[0.2718]**	[0.2755]**	[0.3503]*			
Nº obs.	4091	4091	4091			

Note: *** significant at 1%.
Source: authors' calculations using administrative records from BPS

Estimations were also done considering narrower age bins, instead of the group 46-54. In particular, we considered 47-54, 48-53 and 49-51. As tables 16 to 18 show, results are maintained for these groups. The extension in the UI duration for older workers leads to an increase in unemployment duration for that group.

Table 14. Effect of UI extension on unemployment duration (in months). 49-51

	Linear	Cuadratic	Cubic	Linear+sex control	Cuadratic+sex control	Cubic +sex control
After the change in UI duration						
All	0,936	0,882	1,059	0,933	0,877	1,056
	[0.2102]***	[0.2161]***	[0.2463]***	[0.2098]***	[0.2155]***	[0.2460]***
Nº obs.	1927	1927	1927	1927	1927	1927
Women	0,485	0,279	0,426			
	[0.3939]	[0.4124]	[0.4679]			
Nº obs.	617	617	617			
Men	1,148	1,153	1,385			
	[0.2447]***	[0.2485]***	[0.2812]***			
Nº obs.	1310	1310	1310			
Before the change in UI duration						
All	0,288	0,33	0,158	0,285	0,328	0,16
	[0.3513]	[0.3660]	[0.4049]	[0.3515]	[0.3662]	[0.4052]
Nº obs.	1527	1527	1527	1527	1527	1527
Women	-0,213	-0,309	-0,355			
	[0.5959]	[0.6245]	[0.6822]			
Nº obs.	466	466	466			
Men	0,492	0,589	0,372			
	[0.4316]	[0.4485]	[0.4999]			
Nº obs.	1061	1061	1061			

Note: *** significant at 1%.
Source: authors' calculations using administrative records from BPS

Table 15. Effect of UI extension on unemployment duration (in months). 48-52

	Linear	Cuadratic	Cubic	Linear+sex control	Cuadratic+sex control	Cubic +sex control
After the change in UI duration						
All	1,101	1,088	0,89	1,102	1,09	0,892
	[0.1759]***	[0.1794]***	[0.2136]***	[0.1758]***	[0.1793]***	[0.2136]***
Nº obs.	3766	3766	3766	3766	3766	3766
Women	0,781	0,774	0,493			
	[0.3291]**	[0.3381]**	[0.3996]			
Nº obs.	1213	1213	1213			
Men	1,251	1,236	1,072			
	[0.2054]***	[0.2084]***	[0.2483]***			
Nº obs.	2553	2553	2553			
Before the change in UI duration						
All	0,172	0,162	0,324	0,174	0,164	0,325
	[0.2948]	[0.3010]	[0.3535]	[0.2948]	[0.3011]	[0.3537]
Nº obs.	3007	3007	3007	3007	3007	3007
Women	-0,552	-0,508	0,0396			
	[0.5108]	[0.5154]	[0.5825]			
Nº obs.	920	920	920			
Men	0,484	0,45	0,443			
	[0.3598]	[0.3693]	[0.4388]			
Nº obs.	2087	2087	2087			

Note: *** significant at 1%.
Source: authors' calculations using administrative records from BPS

