SUBSIDISING MATURE AGE EMPLOYMENT OR THROWING COINS INTO A WISHING WELL: A QUASI-EXPERIMENTAL ANALYSIS

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Abstract

This paper evaluates the effect that subsidies to employment maintenance have on the probability of mature age workers staying in the firm. Implementing a quasi-experimental design provided by changes in Spanish labour market regulations, we are able to estimate that subsidy removal had a small though significant impact on the workers' firm attachment rate. Our results show that a 1 pp increase in the worker's cost translates into a 0.11 pp increase in the cumulative probability of the worker separating from the firm in the next five months. This effect was mainly driven by workers with relatively less seniority in the firm, who present lower dismissal costs, and by workers in low-skill jobs, for which the wage-productivity gap seems to negatively evolve with age. In terms of cost-benefit analysis, we document that the previous higher rate of job maintenance was achieved at a disproportionate cost, and therefore the elimination of the subsidy resulted in Social Security efficiency gains.

Resumen

Este artículo evalúa los efectos que los subsidios al mantenimiento del empleo hayan podido tener sobre la probabilidad de que los trabajadores con mayor edad permanezcan en su empresa. Mediante la implementación de un diseño cuasiexperimental, propiciado por cambios en la regulación laboral en España, podemos estimar que la eliminación del subsidio tuvo un efecto pequeño, pero significativo, en la continuidad del trabajador en su empresa. Nuestros resultados muestran que 1 pp de incremento en el coste del trabajador se traduce en 0,11 pp de mayor probabilidad de que el trabajador abandone la empresa en los próximos cinco meses. Este efecto estuvo principalmente causado por los trabajadores de menor antigüedad en la empresa, que a su vez presentan menores costes de despido, y por trabajadores de baja cualificación, para los que parece que la brecha salario-productividad empeora más con la edad. En términos de análisis coste-beneficio, documentamos que el mencionado mayor mantenimiento del empleo se consiguió a un coste desproporcionado, por lo que la eliminación del subsidio supuso una ganancia de eficiencia en la Seguridad Social.

Palabras clave: ineficiencia, bonificaciones al impuesto laboral, demanda de trabajo, costes de despido.

Códigos JEL: H21, H31, J23, J32.

1   Introduction

Employment incentives have been widely used in several European countries to foster employment prospects among certain disadvantaged groups, and to reduce the high level of job turnover rates that some collectives experience. Nevertheless, the light shed by the broad empirical literature on the topic tends to reveal a scarce impact of such policies to achieve the foreseen results (Boone and Van Ours (2004) or Kluve and Schmidt (2002)). In this respect, Card et al (2010) and Card et al (2016) conduct a meta-analysis on the impact of different active labour market programs (ALMP) on a large set of countries, being somewhat more optimistic on the impact of employment incentives which could lead to a small positive effect on employment rates, similar to the one estimated for job-search assistance programs, and more positive, for instance, than the ones observed for public employment programs. However, there are also differences in the timing effects of different ALMPs with training programs providing more positive effects in the long-run than employment incentives. Finally, it should be noticed that in these studies only individually targeted programs are analyzed, excluding employment incentives programs that were available for all workers[1].

In the Spanish case, where most of the employment subsidies have not been individually targeted, mostly directed to wide collectives as youngsters, older workers, females and long-term unemployed, employment incentives have been proven to mildly increase the employment level of the targeted group. In particular, Barceló and Villanueva, 2016 find some positive effects of regional subsidies to permanent employment on new hirings under open-ended contracts but most of the empirical evidence tend to show that such increase, if anything, seems to largely come in detriment of other collectives, cancelling out any conceivable impact on the aggregate employment rate. For instance, Kugler et al, 2002 and Toharia et al, 2008 analyze the incentives to open-ended contracts introduced in the 1997 labour market reform finding very small on employment rates of different workers groups and, whereas employment subsidies might initially reduce a worker's turnover rate, this higher initial firm attachment vanishes with the end of the monetary incentives, failing to have any impact in the long run. García Pérez and Rebollo (2009) find similar results when they analyze regional incentives to permanent employment in Spain that were in place over the 2000s decade. More recently, Gamberoni et al (2016) also find similar results when looking at the impact of the introduction of a new permanent contract, with different fiscal incentives, for small and medium sized firms in the 2012 labour market reform.

Employment incentives can be divided between recruitment incentives; which incentivize new hires through subsidies for a limited period of time, and between employment maintenance incentives; which objective is to subsidize continuing employment of workers previously hired. While the formers haven been widely studied, much less is known about incentives that seek to maintain workers in the firm. There are reasons to believe however that the dynamics of such two different types of incentives might differ from one another. The most prevalent employment incentive in Spain has been to offer cuts in the employers' social security contributions. This measure could be regarded as a subsidy, as it reduces the total firm's labour cost. Whether this foregone income for the Social Security results as a profitable investment, or as a loss for the public accounts and the economy wide, depends on how relevant the incentives are to foster jobs that otherwise would have not existed. The importance of this causal link is

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1   Indeed in Card et al (2010) all employment incentives programs that allowed firms to select individuals whose jobs are subsidized are excluded.

often undervalued by promoters of such policies, but it reveals to be of great relevance when evaluating the efficiency of the implemented incentives.

The objective of this study is twofold. Firstly, we seek to have some insight regarding the extent to which incentives to employment maintenance affect a worker's firm attachment. Secondly, we are concerned with respect to the cost and efficiency of such policy. The paper is organized as follows: in the next section, the nature and characteristics of subsidies to employment maintenance in Spain are described. Subsequent, we detail our quasi-experimental setting derived from the undertaken changes in the Spanish labor market regulation, to which the results of our identification strategy will follow. Finally, we estimate the efficiency of employment maintenance incentives and provide a conclusion of the results.

2   Subsidizing mature age workers' employment maintenance in Spain

In Spain, there has been a wide variety of incentives schemes to promote employment among certain specific collectives, especially between the youth, long-term unemployed and the more mature age workers. Figure 1 shows the expenditure on subsidies to employment of some OECD countries in 2010 as percentage of GDP[2]. Spain ranks 5th among the countries that most spend in employment incentives, with a 0.3% of its GDP, and only surpassed by Belgium, Sweden, Denmark, and Luxembourg. In terms of participant stocks as a percentage of the labor force, the picture is similar, although in this case (see Figure 2) Spain ranks first among OECD countries with 8.6% of the total labor force subject to some bonus scheme, well above 1.7% of the average of OECD countries with available information.

