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Unemployment Benefits and the Timing of Redundancies: Evidence from Bunching*

Laura Khoury†

JOB MARKET PAPER

The latest version of the paper can be found here.

Abstract

Most of the empirical literature related to unemployment insurance (UI) has focused on its impact on outflows from unemployment rather than on inflows. In this paper, I show that workers respond to the design of UI while being employed. I exploit a discontinuity in the level of UI benefits at a particular value of tenure at current job. Using French administrative unemployment data, I analyse the concentration of workers in the tenure distribution at the relevant notch, a phenomenon known as bunching. The bunching mass is used to compute an elasticity of employment spell duration with respect to unemployment benefits. I find an estimate equal to 0.014 in my preferred specification, translating into a 0.5 day of extension for a 10% increase in the replacement rate. This estimate measures strategic behaviours attenuated by optimisation frictions. I identify the underlying mechanism as bargaining between employers and employees who maximise their joint surplus thanks to a state transfer. I find that the elasticity is the highest in the population facing the strongest incentives and in the highest occupations. This heterogeneity can be related to differences either in ability to bargain or in preferences.

Keywords: Unemployment, Behavioural response to taxation, Bunching, Collective bargaining

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1 Introduction

Unemployment insurance (UI) spending accounts for a significant share of social spending in OECD countries, comparable to the share of family cash or incapacity benefits.[1] UI programs aim to reduce risk for individuals, helping them smooth their income and may act as an automatic stabiliser (Maggio and Kermani, 2016; Pareliussen, 2014). Besides their pure monetary cost, UI benefits make the outside option of employed workers more attractive and may influence the design of contracts by employers. The literature has mainly focused on the UI disincentive effect on the job search effort of the unemployed (Schmieder and Von Wachter, 2016). In parallel, many papers have explored the role of employment protection legislation (EPL) in enhancing job creation.[2] However, little is known about the impact of UI on the behaviour of employed workers and employers. The effect of UI on outcomes during employment is a relevant behavioural response since it can trigger potential costs that are usually not taken into account in the optimal UI framework. In times of high unemployment where the performance of UI schemes is highly scrutinised,[3] accurately measuring their costs and benefits turns out to be of crucial importance.

In this paper, I shed light on this often neglected aspect of UI, investigating how UI design affects the behaviour of employers and employed workers. I focus on its effect on the timing of the redundancy decision, *i.e.* when a firm facing economic difficulties decides to lay off part or the totality of its workforce. I exploit a notch created by a discontinuous jump in the level of UI benefits offered to laid-off workers above a tenure threshold. It allows me to measure whether the official contract termination is postponed when it benefits both employers and employees. The main contribution of this paper is to highlight the existence of strategic behaviours from employers and workers in response to UI incentives, where UI is used to maximise the surplus from separation. This paper also contributes to gaining insights into the employer-employee bargaining black box by analysing the individual and firm-level determinants of collusion between the worker and the firm.

[1] UI benefits weighed for around 1% of GDP on average in 2015, only including cash benefits.

[2] Theoretical arguments have been provided to support a relationship between EPL and job creation going on both directions (Addison and Teixeira (2003) for a review). Empirically, no consensus has been reached. The International Labour Organisation points out that "Irrespective of the methodology used, there is a general consensus that the impact of EPL on employment/unemployment level is rather mixed" (ILO, 2012). For instance, Bassanini and Duval (2006) find no significant effect of EPL on employment whereas Micco et al. (2006) find a negative impact.

[3] In many OECD countries (Spain, Italy, France, etc.), the unemployment rate is still higher than pre-recession levels.

I focus on a French unemployment program targeted at workers made redundant. Redundancies have attracted particular public interest as they often end up in mass layoffs.[4] A UI package targeted at laid-off workers called *Contrat de sécurisation professionnelle* (CSP) was introduced in 2005[5] in addition to the main UI benefits.[6] It introduced a non-linearity in the compensation amount at a tenure threshold, which went from two years to one year in 2011. Laid-off workers having completed one year (respectively two years before 2011) of tenure are entitled to a specific benefit equivalent to 80% of their previous gross earnings.[7] Those under this threshold only receive the standard benefit that represents 57.4% to 75% of previous gross earnings, depending on the past wage. This jump in the level of UI benefits incentivises workers to reach the tenure threshold before being laid-off.

This paper documents the existence of a sizeable concentration of workers laid-off right after one year in the distribution of seniority at layoff, a phenomenon known as bunching. I argue that it is the incentives created by the UI that explain the observed bunching. This result is robust to several tests ruling out alternative hypotheses. I model the underlying mechanism as a bargaining process between employers and employees on the contract termination date. In this setting, I do not consider the potential impact of the UI benefits level on the layoff decision itself, but I focus on the timing of this decision. On the employee side, the expected UI payment can affect whether the employee proceeds with negotiation on the contract termination day. On the firm side, the employer may consider additional UI benefits as a way to offset the psychological and social cost of the redundancy for the worker. A significant financial compensation is likely to deter workers from harming their employer's reputation or from claiming extra-legal severance payment.[8] This reduction in the layoff cost can compensate for the maintenance of the wage for a few additional days, whereas the employer does not support the direct cost of the CSP.[9] French legislation defines minimum time periods between each step of the redundancy procedure. The

[4]However, they account for a relatively small share of contract terminations (2.6% of all registrations to UI according to the French Unemployment Agency). In France, laid-off workers represent about 7% of flows into paid unemployment. They stay unemployed longer than the average worker, and therefore represent 10% of the stock of unemployed people on benefits at any given time.

[5]Law №2005-32 of January, 18^{th}, 2005 - art. 74 JORF January, 19^{th} 2005

[6]The UI scheme in France is characterised by a main insurance benefit, the *Allocation de retour à l'emploi* (ARE), designed for all workers having lost their jobs unintentionally, and fulfilling very general and nonrestrictive conditions.

[7]It translates into virtually 100% of previous net earnings.

[8]There is a growing literature showing the sensitivity of firms to social pressure (Luo and Bhattacharya, 2006; Baron, 2011; Schmitz and Schrader, 2015; Bénabou and Tirole, 2010).

[9]The employer does not pay an additional contribution to fund the CSP scheme. He may pay an indirect cost if such a strategy leads to an increase in the reservation wage or in the unemployment rate, thereby leading to an increase in employers' contributions. However, given the number of employees concerned, this indirect cost can be considered second order.

scenario supported by this paper is that, through these minimum time periods, the employer has some room to strategically extend the length of the procedure, and thus the length of the employment spell.

The particularity of my setting – a two-sided negotiation whereas the financial incentives lie mainly on the workers' side – and the heterogeneity I observe in the magnitude of bunching call for the introduction of a theoretical framework. It clarifies the cost and benefits of extending the employment spell on each side. This setting motivates the need to take into account the interactions between the different agents, and to cast light on the bargaining process between employers and employees in a contentious context.[10] I investigate the heterogeneity in bunching by a tentative decomposition of the factors explaining bunching into incentives, preferences and ability to negotiate.

To disentangle the role of financial incentives from other explanatory factors, I build upon the bunching methodology to compute a reduced-form estimate of the employer and employee's response to UI benefits in terms of contract length. I exploit the change in the seniority threshold from the first period (September, 2009 - August, 2011) to the second period (October, 2011 - September, 2014) using the first period distribution as a counterfactual. This method, known as the difference-in-bunching strategy (Brown, 2013), isolates the pure effect of the UI program, regardless of the role of other labour regulations or social norms that could trigger some bunching unrelated to the behaviour of interest.[11] It provides an estimate of the elasticity of contract extension to the level of UI benefits. This estimate is used as a metric neutralising the variation in financial incentives, and allowing other sources of heterogeneity to be explored.

This study contributes to the literature on the effect of taxes and benefits on labour supply. The behavioural response to non-linearities in the budget set, either through a discontinuity in the slope or in the level of the budget constraint, has been extensively studied in labour and public economics. Tax and transfer policies often lead to the creation of such kinks and notches, exhibiting a bunch at this point of the distribution. I draw on the growing bunching literature (see Kleven (2016) for a review) by identifying strategic behaviours at the level of the employer-employee pair. Important optimisation frictions have already been highlighted by several papers (Chetty et al., 2011; Kleven and Waseem, 2013). They attenuate the magnitude of bunching as predicted by the standard labour supply model, and account for the gap between

[10] Redundancies often involve collective lay-offs and as a consequence, are highly covered by the media.
[11] Round-number or psychological anchoring effect for example.

observed and structural compensated elasticity of income with respect to the net-of-tax wage. I characterise here a new source of frictions, bargaining frictions, that makes the adjustment of contract length not necessarily coincide with what would be optimal for the worker.

Therefore, one contribution of this paper is to provide insights into the employer-employee bargaining black box, by identifying individual and firm-level determinants of bunching. In particular, I find evidence that the rescheduling is part of an individual more than a collective negotiation process. The positive relationship between the presence of work councils and outcomes such as wages, job satisfaction or employment relationships has been documented (Addison et al., 2004, 2010; Hübler and Jirjahn, 2003; Grund and Schmitt, 2011; Grund et al., 2016). Yet, less is known about the relationship between the presence of representatives and more individual outcomes, especially when the layoff decision has already been taken, and the worker is close to leaving the firm. Grund and Martin (2017) show that work councils have a positive impact on the incidence of severance payment in the case of a plant closing, but a negative impact in the case of individual dismissal. My findings point to a non significant impact of representation institutions on the incidence of bunching. This may be explained by the fact that this outcome is highly dependent on individual parameters, and is not relevant for all laid-off workers.

A novelty of this paper is that it analyses behaviours when employed, at the moment of the layoff. Indeed, up to now, most works have tended to emphasize the effect of UI design on unemployment outflows rather then inflows. A few papers have investigated the impact of UI on unemployment inflows, generally focusing either on the eligibility criteria to UI benefits (Van Doornik et al., 2018; Rebollo-Sanz, 2012; Christofides and McKenna, 1995; Green and Riddell, 1997) or on changes in the potential benefit duration of older workers (Jäger et al., 2018; Tuit and van Ours, 2010; Baguelin et al., 2016; Baguelin and Remillon, 2014). They show that the separation rate is positively affected by these two parameters through strategic scheduling of contract termination according to UI entitlements. I build on this existing evidence, widening the scope by not focusing solely on older workers, whose labour supply decision is likely to be particular, and influenced by retirement considerations. I am also able to distinguish between layoffs and resignations, which is crucial to interpret the results, as resignations do not open entitlements to the UI program under study. Observing layoffs allows me to explore the bargaining process between employers and employees and to decompose the driving factors of the extension decision. In my setting, UI does not affect the decision of layoff itself, but its timing,

conditional on the decision having been taken. It means that the incentives for the employer to grant the extension of the contract are even less straightforward, as the layoff decision has made it clear that the match was not profitable anymore. In this context, UI may be used as a way to soften the conditions of the redundancy, thereby leading to several types of inefficiencies.[12] I am therefore interested in the conditions that make employers and employees collude to maintain a match that has turned non-productive. By performing a heterogeneity analysis, I describe the characteristics of the retimed matches to gain insights into those conditions.

This paper also relates to the literature on the optimal unemployment insurance, as the elasticity of unemployment duration to the level of UI benefits is one of the parameters entering the sufficient statistics formula (Baily, 1978; Chetty, 2006). This optimality condition equalises the moral hazard cost of transferring one euro from the employed to the unemployed state, to the benefits of such a transfer, in terms of consumption smoothing. I focus on the impact of the level of UI benefits in France, where this topic has been rarely studied since the sources of variation are scarce.

A final contribution of the paper is methodological. It warns against the use of eligibility thresholds in quasi-experimental methods (*e.g.* regression discontinuity design), as they can be manipulated even in some contexts where researchers might not particularly expect it.

The remainder of this article is organised as follows: Section II gives an overview of the legislative framework, Section III presents the data and provides empirical evidence of bunching. Section IV elucidates each party's theoretical costs and incentives, while Section V describes the bunching method and its implementation, and analyses the sources of variation of the bunching intensity. Section VI provides some robustness checks. Section VII derives the welfare implications and Section VIII concludes.

2 Institutional Background

The UI program under study is targeted at laid-off workers. In France, when an employer wants to separate from a worker under a permanent contract after the probation period, he has two main options: dismissal for personal reasons and layoff for economic reasons. The first

[12] For example: (i) the maintenance of a poor match some additional days; (ii) the employer using this third-party compensation, whose cost does not enter his utility function, to ease the layoff conditions; (iii) the covering by UI of people who should not have been covered, which increases UI spending mechanically and indirectly through a possible longer unemployment duration.

motive is linked to the behaviour of the person dismissed whereas the second motive is justified by economic difficulties faced by the firm. In both cases, the reason has to be clearly stated and supported by objective and verifiable facts. As the separation motives are very different between the two separation options, the concerned populations are likely to differ as well. The population of laid-off workers is mainly composed of workers in shrinking industries, on average older, more frequently male, less educated but with higher wage and compensation duration than the other compensated workers (Unedic, 2015). This is the reason why a specific benefit package called CRP (*Convention de reclassement personnalisée*) was introduced on April, 5^{th}, 2005[13] for laid-off workers in addition to the main UI benefits. It was in effect during my first period of interest (September, 1^{st}, 2009-August, 31^{st}, 2011). It was then transformed into CSP (*Contrat de sécurisation professionnelle*), in effect during my second period of interest (October, 1^{st}, 2011-September, 30^{th}, 2014). Any changes taking place after this date are not taken into account, in particular the reform enforced on April, 1^{st}, 2015 which introduced many modifications to the scheme.

The two schemes have been designed in the same spirit, as a way to secure the professional path of laid-off workers by offering comprehensive and personalised support to help them reintegrate the labour market as soon as possible, and in good conditions. They give access to career coaching, training, assistance in the design of a professional project and even psychological support. Besides these aspects, one of their main characteristics is to introduce a non-linearity in the compensation amount at a tenure threshold. This threshold went from two years to one year in 2011. While all the laid-off workers are entitled to the coaching and training components of the CSP-CRP, laid-off workers having completed one year (respectively 2 years for the CRP) of tenure are entitled to a specific benefit equivalent to 80% of previous gross earnings (which translates into virtually 100% of previous net earnings). This specific benefit is called ASP. Those under this threshold only receive the standard benefit, whose replacement rate lies between 57.4% to 75% of previous gross earnings, depending on the past wage.

In this paper, I focus on the CSP,[14] and I use the CRP only for comparative purposes. In the following paragraph, the legislative rules regarding the CSP will be detailled, as the rules that apply to the CSP also apply to the CRP (the main change being on the seniority criteria

[13] Law №2005-32 of January, 18^{th}, 2005 - art. 74 JORF January, 19^{th} 2005

[14] This choice is justified by the fact that the legislation has been more stable and with clearer incentives during the period the CSP was in place. Indeed, the CRP benefit has been gradually decreasing for a certain period of time, and the total compensation length has been extended in 2009.

to benefit from the higher compensation). A detailled description of the legal layoff timeline is provided in Appendix A.

Scope of the CSP

In firms with less than 1,000 employees or in compulsory liquidation or receivership (whatever the workforce size), employers are bound to offer the CSP to any employee they want to lay-off, during the interview prior to layoff or after the last meeting of employees' representatives. It should be noticed that workers laid-off for economics reasons are necessarily workers in open-ended contracts.

To benefit from the CSP, the worker must also meet the following criteria: (i) having worked at least 122 days or 610 hours within the last 28 months; (ii) not having reached the compulsory retirement age; (iii) to live on the territory where the unemployment insurance is applicable; (iv) being physically able to work. Those criteria also apply to receive the standard benefit.

The seniority condition does not determine the eligibility to the CSP, but to higher benefits (ASP). Under one year of seniority, the worker is only entitled to receive the standard benefit (ARE) and to benefit from the counselling and training dimensions of the CSP.[15]

Steps of the legal procedure

A quick description of the different steps is provided, as this information will be useful later to understand whether employers and employees have room to strategically delay layoffs.

The procedure for redundancies implies several steps, whose number depends on the workforce size and the number of people laid-off. It involves meeting and discussing with employees' representatives, when they are present in the firm, and respecting minimum periods of time between each step. The whole procedure is monitored by the Health and Safety Inspection.

In the concerned firms, the employer, after having announced the economic layoff plan and discussed with the employees' representatives, must offer the CSP, individually and in a written way, to any eligible worker, either during the interview prior to layoff, or after the last meeting of the employees' representatives, or after the approval of the redundancy plan, if any. The

[15] If he chooses to accept it. The CSP is offered to any eligible worker but he decides ultimately if he accepts it or if he just gets the standard compensation scheme.

employee has a 21 days period to take his decision: if he refuses, he gets the standard benefit scheme; if he accepts, the work contract terminates at the end of the 21 days period, without any advance notice.

The CSP is organised, over a maximum period of 12 months, as a path back to employment, through intensive counselling and coaching, and possibly through a career change or the creation of an enterprise. During the whole process, the unemployed worker benefits from regular meetings with his dedicated counsellor, including a skills' assessment, the formulation of a professional project, a social and psychological support, training, advice for job interviews, etc.

If the guidance and counselling dimensions can be seen as attractive – as additional resources to accelerate the return to employment – or troublesome – felt like ways to monitor the worker too closely – the additional benefit offered to workers eligible to the CSP and having completed at least one year of seniority creates strong financial incentives to go beyond this one-year seniority threshold. However, as the layoff decision and its timing are in the hand of the employer, it is not up to the employee to decide whether he completes his seniority year. In theory, the layoff decision, in the setting we are interested in, is only motivated by the economic difficulty of the firm, and should affect workers within the enterprise, if not randomly,[16] at least not according to some sharp eligibility thresholds.

Two important consequences of the acceptance of the CSP should be noted: First, as soon as the 21-day period ends, the worker starts to be compensated without any waiting period or notice, on the basis of the standard benefit or the ASP, depending on his seniority. Second, for workers accepting the CSP, the breach of the work contract is no longer considered a layoff, but a mutually agreed termination, which may imply less administrative constraints for the employer in the future. The worker is still entitled to receive severance payments and to appeal Labour Court, but is much less likely to do so. This reduction in trial risk can be considered a reduction in the layoff cost.

The different possibilities and their consequences are summed up in Table 1.

A more detailed presentation of the consequences of accepting the CSP and how they are valued can be found in Appendix B. Redundancies can be either collective or individual. Collective redundancies are defined as the layoff of more than one employee within a 30-day period. The main steps of the legal procedure are essentially the same in the collective and in the

[16] In setting up a collective redundancy plan, the employer has to follow some criteria to determine which workers will be laid-off in priority. Among them, there are the family load, the seniority, social characteristics making the return to work difficult, the professional skills, etc.

Table 1: Entitlements according to worker's decision and seniority

Accepting the CSP		**Refusing the CSP**
Seniority < 365 days	Seniority ≥ 365 days	Whatever the seniority
Counselling + training	Counselling + training	
ARE	ASP	ARE

individual case, although some requirements depend on the number of persons laid-off. For instance, if the employer plans to lay off 2 to 9 employees, he has to organise a meeting with the work council, whereas there is no such an obligation for an individual layoff. As a more general information on the legal framework, it should be mentioned that all laid-off workers eligible for this UI program are in permanent contract. In addition, although there is a probation period to permanent contracts, its maximum duration is equal to eight months (only for executive workers in case it is renewed). It means that a spike in the separation probability at one year could not be rationalised by regularity in fixed-term contract or probation period duration.

3 Empirical Evidence of Bunching

3.1 Data

I use administrative data (*Fichier national des allocataires*, FNA) collected by the organisation in charge of the unemployment insurance in France, the *Union nationale interprofessionnelle pour l'emploi dans l'industrie et le commerce* (Unédic) for the years 2009 to 2014. More precisely, I focus on two sub-periods, for comparative purpose, gathering respectively the contract terminations for economic reasons occurring between September, 1^{st}, 2009 and August, 31^{st}, 2011, and October, 1^{st}, 2011 and September, 30^{th}, 2014. I select only the contract terminations for economic reasons opening entitlements to the CSP, that are contract terminations for economic reasons in firms of less than 1,000 employees, or firms in compulsory liquidation or receivership (whatever the workforce size). If the total number of workers laid-off as part of a redundancy represents a relatively small share of total separations, it is equivalent to about 10% of entries into subsidised unemployment. My sample is made of all workers eligible to the CSP, accounting for 482,497 observations in the first period, and 636,350 observations in the second period. The unit of observation is the layoff.

The CSP is offered to any eligibile laid-off workers: if he chooses to accept it, he will benefit

from the package for a maximum of 12 months. If he has not found a job by the end of the 12 months, he can switch to the standard compensation scheme (ARE) if the initial compensation duration he was entitled to was greater than 12 months (meaning that he has been affiliated more than 12 months before the contract termination). Then, the compensation duration is computed by subtracting the duration of the CSP to the initial compensation duration.

In my analysis, I consider the whole compensated period by reconstructing the unemployment spell: it corresponds either to the CSP duration to which we add the potential compensation period as part of the standard benefit that immediately follows, or directly the standard benefit compensation period if the worker has rejected the CSP. In somes cases, the unemployed person has experienced several episodes during the same unemployment spell, either because he found a temporary job and resumed UI compensation after, either because he interrupted compensation for sickness or other motives. As the information on the reason why the unemployed person left the UI register is not entirely reliable, I chose to gather within the same spell the episodes separated by a period shorter than the minimum affiliation requirement to open a new entitlement to UI benefits (that is 4 months). I do not, however, add these periods to my computation when counting the total duration of the compensated spell.[17]

Another limit of the data is that I do not directly observe the return to work: the only variable I am able to measure is the duration of compensated unemployment, which is an imperfect proxy for the return to work, as leaving unemployment does not necessarily mean that the worker has found a new job (Card et al., 2007). It means that I cannot have information on the future employment spells after the layoff. I cannot say anything on the quality of the job found after the layoff, or on the probability of being rehired by the same employer for example. However, as the return to work is not my main outcome of interest, I can still use the duration of compensated unemployment to gain insights into the effect of the CSP on labour supply.