Table 16. Effect of UI extension on unemployment duration (in months). 47-53

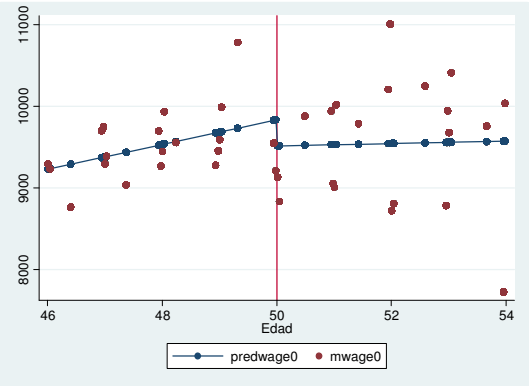
	Linear	Cuadratic	Cubic	Linear+sex control	Cuadratic+sex control	Cubic +sex control
After the change in UI duration						
All	0,9830	1,0000	0,9180	0,9850	1,0020	0,9190
	[0.1482]***	[0.1498]***	[0.1898]***	[0.1482]***	[0.1498]***	[0.1898]***
Nº obs.	5624	5624	5624	5624	5624	5624
Women	0,8920	0,9370	0,4540			
	[0.2775]***	[0.2809]***	[0.3550]			
Nº obs.	1825	1825	1825			
Men	1,0310	1,0300	1,1390			
	[0.1740]***	[0.1754]***	[0.2214]***			
Nº obs.	3799	3799	3799			
Before the change in UI duration						
All	0,472	0,468	0,0472	0,472	0,468	0,047
	[0.2559]*	[0.2581]*	[0.3169]	[0.2559]*	[0.2581]*	[0.3169]
Nº obs.	4426	4426	4426	4426	4426	4426
Women	-0,146	-0,0749	-0,789			
	[0.4559]	[0.4578]	[0.5413]			
Nº obs.	1329	1329	1329			
Men	0,744	0,707	0,401			
	[0.3087]**	[0.3117]**	[0.3882]			
Nº obs.	3097	3097	3097			

Note: *** significant at 1%.
Source: authors' calculations using administrative records from BPS

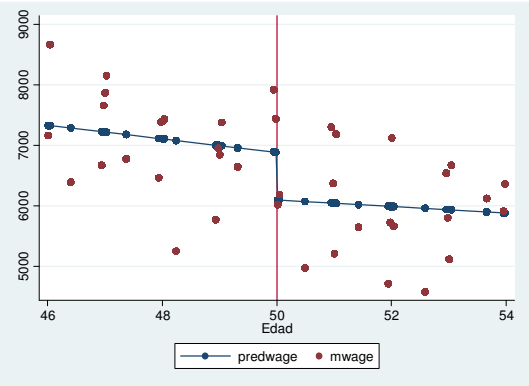
The same analysis was done considering wages at reemployment as outcome variable. The graphical analysis (Graph 8) is not as clear as in the case of duration.

Graph 8. The effects of the extension in UI on wages: age threshold

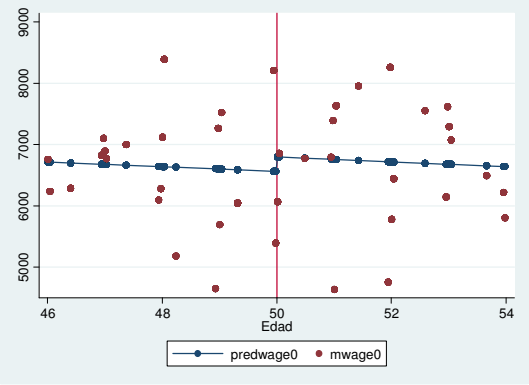
a) before



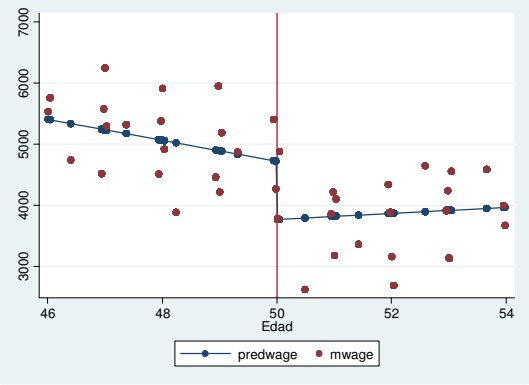
b) after



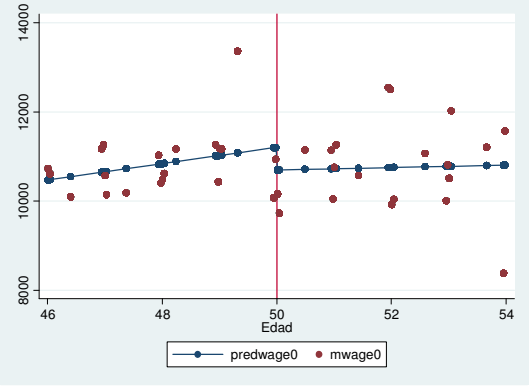
a) before (women)