Figure 1
Public expenditure on employment incentives (%GDP)

SOURCE: OECD.

Figure 2. Share of total labor force under employment incentives (%)
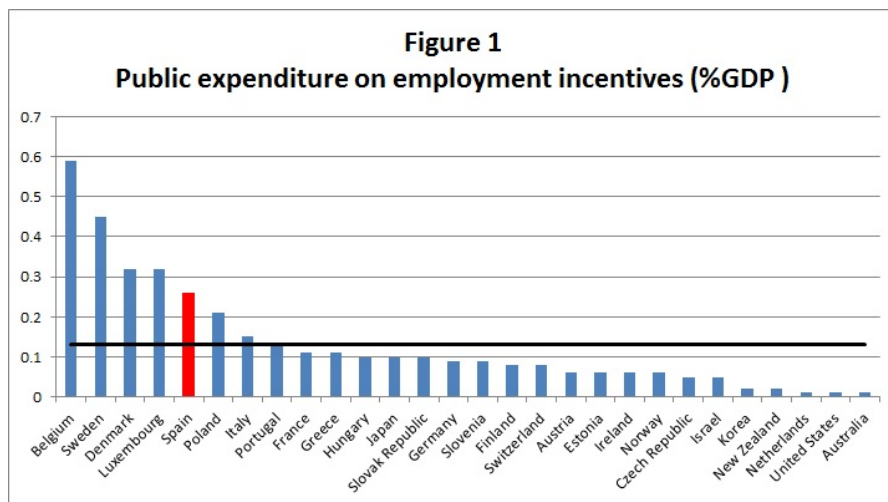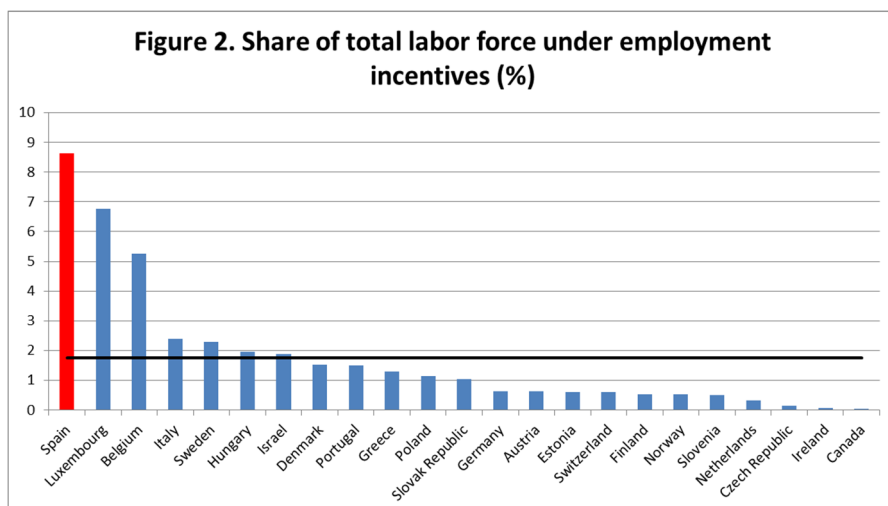
SOURCE: OECD.

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2   The picture is quite similar if we look at the average of the period 2004-2011. However, in 2013, the expenditure in these incentives decreased significantly in Spain (to less than 0.1% of GDP) due to the different measures approved to reduce the high fiscal deficit.

Our study focuses on employment maintenance incentives for mature age workers. More specifically, in June 2006 rebates in the employer's social security contributions to increase mature age workers firm's attachment were introduced[3]. This policy was targeted at workers of age 60 and older, hired under a permanent contract, and with at least 5 years of seniority within the firm. Social security rebate amount 50% of the payroll tax at the age of 60, and it increased 10 pp per year up to a maximum of a 100% at the age of 64.

To possibly explain the rationale of such a measure one has to evaluate how employees' productivity evolves throughout their working life. Some empirical research has pointed towards an inverse relationship between productivity and age after some peak is reached (Skirbekk, V. 2003), and that the pay-productivity gap increases with age (Ilmakunnas, P. & Maliranta, M. 2005). There is mixed evidence however respect to these results, as this wage-productivity gap seems to differ depending on the type of tasks that the worker develops within the firm (Skirbekk, V. 2003), (M. Roger & M. Wasmer, 2011). If we consider that such a trade-off exists, employment incentives to the maintenance of older workers in the firm can be viewed as a way to compensate firms for the undergone productivity that mature age workers experience in a context of downwardly rigid wages. Our goal is to estimate the causal impact that such policy has on the probability of mature age workers staying in the firm, and whether this measure can be justified in terms of a cost-benefit analysis.

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3 RDL 5/2006 of 9th of June.

3   The elimination of employment incentives as a quasi-experiment for their evaluation

To evaluate the significance of the incentives to employment maintenance targeted at mature age workers we are going to adopt a quasi-experimental analysis strategy. This approach is feasible due to the several changes that the Spanish labor market regulation underwent in 2012. Of special relevance to our strategy is the RDL 20/2012, of 13th of July, which, and after 6 years in force, eliminated the incentives to employment maintenance from August 2012 and onwards. This elimination resulted in an unanticipated exogenous upward shift in the labor cost for firms that employed these workers. In terms of the change in the labor cost per-worker, the elimination of the employment incentive in 2012 lead to a rise in the labor cost of between 10% and 22.2%[4] (see Table 1). Whether this increase in the worker's labor cost had consequences for the worker's continuation in the firm is the first question we are going to address.