My main variable of interest is the tenure variable: I need a precise and reliable measure of the density of the tenure at current job on a daily basis to understand what happens at the one-year threshold. The information on tenure comes form the certificate delivered by the employer either to the employee for him to receive unemployment benefits, or directly to the employment agency (*Pôle Emploi*). As this certificate is mandatory for the employee to be compensated and the information on tenure determines the way the worker will be compensated, this information

[17] Although this choice can be discussed, we can argue that these breaks generally correspond to small employment periods – and then should not be counted in the unemployment spell duration – or to periods where the unemployed person was not able to look for a job – for sickness or maternity for example.

is closely monitored by the employment agency and can be deemed reliable. The contract termination occurs at the end of the reflection period granted to the employee eligible to the CSP, no matter his answer. Yet, I find some inconsistency in the data between the end of the contract date and the beginning of the advance notice period: indeed, in case the worker refuses the CSP, he will receive the standard benefit, and will potentially carry out a notice period, that is a period when he knows he is laid-off, but he continues to work and to be paid. This period is a way to give the worker some time to find a new job while continuing to receiving a wage. In some cases, the notice is not carried out but the worker still gets the corresponding earnings. Adjusting for this discrepancy by subtracting the notice duration to the tenure value does not affect the results. I then choose to keep the raw tenure variable for everyone.

A simple descriptive analysis of my sample indicates that the CSP takeup rate is much lower below one year of tenure (26%) that above (56% between one and two years of tenure). Workers accepting the CSP are on average, older, more frequently women, more educated, more skilled, and working in larger firms in the service or manufacturing sector (Table 17 of Appendix C). The multivariate regression (Table 18 of Appendix 17) reveals that individual characteristics play a bigger role in explaining the decision to accept the CSP than firm characteristics.

3.2 Documentation of the Bunching

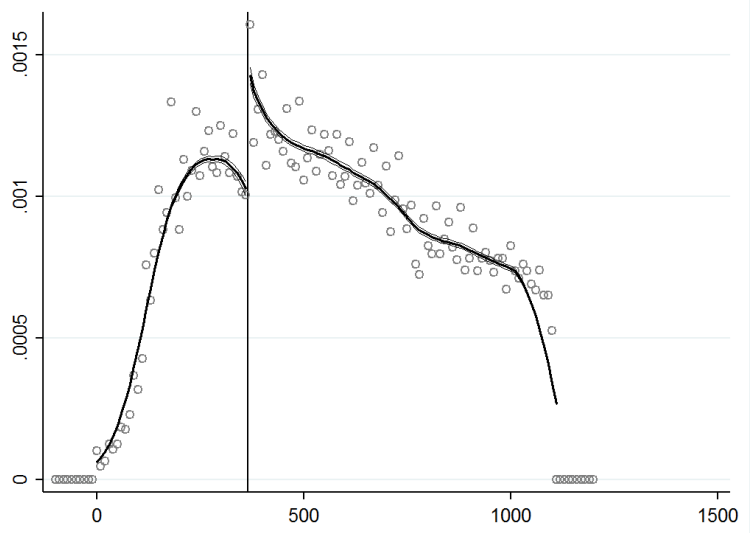
First evidence that some manipulation occurs at the one-year seniority threshold is provided by the McCrary (2008) test which analyses the difference in log density between both sides of a specific threshold. This test is traditionally used in RDDs to make sure that the running variable has not been manipulated. The McCrary (2008) test on the seniority density highlights the discontinuity at the strategic one-year threshold.

Figure 1 provides striking graphical evidence of bunching just above the 365 days threshold for our period of interest:

It shows a significant 36% increase in the density at the cutoff, with a hole at the left side and a mass at the right side, two distinctive features of bunching.

Although this graph provides evidence of some concentration of workers at one year, I cannot yet rule out the possibility that this pattern is due to other factors than the CSP. First note that all the contract terminations for economic reasons examined in my sample are open-ended contracts, meaning that this pattern cannot be due to some regularity in the duration of fixed-term contracts. Second, the observed spike cannot be accounted for neither by the existence

Figure 1: McCrary test on the seniority variable at the 365 cutoff (October, 2011 - September 2014)



Source: FNA.
SAMPLE: The whole population of workers eligible to the CSP entering unemployment between October, 2011 and September, 2014. Binsize: 10, bandwidth: 100.

of renewable trial periods, as the maximum duration that can be reached corresponds to eight months (for executive workers).

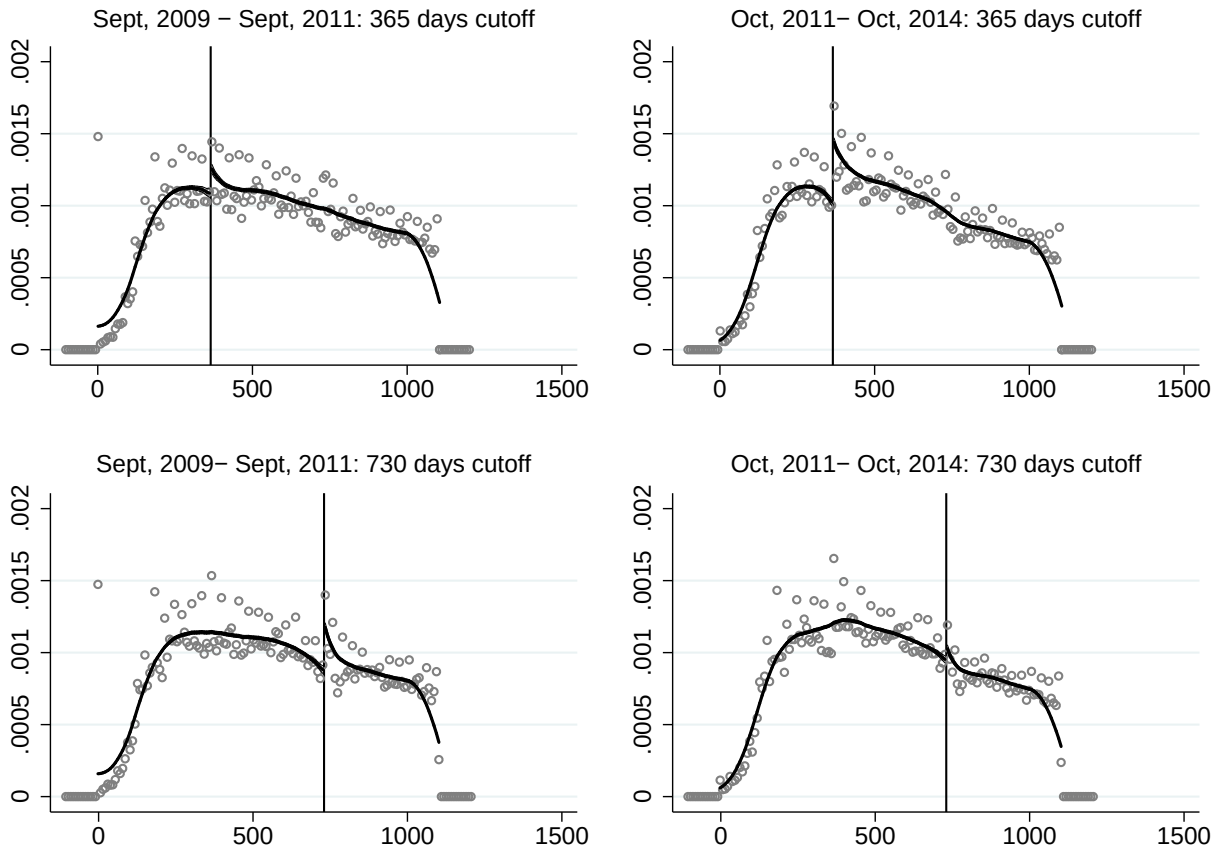
We can still distinguish several explanations to the spike in the density that we observe at the cutoff, either through psychological mechanisms (anchoring phenomenon on a reference point) or legislative feature (the 365-days cutoff can serve as a threshold for other administrative schemes). I argue that this concentration is indeed due to strategic behaviours in response to the incentives introduced by the CSP, and that it is not just an administrative or psychological reference point. Three pieces of evidence support this scenario.

I exploit the fact that a similar package existed before the introduction of the CSP in September, 2011, the CRP. The main difference with the CSP is that, to qualify for the higher benefit, the requirement is *to have at least two years of tenure* instead of one.

I then perform a placebo test on the period *preceding the introduction of the CSP* by plotting the distribution of the seniority density at the same threshold, when the CRP was in effect. Reassuringly, we observe a discontinuity in the tenure density at two years in the period September, 2009 - August, 2011, which disappears completely after the CRP has been replaced by the CSP. The density jumps by 32% at the cutoff, and the discontinuity is significantly different from zero. No or a much smaller discontinuity is, however, observed respectively at

the one-year and two-years seniority cutoffs for the 2009-2011 and 2011-2014 periods. It means that when no incentives created by the UI benefits schedule exist at some points of the seniority distribution, no bunching is observed. This finding needs to be qualified by the fact that I find some evidence of a small discontinuity at the one-year seniority threshold for the 2009-2011 period that is necessarily explained by some factors unrelated to the CRP/CSP: although much smaller in magnitude (a 16% jump instead of a 36% jump after the introduction of the CSP), it should not be neglected, and it calls for the use of a difference-in-bunching methodology, as I will further explain in sub-section 5.1.2.

Figure 2: McCrary test on the seniority variable at the 365 and 730 days cutoffs for the two periods of interest



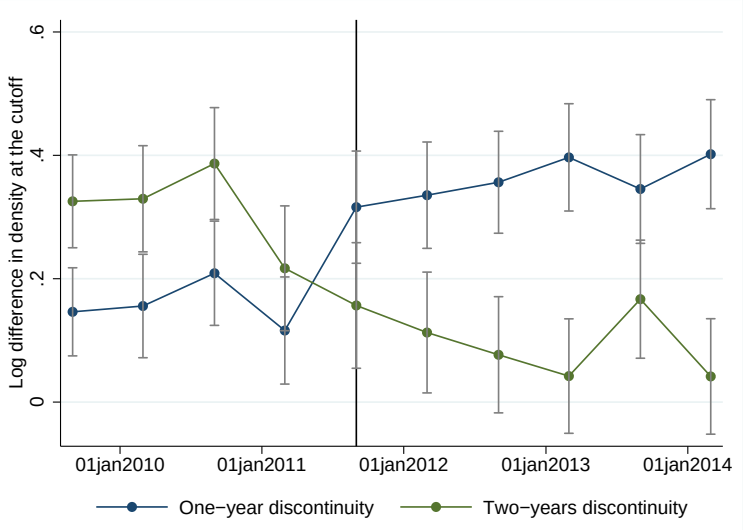
Source: FNA.
SAMPLE: The whole population of workers eligible to the CSP entering unemployment between September, 2009 and September, 2014 (1,118,847 observations). Binsize: 10, bandwidth: 100.

This spike at the 2 years cutoff can be interpreted as a sign that the bunching is a response to the CSP and CRP packages, as, if it would have been linked to any other feature of the legislation related to the one year seniority cutoff, it would not have been observed at the

two year cutoff in the 2009-2011 period. Similarly, after the introduction of the CSP, the discontinuity at the two year cutoff disappears while the discontinuity at the one year threshold starts appearing (Figure 2). All in all, having discontinuities in the seniority density at the threshold corresponding respectively to the CSP and CRP legislation for the relevant period, and, conversely, not observing these discontinuities for the period the CSP or the CRP are not applicable are all elements converging toward the strategic behaviours scenario.

In addition to observing a shift in the discontinuity location at the relevant thresholds respectively for the CRP and the CSP, we notice that this shift occurs rapidly. In the first semester after the introduction of the CSP, we already observe a sharp decrease in the two-years discontinuity and an important increase in the one-year one (Figure 3). In the following semesters, the discontinuity at one year goes on increasing and then stabilises, while the one at 730 days almost disappears. We also see this gradual evolution in Table 19 and in Figure 12 of Appendix D: the share of the bin gathering seniority values within the bunching area[18] relative to the whole distribution considerably rises at the introduction of the CSP.

Figure 3: Evolution of the log difference in density at one and two years (2009-2014)



Source: FNA

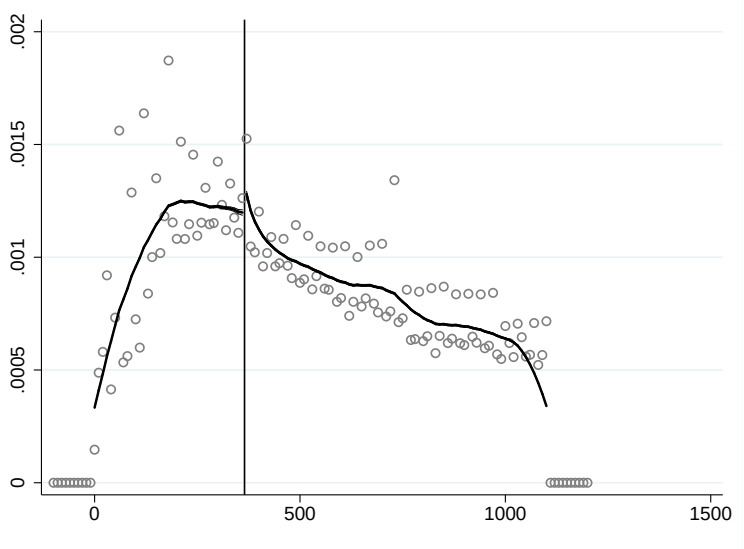
The immediate translation of the legal scheme into a change in the seniority distribution corroborates the hypothesis that the behavioural response is driven by the CRP-CSP incentives.

To be fully convinced that the bunching we observe is not just linked to another feature

[18]The bunching area has been defined visually as the [365;397] bracket.

of the legislation or to a round-number effect (employers when reporting the date of contract termination choose it so that they have a round-number seniority), I perform another placebo test by plotting the seniority density of all the persons registered as unemployed after the termination of an open-ended contract, excluding economic layoffs. Figure 4 does not exhibit any significant discontinuity at the relevant threshold, confirming my hypothesis.[19]

Figure 4: McCrary test on the seniority variable at the 365 days cutoff on all open-ended contracts (excluding workers eligible for the CSP) (France, 2011-2014)



Source: FNA.
SAMPLE: The whole population of unemployed person after an open-ended contracts over the period between October 2011 and September 2014 (excluding workers eligible for the CSP). Binsize: 10, bandwidth: 100.

A last concern could be that the discontinuity observed in the population of eligible laid-off workers registered at the UI would not be observed in the total population of eligible laid-off workers. It means that the bunching would be due to a discontinuity in the UI takeup rate while the separation rate would be smooth at the threshold. It is unlikely, as even those right below the one year threshold are still entitled to a significant level of UI benefits[20] for at least 12 months. Still, to rule out this hypothesis, I need to rely on another data source. I use the

[19] Not identifying any discontinuity at the one-year threshold among all open-ended contracts while identifying some bunching at the same threshold under the pre-CSP period could seem puzzling. Indeed, if the bunching observed among laid-off workers under the pre-CSP period is unrelated to UI incentives, it should appear similarly among other types of open-ended contracts layoffs. One explanation could be that the pre-CSP bunching is related to a round-number effect that exists in the case of other open-ended contracts but might be attenuated by the fact that severance payment start to be paid at one year of seniority. In case of more individual layoffs where other incentives – like the CSP – do not interfere, employers could be more prone to dismiss right before the one year threshold, potentially reducing the round-number spike at one year.

[20] With a gross replacement rate between 57% and 75%

Déclaration mensuelle obligatoire des mouvements de main-d'oeuvre, which gathers the monthly forms any employer in a firm of 50 employees or more has to return to the Labour Ministry. It describes all the employment flows, with information on the starting and ending dates of the contract, on the type of contract, and on the separation motive. I plot the same tenure distribution for laid-off workers in firms of less than 1,000 employees. Reassuringly, Figure 16 of Appendix E shows a similar bunching at the one-year cutoff. Although UI registration rate might differ from one side of the threshold to the other, Figure 16 ensures that the separation rate is indeed discontinuous at the threshold.

3.3 Underlying Mechanisms: Exploration of the Bargaining Process

My preferred scenario to justify the excess mass in layoffs after one year of tenure is that, conditional on the layoff having been decided, employers and employees bargain over the date of contract termination as they have both incentives and room to do so. On the worker's side, differences in preferences interact with differences in ability to negotiate and in incentives, whereas on the employer's side, the cost of extending the work contract and then of paying employees additional weeks or months while knowing that they would be fired eventually is also likely to change among employers.

Profile of the typical buncher

To investigate in further details the type of employees and employers concerned by this bunching phenomenon, I produce two types of graph, that can be found in Appendix F. The first ones are testing whether there is a discontinuity at the cutoff in the distribution of some observable characteristics, and the second ones are specifying for which values of these observable characteristics the discontinuity in the seniority density is the highest. In other words, the first graphs indicate in which dimensions the populations on each side of the cutoff differ on average. The second graphs reproduce the McCrary (2008) test on the seniority density by subpopulations.

The main insights from these visual elements are that bunchers are typically working more frequently full-time, with a high level of education, are more skilled, with a higher wage as compared to those below the threshold, and are more frequently a woman (Figures 17-26).

Table 2 provides numerical evidence – from the McCrary (2008) test – of the stronger

magnitude of the discontinuity for some sub-populations, to refine the profile of the typical buncher.

Table 2: Magnitude of the discontinuity at 365 days for different values of the observables

Variable	**Log discontinuity estimates**
Sex	
Male	0.314***
	(0.022)
Female	0.45***
	(0.032)
Diploma	
Primary school	0.054
	(0.085)
Vocational high school	0.317***
	(0.030)
Bac+5 or more	0.62***
	(0.071)
Level of qualification	
Executive	0.614***
	(0.069)
Skilled employee	0.42***
	(0.028)
Unskilled employee	0.148**
	(0.062)
Working time	
Full time	0.382***
	(0.020)
Part time	0.25***
	(0.044)

** p<0.05, ** p<0.01, *** p<0.001*
SAMPLE: The whole population of workers eligible to the CSP entering unemployment between October, 2011 and September 2014

All the characteristics of the typical buncher may be associated with a higher bargaining power, which is compatible with my preferred scenario.

Layoffs order

As explained in the description of the institutional background, layoffs can be either collective or individual. More precisely, I observe in my sample that among all firms laying-off at least one worker during my period of observation, 41.2% of them laid-off at least two individuals. It

corresponds to 76.8% of laid-off workers in the sample.[21] I can use these collective layoffs to infer what is the underlying mechanism driving bunching.

If the bargaining scenario was true, we might observe that people laid-off as part of the same collective layoff plan would have different end of the contract dates. In particular, we might have people right above the cutoff laid-off later than those far from the threshold (either above or below) and for which it is useless or too costly to manipulate the seniority.

Spotting firms for which several layoffs are observed for the period October 2011-September 2014, I can count the number of people laid-off and look at the layoff order. All the layoffs observed for the same employer over a period of 30 days (the legal criteria to consider a layoff as collective is to have several layoffs on a 30 days period) are gathered into the same layoff episode to get the order, by date of contract termination, of each layoff in the same episode. Indeed, I find that having a seniority lying between 365 and 380 days (corresponding to the area right above the cutoff) is associated to a lower probability of being laid-off the first as part of a collective layoff plan (- 12.8ppts). However, it is also associated with a higher probability of being laid-off the second (+10.4ppts). The rest of the distribution is rather similar (as observed on Figure 5). As the median of the variable giving the position is 2, being in the second position means, in 50% of the cases, being the last laid-off in the layoff plan. Thus, it appears that workers close to the cutoff are indeed more frequently laid-off later in the layoff plan.

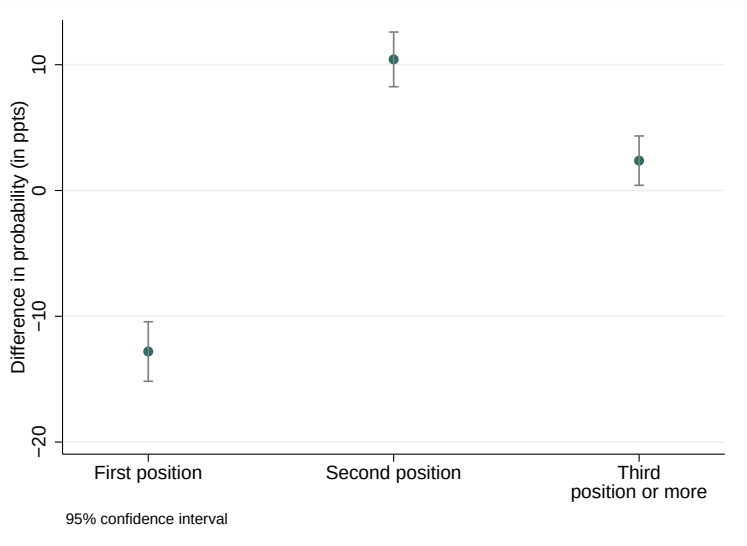
The results are robust even if we make the window above the cutoff vary, as illustrated in Table 21 of Appendix G .

I also look at the relationship between the proportion of persons whose layoff seems strategically delayed and the value of seniority at the beginning of the layoff spell.

To construct Figure 6, I identify individuals: (i) laid-off as part of a collective layoff plan; (ii) not laid-off first (which suggest a waiting time); (iii) laid-off just (i.e. within 10 days) after reaching the one year condition (which suggests the waiting time was related to the ASP). Figure 6 plots the proportion of people fulfilling these three conditions among people fulfilling conditions 1 and 2 as a function of tenure at the moment of the first layoff within the same collective redundancy. This proportion indeed goes up as the gap between the seniority value at the moment of the first layoff and the cutoff closes. This result suggests that the cost of waiting strategically increases with the initial distance to the cutoff.

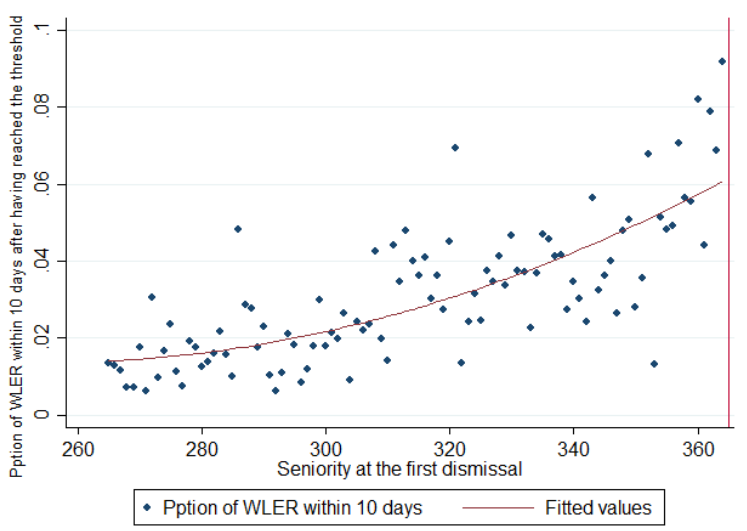
[21] A more detailled description of the distribution of the redundancy size can be found in Table 20, Appendix G.