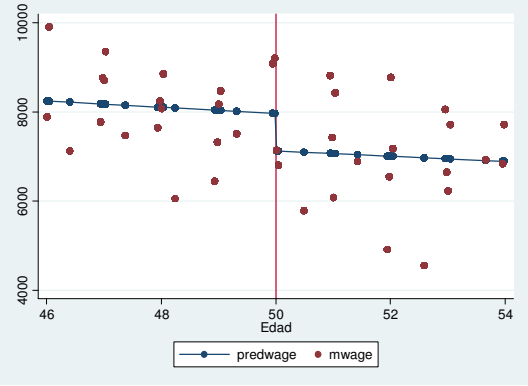
b) after (women)



3..e) before (men)



3.f) after (men)



Source: authors' calculations using administrative records from BPS

Regression analysis shows that there are no differences in wages at reemployment when treated individuals are compared with untreated ones (table). In all cases, we are only considering workers who reenter the labor market. The treatment coefficient not significant for men nor woman, and when estimations are done considering narrower age bins, results remain the same.

Table 17. Effect of UI extension on wages at reemployment ($U dec 2009)

	Linear	Cuadratic	Cubic	Linear+sex control	Cuadratic+sex control	Cubic +sex control
After the change in UI duration						
All	829.3	814.8	-303.1	663.9	660.2	-291.7
	[581.0]	[588.6]	[734.2]	[557.6]	[565.1]	[703.2]
Nº obs.	4,149	4,149	4,149	4,149	4,149	4,149
Women	11.26	5953	-898.6			
	[559.9]	[561.8]	[730.4]			
Nº obs.	1,336	1,336	1,336			
Men	971.2	965.7	-38.12			
	[773.5]	[785.1]	[973.6]			
Nº obs	2,813	2,813	2,813			
Before the change in UI duration						
All	-308.0	-314.1	-375.6	-201.0	-214.2	-399.2
	[466.7]	[468.5]	[642.9]	[451.0]	[452.8]	[621.8]
Nº obs.	5,422	5,422	5,422	5,422	5,422	5,422
Women	460.7	460.6	-13.14			
	[561.2]	[565.0]	[762.7]			
Nº obs.	1,658	1,658	1,658			
Men	-498.1	-518.0	-570.4			
	[600.3]	[602.4]	[823.5]			
Nº obs.	3,764	3,764	3,764			

Note: *** significant at 1%.
Source: authors' calculations using administrative records from BPS

5. Final comments

References

Annex

Table A.1. Differences in differences estimation. Effects of the change in UI benefits on unemployment duration and wage loss. Sample 1 (all)

	Coefficient	Std. Err.	T	P>t	Confidence interval	
Unemployment duration						
Treatment	-0.20	0.04	-5.68	0.00	-0.27	-0.13
Time	-0.19	0.07	-2.69	0.01	-0.33	-0.05
treatment*t	0.01	0.00	7.11	0.00	0.01	0.01
treatment*t*gender	0.77	0.03	22.90	0.00	0.70	0.83
treatment*t*age	0.06	0.04	1.60	0.11	-0.01	0.14
Nº of treated obs. Before	16422					
Nº of treated obs. After	24267					
Nº of control obs. Before	8907					
Nº of control obs. After	8585					
Wage loss						
Treatment	-0.10	0.01	-18.07	0.00	-0.11	-0.09
Time	-0.02	0.01	-2.09	0.04	-0.03	0.00
treatment*t	0.00	0.01	0.15	0.88	-0.03	0.03
treatment*t*gender	0.02	0.01	2.84	0.00	0.01	0.03
treatment*t*age	0.00	0.00	3.67	0.00	0.00	0.00
Nº of treated obs. Before	8479					
Nº of treated obs. After	5434					
Nº of control obs. Before	25920					
Nº of control obs. After	21558					

Note: *** significant at 1%.
The estimation included months fixed effects controls.
Source: authors' calculations using administrative records from BPS