Table 1: Change in labor cost by worker's age after the elimination of the subsidy

Age (years)	60	61	62	63	64	65+
% discounted	50%	60%	70%	80%	90%	100%
Per-worker cost change	+10.0 %	+12.2 %	+14.6 %	+17.0 %	+19.5 %	+22.2 %

Ideally we would like to observe the probability of continuing in the firm for the same workers both with a subsidy in force and with no subsidy in place. As only one outcome can ever be observed, we need to find a suitable comparison or control group to proxy for the event and outcome that cannot be observed, in our case, the workers' firm attachment rate when the subsidy is not suppressed. In principle, workers aged 60 and older, subject to a permanent contract, and with less than 5 years of seniority within the firm were not affected by the subsidy removal, as they never benefited from it, and they shared the same macroeconomic conditions that their counterparts with greater seniority. There are reasons to believe, however, that workers who manage to remain in the same firm for longer periods might substantially differ from those workers that do not. Table 2 confirms this concern, as workers with more than 5 years of seniority within a firm have on average 36% more professional experience in the labor market, show a higher incidence of males, a significantly lower part-time ratio and higher wages. Thus, these two groups seem to differ in several observed and probably non-observed characteristics, which may invalid the control group for our analysis.

Table 2: Worker characteristics by age and seniority

	Worked years (a)		Percentage of men		Part-time work		Daily wage median	
Seniority Age	High (+5)	Low (-5)	High (+5)	Low (-5)	High (+5)	Low (-5)	High (+5)	Low (-5)
60	23.7	18.5	67.7	60.9	8.1	18.6	70.7	59.2
61	23.1	17.3	69.5	55.3	8.0	22.4	66.6	56.8
62	22.4	16.3	66.9	56.9	8.8	22.6	60.6	55.8
63	22.0	16.3	68.2	55.4	13.0	24.3	60.0	54.0
64	22.1	15.4	66.6	52.1	10.4	25.3	62.2	53.3

(a) Total worked years in the last 30 years of each worker; since working histories are only observed from 1980
Source: MCVL

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4 Note that the rebate only affected what is called "common contingencies", which accounts for a tax rate of 23.6%. But there is still a remaining contribution rate of 6.3% which was not subsidized. Hence, these figures regarding per-worker cost change are computed comparing the total labour cost (including the additional 6.3%) with and without applying the subsidy only to the 23.6% rate of common contingencies. Also note that the cost change could be smaller for those workers earning more than 3262.5 € per month, the upper bound for Social Security contribution base in force in year 2012 (results excluding these observations are reported in Appendix C).

In order to overcome this drawback, we make use of yet another employment maintenance incentive. The Law 42/2006, of 28th December (2007 State Budget), introduced "reductions on social security contributions to job maintenance" for those workers aged 59 years and older, subject to a permanent contract, and with at least 4 years of seniority within the firm[5]. This measure survived the RDL/2012, of 13th of July, which resulted in workers aged 59, under a permanent contract, and with at least 5 years of seniority in the firm remaining subsidized throughout 2012[6].

To assess the suitability of workers 59 years old under a permanent contract and with at least 5 years of seniority as a comparison group we draw our attention once again on some descriptive statistics. If we look at Table 3 we observe that this group is reasonably similar to workers aged 60 and older with the same type of contract and seniority. Despite that this homogeneity diminishes somewhat as workers' age increases, it constitutes a good control group for our case study. As we warned before it is important to notice however, that because incentives to employment maintenance were eliminated too in 2013 for our control group, we are limited to a five month window to estimate the effects of the subsidy suppression. We notwithstanding argue that five months is a reasonable elapse of time to analyze how firms reacted to this exogenous shift in the workers' cost.

Table 3: Worker characteristics by age

Age	Worked years (a)	Percentage of men	Part-time work	Daily wage median
59	23.7	70.1	7.4	70.8
60	23.7	67.7	8.1	70.7
61	23.1	69.5	8.0	66.6
62	22.4	66.9	8.8	60.6
63	22.0	68.2	13.0	60.0
64	22.1	66.6	10.4	62.2

(a) Total worked years in the last 30 years of each worker; since working histories are only observed from 1980
*Source: MCVL*

Therefore, in our analysis therefore we could regard the elimination of the subsidies to employment maintenance as the treatment, and workers of age 60 and older subject to a permanent contract and with at least 5 years of seniority within the firm as the treated group. To infer the counterfactual outcome we will exploit the continuation of the subsidies to employment maintenance for workers 59 years old, hence our control group is going to be composed by those workers aged 59 under a permanent contract and with at least 5 years of seniority in the firm (Figure 3)[7].

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5   It had a maximum duration of one year, and entitled to a reduction of 40% in the payroll tax.

6   The explanation of why did one measure survived while the other remained in place lies in the different legal origins of each of them. While the bonus on the social security contributions for workers aged 60 and older was introduced by a RDL in the labor market regulation at one point in time and remained in force until its suppression, the bonus on the contributions for workers aged 59 and older was regulated by the State's Budget Law, which has a yearly periodicity. As a matter of fact, the State's Budget in 2013 did not include any incentives to employment maintenance, which de facto eliminated them. It maintained nevertheless the reduction to those workers that had previously gained the right to receive it.

7   Note that this design, being nice in terms of control and treated groups, makes it harder to extrapolate our results to other employment incentives targeted to different groups. This last caveat is especially important in our case, as the set of people analyzed here is very specific, not only in terms of age, but also in tenure, which implies high severance payments for those firms willing to fire a worker after the subsidy removal.