Figure 5: Layoff order within the same layoff plan with respect to the distance from the cutoff (France, October 2011-September 2014)



Source: FNA.
NOTE: The layoff plan gathers all layoffs from the same employer on a 30 days period. Being right above the cutoff means having a seniority lying between 365 and 380 days (included). Workers with a seniority right above the cutoff have a higher probability of being laid-off in the second, third, or higher position within a layoff spell. It suggests that employers have waited for them to cross the cutoff before dismissing them.

Figure 6: Proportion of laid-off workers laid-off after a first layoff right after one year of service (France, October 2011-September 2014)



Source: FNA.
NOTE: The layoff plan gathers all layoffs from the same employer on a one year period.

This finding also confirms that the excess mass right above the one-year threshold comes from the area right below the threshold – which is consistent with hole visible at the left hand side of the cutoff (Figure 1) – in line with the hypothesis of strategic bargaining for people just below one year of seniority.[22]

Cost of extending the contract

In the bargaining scenario, we must consider the trade-off between the benefit for the employee to move up the 365-day cutoff and the cost for the employer to extend the contract. A likely hypothesis is that this cost varies among employers, and might be higher for firms that have economic difficulties but continue their activity than for firms definitively shutting down, as for these firms, paying some workers additional weeks or months will not change the final outcome, whereas it can put in jeopardy firms trying to overcome their difficulties. To have an idea of which firm is shutting down, I compute the difference between the number of people laid-off during the same layoff episode and total workforce size. Figure 30 of Appendix G shows that having a seniority lying between 365 and 380 days is associated with smaller values of the difference between the number of people laid-off during the same layoff episode and total workforce size .

If I consider "having a difference between the total workforce size and the number of people laid-off during the same layoff episode lower than 5" as a proxy for the firm shutting down, we see that having a seniority lying between 365 and 380 days is associated with a 12.5 percentage points higher probability of shutting down. If I make the definition of "being right above the cutoff" and of the proxy for shutting down vary, the results go all in the same direction, as made clear in Table 22 of Appendix G.

These results indeed show that employers seem more willing to grant contract extension when the firm is shutting down, and therefore when it represents a negligible cost for them.

To further investigate the bargaining scenario, other workforce adjustment mechanisms have been explored, to understand to what extent bunching firms are also more likely to use other types of contract terminations in the neighbourhood of economic layoff as a potential way to alleviate administrative and financial constraints linked to job separation. Appendix H shows

[22] Another scenario could be that employers falsify the contract termination date to make workers better-off. But this is not consistent with my finding as, in that case, they would not necessarily choose workers with true seniority just below the cutoff.

that bunching firms seem more willing and potentially more able to use other types of contract termination within the same episode, which could be associated with a better knowledge and use of job separation legislation.

4 Theoretical Framework of Negotiated Layoff

Setup – I develop an illustrative model, motivated by the preceding empirical findings, aiming at organising the analysis of the observed bunching by clarifying each party's incentives and cost.

The model describes a firm hit by a productivity shock that makes the employment contract not profitable anymore. I assume that wage cannot be adjusted downward after the contract has been set up as open-ended contracts entail wage rigidity.

The specificity of the setting under study is that, contrary to the traditional bunching scenario – a change in marginal tax rate in most cases – the optimisation is not at the worker's level: it is the joint optimisation of the employer and the employee that determines the optimal number of extension days from the moment the layoff is announced. Employer and employee decide whether to proceed or not with the extension of the contract based on the sum of their net utilities from the extension. Conditional on the extension being efficient from a joint point of view, the employee and the employer bargain over the cost of the layoff. The employee trades the extension of the contract against a lower layoff cost, through a reduction in the supra-legal severance payment or in the risk of paying damages.

I do not consider the impact of UI benefits on the design of the contract at the moment of the hiring decision, to focus on the effect on the timing of the layoff once it has been decided.

On the firm's side, the profit has become negative. I describe the payoffs in the case where no extension occurs (indexed by 0), and in the case there is extension :

$$\Pi(0) = -t^0$$

$$\Pi(d) = (P - w)d - t$$

with t^0 the payment made to the employer at the moment of the layoff when there is no extension, t the payment made to the employer at the moment of the layoff when there is extension, P worker's productivity, w the wage and d the number of days of extension. Note that, after

the productivity shock, we have $P < w$.

Similarly, on the worker's side:

$$U(0) = SBd + t^0 + V_u^0$$
$$U(d) = (w - \alpha)d + t + V_u^d$$

with SB being the standard benefit, α disutility from work, and V_u^0 and V_u^d respectively the utility derived from unemployment in the no extension and in the extension scenario (with $V_u^d > V_u^0$ because of the jump in benefits at the threshold).

Condition for the extension of the contract – There is extension of the contract if and only if the surplus associated with the extension is positive.

$$U(d) - U(0) + \Pi(d) - \Pi(0) \geq 0 \Leftrightarrow (P - SB - \alpha)d + V_u^d - V_u^0 \geq 0 \quad (1)$$

Based on the consideration of the surplus, this condition describes the cases where the extension is efficient. We have $d = L_{365} - L_{initial}$, with L_{365} being the threshold at 365 days, and $L_{initial}$ the seniority value at the moment the layoff is announced, before any extension. L_0 is the lowest value of $L_{initial}$ which verifies 1, or, in other words, the initial value of seniority of the marginal buncher.

However, we have been silent on the underlying negotiation mechanisms that make this extension happen. To be implemented, negotiation needs to ensure that both parties are at least as well-off as if no extension takes place.

Bargaining on the layoff cost – Once condition (1) is verified, a negotiation occurs on the level of the severance package granted to the employee upon separation after the extension, that is the contingent part of the layoff cost.

We are interested in the set of parameters which lead to an efficient outcome, that is, which make each party at least as well-off as in the no extension scenario.[23]

[23] Regarding the determination of the solutions for t, a standard Nash bargaining framework could have been considered. I show in Appendix I that the Nash solutions are actually a subset of the efficient solutions I am describing in the core of the paper. I then stick to the more general formulation of the model.

It means that the supra-legal severance package in case of extension, t, should be such that:

$$(P - w)d - t + t_0 \geq 0 \tag{2}$$

In practice, an additional constraint has to be fulfilled: the negotiated severance package in case of extension cannot be negative. It means that, although the employee is willing to accept a reduced severance package in exchange of the extension of his contract, it is not possible for the employer to make the employee pay at the moment of the separation.

$$t \geq 0 \tag{3}$$

Conditions for an agreement – From equations 1, 2 and 3, we end up with two necessary and sufficient conditions for the bunching to occur:

1. Efficiency condition $(P - SB - \alpha)d + V_u^d - V_u^0 \geq 0$
2. Feasibility condition $t^0 \geq d(w - P)$

Those two conditions describe the whole set of parameters that would lead to an efficient extension.

We define L_1 as the lowest value of the initial seniority which verifies both conditions. We observe empirically that those bunching are the ones with initial seniority above $L_{min} = max(L_0, L_1)$.

Testable predictions – I do not explicitly model here the respective bargaining powers that determine the division of the surplus, as I am primarily interested in the conditions that make the bunching occur. In addition, I have no information available on the level of t in my data, preventing me from discussing the empirical implications of the surplus division rule.

However, the bargaining power may still influence the likelihood to bunch, as it is related to t^0 which enters the feasibility condition. In this framework, t^0 has been taken as exogenous at the moment of the layoff, but we can imagine that the bargaining power that has determined the division of the surplus from extension is correlated to the bargaining power intervening in the determination of t^0.

Table 3 sums up the correlations that we expect to see between the magnitude of the bunching and different parameters:

Table 3: Predicted correlations with the likelihood to bunch

Parameter	Correlation
Distance to the one-year threshold d	(-)
Baseline supra-legal severance package t^0	(+)
After-shock productivity P	(+)
Jump in utility from unemployment $V_u^d - V_u^0$	(+)
Standard benefit SB	(-)
Wage w	(-)
Disutility from work α	(-)

The difference in utility $V_u^d - V_u^0$ cannot be directly measured. This difference captures both the change in benefits at the threshold, and the fact that if the extension is granted, when V_u is measured, at the moment where the worker reaches one year of tenure, he will be entitled to a compensation duration D. If no extension is granted, the worker is entitled to the same duration. However, at one year, he will have already consumed d days of benefits.

Empirically, as the difference in benefits is large, if d is small, the difference $V_u^d - V_u^0$ can be proxied by the difference in replacement rate at the threshold ΔC.

The challenge of the empirical analysis is to disentangle the different mechanisms that can explain the variation in the bunching magnitude: (i) the level of the incentives, captured by ΔC and SB; (ii) individual worker's characteristics such as P, α or w; (iii) the bargaining power captured through t^0.

5 Heterogeneity in Bunching

Since the standard benefit replacement rate varies according to previous earnings, the jump in expected benefits at the one-year threshold varies accordingly (from 5 to 22.6 percentage points). A first natural heterogeneity analysis involves comparing the behavioural response of subpopulations defined with respect to their potential gain when crossing the cutoff. I therefore split my sample into four gain categories (the distribution can be found in Table 31, Appendix L). The McCrary (2008) test computed on these different categories shows that the magnitude

of the bunching is positively correlated to the magnitude of the difference in replacement rates, and then to the wage (Table 4).

Table 4: Log discontinuity estimates according to potential gain

Potential gain from ARE to CSP	Log discontinuity estimates
$Gain < 10 ppts$	.1074
	(.1031)
$10 ppts \leq Gain < 15 ppts$	.2673***
	(.0513)
$15 ppts \leq Gain < 20 ppts$	.3012***
	(.03023)
$Gain \geq 20 ppts$	.4640***
	(.0265)

** p<0.05, ** p<0.01, *** p<0.001*

Yet, it is difficult to disentangle the different channels at play: the population having a higher potential gain, and then higher earnings, is also significantly more educated, more skilled, working more frequently full-time, than the rest of the population. It means that, for the moment, we cannot decompose the effect of having higher incentives and of having characteristics associated with more bargaining power.

What is at stake here is to know whether the higher propensity to bunch as the potential gain increases is due: (i) to higher financial incentives, keeping preferences and the ability to bargain constant; (ii) to different preferences coupled with higher incentives, keeping the ability to bargain constant; (iii) to a higher ability to bargain coupled with higher incentives, keeping preferences constant.

Therefore, we need a metric that neutralises the effect of having higher incentives, to see to which extent it varies with different characteristics. In other words, if we observe differences in L_{min}, we do not know yet if it comes from a higher Δ_C – higher incentives – a higher ability to bargain (through t^0) – or differences in preferences – α – or productivity – P. Next subsections will develop the methodology that uses bunching first to recover a reduced-form elasticity of contract duration with respect to the level of benefits, and second to describe the buncher characteristics as compared to the workers eligible to bunching in a counterfactual distribution that would be observed absent the notch. Those descriptive statistics help to better understand the typical buncher profile and the sources of heterogeneity in bunching. However, to separate

the effect of Δ_C from the joint effect of α and of the bargaining power, the reduced-form elasticity will be used as a metric measuring bunching for a given level of incentives. This elasticity will be computed for different subpopulations defined in terms of potential gain, individual and firm level characteristics to see which factors have a greater weight in explaining bunching variation.

5.1 Empirical Bunching Estimation

5.1.1 Baseline methodology

Drawing on the bunching literature (Saez, 2010; Chetty et al., 2011; Kleven and Waseem, 2013; Brown, 2013), I exploit the observed hole and spike in the seniority distribution to have an estimate of the elasticity of labour supply, using the relationship between observed bunching and elasticity brought to light by Saez (2010). An additional difficulty here is that we are in the case of an upward notch, as disposable income dramatically increases at the one-year threshold, thanks to a jump in the level of the budget set. Then, I cannot identify an area of strictly dominated choice and use it to estimate the optimisation frictions pointed out by Chetty et al. (2011) and Kleven and Waseem (2013), though these frictions are likely to be important in this case, as the extension of the contracts can only occur at some bargaining cost.

The usual methodology rests upon the standard labour supply model where the individual trades off the value of consumption (measured by the disposable income when employed or unemployed) with the cost of work effort (captured by the before-tax-and-benefits income). In my particular setting, the optimisation is, however, at the level of the joint surplus, which complicates the derivation of a structural elasticity parameter. Moreover, the definition of the structural underlying parameter is not obvious *ex ante*, as the behaviour observed is a mix of the employer's response, the employee's response, and potentially some bargaining frictions. For these reasons, and because I am primarily interested in gaining insights into the differences of behaviours between subgroups rather than having a precise estimate of a structural parameter, I implement a reduced-form strategy to uncover the elasticity of contract extension thanks to an estimation of the bunching. This estimate will be informative on the response in presence of important negotiation frictions, and then, will not give a precise measure of the true workers' optimisation behaviour. Nonetheless, it does not rely on any structural assumption. It will be used as a metric to compare subgroups behaviours, neutralising the impact of the differences in incentives.

Figure 33 illustrates the implications of introducing a notch in the budget set. It makes all

the individuals located in the interval $[L^*, L^* - \Delta L^*)$ in the pre-notch distribution to bunch at the notch point, with L^* being L_{365}. $L^* - \Delta L^*$ corresponds to the pre-notch seniority of the marginal buncher, L_{min}, or, in other words, to the lowest pre-notch seniority value of the bunchers. The marginal buncher is the one exaclty indifferent between the notch point and his best interior solution after the introduction of the scheme. There is a hole in the post-notch density distribution as no individual is willing to locate between $L^* - \Delta L^*$ and L^*.

Excess bunching at the notch can be expressed as:

$$B = H_0(L^*) - H_0(L^* - \Delta L^*) = \int_{L^* - \Delta L^*}^{L} h_0(L)\, \mathrm{d}L \approx h_0(L^*)\Delta L^*$$

where $H_0(L)$ and $h_0(L)$ are respectively the seniority cumulative distribution function and the seniority density function in the absence of the notch. The approximation holds if we assume that the density $h_0(L)$ is roughly constant over the interval $(L^* - \Delta L^*; L^*)$.

The reduced-form approach does not rely on any parametric assumption. As we are in the case of a notch, the extension day response needs to be related to a change in the implicit marginal replacement rate between the notch point L^* and the last bunching point $L^* - \Delta L^*$, as in Kleven and Waseem (2013). The implicit replacement rate, r^*, is given by the following expression:

$$r^* \equiv \frac{B(L^* - \Delta L^*) - B(L^*)}{\Delta L^*}$$

$B(L)$ gives the amount of benefits paid at any value of L. If we denote r_0 the standard benefit replacement rate and Δr the change in replacement rate at the notch, we have:

$$\begin{aligned} r^* &= \frac{L^*(r_0 + \Delta r) - (L^* - \Delta L^*)r_0}{\Delta L^*} \\ r^* &= r_0 + L^* \frac{\Delta r}{\Delta L^*} \end{aligned}$$

The elasticity parameter becomes:

$$e_{RF} = \frac{\Delta L^*/L^*}{\Delta r * /(1 + r*)} = \frac{\Delta L^*}{L^*} \times \frac{1 + r_0 + L^* \frac{\Delta r}{\Delta L^*}}{L^* \frac{\Delta r}{\Delta L^*}}$$

$$e_{RF} = \left(\frac{\Delta L^*}{L^*}\right)^2 \times \frac{1 + r_0 + L^* \frac{\Delta r}{\Delta L^*}}{\Delta r}$$

The formula essentially treats the notch as an hypothetical kink where the replacement rate

would jump to r^*. However, the kink schedule includes interior points that are strictly prefered to L^* by the marginal buncher, who then would not become a buncher if faced with this kink. Therefore, the bunching response to the notch overstates the reponse that would be created by the corresponding kink, making e_{RF} an upper-bound to the true structural parameter.

The reduced-form elasticity depends on policy parameters, Δr, r_0, L^*, and on the response in terms of extension days, which needs to be estimated. The bunching methodology aims precisely at providing an estimation of the extension days response, through the measure of the bunching mass at the notch point.

The empirical methodology consists in estimating the excess mass of individuals laid-off at a seniority value within the defined bunching area by computing a counterfactual seniority density, and compare it with observed one.

I start by fitting a polynomial to the empirical distribution, excluding an area around the notch point, that I will refer from now on as the *excluded area*. The counterfactual distribution is then estimated using the same coefficients, from a regression of the following form:

$$c_s = \sum_{j=0}^{J} \beta_j \cdot (L_s)^j + \sum_{i=L_l}^{L_u} \lambda_i \cdot \mathbb{1}_{L_s=i} + \nu_i \tag{4}$$

where c_s is the number of individuals in bin s, L_s the seniority value in bin s, J is the order of the polynomial, $[L_l; L_u]$ the excluded area around the notch point. The counterfactual distribution is then computed as the predicted value from equation 4, omitting the contribution of the dummies around the notch point. It follows that the counterfactual density is given by:

$$\hat{c_s} = \sum_{j=0}^{J} \hat{\beta_j} \cdot (L_s)^j \tag{5}$$

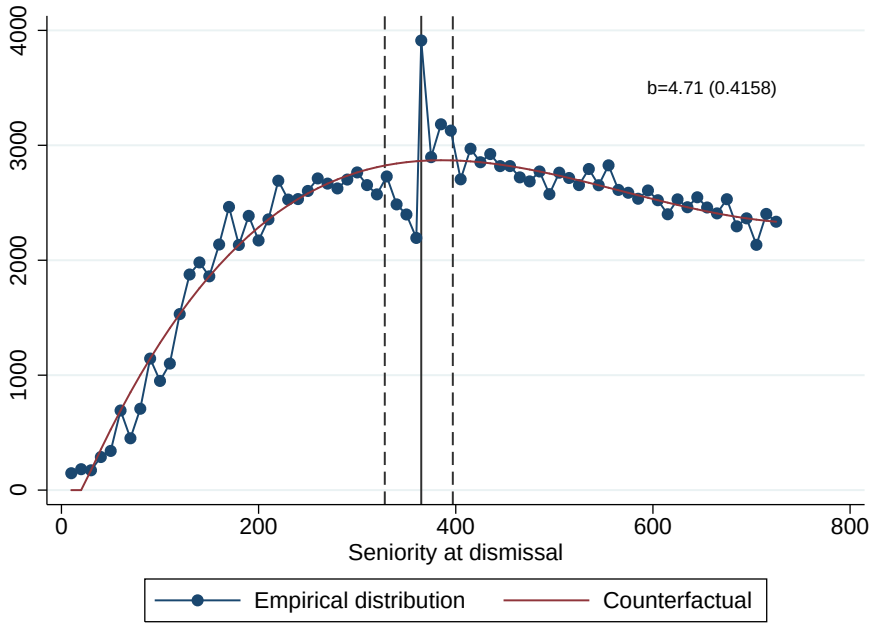
Empirically, excess bunching $\hat{B}$ is obtained by taking the excess number of individuals located at the notch of the observed distribution as compared to the counterfactual one.

$$\hat{B} = \sum_{L^*}^{L_u} c_s - \hat{c_s}$$

The excluded area upper bound can be determined visually without ambiguity, as the spike is typically sharp. Regarding the lower bound, the missing mass is harder to delimit as it is more diffuse: the standard methodology is to set the upper bound, and to determine the lower bound

through an iterative process, by making it vary and reestimating the counterfactual density until the bunching mass ($\hat{B}$) and the missing mass ($\hat{M} = \sum_{L_l}^{L^*} \hat{c_s} - c_s$) equalise.[24]

Figure 7: Empirical and counterfactual distributions of seniority at layoff (October 2011-September 2014)



Source: FNA.
Binsize: 10. The counterfactual distribution has been computed by fitting a 4^{th} order polynomial, excluding an area around the notch, and extrapolating the distribution in the excluded area. The excluded area upper bound has been determined visually where the bunching stops. The lower bound has been found through an iterative process so that the excess and missing masses equalise.

Following Chetty et al. (2011), we define b as the excess mass around the notch as a proportion of the average density of the counterfactual distribution in the area around the notch:

$$\hat{b} = \frac{\sum_{L^*}^{L_u} \hat{c_s} - c_s}{\sum_{L^*}^{L_u} \hat{c_s}/(L_u - L^* + 1)}$$

The identification of the elasticity from bunching measurement rests upon two assumptions: (i) the counterfactual distribution is smooth in the bunching area, so that B captures a behavioural response; (ii) Bunchers come from a continuous set $M = B$ below the notch point so that we can identify a marginal buncher.

In the spirit of Goupille-Lebret and Infante (2018), I decompose the contribution to the

[24] Missing mass must be equal to bunching mass as all the bunchers come from the left side of the cutoff, creating a hole.

observed distribution of the points within the excluded area into the part due to points above and the part due to points below the notch. The part below corresponds to the hole created by the postponement of contract termination whereas the mass above captures the concentration of layoffs once the cutoff is passed. By measuring the two components separately, I relate the layoffs located right after the cutoff to the missing ones that have been strategically retimed. Then, I redefine the regression model as :

$$c_s = \sum_{j=0}^{J} \beta_j \cdot (L_s)^j + \gamma_1 \cdot \mathbb{1}_{L_l \leq L_s < L^*} + \gamma_2 \cdot \mathbb{1}_{L^* \leq L_s \leq L_u} + \nu_i$$

Table 30 of Appendix J shows the corresponding regression results: the seniority bin counts are regressed on a 4^{th} order polynomial of the seniority value, with a specific set of dummies for being located in the bunching area above the notch point and another set of dummies for being located in the bunching area below the notch point. This table indicates that for my period of interest, being located in the upper (respectively lower) bunching area is always associated with a significant rise (resp. decline) in the number of laid-off workers at this seniority value. It means that we indeed observe a significant hole and spike in the distribution of the seniority around the notch point in the period were the CSP was in force, whereas no such pattern is observed for the pre-CSP period.

Replicating the results highlighted by the McCrary tests, Figures 13 and 14 show that no significant bunching occurs at the two-year cutoff during the post-CSP period, whereas there is bunching at the strategic two-years cutoff during the pre-CSP period.

I derive elasticity estimates from the observed bunching using a reduced-form approach, relating the bunching mass to the extension day response entering the elasticity formula. Following Kleven and Waseem (2013), I use two methodologies to recover ΔL^*. The first one is called the "convergence method", and uses the point of convergence L_l which makes the missing and excess mass equalise as an estimate of L_{min}. Indeed, if the area delimiting the bunching mass can be determined visually, the lower bound corresponding to L_l, the marginal buncher seniority, is defined so that the missing and excess masses are equal. In my case, as the jump in benefits occurs above the threshold, the missing mass appears below the threshold. L_l rather corresponds to a "point of divergence", where the counterfactual and empirical distributions start to diverge. The distance between L_l and L^* provides a measure of the extension day

response ΔL^*. This would give an upper bound of the true behavioural response, as it assumes that all the individuals located between L^* and L_l respond to the incentives by bunching at the notch point. The fact that the missing mass area is not entirely empty would be due to some optimisation frictions.

However, if we allow for some heterogeneity in the elasticities, observing some individuals in the missing mass area, between the notch point and the marginal buncher point, could be rationalised by low elasticity values. In this context, bunching could be used to estimate an average extension days response $E[\Delta L_e^*]$. Denoting by $\bar{h_0}(L,e)$ the joint seniority-elasticity distribution in the pre-notch situation, we have:

$$B = \int_e \int_{L^*-\Delta L^*}^{L} \bar{h_0}(L,e)\,\mathrm{d}L\mathrm{d}e \approx h_0(L^*)E[\Delta L_e^*]$$

Using the measure of $\hat{B}$ and an estimate $\hat{c_s}$ of $h_0(L^*)$ at the notch, we can retrieve the average extension day response. This second method would give a lower bound to the reduced-form elasticity as it assumes that all the individuals in the missing mass area have not bunched because of a too low elasticity.[25]

Using both methods, I provide upper and lower bounds to the reduced-form elasticity, and make the estimation window vary to test the robustness of the estimation.

Table 5 shows consistent reduced-form estimates throughout different estimation windows and excluded area boundaries. Standard errors are computed using a bootstrap procedure generating a large number of distributions and associated estimates of each variable. The standard errors correspond to the standard deviations of the distribution of each variable estimate.

The elasticity's lower bound appears quite low, but we have to keep in mind that it does not account for the optimisation frictions. Using the estimate bounds computed on the one-year bandwidth, it means that a 10% increase in UI marginal replacement rate leads, on average, to 0.52 to 4.36 days response, measured at one year.

5.1.2 The Difference-in-Bunching Strategy

The presence of a small discontinuity in the density in the period preceding the introduction of the CSP (referred from now on as the pre-CSP period) justifies the use of a difference-in-bunching strategy (as in Brown (2013) in the case of retirement decisions), to neutralise the

[25] As I am in the case of an upward notch in the level of disposable income, I am not able to identify a strictly dominated region to estimate the optimisation frictions and to rescale $E[\Delta L_e^*]$ as in Kleven and Waseem (2013).

Table 5: Reduced-form elasticity estimates

Seniority window	[120;540]		[180;540]		[0;730[		[0;1100[	
L_u	398		398		398		398	
L_l	309***		323***		338***		339***	
	(4.13)		(11)		(5.46)		(4.69)	
b	5.55***		5.01***		4.72***		4.56***	
	(0.3181)		(0.3478)		(0.3462)		(0.3295)	
m	5.59***		5.05***		4.7***		4.53***	
	(0.342)		(0.37)		(0.3564)		(0.3209)	
% change in replacement rate	12		11.98		11.8		12	
	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
ϵ_{RF}	0.0173***	0.3468***	0.0154***	0.2312***	0.0143***	0.1194***	0.0137***	0.1136***
	(0.0012)	(0.0369)	(0.0012)	(0.0864)	(0.0012)	(.0374)	(0.0011)	(0.0318)

** p<0.05, ** p<0.01, *** p<0.001*

NOTE: The elasticity is computed using the same formula as in Chetty et al. (2011) adjusted for the notch $\frac{(m/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ for the lower bound, and using $\frac{(\Delta L^*/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ with ΔL^* measured as the distance between the point of divergence and the notch point for the upper bound.
Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling. 600 replications.

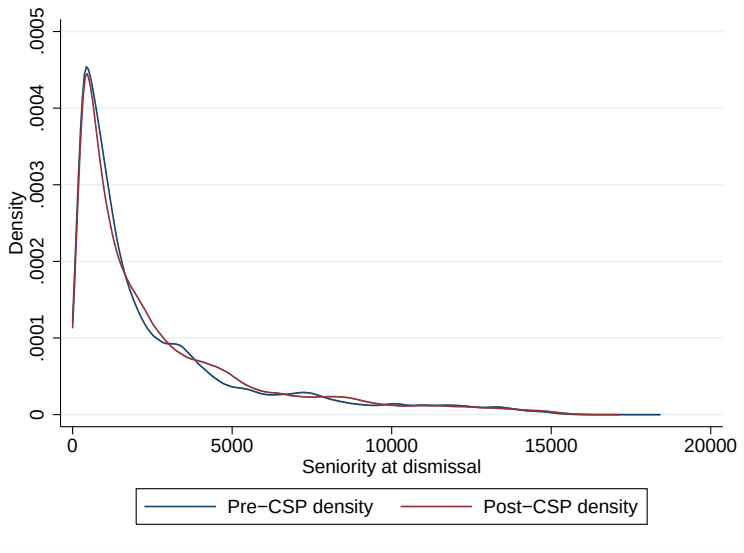
effect of other factors unrelated to the behaviour of interest. The methodology consists in measuring the pure CSP-related bunching as the excess mass relative to the counterfactual density, no longer computed by fitting the empirical one excluding an area around the notch point, but by taking the pre-CSP density. Using the pre-CSP density makes it possible to take into account any pattern in the seniority distribution at layoff that would not be a response to UI incentives. The identification relies on the assumption that, absent the notch, the shape of the seniority distribution should be the same in both periods.[26] If this assumption holds, taking the difference between the observed distributions before and after the introduction of the CSP isolates the bunching exclusively due to the incentives created by the CSP.

A comparison of the pre and post-CSP densities on the whole distribution (Figure 8) and on a tightened 6-months window around the notch point (Figure 34) is a first evidence that the period preceding the introduction of the CSP can be convincingly used as a counterfactual. We observe that, when we choose a 6-months window, the two curves cross at the left hand side of the cutoff around the value 180. The fact that the missing mass is more spread out than the bunching peak can justify the need to take a larger window at the left hand side of the cutoff,

[26] The raw number of laid-off workers can vary across time, as long as the distribution of seniority at layoff stays unchanged in both periods.

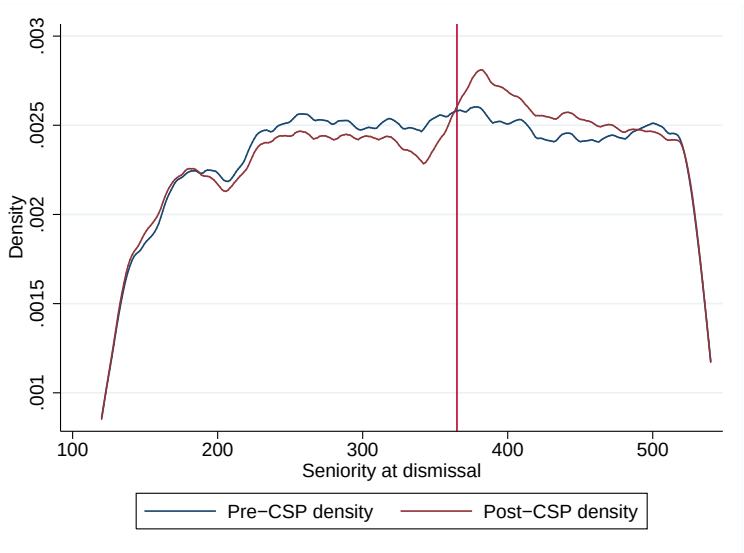
to be sure we are not failing to measure the missing people who have strategically retimed their layoff and who should have had a seniority lower than 180 days. Then, I also use a window from 120 to 540 days, as shown on Figure 9.

Figure 8: Pre and Post-CSP seniority density on the whole distribution



Source: FNA.

Figure 9: Pre and Post-CSP seniority density around the notch (120-540 days)

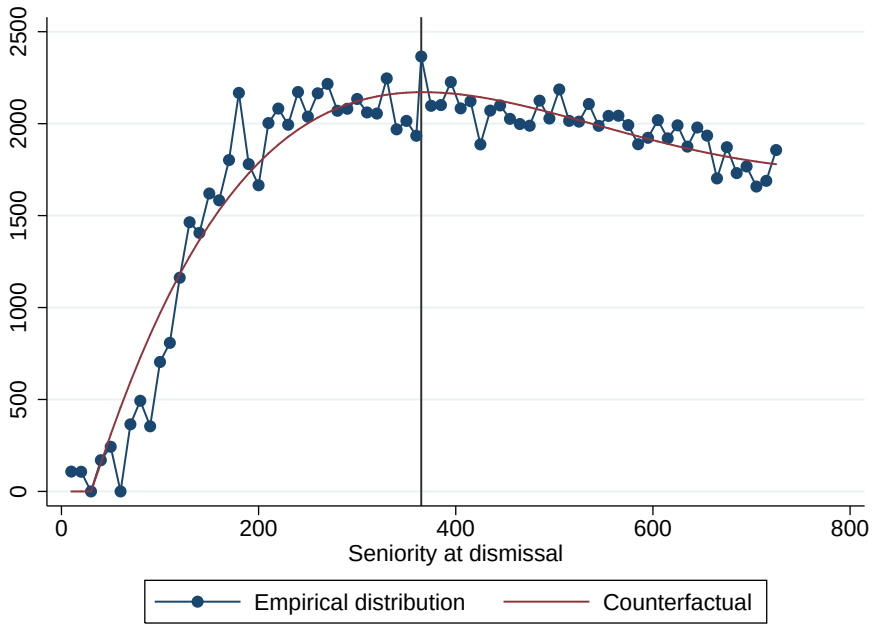


Source: FNA.

Figure 9 clearly shows that both densities are at the same level and have the same shape,

except around the notch point. The post-CSP density shows a hole before the threshold, and a spike after, as compared to the pre-CSP density. We see in Figure 10 that the pre-CSP distribution exhibits a small increase at the one-year threshold but which does not have the same pattern as a bunching mass, and is not preceded by a hole before the cutoff. It provides an additional rationale to use the pre-CSP distribution as part of a difference-in-bunching estimation.

Figure 10: Empirical and counterfactual distributions of seniority at layoff, August 2009-August 2011, 1y cutoff



Source: FNA.
Binsize: 10. The figure exhibits no significant bunching at the notch, other than related to a round-number effect.

I reproduce the reduced-form methodology, adjusting the formula from Chetty et al. (2011) by measuring b and m as the areas between the before and after densities.

Table 6: Difference-in-bunching elasticity estimates

Time period	Sept, 2009 - Sept, 2014			Jan, 2011 - June, 2012	
L_u	395	395	395	395	395
L_l	325***	324***	325***	308***	308***
	(11.7)	(12.02)	(13.65)	(11.89)	(11.87)
Seniority window	[120;540]	[180;540]	[0;730[	[120;540]	[180;540]
b	3.24***	3.04***	3.75***	5.4***	5.04***
	(0.5525)	(0.5043)	(0.702)	(0.8718)	(0.9118)
m	3.18***	3.03***	3.7***	5.37***	4.93***
	(0.5141)	(0.4592)	(0.6763)	(0.8941)	(0.8429)
ϵ^{ub}_{RF}	0.2137**	0.223*	0.2197*	0.3708***	0.3694***
	(0.0979)	(0.115)	(0.1158)	(0.1176)	(0.1168)
ϵ^{lb}_{RF}	0.0094***	0.0089***	0.011***	0.0166***	0.0151***
	(0.0016)	(0.0014)	(0.0022)	(0.003)	(0.0028)

** p<0.05, ** p<0.01, *** p<0.001*

NOTE: The elasticity is computed using the same formula as in Chetty et al. (2011) adjusted for the notch $\frac{(m/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ *for the lower bound, and using* $\frac{(\Delta L^*/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ *with* ΔL^* *measured as the distance between the point of divergence and the notch point for the upper bound. The counterfactual density is derived from pre-CSP distribution of tenure.*
Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling. 200 replications.

Using the pre-CSP density as counterfactual yields estimates very close to those obtained with the computed density, suggesting that non-CSP factors do not play a major role in explaining the bunching. Most of the observed bunching can then be imputed to a behavioural response to incentives created by the CSP. If we focus on the average response, using a one-year bandwidth, the difference-in-bunching estimate is equal to 0.011, which corresponds to 77% of the baseline estimate.

I make the time window vary, to ensure that I am not capturing the effect of the change in the economic context between September, 2009 - August, 2011 and October, 2011 - September, 2014. Thus, I restrict the window to January, 2011 and June, 2012. I get estimates of the same order of magnitude, though slightly higher. [27] In any case, it makes us even more confident than the baseline elasticity estimates are not capturing a spurious phenomenon that would not be related to UI incentives.

5.2 Characterisation of the buncher

Drawing on the descriptive statistics provided in section 3.3, a more systematic investigation of the buncher characteristics can allow the identification of the difference between the population eligible for bunching and the one actually bunching in terms of observable, pre-determined characterisitcs. As in Diamond and Persson (2016), summary statistics of the buncher can be recovered by applying the bunching methodology to individual characteristics instead of the seniority density. If we consider *passing the threshold* as a treatment, and my sample in a potential outcome framework, workers whose observed seniority falls into the bunching window and who are missing below the threshold can be considered compliers. Those under the threshold in the observed distribution can be thought as never takers as their seniority value makes them potentially eligible for manipulation while it did not occur. Finally, those whose observed and counterfactual seniority falls into the bunching window are always takers.

For any observable characteristic X, I use workers outside of the manipulation region to estimate $E(X|s)$ at any seniority s inside the manipulation region:

$$X_{is} = \sum_{j=0}^{J} \beta_j \cdot (X_{is})^j + \nu_{is} \tag{6}$$

[27] It is potentially due to the fact that the economic situation has improved from 2009 to 2014, reducing the number of economic layoffs and the need to optimise unemployment compensation.

where $s < L_l$ or $s > L_u$.

It provides an estimate of the expected value of any observable for each seniority bin, had there been no bunching. It can then be compared to the actual value of the variable in the bunching area above (respectively below) the threshold, denoted $\bar{X}^{up_actual}$ (respectively $\bar{X}^{down_actual}$).

Workers located in the bunching area above the threshold includes both "manipulators", who crossed the cutoff in response to the UI incentives, considered compliers, and workers who would have had the same seniority value absent UI incentives, who are always-takers.

$$\begin{aligned}\bar{X}^{up_actual} &= \frac{1}{N_{up}^{total}} \sum_{i=L^*}^{L_u} X_i \mathbb{1}_{s=i} \\ &= \frac{N_{up_alt}}{N_{up_alt} + N_{compliers}} \bar{X}^{up_alt} + \frac{N_{up_alt}}{N_{up_alt} + N_{compliers}} \bar{X}^{compliers}\end{aligned}$$

with N_{up_alt} being the number of always-takers and $\bar{X}^{up_alt}$ their average value of X.

Similarly, I define

$$\begin{aligned}\bar{X}^{down_actual} &= \frac{1}{N_{down}^{total}} \sum_{i=L_l}^{L^*-1} X_i \mathbb{1}_{s=i} \\ &= \frac{N_{down_alt}}{N_{down_alt} - N_{compliers}} \bar{X}^{down_alt} - \frac{N_{down_alt}}{N_{down_alt} + N_{compliers}} \bar{X}^{compliers}\end{aligned}$$

with N_{down_alt} being the number of never-takers who choose to locate below the threshold even in the presence of UI incentives, and $\bar{X}^{down_alt}$ their average value of X.

We recover $\bar{X}^{down_alt}$ and $\bar{X}^{up_alt}$ by using extrapolation from equation (6) as well as the counterfactual density previously estimated with (5).

Equation (5) computed for the bunching regions below and above the cutoff allows the estimation of the number of always-takers and never-takers.

Finally, using information both from the excess and missing masses, it follows that

$$\begin{aligned}\bar{X}^{compliers} = 0.5 \cdot \left(\frac{N_{up}^{total}}{N_{up}^{total} - N_{up_alt}} \cdot \bar{X}^{up_actual} - \frac{N_{up_alt}}{N_{up}^{total} - N_{up_alt}} \cdot \bar{X}^{up_alt} \right) + \\ 0.5 \cdot \left(\frac{N_{down_alt}}{N_{down}^{total} - N_{down_alt}} \cdot \bar{X}^{down_alt} - \frac{N_{down}^{total}}{N_{down_alt} - N_{down}^{total}} \cdot \bar{X}^{down_actual} \right)\end{aligned}$$

I can then compare compliers' characteristics with those of workers located right below the cutoff in the absence of UI incentives, and then "eligible" for contract extension.

Table 7: Characteristics of compliers and eligible workers

	Compliers	Eligible	Difference
Age	36.34	35.58	0.762***
	(1.801)	(0.042)	(0.127)
Gender	0.41	0.33	0.079***
	(0.027)	(0.002)	(0.002)
Education	7.13	6.31	0.824***
	(0.313)	(0.008)	(0.022)
Skills	2.89	3.47	-0.581***
	(0.182)	(0.005)	(0.013)
Working time	0.95	0.94	0.005
	(0.046)	(0.001)	(0.003)
Firm size	17.32	29.63	-12.310***
	(4.645)	(0.472)	(0.330)

** p<0.05, ** p<0.01, *** p<0.001*
NOTE: The bunching boundaries are located at 324 days and 397 days. The area used to estimate the counterfactual is included between 0 and 1100 days. The polynomial fitting the seniority bin count is of order 4. Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling (200 replications).
Î Skills are given from a scale from 1 (high skills) to 6 (low skills). Education ranges from 1 (no education) to 10 (5 years or more of higher education).

Compliers are, on average, older, more frequently female, more educated and more skilled, and work in smaller firms (Table 7).

I perform the same analysis on the sample of never-takers (Table 37), to gain insights into the bargaining frictions. Indeed, the never-takers are the ones for which bargaining frictions are so high that they do not manage to negotiate the contract extension even though they are close to the tenure threshold.[28] They are significantly younger, less educated, less skilled and work in bigger firms than compliers.

Using a more systematic approach, this analysis confirms previous evidence on the profile of the typical buncher. Still, those characteristics could be associated with higher bargaining power, higher incentives, or different preferences. Next subsection precisely aims at disentangling the role of the incentives from other channels, by using the elasticity measure derived from bunching (section 5.1).

[28] Never-takers are identified as those being in the missing mass area in the empirical distribution

5.3 Interaction Between Ability and Incentives

The reduced-form elasticity as computed above is a way to measure to what extent the couple employer-employee responds to an increase in the level of unemployment compensation at the moment of the layoff, by retiming the termination of the contract. It scales the observed response in extension days by the magnitude of the financial gain, and provides a metric that should be valid for any value of the gain in UI benefits.

As such, it can be used to compare the behaviours of different categories of the population, precisely delimited by their potential gain when crossing the one-year cutoff.

Table 8: Elasticity estimates by gain categories

Gain category	Average gain in replacement rate (in %)	L_u	L_l	b	m	ϵ_{RF}^{lb}	ϵ_{RF}^{ub}
$Gain < 10ppts$	3.58	369	340***	1.8	1.69	0.00545	0.2181
			(14.91)	(1.2776)	(1.1987)	(0.0044)	(0.1968)
$10ppts \leq Gain < 15ppts$	8.66	398	339***	3.77***	3.76***	0.0113***	0.1311***
			(6.04)	(.8895)	(.8906)	(0.0026)	(0.0477)
$15ppts \leq Gain < 20ppts$	10.95	398	342***	3.56***	3.53***	0.0106***	0.0993***
			(5.14)	(0.5203)	(0.5164)	(0.0017)	(0.0336)
$Gain \geq 20ppts$	14.04	398	334***	5.99***	6.02***	0.0184***	0.1412***
			(8.07)	(0.4764)	(0.4704)	(0.0016)	(0.0512)

** p<0.05, ** p<0.01, *** p<0.001*

NOTE: The elasticity is computed using the same formula as in Chetty et al. (2011) adjusted for the notch $\frac{(m/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ for the lower bound, and using $\frac{(\Delta L^*/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ with ΔL^* measured as the distance between the point of divergence and the notch point for the upper bound. The area used for estimating the counterfactual is included between 0 and 730 days. The polynomial fitting the seniority bin count is of order 4. Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling. 200 replications.

In Table 8, the elasticity parameter shows that – keeping incentives fixed – the last category seems to be much more responsive to a change in UI benefits than the first ones, especially when looking at the average extension days response (lower bound estimate). Overall, the elasticity increases with the category, and is not even significant for the first one, although the pattern is less clear for the two middle categories. For a 10% increase in the replacement rate, workers in the highest gain category would increase the length of their contract by 0.67 days on average, whereas worker in the third gain category would increase it by 0.39 days if we stick to the lower bound estimates, and by 5.2 versus 3.6 days if we look at the upper bound. This positive relationship indicates that people in the highest incentives category do negotiate more on contract termination to reach the cutoff, but not only because their gain from unemployment compensation is higher, but also because they have different preferences, and/or different

abilities to bargain. An exploration of the observable characteristics of the different groups can help disentangling the role of the different parameters.

5.3.1 Individual characteristics

Descriptive statistics be gain category – Belonging to a higher gain category is associated, on average, to a higher age, a higher level of education, to a higher probability of being executive, to longer working hours, and, mechanically,[29] to higher earnings (Tables 32 and 33, Appendix L). These characteristics are likely to be positively correlated to bargaining power, through the fact that more educated and skilled people are more able to voice their claims or to use the representation resources available, and that they are able to forego a higher amount of severance payment. Indeed, the amount t^0 of supra-legal severance payment the worker is able to negotiate in the no bunching scenario is likely to increase with earnings, which are positively correlated to potential gain.

Those results can be interpreted in two ways: either these characteristics are associated with differences in preferences, for example, an older executive with high earnings may be more willing to extend his employment spell even if he knows he is laid-off, whereas the psychological cost to keep on working in the firm can be greater for other types of workers; or these characteristics put the worker in a better position to negotiate with the employer, and to offer him a high transfer.

Heterogeneity in bunching within a gain category – Previous subsection has shown that elasticity increases with gain category even though incentives are kept constant. Descriptive statistics (Tables 32 and 33, Appendix L) give information on how the characteristics of workers vary with the gain category. However, to be able to disentangle the role of incentives and of different observable characteristics that may be correlated with bunching, I investigate how the magnitude of bunching varies with several covariates, holding gain category fixed. Graphical evidence can be found in Figures 40 to 45 in Appendix L. We observe the same pattern: within the same gain category, bunching increases with age, education, skills, and being a woman,

[29] The standard benefit replacement rate increases as earnings decrease, reducing the gap between the two types of benefits replacement rates.

especially in the highest gain category where estimates are more precise.