Figure 3: Timing of subsidies

Figure 4. Difference in the dismissal rate between treated and control group in 2012
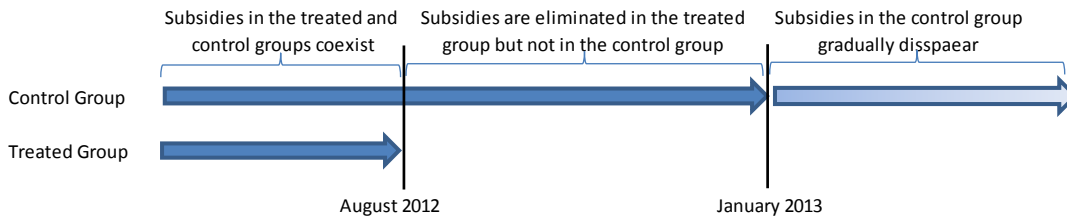
We observe the share of workers that separate from the firm in both the treated and the control group, before and after the subsidies are suppressed. Figure 4 provides a picture of this diff-in-diff strategy.
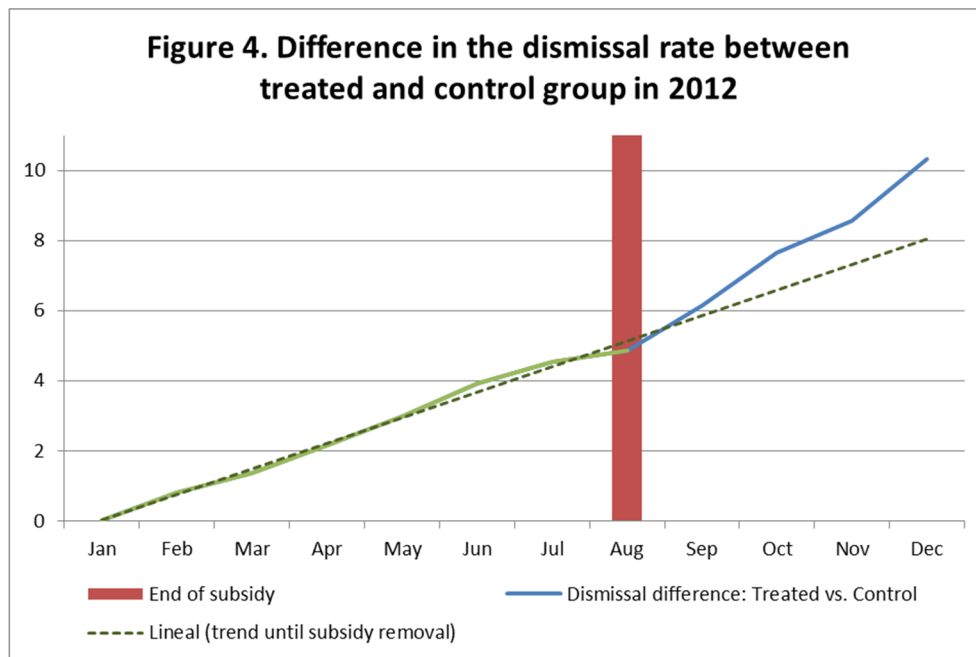
Figure 4 displays the difference in the share of workers that separate from the firm between the treated and the control group from the beginning of the year and throughout 2012. The first thing to notice is that this difference is increasing in time (positive slope) which accounts for the higher probability of separating from the firm in the treated group (60 to 64 years old) versus the control group (59 years old). Secondly, this increase in the difference of the separation rate between the treated and the control group is continuous until the subsidy is suppressed, when a discontinuously increase in the slope is observed. The break in the trend observed in the graph supports the argument that incentives to employment maintenance for mature age workers were positively associated with a higher attachment to the firm. When the incentives where eliminated, those workers that were previously entitled to a reduction on their social security contributions saw their probability of losing their job increase. If we consider that this continuous and strictly increasing monotonic difference in the workers' firm attachment rate was to continue throughout 2012 had the incentives remained in place, the higher probability of losing the job after the subsidy was suppressed would be given by the difference of the blue line and the dotted green line. The blue line displays the observed difference in the firms' attachment rate between the treated and the control group, while the dotted green line represents the trend of

this difference until the subsidy was eliminated. If we are concerned however that this difference in the workers' firm attachment rate between the treated and the control group needs not to be a continuous function of time, we conduct a placebo test and observe how this relationship unfolded in the previous years, where both treated and control group enjoyed cuts in the employer's social security contributions. In Figure 5 we observe that, in fact, the difference in the workers' firm attachment rate between the treated and the control group in the years previous to the suppression of the incentives to employment maintenance displays no discontinuous change in the slope. More the reverse, this difference represent a continuous strictly increasing monotonic function of time with no specific month at which the continuity is observed to break. This finding consolidates the argument that subsidies to employment maintenance for mature age workers seem to increase the probability that a workers remains in the firm. The following section addresses the estimation of the quantitative effect of such subsidies.

Figure 5. Difference in the dismissal rate between treated and control groups in previous years
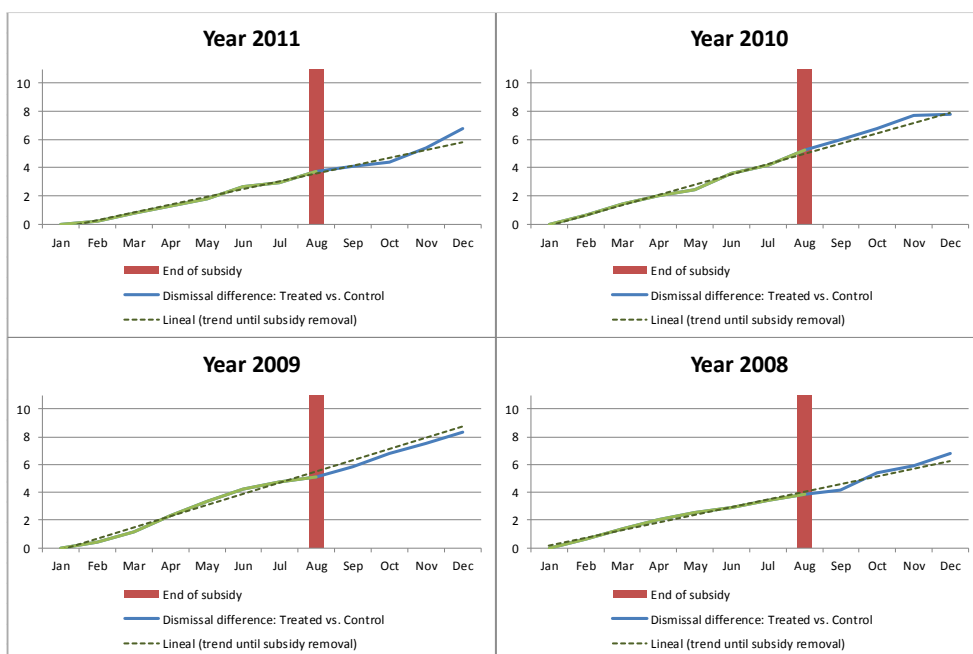
4   Data, estimation strategy and empirical results

We use of Spain's Social Security Administrative Labor Records (Muestra Continua de Vidas Laborales), which records the employment histories of a 4% non-stratified random sample of workers that related with the social security system at some point between 2005 and 2013. For these workers, the MCVL records all labor market transitions and job characteristics since 1980 or since first appearance in the social security system. Given the administrative nature of the data, this dataset allows us to accurately estimate the effects that cuts in the employer's social security contributions have on employment, income from contributions, and cost of unemployment benefits.

To accurately evaluate to what extent incentives to employment maintenance influence the probability of a mature age worker staying in the firm, we estimate a probit model that incorporates our quasi-experimental design and our diff-in-diff strategy. The question we are empirically addressing is the following: *Given that a worker has kept her job as far as July, what is the probability that she will lose her job between august and the end of the year?*

$$Y^*_{it} = c_i + \alpha_0 D_{it} + \sum_{i=1}^{n=6} \alpha_i A_{it} D_{it} + \sum_{i=7}^{n=3} \alpha_i S_{it} D_{it} + \sum_{i=1}^{n=6} \beta_i A_{it} + \sum_{i=1}^{n=3} \beta_i S_{it} + \gamma_0 G_i + \gamma_1 H_{it} + \sum_{i=1}^{n=5} \mu_i y_t + \varepsilon_{it}$$

$$\varepsilon_{it} \sim N(0,1)$$

$$Y = 1 \; if \; Y^* > 0$$
$$Y = 0 \; otherwise$$

Where Y is a binary variable that is 1 when the worker separates from the firm and is 0 otherwise, D is our treatment binary variable which is one when the subsidies to employment maintenance are no longer in force, and 0 otherwise. A denotes the age of the worker, S reflects the level of seniority within the firm, G accounts for the gender of the worker, H registers the skill level of the worker, and y introduces fixed year effects.

Full results of the estimation, together with some alternative specifications, are presented in Appendix A. Tables 4, 5 and 6 in the main text are based on predicted probabilities coming from the first model there, calculated only for the treated group[8].

Overall and age results are reported in Table 4. The probability of a worker losing her job between August and December increased from 6.7% when subsidies to employment maintenance were in place, to 8.5% once the subsidies were eliminated. Therefore, the end of the subsidies to employment maintenance originated a 1.8 pp increase in the probability of a mature age worker losing her job, significant at the 5% level.

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[8] Presenting results only for the treated group (i.e. average treatment effect on the treated) seemed better than presenting average marginal effects for the whole sample, because the natural counterfactual exercise is to assess what would have happened to the treated group, should the incentives had not disappeared. Nevertheless, usual average marginal effects are reported in Appendix A.

Table 4: Probability of job loss: Overall

Age (years)	Subsidy applies	No subsidy	Increase (pp)
Overall	6.7	8.5	**1.8 ****
60	5.5	7.0	**1.5 ***
61	5.6	6.7	1.1
62	5.7	7.8	**2.1 ***
63	9.3	11.0	1.6
64	10.5	15.1	**4.6 ****

*, **, ***, significant at 10, 5 and 1% respectively

Accounting for differential effects of the end of incentives to employment maintenance for different age levels (results are also shown in Table 4), we observe that the increase in the probability of separating from the firm increased for all age levels, although the increase is not statistically significant for workers of age 61 and 63. More notoriously, it seems that workers aged 64 were the collective that experienced the highest increase in the probability of separating from the firm after the subsidies were suppressed, of the order of a 4.6 pp increase (significant at the 5% level). This result seems striking at first, since workers aged 64 are very close to the legal retirement age in Spain[9]. Why would a firm incur in the cost of dismissing a worker when she is so close to retirement? One possible explanation would be that workers separating from their job are negotiating an exit to retirement with the firm, and therefore the separation would not be coming from a strictly dismissal procedure, but rather from a bargaining process throughout which both parts, firm and employee, negotiate an end to the employment contract that is beneficial for both parts. In practice however, it is not straightforward to disentangle whether a worker exits a firm involuntarily or voluntarily. This is particularly the case when a worker does not exit the firm directly to retirement, but rather chooses a two-step strategy by which first exits to unemployment to receive unemployment benefits before transitioning to retirement.

In Appendix B we partly test the suspicion that the increase in the separation rate of workers aged 64 after the subsidy is suppressed arises from exits to retirement. It is important to notice however that this concern does not invalidate the scope and estimates of our study, which seeks to evaluate the effect that incentives to employment maintenance have on the probability of mature age workers remaining employed in the firm. Discerning between exits to unemployment and exits to retirement therefore is indifferent to the purpose of the policy, which final goal is to maintain the jobs of those workers previously hired. This partial analysis is therefore motivated to understand the high increase observed in the probability of separating from the firm of those workers 64 years old.

In order to account for the effect that the end of subsides to employment maintenance had on workers with different levels of tenure within the firm, the model includes interactions of the treatment with three levels of seniority[10]. Table 5 shows that the workers that were the most affected by the end of subsidies were those with relatively less seniority in the firm. The probability of losing the job for workers between 5 and 9 years of seniority increased in 2.7 pp after the subsidy was removed (significant at the 1% level), this increase descends to 1,9 pp for the employees between 10 and 17 years of seniority, and has no significant effect for the employees with a seniority in the firm greater than 18 years. The result that the end of incentives to

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9 The legal retirement age in Spain is currently 65 years old.

10 Low seniority: 5 to 9 years, Medium seniority: 10 to 17 years, and High seniority: 18 or more years in the firm. These ranges are the result of evenly distributing the workers in 3 seniority cells.

employment maintenance negatively affected the probability of staying in the firm of those workers with relatively less seniority, while it had no effect on workers with relatively higher seniority is the expected result, as seniority is proportional to the worker's dismissal cost[11]. Furthermore, this finding suggests that dismissal costs were already acting as an incentive to maintain workers in the firm, which resulted with the end of subsidies to mature age workers with high seniority and high dismissal costs (our treated group) not having a large impact on the workers' firm attachment rate.