I also take advantage of the fact that above a certain earnings threshold, the replacement rate of the standard benefit is held constant, at 57.4%. Therefore, while wage keeps on increasing, the gap in replacement rate between both types of benefits is fixed, providing an opportunity to study how bunching varies with wage, controlling for variation in financial incentives. I divide the distribution of wage above the threshold where the gap in replacement rates remains constant into two parts above and below the median and I compute the log difference in the seniority density at the one-year cutoff. Figure 46 of Appendix L shows that bunching still increases slightly with wage, possibly capturing the role of individual ability to bargain or preferences. However, as standard errors are large, I cannot rule out the hypothesis that wage has no influence on the magnitude of bunching, at least in this area of the distribution.

Elasticity by individual characteristics' cell – To perfectly neutralise the influence of financial incentives, the elasticity can be derived for different subpopulations defined in terms of firm size, sector, age, gender and education. In order to keep a sufficiently large sample size by cell and not to compute too many statistics, I design broad categories for each covariate. This method makes it possible, nonetheless, to control for several characteristics at the same time. Tables 9 and 10 show that there is still variation in the behavioural response after controlling for financial incentives and some individual and firms characteristics. The highest estimates are typically found in small firms among highly educated individuals, in the retail, food and accommodation, and services sectors. This pattern can be rationalised by differences in preferences or individual characteristics between cells, or by differences in ability to negotiate. However, statistics on representation institutions indicate that the presence of representatives is an increasing function of firm size, and that the building sector is where the unionisation rate of representatives is the highest (Breda, 2016). It suggests that the type of firms where the elasticity is the highest is typically not the one where employees are better represented, arguing for an individual bargaining process.

Table 9: Elasticity estimates by cell (small firms)

				Change in replacement rate (in %)	L_l	b	m	ϵ_{ub}	ϵ_{lb}
				11.39***	324***	3.26***	3.26***	0.2531	0.0097***
		Male	Low education	0.08	21	0.98	0.89	0.1690	0.0028
	Less than 45yo			11.94***	345***	3.39***	3.63**	0.0843*	0.0109**
			High education	0.12	9	1.26	1.42	0.0487	0.0045
				10.13***	315***	3.35*	3.43*	0.3434**	0.0105*
Industry, Agriculture, Building		Female	Low education	0.22	15	1.84	1.87	0.1365	0.0063
				11.58***	331***	4.32**	4.80**	0.1893	0.0150*
			High education	0.19	19	2.03	2.45	0.1395	0.0084
				11.97***	322***	3.50**	3.44**	0.2551*	0.0103**
		Male	Low education	0.13	20	1.56	1.58	0.1540	0.0051
	45yo and more			12.86***	319***	2.48*	2.40*	0.2646**	0.0070*
			High education	0.31	17	1.32	1.25	0.1263	0.0038
				10.51***	326***	3.22*	3.37*	0.2386	0.0103*
		Female	Low education	0.34	19	1.81	1.88	0.1561	0.0062
				11.82***	323***	1.67	1.66	0.2446**	0.0048
			High education	0.37	16	1.32	1.24	0.1189	0.0038
				11.68***	322***	4.33***	4.54***	0.2540*	0.0139***
		Male	Low education	0.10	17	1.34	1.40	0.1407	0.0047
	Less than 45yo			12.39***	310***	7.44***	6.89***	0.3462***	0.0218***
			High education	0.08	13	1.20	1.24	0.1078	0.0044
				10.40***	321***	4.09***	4.39***	0.2871*	0.0136***
Retail, Food and accommodation, Services		Female	Low education	0.11	20	1.40	1.44	0.1734	0.0049
				11.87***	315***	6.86***	8.12***	0.2973***	0.0265***
			High education	0.08	10	1.06	1.24	0.0939	0.0047
				12.29***	314***	5.53***	5.34***	0.3164***	0.0166***
		Male	Low education	0.13	15	2.08	1.82	0.1224	0.0062
	45yo and more			13.24***	304***	13.14***	12.72***	0.3767***	0.0443***
			High education	0.11	5	2.65	2.32	0.0477	0.0099
				10.89***	327***	5.71***	5.33***	0.2227***	0.0167***
		Female	Low education	0.20	15	1.59	1.41	0.1325	0.0049
				12.47***	324***	7.79***	9.36***	0.2224***	0.0314***
			High education	0.17	14	2.27	2.76	0.1136	0.0107

** p<0.05, ** p<0.01, *** p<0.001*

This table displays elasticity estimates by cell, with their standard errors below. Elasticity estimates are computed using the same formula as in Chetty et al. (2011) adjusted for the notch $\frac{(m/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ for the lower bound, and using $\frac{(\Delta L^*/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ with ΔL^* measured as the distance between the point of divergence and the notch point for the upper bound. The area used for estimating the counterfactual is included between 0 and 730 days. The polynomial fitting the seniority bin count is of order 4. Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling. 100 replications.

Small firms include firms with less than 10 employees. Low education corresponds to people having less than the high school diploma or having at most a vocational high school degree.

Standard errors are below the estimates.

Table 10: Elasticity estimates by cell (large firms)

				Change in replacement rate (in %)	L_l	b	m	ϵ_{ub}	ϵ_{lb}
Industry, Agriculture, Building	Less than 45yo	Male	Low education	11.72***	311***	2.06**	1.98**	0.3398***	0.0057**
				0.09	11	0.91	0.92	0.0957	0.0028
			High education	12.93***	307***	8.83***	8.71***	0.3594***	0.0285***
				0.11	11	2.22	2.03	0.0914	0.0077
		Female	Low education	11.33***	323***	2.51	2.50	0.2486*	0.0074
				0.34	18	1.54	1.53	0.1393	0.0048
			High education	12.40***	331***	3.18*	3.57*	0.1880	0.0108
				0.16	22	1.85	2.03	0.1535	0.0066
	45yo and more	Male	Low education	13.05***	345***	2.71***	2.79**	0.0951	0.0081**
				0.10	17	1.01	1.09	0.1033	0.0034
			High education	13.93***	326***	2.37*	2.37*	0.2110	0.0069
				0.17	21	1.42	1.43	0.1446	0.0044
		Female	Low education	11.75***	322***	1.28	1.39	0.2702	0.0040
				0.82	25	1.14	1.41	0.2075	0.0043
			High education	13.26***	322***	1.37*	1.41	0.2366*	0.0040
				0.27	17	0.79	0.88	0.1272	0.0026
Retail, Food and accommodation, Services	Less than 45yo	Male	Low education	12.18***	320***	4.10***	3.86***	0.2677**	0.0116***
				0.15	16	1.48	1.32	0.1269	0.0043
			High education	12.92***	307***	6.29***	7.00***	0.3615***	0.0222***
				0.09	11	1.54	1.55	0.0902	0.0056
		Female	Low education	11.04***	318***	3.79*	3.85**	0.3007**	0.0118*
				0.19	19	1.94	1.90	0.1497	0.0064
			High education	12.32***	312***	7.11***	8.13***	0.3272***	0.0265***
				0.10	14	1.55	1.70	0.1215	0.0063
	45yo and more	Male	Low education	13.05***	323***	3.81*	4.01**	0.2365*	0.0121*
				0.16	19	2.00	2.00	0.1429	0.0064
			High education	13.88***	319***	3.38*	3.48*	0.2621*	0.0104*
				0.13	19	1.81	1.85	0.1357	0.0058
		Female	Low education	10.82***	316***	3.12	3.34	0.3213**	0.0102
				0.41	18	1.91	2.06	0.1454	0.0068
			High education	13.47***	329***	2.70	2.97	0.1907	0.0088
				0.22	20	1.65	1.86	0.1438	0.0059

** p<0.05, ** p<0.01, *** p<0.001*

This table displays elasticity estimates by cell, with their standard errors below. Elasticity estimates are computed using the same formula as in Chetty et al. (2011) adjusted for the notch $\frac{(m/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ for the lower bound, and using $\frac{(\Delta L^*/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ with ΔL^* measured as the distance between the point of divergence and the notch point for the upper bound. The area used for estimating the counterfactual is included between 0 and 730 days. The polynomial fitting the seniority bin count is of order 4. Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling. 100 replications.

Small firms include firms with less than 10 employees. Low education corresponds to people having less than the high school diploma or having at most a vocational high school degree.

Standard errors are below the estimates.

I focus on a specific variable entering the decision to bunch according to my theoretical framework, that is the supra-legal severance payment received by the worker when there is no extension (t^0). The model predicts that the magnitude of bunching will be positively correlated with the level of t^0. Unfortunately, I have no direct measure of t^0 in my data for the sample of laid-off workers,[30] but I use the information available for dismissed people after an open-ended contract. I restrict the sample to those having a seniority lower than 2 years and I fit a zero-inflated negative binomial model. The regression output and a discussion on the choice of the model can be found in Appendix M. I use the regression coefficients to predict the value of the supra-legal severance payment that would have been paid to the the laid-off workers of my sample. I can then test the model's prediction by computing the elasticity on a high supra-legal severance payment versus a low supra-legal severance payment sub-group. Table 11 shows that, in accordance with the model, the high supra-legal severance payment group exhibits a higher elasticity than those who would receive low supra-legal severance payments when there is no extension. These results have to be taken cautiously, first because the value of t^0 is predicted by the zero-inflated negative binomial model, and not directly observed. Second, if the elasticity allows to control for the level of incentives, t^0 is still likely to be correlated with other variables that have in turn an impact on the likelihood to bunch. Still, they suggest that a higher t^0 makes the extension of the contract more likely, through the feasibility condition in the model. It can be argued that a higher t^0 is itself the result of a higher bargaining power, which would imply a positive link between the bargaining power and the propensity to bunch.

[30] Supra-legal severance payment is recorded in the UI data as it defines the legal delay between the day the job-seeker registers as unemployed, and the first day he actually receives benefits. However, one of the consequences of accepting the CSP is that there is no such a delay. The information on the supra-legal severance payment is, therefore, not recorded for those accepting the CSP.

Table 11: Elasticity estimates by baseline supra-legal severance payment

Supra-legal severance payment category	Average gain in replacement rate (in %)	L_u	L_l	b	m	ϵ^{lb}_{RF}	ϵ^{ub}_{RF}
Low gain	11.27***	398	339***	4.43***	4.39***	0.0133***	0.1215**
	(0.0004)		(8.03)	(0.5665)	(0.5587)	(0.0018)	(0.0553)
High gain	12.79***	398	329***	5.54***	5.58***	0.0171***	0.1809***
	(0.0004)		(9.76)	(0.5669)	(0.5832)	(0.002)	(0.0701)

** p<0.05, ** p<0.01, *** p<0.001*
This table displays elasticity estimates by cell, with their standard errors below. Elasticity estimates are computed using the same formula as in Chetty et al. (2011) adjusted for the notch $\frac{(m/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ for the lower bound, and using $\frac{(\Delta L^*/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ with ΔL^* measured as the distance between the point of divergence and the notch point for the upper bound. The area used for estimating the counterfactual is included between 0 and 1100 days. The polynomial fitting the seniority bin count is of order 4. Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling. 100 replications.
Low (respectively high) severance payment category corresponds to a supra-legal severance payment below (respectively above) the median.

What we can draw from this analysis is that the propensity to bunch is positively correlated to the magnitude of the financial incentives, but that individual characteristics, including the bargaining power, still play a role in explaining the variation in bunching when keeping potential gain constant. I now turn to the exploration of firms' characteristics, and, in particular, to the forms of employees' representation.

5.3.2 Firms' characteristics

Bunching and employees' representation – I use the aggregate statistics provided by the Statistics department of the Ministry of Labour, Employment, Professional training, and Social Dialogue[31], computed from the 2011 REPONSE survey on managers, employees and employees' representatives in firms of more than 10 employees, drawing a picture of the state of professional relationships in France. The data, available online, gives the aggregate proportion of employees' representatives and their different forms (unionised or not for example) by workforce size category. It also indicates the proportion of firms having negotiated on a specific topic in the last two years, decomposed by topic, by workforce size, by industry or by type of collective agreement.

I start by imputing the probability of not having any representative institution within the firm, which is a decreasing function of workforce size. I then run a cell analysis by examining how the magnitude of the jump in density varies with the gain and representation category.

[31] DARES, Directorate of research activity, studies and analyses

One caveat has to be made, as the data only covers firms with more than 10 employees, leaving 48.6% of my sample without any information on employees' representation.[32] I then focus on this subsample of firms with more than 10 employees, keeping in mind this limitation.

Table 12: Log discontinuity estimates by gain and representation categories

		Gain category			
		$gain < 10ppts$	$10ppts \leq gain < 15ppts$	$15ppts \leq gain < 20ppts$	$20ppts \geq gain$
Probability of having no representative within the firm	$p \leq 0.05$	.09568	.09744	.16337*	.39973***
		(.37148)	(.18412)	(.08929)	(.07152)
	$0.05 < p \leq 0.1$	.25452	.33265*	.18852**	.39394***
		(.468713)	(.18518)	(.08880)	(.06927)
	$0.1 < p \leq 0.5$	-.06454	.32650	.19934	.65682***
		(.45927)	(.28568)	(.15456)	(.11770)
	$p > 0.5$	.14372	.58716*	.20545	.41178***
		(.62489)	(.31582)	(.14480)	(.10643)

** p<0.05, ** p<0.01, *** p<0.001*

The probability of having no representative at all within the firm has been imputed based on data from the REPONSE survey (Statistics department of the Ministry of Labour, DARES), according to firm size. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. The log difference in density has been computed for each cell defined in terms of financial incentives and the presence of representation in the firm. Estimates increase with potential gain but no systematic pattern is found concerning the relationship between representation and the magnitude of the discontinuity.

Table 12 shows that the gain category seems to matter more than the quality of representation in explaining the magnitude of the bunching. Indeed, as the probability of having no representation within the firm increases, keeping the gain category fixed, the propensity to bunch does not seem to vary significantly, or slightly increases, indicating, if any, a negative correlation between the quality of the representation and the magnitude of bunching. On the contrary, the magnitude of bunching increases almost systematically as the gain category increases, keeping the probability of being represented fixed. The bunching is always significant and of high magnitude in the highest gain category, no matter the forms and intensity of representation in the firm. Focusing on this category, we observe that the magnitude of bunching tends to go up as the probability of having no representation increases. It would suggest that representation structures, within the firm, are not necessarily helpful in negotiating the extension of work contracts, but it is more the way different categories of workers, more or less skilled or educated, are able to mobilise the available resources that seems to matter. The elasticity estimates for the corresponding cells can be found in Appendix L (Table 34).

Table 12 indicates that individual characteristics, correlated to individual preferences or ability

[32] Firms of less than 10 employees face no legal obligation in terms of employees' representation.

to bargain, have a greater impact on bunching than the quality of representation at the firm level. Yet, it should be noted that the way the quality of representation is measured is very broad – the probability of having no representation at all decomposed by large workforce size categories – and the forms of representation are likely to vary within each category. In addition, this analysis leaves aside all firms with 10 employees or less, which represents almost half of the sample, and describes only correlations with the magnitude of the jump in density.

To complement this picture, I compute a proxy for bunching at the firm level. For any firm with more than two layoffs in the period of interest, I compute the proportion of workers with a seniority at lay-off lying in a small window above one year – which is an indicator of bunching. It should be noted that 23% of the sample are firms dismissing only one person, and are then excluded from this analysis. Among those firms, the proportion of firms with some of their laid-off workers located just above one year is 4.34% if we take a five days window, indicating that the bunching is concentrated among a small number of firms. Keeping in mind that, as a consequence, the sample size is small, I observe that the propensity to bunch at the firm level is negatively and significantly correlated with the workforce size. In Table 38 of Appendix N, I regress the propensity to bunch on individual characteristics as well as representation indicators from the REPONSE survey or directly on workforce size. Potential gain, education and sex, always have a positive and significant effect, whereas variables related to the representation structures – *e.g.* probability of having a work council, a unionised delegate, workforce size – are not significant, or have a low magnitude negative effect. These results go in the same direction as the previous one, suggesting that the representation in the firm, at least in terms of volume, does not seem to favour more bunching.

Bunching and firms fixed-effects – As I have no precise data on the quality of representation within the firm, I can use a fixed-effect logit model to determine, within a firm, which individual characteristics are associated with a higher propensity to bunch. I define as bunching any individual with a seniority at layoff falling between 365 and 397 days, as it corresponds to the bunching area for most bandwidths. I consider a logit model as my outcome is a binary variable, and I use firm fixed-effects to neutralise any characteristic specific to the firm, that I am not able to capture with the information at hand. Again, the limitation of this analysis is that I use only the subsample of firms for which I have several observations (*i.e.* several

persons laid-off), and with some variation in the bunching dummy. It leaves me with 19,868 observations distributed in 3,396 firms.

Table 13 shows that potential gain, age, education level all have a positive effect on the propensity to bunch. Though, part of the effect of potential gain is captured by the other characteristics, as having a higher potential gain, and then higher earnings, is also associated with a higher level of education, a higher age and a higher chance to be a male.

Table 13: Fixed-effect logit of the propensity to bunch

	Propensity to bunch	Propensity to bunch
Potential gain from ASP	2.4502*	2.4064*
	(1.3862)	(1.378)
Education level		.0305**
		(.0130)
Age		.0043*
		(.0022)
Gender		-.0814
		(.0565)
Being an executive		-.0541
		(.0918)
Observations	19,868	19,823

** p<0.05, ** p<0.01, *** p<0.001*
Standard errors are clustered at the firm level.
I use firms for which I observe several layoff over the period to run a fixed-effects logit model. I restrict the sample to seniority values between 6 and 18 months, to compare those bunching – having a seniority between 365 and 397 days – with those having a seniority close but outside the bunching window. Neutralising the effect of time invariant firms characteristics, we still observe a positive impact of age and education, even after controlling for financial incentives.

Table 13 indicates that, keeping all firms characteristics constant – including some unobservable management practices or representation quality on which we have no precise information – the propensity to bunch is positively correlated to the level of the potential gain. When adding some other characteristics – which are themselves correlated to the potential gain – the coefficient of the potential gain decreases. Education level and age are both positively and significantly correlated to the propensity to bunch. It could mean that, keeping firm's characteristics and incentives constant, more educated and older workers have preferences encouraging bunching, or that they are more able to take advantage of the representation structures that exist in the firm, or even that there is some heterogeneity in management practices (if the employer acts differently according to the type of employee).

All in all, these results suggest that the representation structures are not necessarily helpful in negotiating the extension of the contract, or that, at least, individual characteristics seem to matter more when it comes to explaining bunching. It could also indicate an heterogeneity in the representation quality according to the level of education or skills, within the same firm. This finding is in line with other cases of individual-level bargaining settings, where it has been shown that the level of qualification were a strong determinant of the bargaining outcome. For example, in France we observe that executives are able to negotiate much higher severance payments in case of mutually agreed work contract termination, whereas low-skilled workers only get the legal minimum payment in most cases (Bouvier, 2017). A potential explanation put forward in the study is the difference in the level of information and in the level of knowledge of the decision-making process in the firm.

6 Robustness Checks

6.1 Round-Number Fixed Effects

Following Kleven and Waseem (2013), I use an alternative strategy to take into account round-number fixed effects. Indeed, it is reasonable to think that the distribution of seniority at layoff will exhibit small peaks at regular intervals, as, for example, employers may lay off the first or last day of the month. This would mechanically lead to higher densities at seniority values around multiples of 30, though it would not be driven by any strategic behaviour. The optimisation behaviour at the one-year threshold, clear of the effect of being at a round month and year value, can be measured by accounting for this phenomenon.

A simple way of doing this is to add to the density regression round-number fixed effects, that is to say a dummy equal to one for each value of seniority around a multiple of 30. To account for the fact that a month lasts either 28, 29, 30 or 31 days I choose the bandwidth such that the round-number dummy is equal to one for any number i meeting the following condition: $k - 0.1 \leq \frac{i}{30} \leq k + 0.1, k \in \mathbb{N}$.

The density regression becomes:

$$Den_s = \sum_{j=0}^{J} \beta_j \cdot (L_s)^j + \gamma_1 \cdot \mathbb{1}_{L_l \leq L_s < L^*} + \gamma_2 \cdot \mathbb{1}_{L^* \leq L_s \leq L_u} + \rho \cdot \mathbb{1}_{k-0.1 \leq \frac{L_s}{30} \leq k+0.1, k \in \mathbb{N}} + \nu_i$$

Adding these round-number fixed effects to compute the density does not change much the results (Table 14). Not surprisingly, the parameters are a bit lower, as we remove part of the bunching only due to the regularity in hiring and firing dates.

Table 14: Reduced-form elasticity estimates with round-number fixed effect

L_u	398	398	398
L_l	312***	323***	342***
	(8.3)	(7.92)	(3.43)
Seniority window	[120;540]	[180;540]	[0;730]
b	5.19***	4.86***	4.1***
	(0.3307)	(0.3135)	(0.3314)
m	5.25***	4.92***	4.15***
	(0.3668)	(0.3494)	(0.3593)
Average change in replacement rate (in %)	11.98***	11.98***	11.98***
	(0.0003)	(0.0003)	(0.0002)
ϵ_{RF}^{ub}	0.3275***	0.2306***	0.097***
	(0.0768)	(0.0659)	(0.0205)
ϵ_{RF}^{lb}	0.0161***	0.015***	0.0124***
	(0.0012)	(0.0012)	(0.0012)

** p<0.05, ** p<0.01, *** p<0.001*

NOTE: Elasticity estimates are computed using the same formula as in Chetty et al. (2011) adjusted for the notch $\frac{(m/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ for the lower bound, and using $\frac{(\Delta L^*/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$ with ΔL^* measured as the distance between the point of divergence and the notch point for the upper bound.

Taking into account the regularity in starting and ending dates of work contracts leaves the results virtually unchanged.

6.2 Response at the two-years cutoff

The existence of a similar setting at a different seniority value under a different period has also been exploited to compute elasticity estimates from the bunching response at the two-years cutoff during the pre-CSP period. This is a way to check whether the response is similar under both periods and cutoffs, and to confirm that the bunching measured is indeed a behavioural response to incentives created by the UI design, no matter the value of the threshold or the time period considered.

Table 39 of Appendix O exhibits elasticity estimates derived from the average response very close to those from the main estimation, around 0.008, although the missing mass area is more

stretched out, leading to a higher upper bound.

The same threshold under the post-CSP period could have been used to measure some optimisation frictions, the idea being that any bunching observed at two years after September, 2011 is the sign of some workers not able to adjust to the new incentives. However, as depicted in Figure 2, no significant bunching occurs at this point under the post-CSP period. This is in line with the fact that it is not possible to determine the missing mass lower bound that equalises the missing and excess masses, and that delimits the area where the behavioural response is observed. Then, it indicates that the main frictions attenuating the bunching of interest come from negotiation frictions that do not allow workers to adjust freely their layoff date.