Table 5: Probability of job loss: By seniority

Seniority	Subsidy applies	No subsidy	Increase (pp)
Low	7.0	9.7	2.7 ***
Medium	6.5	8.4	1.9 **
High	6.5	7.3	0.8

*, **, ***, significant at 10, 5 and 1% respectively

We argued before that the logic behind the introduction of cuts in the employer's social security contributions for mature age workers steams from the decrease in the workers' productivity at the end of their working life in a context of downwardly rigid wages. At the same time, some studies have evidenced an asymmetric evolution of workers' productivity arising from differences in the type of tasks that different jobs demand. According to these studies, productivity does not decrease for high-skill workers in high-skill jobs, but it does for workers involved in more manual tasks in low-skill jobs. If this is the case we should expect the end of subsidies to employment maintenance to have had an asymmetric impact on the probability of a worker separating from the firm between high-skilled jobs and low-skilled jobs. When we also interact the treatment with the skill level a job demands we in fact observe the expected pattern. Table 6 displays that after subsidy removal the probability of separating from the firm for a worker in a low-skill job went from 6.8% to 8.8% (2 pp increase and significant at the 5% level), while for workers in high-skill jobs the end of subsides did not have any statistical significant effect. This finding supports the argument that workers' productivity evolves differently with age according to the different level of skills a job demands.

Table 6. Probability of job loss: By skill level

Skill	Subsidy applies	No subsidy	Increase (pp)
Low	6.8	8.8	2.0 **
High	5.4	6.0	0.6

*, **, ***, significant at 10, 5 and 1% respectively

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[11] Workers with high seniority in the firm have also more firm specific human capital.

5   Cost-benefit analysis

We are now going to take advantage of the exogenous upward shift in the cost of those workers affected by the end of subsides to estimate the elasticity of job separation to worker's cost. This in turn will provide us with a reference for the magnitude of the increase in the probability of separating from the firm of those previously subsidized workers. We estimate a probit model where the dependent variable is the probability of losing the job after the removal of the subsidy, and the independent variable represents the relative change in the worker's cost.[12] In addition, the regression includes all control variables used in our baseline model.

Our result shows that a 1pp increase in the worker's cost translates into an increase of 0.11pp in the probability that the worker separates form the firm, significantly different from zero at the 5% level[13]. This low elasticity of job separation to worker's cost is explained by the nature of the workers in our sample, which are characterized by high seniority in the firm and high dismissal costs.

However, so far we have only considered the firms response to the end of subsidies through the continuation of an existent job. However, firms might have reacted to the subsidy suppression by passing the increase in the worker's social contribution expenses towards the worker's wage, with no repercussion on the employment level. This possibility however seems implausible in the case of Spain, where the labor market is characterized by strong downwardly rigid wages[14]. In fact, from Figure 6 we observe that the wages of those workers that kept their job were not affected once the subsidy was eliminated. Had firms been able to adjust the increase in the workers' cost through a reduction of wages (accommodate the workers' wage to their marginal productivity), the suppression of incentives to employment maintenance could have left unchanged the employment prospects of those workers previously subsidized.

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12 The policy specifies that those workers aged 60 and older and with at least 5 years of seniority in the firm are entitled to a 50% reduction in the social security contribution, which increases 10 pp yearly. This implies that, for example, a worker that turns 61 years old but has only 5 years of seniority in the firm is only entitled to a 50% reduction, while a worker of the same age with 6 years of seniority or more is entitled to a 60% reduction (after benefiting from a 50% reduction the previous year), and so forth.

13 0.12pp increase excluding those observations with right-censored wages. Our dataset reports contribution bases, and so our observed wages are right-censored. Because the increase in the worker's cost is proportional to the worker's wage up to the maximum contribution base, we perform a second regression excluding those observations with right-censored wages for which we do not exactly know the cost's variation.

14 For instance, Font et al (2015) show a very mild procyclical wage pattern in Spain highlighting the existence of downward wage rigidities that additionally reduce wage cyclicality in recessions

Figure 6: Daily wage median in 2012 of those workers that remained employed
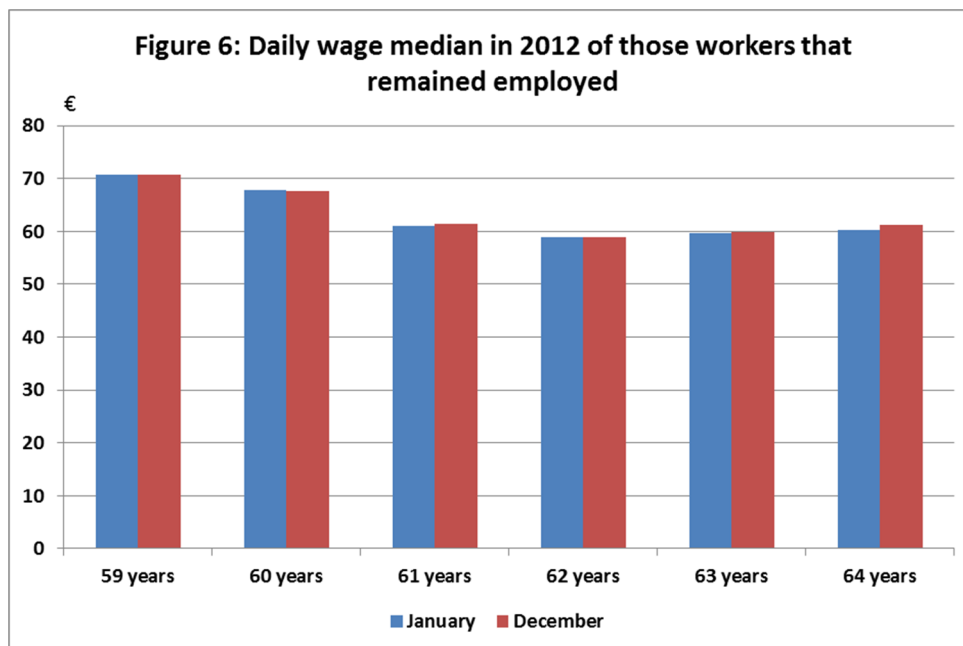
The end of subsides to employment maintenance had a small but significant effect on the probability of a previously subsidized worker losing her job. This small effect points towards the existence of a large deadweight steaming from the implementation of the policy. In this section we conduct a "welfare analysis" on the elimination of the subsidy, and estimate the efficiency of policies aimed at incentivizing the maintenance of mature age workers' jobs[15]. In order to do that, we estimate the probability of a worker in our treatment group to be displaced from her job before and after the subsidy is suppressed, computing the marginal coefficients combining the treatment effect with the age and the level of seniority in the firm from our baseline model estimates[16]. The coefficients are then used to estimate the level of wages, social security contributions, and unemployment benefits both in a world where the cuts in the employers' social security contributions no longer exist, and in a world where these incentives to employment maintenance persist (the counterfactual).

In particular, our treated groups consists of 6,383 individuals who had a permanent job with at least 5 years of tenure, and at least 60 years of age, in August 2012. We look at their situation in December 2012, and several outcomes can occur. Most of them (5824) are still working for the same firm. Very few (86) are still working, but for a different firm. And finally, some of them (473) are not working. Our observed world (without subsidies) is computed by adding wages and unemployment benefits separately for those three groups.

Now, we construct the counterfactual world (with subsidies) in the following way. The first group is unchanged with the same people and same wages. For each of the individuals in the other two groups, we compute a probability of recovering their old job, based on the estimated effects of the subsidy in the baseline model[17]. We apply these probabilities to the second group, replacing the December wage by the wage in the previous job when appropriate. Finally, we also apply the probabilities to the non-employed group, replacing unemployment benefits by previous wage when appropriate.

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15 Of course, this efficiency assessment is only valid as long as the introduction of a subsidy has no asymmetrical effects with respect to its removal.

16 We use those coefficients for which the impact of the end subsides is significant at the 10% level.

17 Specifically, for a given individual, let p and p' be the probabilities of losing the job with and without the subsidy, respectively. These are equivalent to those reported in tables 4, 5 and 6, but taking into account all individual characteristics at the same time. Then, the probability of keeping the last job in the counterfactual world is given by (p'-p)/p'.

Table 7 shows the results.[18] Eliminating the subsidies to employment maintenance generated a net increase of 39.5 million € in the Social Security funds in the month of December[19] alone, detailed as follows. The end of incentives translated to a loss of 3.1 million € in total wages, which in turn reduced in 1.1 million euro the income from social security contributions. The mild but significant increase in the probability of mature age workers separating from their job resulted in a greater expense on unemployment insurance benefits, of the order of 1.1 million € higher. On the other hand, the end of the subsidies resulted in direct savings of 41.7 million € for the Social Security. In other words, the 41.7 million € investment to promote the job maintenance of older workers solely achieved an increase of 3.1 million € in labor wages, 1.1 million € in social security contributions, and a decrease of 1.1 million € in unemployment benefits. This low investment return shows the high inefficiency of the policy to achieve the foreseen results, and evidences the generation of an important deadweight that accounted for 87.3% of the subsidies[20]. The intuition is simple. Subsidies managed to keep employment for only a small subset of people. After removal, these people started earning unemployment benefits, which are clearly greater than the cost of the subsidy for a given individual. But since they are very few, the savings coming from not paying the subsidy to the whole treated group more than compensates the extra unemployment benefits earned by the few who lost their jobs.

TABLE 7: BENEFIT-COST ANALYSIS OF SUBSIDY REMOVAL (December)
(in million €)

	Without subsidy (observed)	With subsidy (counterfactual)	Effect of re-introducing the subsidy
TOTAL LABOR INCOME			
Workers that remain in the firm	273.94	273.94	0.00
Workers separating from the firm and finding a job elsewhere	3.29	3.32	0.04
Direct effect of subsidy removal		3.11	3.1
Total	**277.22**	**280.37**	**3.14**
SOCIAL SECURITY CONTRIBUTIONS			
Workers that remain in the firm	99.30	99.30	0.00
Workers separating from the firm and finding a job elsewhere	1.19	1.20	0.01
Direct effect of subsidy removal		1.13	1.13
Total	**100.49**	**101.63**	**1.14**
Subsidy Cost	-	41.7	-
Unemployment benefits cost	8.63	7.53	-1.10
Net Income Social Security	91.86	52.37	-39.49

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18 Since MCVL is a random sample of 4% of the population, we consequently elevate these amounts using a flat population weight of 25.

19 We use the month of December to draw comparisons between the two states of the world. If we consider that 5 months is a big enough lapse of time for companies to decide on whether maintain or fire their previously subsidized employees, the cost of eliminating the subsidies should be around their maximum in the month of December, considering that some previously employed workers may increase their reemployment opportunities later on.

20 If we use the highest point in the confidence interval of our estimated marginal coefficients (using those coefficients which change is significant at the 10% level), or we use the coefficients regardless the coefficients' significance, the results are almost the same.

6 Conclusions

This study evidences the small, although significant, effect that subsidies to employment maintenance have on mature age workers' firm attachment. Inasmuch as the subsidy was targeted at employees with high seniority in the firm, employers' decision over workers' dismissal was highly influenced by the elevated severance payment this group of workers is entitled to. Since dismissal costs were already acting as an incentive for firms to maintain workers in the firm, the increase in the workers' cost after the end of incentives to employment maintenance had a weak impact on the probability of workers separating from the firm. As a matter of fact, a worker's seniority played a fundamental role in the worker's continuation in the firm. Employees with relatively lower seniority in the firm, and hence with smaller dismissal costs, significantly saw their probability of separating from the job increase; while this probability remained unchanged for those employees with a relatively higher tenure in the firm. Moreover, the end of cuts in the employer's social security contributions affected the worker's productivity-cost gap. The probability of losing the job for low-skilled workers experienced a significant increase after the subsidy was eliminated, while this probability remained unaffected for high-skilled workers. This finding implies that while low-skilled workers were mildly benefiting from the policy, firms employing high-skilled workers were simply cashing in the subsidies to employment maintenance. The elevated deadweight originated from the policy inefficiency advises against subsides to employment maintenance targeted at highly tenured older workers. If anything, incentives to employment maintenance should be targeted at workers with low seniority in the firm, which present the lowest dismissal cost and the highest turnover rate, and at workers in low-skilled jobs, whose productivity is more likely to be below the wages negotiated in collective agreements. Notwithstanding, subsidizing workers' employment maintenance is mostly likely to carry a high deadweight associated, and desirability of such policies should be questioned.