7 Welfare implications

The ultimate welfare impact of the extension of work contracts depends not only on the impact on the length of the employment spell, but also on the impact on the length of the unemployment spell. It is a well established fact that higher unemployment benefits are associated with longer unemployment duration (Schmieder and Von Wachter, 2016). Although I am not able to disentangle the moral hazard from the selection effect, precisely because there is bunching, Figure 48 (Appendix P) shows that there is a large jump in subsidised unemployment duration at the one-year cutoff. A further decomposition of the effect by gain category highlights a strong and significant increase in unemployment duration for the highest gain category, whereas no significant jump is observed for the lowest gain category, where no bunching is measured (Figure 49, Appendix P). In any case, to have a complete picture of the welfare implications of this delay strategy, this effect on the unemployment spell must be taken into consideration.

Having this in mind, I am able to compute an estimate of the cost and benefits of the extension of the contracts from the point of view of the government. On the cost side, the direct loss due to the payment of higher benefits is doubled-up with an indirect loss from the lengthening of the subsequent unemployment spell.[33] Using the same methodology as in section 5.2, I compute the average daily wage (w), unemployment spell duration (D), daily standard benefit (SB) and daily CSP benefit (ASP), as well as the takeup rate ($t^{CSP}_{compliers}$) for

[33]This indirect effect has to be taken into account, although the CSP itself is limited to 12 months. After those 12 months, the job-seeker can keep on receiving benefit but at the standard replacement rate.

the population of compliers and for the population of eligibles. It follows that:

$$\text{Individual difference in total benefits} = \underbrace{(ASP_{compliers} - SB_{compliers}) * min(D_{compliers}, 365)}_{\text{Direct cost}} + \underbrace{SB_{compliers} * (D_{compliers} * D_{eligibles})}_{\text{Indirect cost}}$$

$$\text{Aggregated difference in total benefits} = \text{Individual difference in total benefits} * B * t^{CSP}_{compliers}$$

B computed in section 5.1 gives the excess bunching, that is the number of individual in excess in the bunching area, who come from the area where a hole is observed.

On the other hand, a few more days of employment translates into more contributions paid to fund the UI scheme. Employers also contribute to the funding of the CSP by paying to the State part of the severance payment S they would have paid to the worker for any worker accepting the CSP. It means that the State receives more severance payment contributions only to the extent that there is a difference in takeup rate between compliers and eligibles. With a total contribution rate of 6.4% over the whole period, we have:

$$\text{Individual difference in contributions paid} = w_{compliers} * \Delta L * 0.064 + S * (t^{CSP}_{compliers} - t^{CSP}_{eligibles})$$

$$\text{Aggregated difference in contributions paid} = \text{Individual difference in contributions paid} * B$$

ΔL gives the average response in terms of days of extension, and is derived from the measure of the bunching, as explained in section 5.1.

Using the values found in Appendix P (Table 40), the total additional benefits paid amount to 16,640,251€ over the whole 3 years period. With total additional contributions paid equal to 1,870,911€, the net cost for the unemployment insurance is 14,769,340€.

This simple computation highlights the fact that employers and workers use the UI scheme as a way to improve the conditions of the layoff for the employee while alleviating its cost for the firm, at the expense of the government.

To give more sense to these figures, I compare them to the annual amount of CSP-related spending from the UI. UI accounts (Unedic, 2018) indicates annual net and gross CSP spending, but without taking into account neither the standard benefit that would have been paid instead of the ASP, nor any behavioural response in terms of unemployment duration. Therefore, I also compute net spending without taking into account the counterfactual capital of benefits that would have been paid absent bunching. As workers with tenure value around one year account

only for a small share of workers taking the CSP, I also relate my figures to UI spending for workers taking the CSP with a tenure below 2 years.[34]

Table 15: Relative annual cost of bunching without taking into account the counterfactual benefits

	Due to bunching	Overall	Ratio (in %)
Net spending	12,773,967	1,050,750,000	1.2%
Gross spending for CSP workers below 2 years of tenure	13,397,603	242,000,000	5.54%

** p<0.05, ** p<0.01, *** p<0.001*
NOTE: Those figures do not take into account what would have been paid to the workers absent the bunching. I have subtracted from the Unedic spending those related to the counselling and guidance part of the CSP, as well as those related to additional CSP-related benefits that I am not able to compute. I am taking the average values over the 2014-2017 period.

Although spending related to bunching do not account for a huge share of total CSP spending, it exemplifies the distortions that can be created by UI design on the labour market.

8 Concluding Remarks

The impact of UI parameters on employment outcomes has drawn some attention in recent years, in particular since we observe that the interaction of UI and the labour market can influence the forms of employment: by taking into consideration the shortening of employment spells and allowing workers to be covered even between two short work contracts, the UI has sometimes been accused of encouraging the development of these precarious forms of work.

The setting under study has an impact on the timing of economic layoffs, and therefore, on the duration of the employment spell. Bunching evidence, identified as being due to the design of the CSP, is used to quantify the sensitivity of the duration of the contract to UI financial incentives. Bunching behaviour is the result of the bargaining of employer and employee who agree to maximise joint surplus by extending the contract when it is profitable to both parties. These strategic behaviours have several public policy implications. First, it encourages to maintain a poor match while it is not efficient anymore. It also allows employers to soften the conditions of the redundancy plan, reducing the risk of having their reputation harmed or of paying damages, thanks to a transfer from the State. They can use the UI scheme as an

[34]For this comparison, I am only able to use gross spending as revenues cannot be disaggregated by tenure in the UI accounts.

instrument for social peace, without bearing the cost of such a strategy, and without internalising it in the conditions of the breach of the contract.

The direct cost of this behaviour is doubled-up with an indirect cost, as receiving higher benefits itself influences the duration of the subsequent unemployment spell. Measuring the effect of the UI scheme on unemployment duration is challenging, precisely because the bunching observed implies that there is a selection issue when ones wants to compare populations on both sides of the cutoff. Although I am not able to fully distinguish the selection effect from the pure moral hazard effect of the CSP, a first intention-to-treat estimate suggests that the workers who bunch have also longer unemployment spells, triggering again additional cost to the UI.

The analysis in terms of individual and firms characteristics reveals that, keeping incentives constant, workers more likely to bunch, and then to take advantage of the UI design, are more educated, more skilled, and better integrated to the labour market (with higher earnings and working hours). Representation structures do not seem to favour bunching. In this setting, I identify a mostly individual bargaining process, where those that are the less in difficulty on the labour market are more able to mobilise the bargaining resources and to get a higher compensation. This finding raises some questions on the efficiency of the UI at targeting the population most in need and further away from the labour market.

References

Addison, John T and Paulino Teixeira, "The economics of employment protection," *Journal of Labor research*, 2003, *24* (1), 85–128.

_ , Claus Schnabel, and Joachim Wagner, "The course of research into the economic consequences of German works councils," *British journal of industrial relations*, 2004, *42* (2), 255–281.

_ , Paulino Teixeira, and Thomas Zwick, "German works councils and the anatomy of wages," *ILR Review*, 2010, *63* (2), 247–270.

Baguelin, Olivier and Delphine Remillon, "Unemployment insurance and management of the older workforce in a dual labor market: Evidence from France," *Labour Economics*, 2014, *30*, 245–264.

_ et al., "Dismissals scheduling and the employment of older workers," *Economics Bulletin*, 2016, *36* (4), 2443–2453.

Baily, Martin Neil, "Some aspects of optimal unemployment insurance," *Journal of Public Economics*, 1978, *10* (3), 379–402.

Baron, David P, "Credence attributes, voluntary organizations, and social pressure," *Journal of Public Economics*, 2011, *95* (11), 1331–1338.

Bassanini, Andrea and Romain Duval, "Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions. OECD Economics Department Working Papers No. 486.," *OECD Publishing (NJ1)*, 2006.

Bénabou, Roland and Jean Tirole, "Individual and corporate social responsibility," *Economica*, 2010, *77* (305), 1–19.

Bouvier, A, "Quels salariés parviennent à négocier leur indemnité de rupture conventionnelle ?," *DARES Analyses*, 2017.

Breda, Thomas, *Les représentants du personnel*, Presses de Sciences Po, 2016.

Brown, Kristine M, "The link between pensions and retirement timing: Lessons from California teachers," *Journal of Public Economics*, 2013, *98*, 1–14.

Card, David, Raj Chetty, and Andrea Weber, "The spike at benefit exhaustion: Leaving the unemployment system or starting a new job?," *American Economic Review*, 2007, *97* (2), 113–118.

Chetty, Raj, "A general formula for the optimal level of social insurance," *Journal of Public Economics*, 2006, *90* (10), 1879–1901.

_ , John N Friedman, Tore Olsen, and Luigi Pistaferri, "Adjustment costs, firm responses, and micro vs. macro labor supply elasticities: Evidence from Danish tax records," *The quarterly journal of economics*, 2011, *126* (2), 749–804.

Christofides, Louis N and Chris J McKenna, "Unemployment insurance and moral hazard in employment," *Economics Letters*, 1995, *49* (2), 205–210.

Diamond, Rebecca and Petra Persson, "The long-term consequences of teacher discretion in grading of high-stakes tests," Technical Report, National Bureau of Economic Research 2016.

Doornik, Bernardus Nazar Van, David Schoenherr, and Janis Skrastins, "Unemployment Insurance, Strategic Unemployment, and Firm-Worker Collusion," 2018.

Fraisse, Henri, Francis Kramarz, and Corinne Prost, "Labor disputes and labor flows," 2011.

Goupille-Lebret, Jonathan and Arturo Infante, "Behavioral Responses to Inheritance Tax: Evidence from Notches in France," *Journal of Public Economics*, 2018, *168*, 21–34.

Green, David A and W Craig Riddell, "Qualifying for unemployment insurance: An empirical analysis," *The Economic Journal*, 1997, pp. 67–84.

Grund, Christian and Andreas Schmitt, "Works councils, wages and job satisfaction," *Applied Economics*, 2011, *45* (3), 299–310.

_ and Johannes Martin, "The Role of Works Councils for Severance Payments," 2017.

_ , _ , and Andreas Schmitt, "Works councils, quits and dismissals in Germany," *German Journal of Human Resource Management*, 2016, *30* (1), 53–75.

Hübler, Olaf and Uwe Jirjahn, "Works councils and collective bargaining in Germany: the impact on productivity and wages," *Scottish Journal of Political Economy*, 2003, *50* (4), 471–491.

Jäger, Simon, Benjamin Schoefer, and Josef Zweimüller, "Marginal jobs and job surplus: Evidence from separations and unemployment insurance," Technical Report, Working Paper 2018.

Kleven, Henrik J and Mazhar Waseem, "Using notches to uncover optimization frictions and structural elasticities: Theory and evidence from Pakistan," *The Quarterly Journal of Economics*, 2013, p. qjt004.

Kleven, Henrik Jacobsen, "Bunching," *Annual Review of Economics*, 2016, *8* (1), 435–464.

Luo, Xueming and Chitra Bhanu Bhattacharya, "Corporate social responsibility, customer satisfaction, and market value," *Journal of marketing*, 2006, *70* (4), 1–18.

Maggio, Marco Di and Amir Kermani, "The importance of unemployment insurance as an automatic stabilizer," Technical Report, National Bureau of Economic Research 2016.

McCrary, Justin, "Manipulation of the running variable in the regression discontinuity design: A density test," *Journal of Econometrics*, 2008, *142* (2), 698–714.

Micco, Alejandro et al., "The economic effects of employment protection: evidence from international industry-level data," 2006.

Oyer, Paul and Scott Schaefer, "Layoffs and litigation," *The RAND Journal of Economics*, 2000, pp. 345–358.

Pareliussen, Jon Kristian, "Surmonter les vulnérabilités des systèmes d'assurance chômage," 2014, (1131).

Rebollo-Sanz, Yolanda, "Unemployment insurance and job turnover in Spain," *Labour Economics*, 2012, *19* (3), 403–426.

Saez, Emmanuel, "Do taxpayers bunch at kink points?," *American Economic Journal: Economic Policy*, 2010, *2* (3), 180–212.

Schmieder, Johannes F and Till Von Wachter, "The effects of unemployment insurance benefits: New evidence and interpretation," *Annual Review of Economics*, 2016, *8*, 547–581.

Schmitz, Jan and Jan Schrader, "Corporate social responsibility: A microeconomic review of the literature," *Journal of Economic Surveys*, 2015, *29* (1), 27–45.

Serverin, E and Julie Valentin, "Licenciement et recours aux prud'hommes, questions de mesure," *L'emploi en ruptures, Paris, Dalloz*, 2009, pp. 121–138.

Tuit, Sander and Jan C van Ours, "How changes in unemployment benefit duration affect the inflow into unemployment," *Economics Letters*, 2010, *109* (2), 105–107.

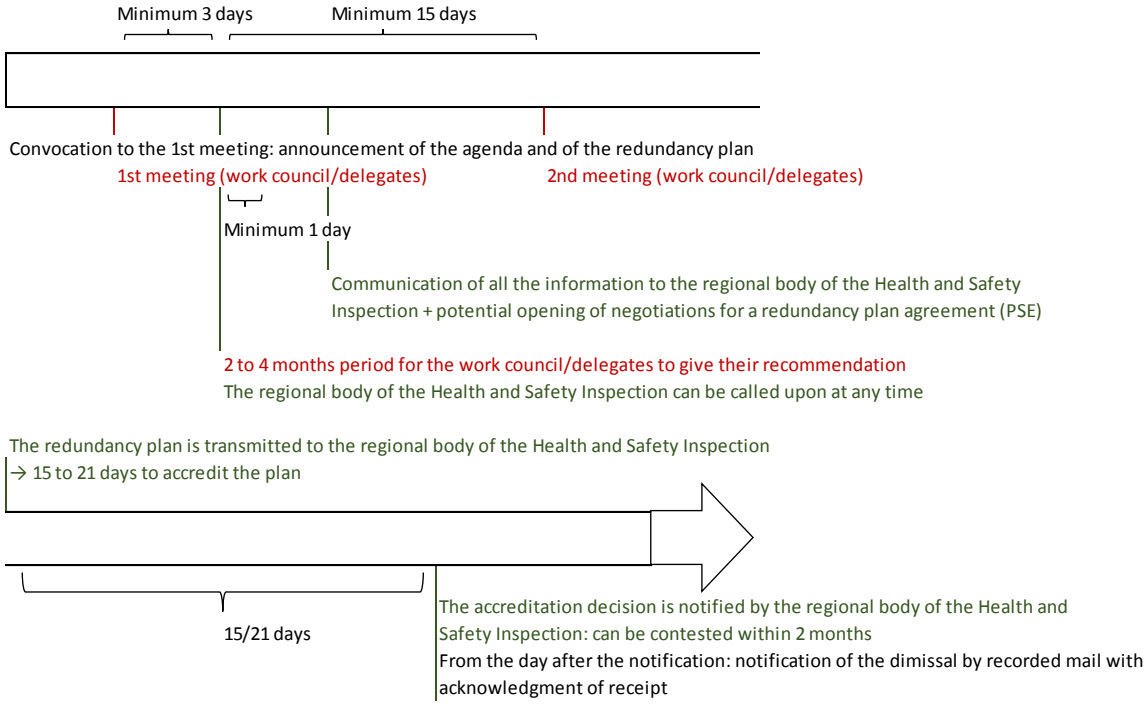
Unedic, "Note Eclairages numéro 10, licenciés économiques et CSP, una analyse comparée," Technical Report, Unedic 2015.

_ , "Bilan financier du CSP: une baisse des dépenses d'allocation par bénéficiaire," Technical Report, Unedic 2018.

Vuong, Quang H, "Likelihood ratio tests for model selection and non-nested hypotheses," *Econometrica: Journal of the Econometric Society*, 1989, pp. 307–333.

Appendix A Legal dimissal timeline

Figure 11: Economic layoff procedure



General procedure for firms with more than 10 employees.

Appendix B Decision to Accept the CSP

Table 16: Consequences of accepting the CSP and their valuation

All workers accepting the CSP	Guidance and counselling	+ / - : depending on preferences
	No waiting period	+
	Less contributions on CSP benefits with respect to ARE	+
	Right to accept very short-term contracts limited	-
If seniority ≥ 365 days	No advance notice or compensation in lieu of notice	+ : can be felt difficult to keep on working in the firm while knowing you are laid-off - : If the return to the labour market anticipated as quick, the worker can use hours of job-search provided for in most of the collective agreements during his notice
	80% replacement rate VS 57.4% to 75%	+++

Appendix C Descriptive statistics on laid-off workers accepting the CSP

Appendix D A bunching response to CSP incentives

Table 17: Characteristics of laid-off workers accepting or refusing the CSP

	Refuse CSP	Accept CSP	Difference (1)-(2)
Age	41.002	42.207	-1.205***
			(0.237)
Proportion of female	0.370	0.426	-0.056***
			(0.001)
Level of education	5.970	6.636	-0.666***
			(0.005)
Proportion of unskilled workers	0.079	0.053	0.026***
			(0.001)
Proportion of unskilled employees	0.091	0.057	0.034***
			(0.001)
Proportion of skilled workers	0.245	0.183	0.063***
			(0.001)
Proportion of skilled employees	0.468	0.545	-0.077***
			(0.001)
Proportion of intermediate occupations	0.029	0.041	-0.012***
			(0.001)
Proportion of executives	0.088	0.122	-0.033***
			(0.001)
Tenure	2576.101	2995.626	-419.525***
			(7.799)
Firm size	63.622	91.544	-27.922***
			(0.856)
Industry and agriculture	0.205	0.213	-0.009***
			(0.001)
Building, Retail, Food and accomodation	0.478	0.440	0.038***
			(0.001)
Services and temporary work	0.317	0.347	-0.029***
			(0.001)
Observations	280,076	356,274	636,350

** p<0.05, ** p<0.01, *** p<0.001*
NOTE: Education ranges from 1 (no education) to 10 (5 years or more of higher education).

Table 18: Determinants of the probability to accept the CSP

	Probability of accepting the CSP
Age	0.00003**
	(0.00001)
Female	0.0141***
	(0.00157)
Level of education	0.0363***
	(0.00039)
Unskilled employee	-0.0309***
	(0.00394)
Skilled worker	0.0152***
	(0.00323)
Skilled employee	0.0824***
	(0.00310)
Intermediate occupation	0.0969***
	(0.00477)
Executive	0.0516***
	(0.00375)
Tenure	0.00001***
	(2.44e-07)
Firm size	0.00004***
	(2.03e-06)
Building, Retail, Food and accomodation	0.0024
	(0.00195)
Services and temporary work	-0.0115***
	(0.00210)
Constant	0.2432***
	(0.00392)
R^2	0.040
Observations	468,212

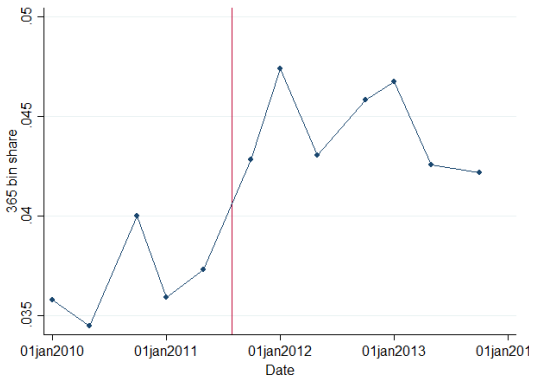
** p<0.05, ** p<0.01, *** p<0.001*
NOTE: Education ranges from 1 (no education) to 10 (5 years or more of higher education). The reference category is unskilled worker in the manufacturing or agriculture sector.

Table 19: Log discontinuity estimates

Time period	Threshold	Log difference
September 2009 - September 2011	365 days	.157***
		(.021)
	730 days	.319***
		(.022)
July 2011 - September 2011	365 days	.067
		(.072)
	730 days	.154*
		(.081)
September 2011 - November 2011	365 days	.315***
		(.060)
	730 days	.174***
		(.067)
December 2011 - February 2012	365 days	.284***
		(.059)
	730 days	.146**
		(.068)
March 2012 - May 2012	365 days	.350***
		(.060)
	730 days	.174**
		(.069)
June 2012 - August 2012	365 days	.332***
		(.063)
	730 days	.040
		(.069)

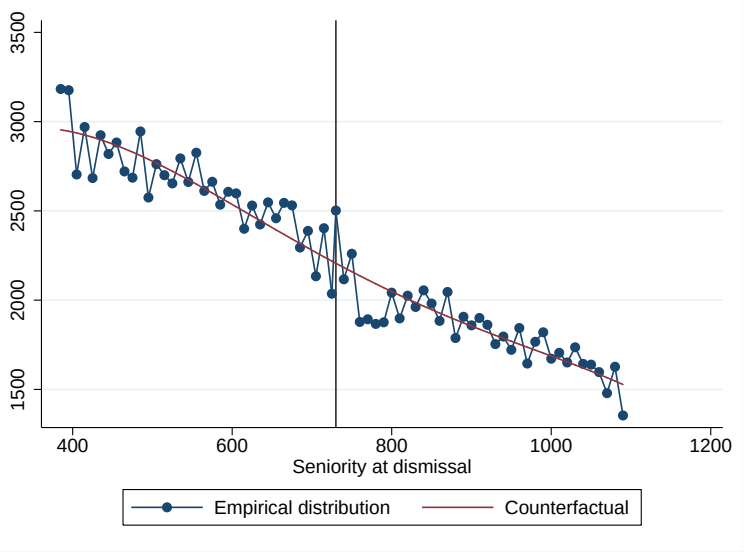
This table gives the log difference in density at the one-year and two-years cutoffs for different periods of time. It shows that the jump in density evolves in accordance with the legal changes in the UI incentives.

Figure 12: Evolution of the share of workers laid-off with a seniority lying in the bunching window (2010-2013)



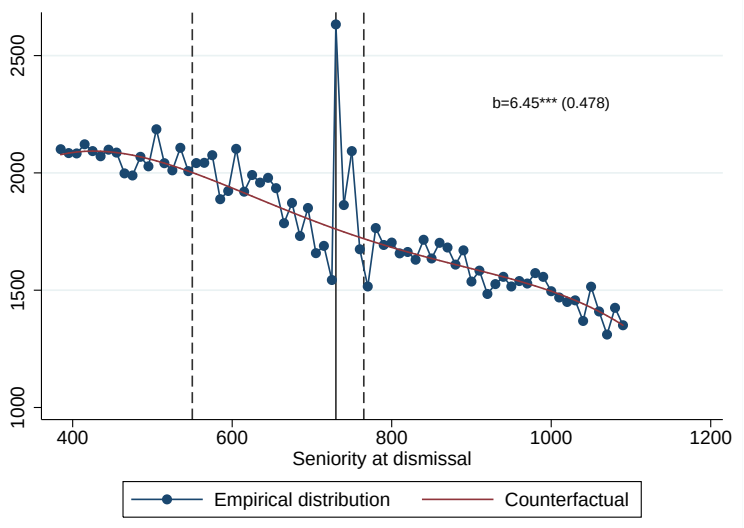
Source: FNA
The bunching window is defined as the 365-397 days seniority bracket, in accordance with the estimation of section 5. The share of workers laid-off within the bunching window increases markedly at the moment when the notch moved from the two-years to the one-year threshold.

Figure 13: Empirical and counterfactual distributions of seniority at layoff, October 2011-September 2014, 2y cutoff



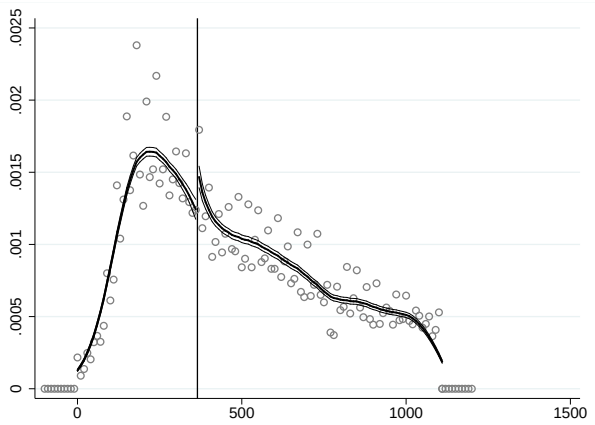
Source: FNA.
Binsize: 10. The figure exhibits no significant bunching at the notch, other than related to a round-number effect.

Figure 14: Empirical and counterfactual distributions of seniority at layoff, August 2009-August 2011, 2y cutoff



Source: FNA.
Binsize: 10. The counterfactual distribution has been computed by fitting a 4^{th} order polynomial, excluding an area around the notch, and extrapolating the distribution in the excluded area. The excluded area upper bound has been determined visually where the bunching stops. The lower bound has been found through an iterative process so that the excess and missing masses equalise. The figure exhibits significant bunching at the notch, similar to the one observed at the one-year cutoff between October, 2011 and September 2014.

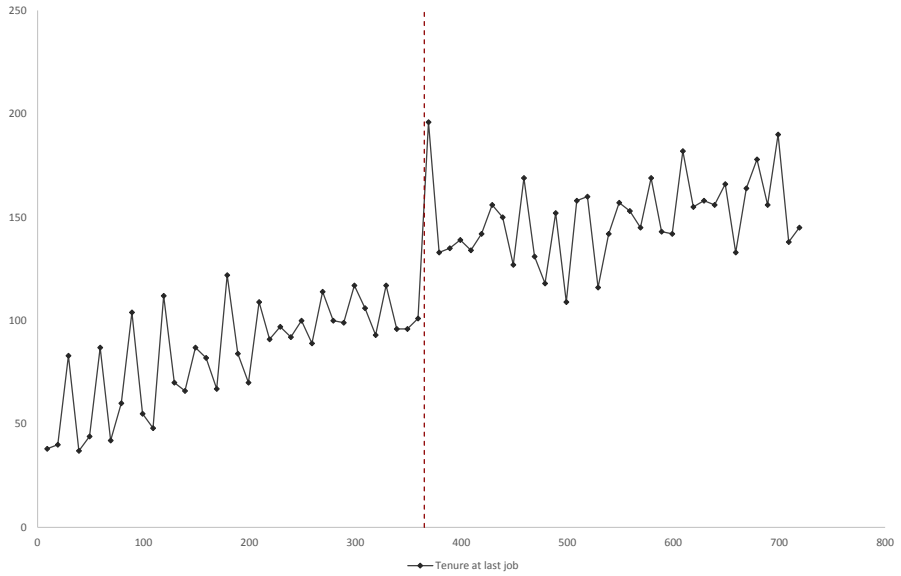
Figure 15: Mc Crary test on employers who did not offer the CSP



Source: FNA
NOTE: It is reasonable to think that employers who did not offer the CSP – while they have the legal obligation to – were not involved in bargaining over the extension of the contract for employees to get the higher CSP benefits. For them, we do not observe significant bunching other than related to a round-number effect (no hole before the cutoff or mass after). It provides additional evidence that the bunching is a response to CSP incentives.

Appendix E Discontinuity in the separation rate

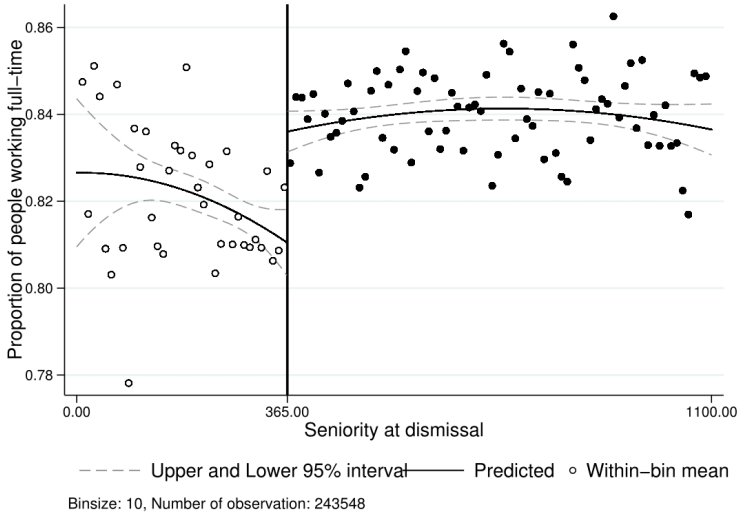
Figure 16: Tenure distribution of all eligible laid-off workers (France, 2011-2014)



Source: FNA. Binsize: 10.
SAMPLE: The whole population of laid-off people in firms of less than 1,000 employees between October, 2011 and September, 2014. The data comes from the mandatory form each employer in a firm of 50 employees or more has to return to the administration to inform on the employment flows. It confirms that the discontinuity in the tenure distribution observed in the UI data does not come from a discontinuity in the UI registration rate, but from a discontinuity in the separation rate.

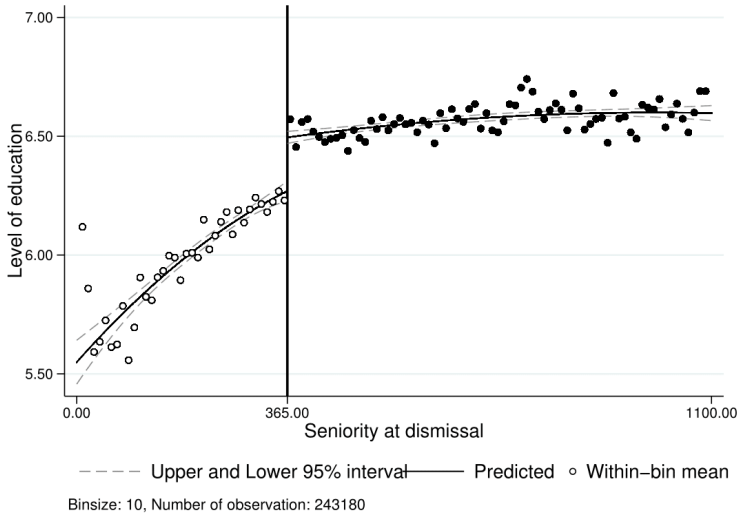
Appendix F Typical Buncher Profile

Figure 17: Distribution of the proportion of full-time workers with respect to seniority (France, 2011-2014)



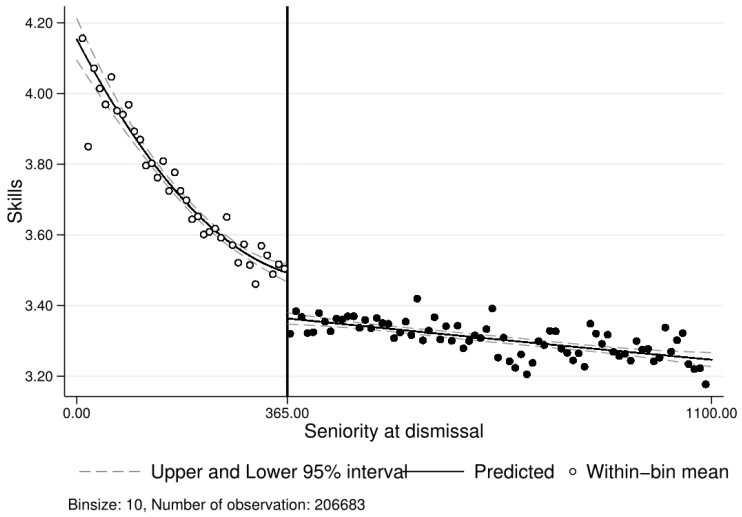
Source: FNA.
SAMPLE: The whole population of unemployed persons eligible to the CSP entering unemployed between October, 2011 and September, 2014. Binsize: 10, bandwidth: 100.

Figure 18: Distribution of the education level with respect to seniority (France, 2011-2014)



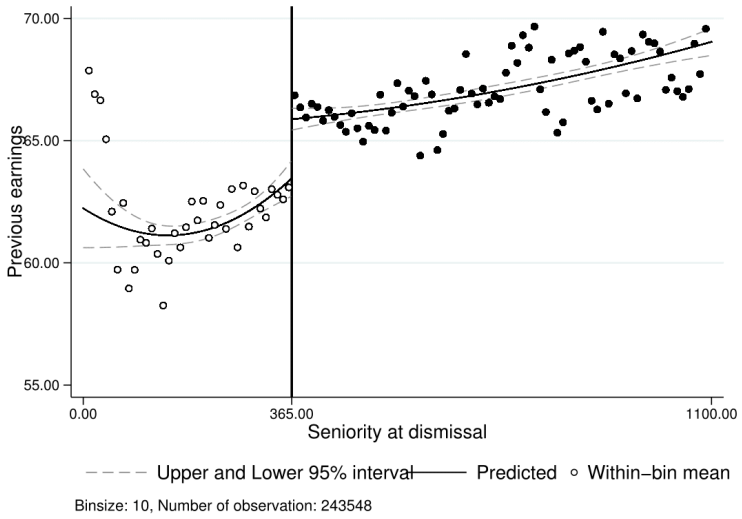
Source: FNA.
SAMPLE: The whole population of unemployed persons eligible to the CSP entering unemployed between October, 2011 and September, 2014. Binsize: 10, bandwidth: 100.
The education variable is coded on a scale from 0 (no education) to 10 (5 years or more of higher education).

Figure 19: Distribution of the level of qualification with respect to seniority (France, 2011-2014)



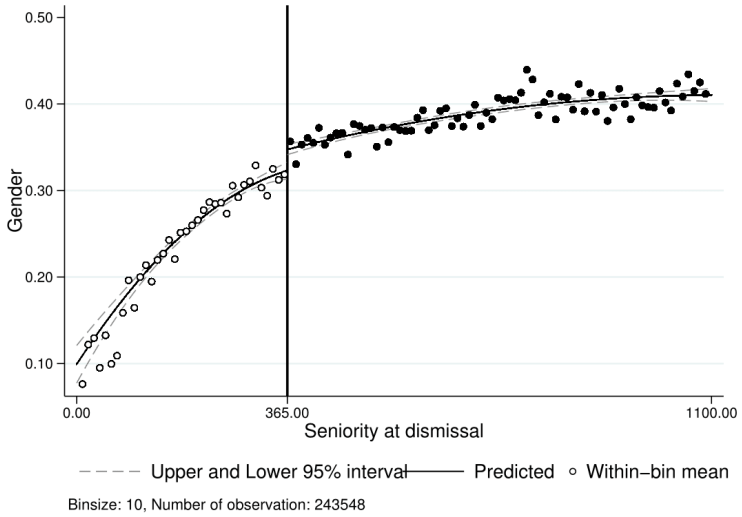
Source: FNA.
SAMPLE: The whole population of unemployed persons eligible to the CSP entering unemployed between October, 2011 and September, 2014. Binsize: 10, bandwidth: 100.
The skills variable is coded on a scale from 6 (unskilled worker) to 1 (executive).

Figure 20: Distribution of the level of previous earnings with respect to seniority (France, 2011-2014)



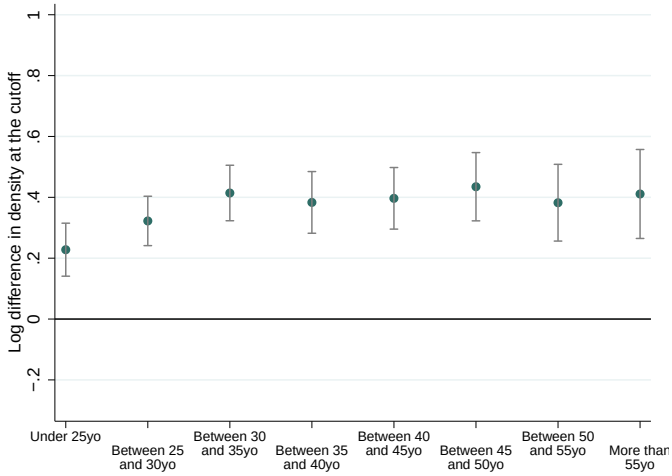
Source: FNA.
SAMPLE: The whole population of unemployed persons eligible to the CSP entering unemployed between October, 2011 and September, 2014. Binsize: 10, bandwidth: 100.

Figure 21: Distribution of the proportion of women with respect to seniority (France, 2011-2014)



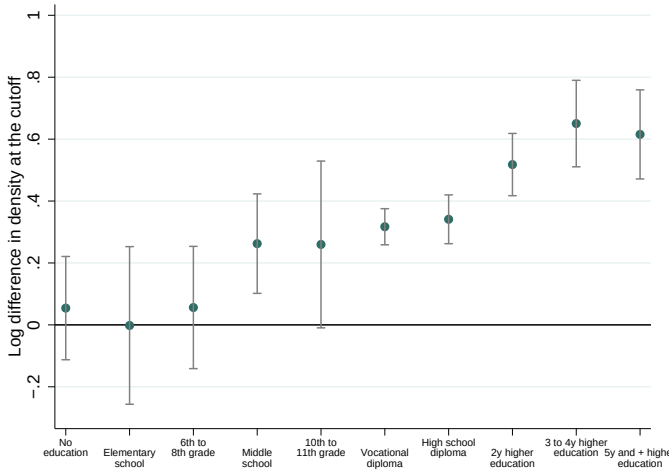
Source: FNA.
SAMPLE: The whole population of unemployed persons eligible to the CSP entering unemployed between October, 2011 and September, 2014. Binsize: 10, bandwidth: 100.

Figure 22: McCrary test by age group



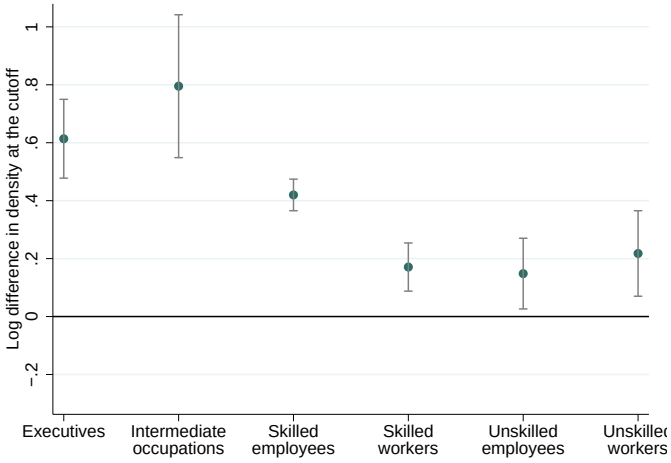
Source: FNA.
Binsize: 10, bandwidth: 100.

Figure 23: McCrary test by education group



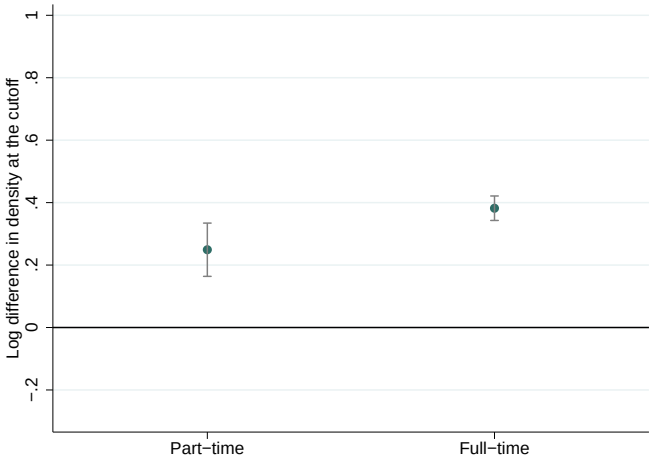
Source: FNA.
Binsize: 10, bandwidth: 100.

Figure 24: McCrary test by qualification group



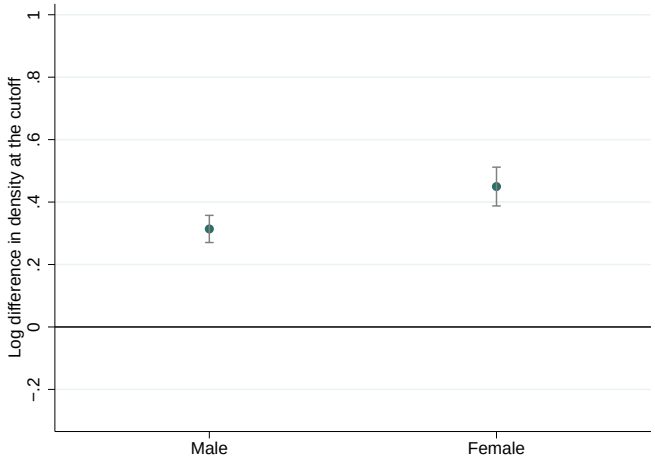
Source: FNA.
Binsize: 10, bandwidth: 100.

Figure 25: McCrary test by working time group



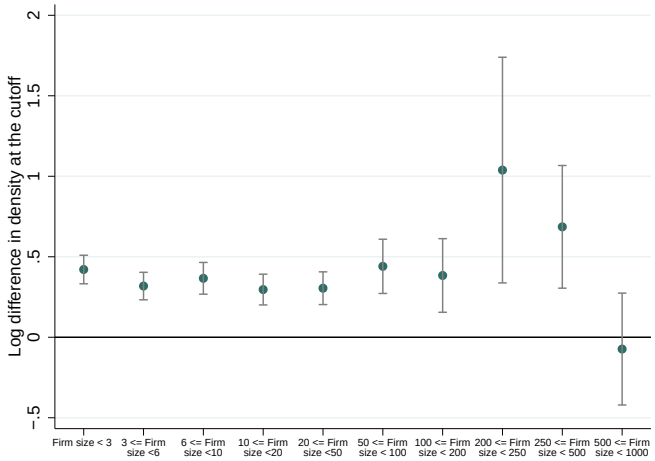
Source: FNA.
Binsize: 10, bandwidth: 100.

Figure 26: McCrary test by gender



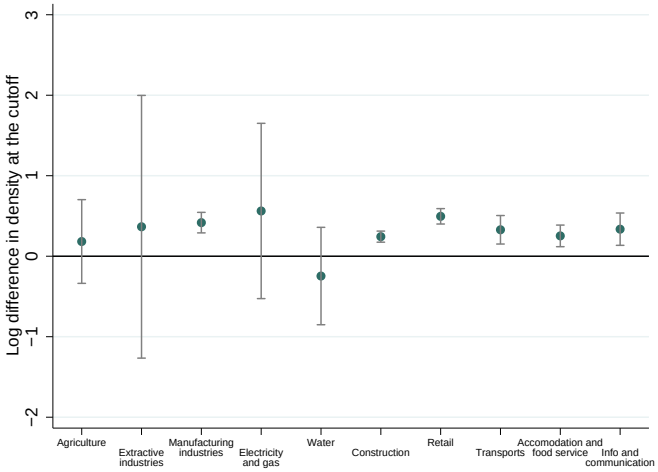
Source: FNA.
Binsize: 10, bandwidth: 100.

Figure 27: McCrary test by firm's size group



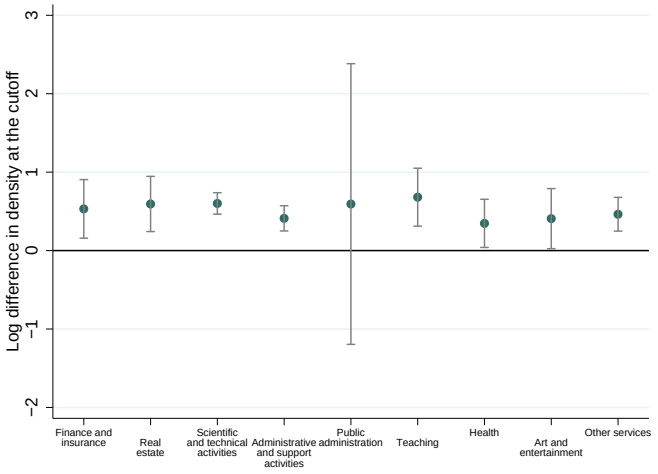
Source: FNA.
Binsize: 10, bandwidth: 100.

Figure 28: McCrary test by sector



Source: FNA.
Binsize: 10, bandwidth: 100.

Figure 29: McCrary test by sector



Source: FNA.
Binsize: 10, bandwidth: 100.