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Appendix A. Full estimation results

All the results in the main text are based on our benchmark model, reported in the first column in this appendix. Nevertheless, for comparability and completeness purposes, we report here full results of the estimation, together with some alternative specifications.

First column is the benchmark model. Second one introduces clustered standard errors at year and age level, with no significant changes. Finally, the last two columns sequentially introduce interactions of the reform with age and skill. The size of the interacted coefficients is important, but they have large standard errors, so tend to be non-significant. This is suggesting that our sample has no sufficient power to estimate a differential effect by age or skill. Therefore, we decided to stick with our benchmark with no interactions.

Full results and alternative models

VARIABLES	(1) Job loss	(2) Job loss	(3) Job loss	(4) Job loss
Subsidy removal	0.0160**	0.0160***	0.0337***	0.0347***
	(0.00677)	(0.00269)	(0.0110)	(0.0111)
Age (reference: 59)				
60 years	0.0113***	0.0113***	0.0117***	0.0117***
	(0.00377)	(0.00290)	(0.00393)	(0.00393)
61 years	0.0116***	0.0116***	0.0128***	0.0128***
	(0.00408)	(0.00367)	(0.00431)	(0.00431)
62 years	0.0148***	0.0148***	0.0141***	0.0140***
	(0.00435)	(0.00409)	(0.00464)	(0.00464)
63 years	0.0445***	0.0445***	0.0455***	0.0455***
	(0.00430)	(0.00274)	(0.00457)	(0.00457)
64 years	0.0565***	0.0565***	0.0539***	0.0538***
	(0.00461)	(0.00354)	(0.00499)	(0.00499)
60 years X subs. removal			-0.0130	-0.0133
			(0.0100)	(0.0101)
61 years X subs. removal			-0.0163	-0.0165
			(0.0107)	(0.0107)
62 years X subs. removal			-0.00811	-0.00829
			(0.0113)	(0.0113)
63 years X subs. removal			-0.0161	-0.0163
			(0.0112)	(0.0112)
Seniority (reference: Low)				
Medium seniority	-0.00571**	-0.00571**	-0.00486	-0.00487
	(0.00286)	(0.00275)	(0.00317)	(0.00317)
High Seniority	-0.00753***	-0.00753**	-0.00505	-0.00510
	(0.00291)	(0.00298)	(0.00320)	(0.00320)
Medium seniority X subs. removal			-0.00500	-0.00490
			(0.00730)	(0.00731)
High seniority X subs. removal			-0.0145*	-0.0141*
			(0.00764)	(0.00765)
Gender (reference: Male)				
female	-0.0134***	-0.0134***	-0.0134***	-0.0134***
	(0.00272)	(0.00243)	(0.00272)	(0.00272)
Occupation (reference: Low)				
High occupation	-0.0161***	-0.0161***	-0.0160***	-0.0140***
	(0.00413)	(0.00434)	(0.00413)	(0.00452)
High occupation X subs. removal				-0.0112
				(0.0110)
Year dummies	Yes	Yes	Yes	Yes
Year-age cluster	No	Yes	No	No
Observations	42,795	42,795	42,795	42,795
Prob > chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0172	0.0172	0.0176	0.0176

Average marginal effects

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix B. Robustness to the exclusion of exits to retirement

In this case, when we exclude exits to retirement, the increase in the probability of job separation only remains significant for low seniority workers. The elimination of incentives to employment maintenance therefore seems to have had an effect on the workers' probability of exiting to early retirement. This result confirms the suspicions that the high increase in the probability of separating from the firm of workers aged 64 is partly explained by its effects on exits to early retirement. In terms of policy cost, this early exit from the labor force to receive retirement benefits does not generates significant additional costs for the Social Security in the long run, as retiring earlier than the legal age carries penalties trough a discount rate that is proportional to the years remaining until the legal retirement age.

Probability of job loss: Overall

Subsidy applies	No Subsidy	Increase (pp)
5.7	6.8	1.1

*, **, ***, significant at 10, 5 and 1% respectively

Probability of job loss: By age

Age (years)	Subsidy applies	No subsidy	Increase (pp)
60	5.1	6.0	1.0
61	5.2	5.8	0.6
62	5.2	6.7	1.5
63	8.7	10.1	1.4
64	5.5	6.9	1.4

*, **, ***, significant at 10, 5 and 1% respectively

Probability of job loss: By seniority

Seniority	Subsidy applies	No subsidy	Increase (pp)
Low	6.1	8.2	2.1 **
Medium	5.6	6.7	1.1
High	5.4	5.4	0.1

*, **, ***, significant at 10, 5 and 1% respectively

Appendix C. Robustness to the exclusion of workers with right-censored wages

The increase in the worker cost after the subsidy was eliminated is proportional to the contribution base. Those individuals with wages above the maximum contribution experienced a relatively smaller increase in their labor cost relative to workers with wages below the maximum contribution base after the incentives to employment maintenance was eliminated. Excluding individuals with wages above this maximum contribution base leads to similar estimates.

Probability of job loss: Overall

Subsidy applies	No Subsidy	Increase (pp)
6.6	8.4	**1.8 ***

*, **, ***, significant at 10, 5 and 1% respectively

Probability of job loss: By age

Age (years)	Subsidy applies	No subsidy	Increase (pp)
60	5.2	6.7	1.5
61	6.0	6.5	0.5
62	5.7	7.6	1.9
63	9.3	11.4	2.0
64	10.4	15.3	**4.9 ** **

*, **, ***, significant at 10, 5 and 1% respectively

Probability of job loss: By seniority

Seniority	Subsidy applies	No subsidy	Increase (pp)
Low	7.2	9.5	**2.3 ****
Medium	6.5	8.2	1.7
High	6.2	7.5	1.2

*, **, ***, significant at 10, 5 and 1% respectively

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