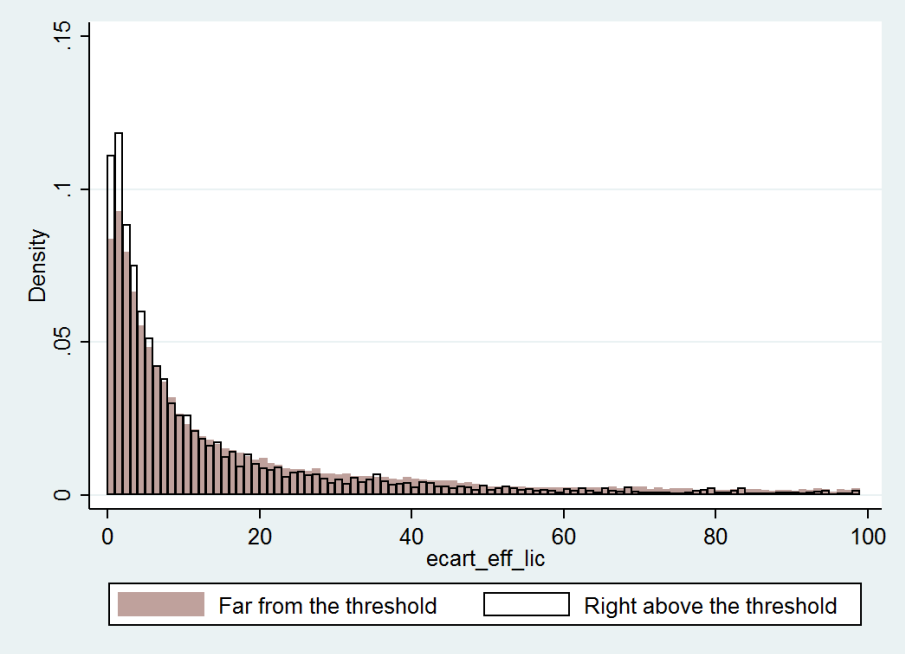
Appendix G Evidence of Contract Extension

Table 20: Distribution of the number of workers laid-off by the same firm

Number of laid-off workers	Over the same 30-day spell		Over the full period	
	As a share of layoff spells	As a share of workers	As a share of firms	As a share of workers
1	68.49%	34.56%	58.79%	23.18%
2	16.41%	16.56%	18.68%	14.73%
3	6.19%	9.36%	8.23%	9.73%
4	2.95%	5.95%	4.26%	6.72%
5	1.71%	4.30%	2.52%	4.97%
6	1.06%	3.20%	1.68%	3.99%
7	0.69%	2.45%	1.14%	3.15%
8	0.49%	2.00%	0.84%	2.64%
9	0.35%	1.61%	0.60%	2.14%
10 and more	1.66%	20.01%	3.26%	28.76%

The full period of observation is October, 2011-September, 2014. A layoff spells gathers all layoffs occurring on the same 30-day period, as this is the legal period to assess whether the redundancy is collective or not, and the number of people laid-off.

Figure 30: Difference between total workforce size and number of laid-off workers by distance to the cutoff (October 2011-September 2014)



Source: FNA.
NOTE: The figure displays the difference between the total number of people layoff as part of the same plan, and total workforce size. The layoff plan gathers all layoffs from the same employer on a 30 days period. Being right above the cutoff means having a seniority lying between 365 and 380 days (included).
LECTURE: Workers right above the cutoff have higher chances of being laid-off in firms shutting down (with a difference equal to 0 or 1). I argue that those firms are more eager to grant contract extension as they have nothing to loose anymore. This is then compatible with the bargaining scenario.

Table 21: Layoff rank within the same redundancy plan

Layoff rank	Far from the threshold		Right above the threshold	
	Seniority < 365 or *Seniority* > 380	*Seniority* < 365 or *Seniority* > 390	365 ≤ *Seniority* ≤ 380	365 ≤ *Seniority* ≤ 390
1^{st} position	47.9%	47.9%	35.1%	35.7%
2^{nd} position	30.2%	30.1%	40.6%	41%
3^{rd} position	22%	22%	24.4%	23.3%

NOTE: I consider all the plans gathering more than one layoff at different dates from the same employer within a 30 days period
(excluding single layoff plans and layoffs where the employer identifier is missing). I then compute the chronological order of the
layoffs and I compare the rank according to the distance of the seniority from the threshold.
It shows that workers right above the cutoff are more frequently laid-off in the last position, suggesting that employers wait for them to
cross the cutoff and start by dismissing other employees.

Table 22: Proportion of firms shutting down

Proportion of firms whose workforce = Nb of people laid-off		**Proportion of firms whose workforce = Nb of people laid-off ± 5**		**Proportion of firms whose workforce = Nb of people laid-off ± 10**	
Seniority < 365 or *Seniority* > 380	365 ≥ *Seniority* ≤ 380	*Seniority* < 365 or *Seniority* > 380	365 ≥ *Seniority* ≤ 380	*Seniority* < 365 or *Seniority* > 380	365 ≥ *Seniority* ≤ 380
6.9%	10.9%	35.3%	47.8%	48.6%	62.8%
Seniority < 365 or *Seniority* > 390	365 ≥ *Seniority* ≤ 390	*Seniority* < 365 or *Seniority* > 390	365 ≥ *Seniority* ≤ 390	*Seniority* < 365 or *Seniority* > 390	365 ≥ *Seniority* ≤ 390
6.9%	10.4%	35.3%	47.1%	48.5%	62.2%

NOTE: Firms shutting down are defined as firms with a number of people laid-off approximately equal to the firm size.
Workers close to the cutoff are more frequently present in firms shutting down. It is compatible with my hypothesis that employers
in firms shutting down have nothing to loose anymore and are therefore more willing to grant the contract extension.

Appendix H Other adjustment mechanisms

Other channels of optimization could possibly be found on the employer's side when looking at substitutions between types of contract termination. As part of the economic dismissal procedure, employers are constrained by some requirements based on workforce size and number of people dismissed. To escape those requirements, they could substitute economic dismissals with other forms of contract termination less administratively demanding, such as contract termination by mutual agreement for example. Interacting both channels of optimization – economic dismissal right after the one-year threshold and substitutions between types of contract termination – two hypothesis could be rationalised: (i) First, we could observe that in those firms with a high propensity to bunch, employers and human resources managers have an accurate enough knowledge of the legislation and bargaining practices to use all potential channels of optimisation of the conditions of contract termination, among which substitution; (ii) on the other hand, it could also be the case that in firms with a high propensity to bunch, having a high proportion of WLER accepting the CSP leads to a high reduction in the number of people considered as dismissed when examining the different requirements in terms of workforce size and number of WLER.[35] Then, firms resorting to contract extension to avoid the economic dismissal procedure requirements do not necessarily need to take advantage of other channels of optimisation.[36] In other words, there could be some degree of complementarity and substitution between the two channels of optimisation.

A descriptive analysis performed on the sample of firms having at least one WLER between October, 2011 and September, 2014 provides some information on the validity of both hypothesis.

Table 23 shows the proportion of each contract termination type over the 30 days preceding and the 30 days following any layoff for economic reason, as 30 days is the relevant period to assess the administrative constraints the employer has to abide by. Contrasting the results by propensity to bunch indicates that being a buncher[37] is predicted to decrease the proportion of WLER and to increase other types of contract termination within the same 30 days spell. Adopting a definition of bunching at the firm level (having at least one buncher dismissed for economic reasons over the whole sample period) does not change the results (Table 24).

This descriptive evidence would be in favor of more complementarity than substitution between the two channels of optimization. In firms used to negotiate the contract termination date, and then more prone to bunching, employers resort more to other types of contract termination, in particular "end of fixed-term contract" and "other dismissals", that are typically contract terminations motives under the control of the employer.

[35] Economic dismissal plans involve some requirements that depend on total workforce size and on the number of people dismissed for economic reason on a 30 days period. Once a WLER has accepted the CSP, he is not considered anymore as dismissed for economic reasons with regards to those requirements. Contract termination is considered as the result of a mutual agreement, then the worker does not enter the counting of the number of people dismissed. This is an additional motive for accepting the extension of the work contracts for workers right below the threshold, although not the only one, as bunching is particularly strong in small firms (under 50 employees) not targeted by those requirements.

[36] In addition to this counting agreement, it is also much less likely that workers benefiting from training, support for a career change and financial compensation would sue their employers. Creating the conditions for the workers to benefit from the CSP is then a way to reduce the dismissal cost.

[37] The propensity to bunch here is defined as having a seniority lying in the bunching area.

This evidence is only suggestive, as we cannot rule out the possibility that the higher proportion of other types of contract termination is not due to strategic behavior to escape administrative constraints related to economic dismissals, but to other factors.

An additional piece of evidence in line with previous results is that this pattern is also pronounced when restricting to firms with a workforce size above 50 and having done at least one economic dismissal over the period, as this is the threshold defining the obligation of setting up a redundancy scheme (Table 25). More precisely, firms with 50 employees or more are more likely to use "end of fixed-term contract" and "mutually agreed termination" as motives for the breach of the contract, two motives that are even more controllable by employers.

To better capture the pure effect of the propensity to bunch, I regress the share of each termination type on a variable indicating that the firm is a bunching type – that is to say has at least one WLER bunching over the whole period – controlling for workforce size and the total number of workers laid-off for economic reasons within the same redundancy plan. Being in a bunching firm has a significant impact on the distribution of types of contract termination – although coefficients are rather small – and is predicted to increase the total number of terminations within the same spell by 15, translating into a 50% rise (Table 26). In particular, being in a bunching firm makes the proportions of end fixed-term contracts, of other dismissals and of end of temporary contracts increase respectively by 0.5, 0.9 and 0.1 percentage points, while the proportion of workers laid-off for economic reasons is predicted to decrease by 1.3 percentage points.

It means that being in a firm that has some of its employees bunching – and then potentially used to negociate the terms and conditions of contract terminations – keeping the workforce size and the total number of WLER in the same episode fixed, is associated to larger scale termination spells, where the additional persons leaving the firm separate through other motives that may be easier to implement and less administratively demanding than the economic dismissal. These results may indicate that some firms concentrate the use of several complementary mechanisms to escape administrative constraints and make separation easier.[38] In the specific context of economic dismissals, negotiation over tenure at dismissal appears as the main mechanism, but is often coupled with the use of various types of contract terminations.

The same findings could also be interpreted another way: if other types of dismissals are often less administratively constraining, they are associated to a higher risk of trial to the Labour Court (Oyer and Schaefer, 2000; Serverin and Valentin, 2009). The filing rate – although not perfectly estimated – amounts to 2% for economic dismissals, versus more than 20% for other types of dismissals (Figures 31 and 32).

Then, firms with a high share of dismissals for personal motive could use the extension of the contract for those laid-off for economic reasons within the same dismissal spell as a way to reduce total dismissal cost. Indeed, granting the contract extension for WLER deters them from appealing Labour Court as they receive an immediate compensation. We can even

[38] Again, it has to be emphasized here that those findings are only suggestive. Indeed, it could be the case that for example bunching firms are also employing more fixed-term contracts and have a higher turnover, without the purpose of releasing the administrative and financial constraints related to job separation.

think that employers would choose, among the workers they want to dismiss, those with the highest damages potential to dismiss them under the economic motive, while granting them the extension of the contract, in order to limit the risk of paying high damages (Fraisse et al., 2011). If the correlation highlighted by Tables 23 to 26 does not allow to decide between those two mechanisms, it suggests a link between the optimisation through substitution of separation motives and through extension of work contracts.

Table 23: Proportion of different contract termination types within the same episode for bunching and non bunching individuals

	Buncher	Non buncher	Difference
End of fixed-term contract	0.03	0.02	-0.002**
			(0.001)
End of temporary contract	0.00	0.00	-0.000
			(0.000)
End of trial period on employer's initiative	0.00	0.00	-0.001***
			(0.000)
End of trial period on employee's initiative	0.00	0.00	0.000
			(0.000)
Economic dismissal	0.94	0.95	0.011***
			(0.002)
Mutually agreed termination	0.01	0.01	-0.002***
			(0.000)
Other dismissals	0.02	0.02	-0.006***
			(0.001)
Quits	0.00	0.00	0.000
			(0.000)
Other motives	0.00	0.00	0.000
			(0.000)

Standard erros in parentheses.
** p<0.05, ** p<0.01, *** p<0.001*
Note: the sample is drawn from people having registered to UI and may not be representative of the distribution of contract termination motives in general. For example, people quitting are usually not entitled to receive UI benefits and may be underrepresented in this sample.

Table 24: Proportion of different contract termination types within the same episode for bunching and non bunching firms

	Buncher	Non buncher	Difference
End of fixed-term contract	0.33	0.25	-0.002**
			(0.001)
End of temporary contract	0.13	0.01	-0.000
			(0.000)
End of trial period on employer's initiative	0.01	0.01	-0.001***
			(0.000)
End of trial period on employee's initiative	0.00	0.00	0.000
			(0.000)
Economic dismissal	0.14	0.43	0.011***
			(0.002)
Mutually agreed termination	0.04	0.09	-0.002***
			(0.000)
Other dismissals	0.30	0.19	-0.006***
			(0.001)
Quits	0.02	0.02	0.000
			(0.000)
Other motives	0.03	0.01	0.000
			(0.000)

Standard erros in parentheses.
** p<0.05, ** p<0.01, *** p<0.001*
Note: the sample is drawn from people having registered to UI and may not be representative of the distribution of contract termination motives in general. For example, people quitting are usually not entitled to receive UI benefits and may be underrepresented in this sample.

Table 25: Proportion of different contract termination types within the same episode depending on workforce size

	Firms with workforce size ≥ 50	Firms with workforce size < 50	Difference
End of fixed-term contract	0.33	0.21	-0.115*** (0.001)
End of temporary contract	0.02	0.01	-0.010*** (0.000)
End of trial period on employer's initiative	0.02	0.01	-0.006*** (0.000)
End of trial period on employee's initiative	0.00	0.00	-0.000*** (0.000)
Economic dismissal	0.34	0.41	0.073*** (0.001)
Mutually agreed termination	0.11	0.07	-0.034*** (0.000)
Other dismissals	0.16	0.26	0.099*** (0.001)
Quits	0.02	0.01	-0.005*** (0.000)
Other motives	0.01	0.01	-0.001*** (0.000)

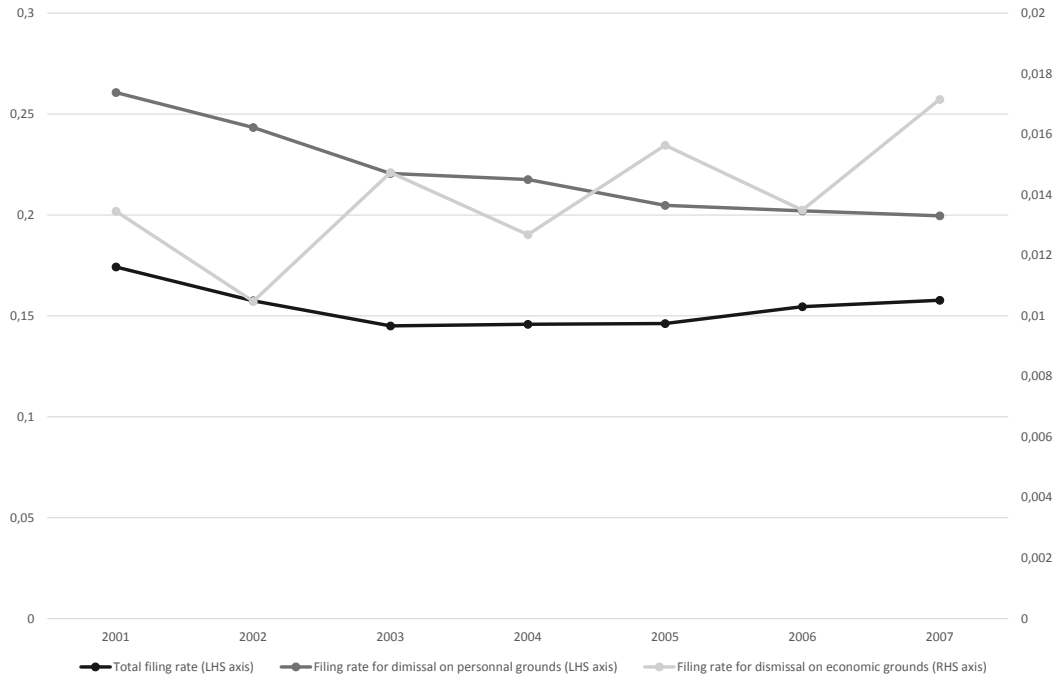
Standard erros in parentheses.
** p<0.05, ** p<0.01, *** p<0.001*
Note: the sample is drawn from people having registered to UI and may not be representative of the distribution of contract termination motives in general. For example, people quitting are usually not entitled to receive UI benefits and may be underrepresented in this sample.

Table 26: Proportion of different contract termination types within the same episode

	End of fixed-term contracts	End of temporary contracts	End of trial period (employer's decision)	End of trial period (employee's decision)	Mutually agreed termination	Other dismissals	Quits	Economic dismissals	Total number of terminations
Propensity to bunch	0.005***	0.001***	0.000***	-0.000	-0.001***	0.009***	0.000***	-0.013***	15.242***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.013)
Workforce size	0.000***	0.000***	0.000***	0.000**	0.000***	-0.000***	0.000***	-0.000***	-0.033***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total number of economic dismissals within the same episode	-0.002***	-0.000***	-0.000***	-0.000***	-0.001***	-0.001***	-0.000***	0.004***	1.017***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)
Constant	0.234***	0.010***	0.014***	0.000***	0.084***	0.240***	0.015***	0.396***	29.664***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.079)

Standard erros in parentheses.
** p<0.05, ** p<0.01, *** p<0.001*
Note: the sample is drawn from people having registered to UI and may not be representative of the distribution of contract termination motives in general. For example, people quitting are usually not entitled to receive UI benefits and may be underrepresented in this sample.

Figure 31: Evolution of the rate of labour disputes brought to court

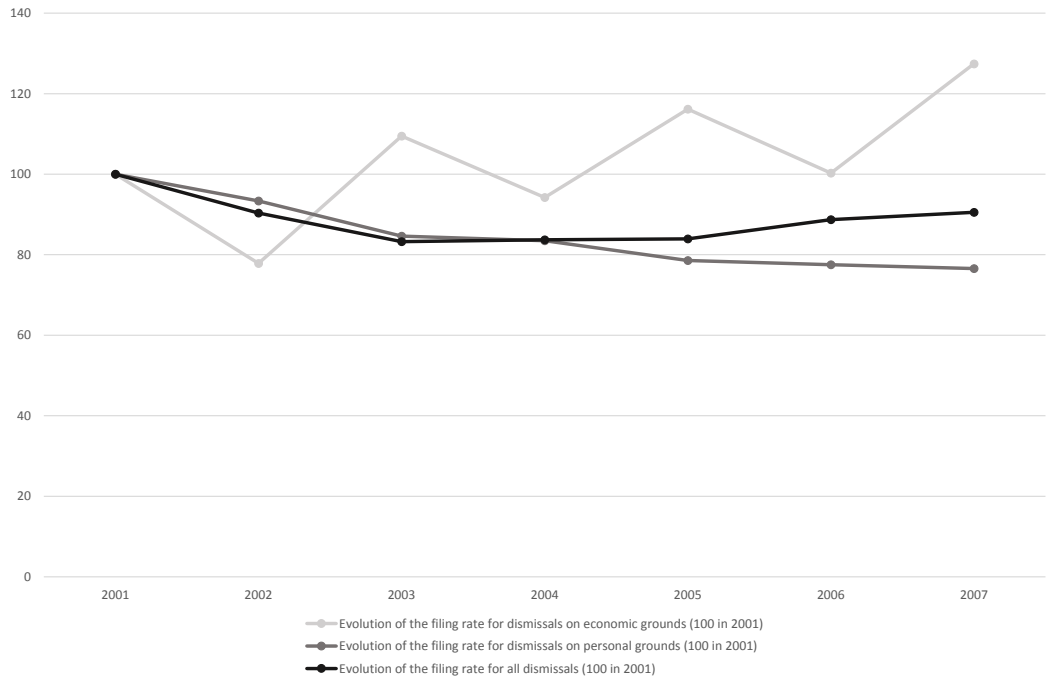


Source: Computation based on figures in Serverin and Valentin (2009)

One concern could be that findings on complementarity of optimisation mechanisms are due to some mechanical difference in the probability of firing a worker for economic reason for firms having or not having already fired a worker for economic reason within the bunching window in the same 60 days period.

The use of this restricted period 30 days before and 30 days after each separation is justified by the legal criteria using the number of people dismissed in the same 30 days period to assess the legal requirements the emloyer has to bear. However, one could argue that a firm firing a worker for economic reason within the bunching window could be mechanically more prone to fire a worker for the same reason in the following days as this type of dismissal is often collective, or less prone as it has just fired a worker for the same motive. It could then induce a difference in either way with firms who did not fire a worker for economic reasons in the same period in the proportion of dismissals for economic reasons. This concern is partly alleviated when adopting a definition of bunching at the firm level – that is having one worker dismissed for economic reason within the bunching window – as the bunching worker has not been necessarily dismissed within the 30 days period we are looking at.

Figure 32: Evolution of the rate of labour disputes brought to court (Base 100)



Source: Computation based on figures in Serverin and Valentin (2009)

Nonetheless, to solve any potential issue related to this, another method has been applied to determine whether a bunching firm display a different pattern in terms of separation motives, even beyond this 30-days period. The pre-CSP period (September, 2009 - September, 2011) has been used to draw a sample of bunching firm, based on all dissmisals for economic reasons that has occurred over the whole pre-CSP period. A firm is defined as bunching when it has dismissed at least one worker for economic reason within the 730-765 days seniority window, as the strategic threshold is at 2 years under the pre-CSP regime. The control group is made of firms having dismissed at least one worker for economic reason within a 694-729 days seniority window over the same period.

Those same treated and control firms are studied over the post-CSP period (October, 2011 - October, 2014) to determine the impact of bunching on the probability to bunch again in the future, and on the distribution of separation motives.

Having been a bunching firm in the past is associated to a 1.3 percentage point increase in the probability of bunching in the future, from a baseline probability of 6% (Table 27). Therefore, it represents a substantial and significant 22% increase, even after controlling for

Table 27: Impact of having bunched in the past on the probability of bunching in the future

	Bunching in the 2011- 2014 period	
	(1)	(2)
Having bunched	0.01340**	0.01272*
	0.00673	0.00671
Firm's workforce size		0.00005**
		0.00002
Observations	5,866	5,865

Standard erros in parentheses.
** p<0.05, ** p<0.01, *** p<0.001*
Note: to maintain a reasonable sample size, bunching in the future has been defined in a less restrictive way as bunching in the past. It corresponds to dismissing a worker for economic reason within the bunching window as opposed to dismissing for economic reason anywhere outside the bunching window (and not only for seniority values right below the bunching cutoff).

firm size. It suggests that optimisation is concentrated among a pool of strategic firms that keep on finding ways of optomising the conditions of the separation in the future.

Regarding the separation motives, firms that have bunched in the past are predicted to use more end of fixed-term contract, dissmisals for economic reasons and dismissal for personnal reasons (Table 28). It seems that bunching firms use other forms of flexible contracts or separations that are under the employer control than non bunching firms, although some can be administratively constraining and with a substantial risk of judicial proceedings such as the dismissal for personnal motive. However, we also notice that bunching firms experience more separations in total (18 more on average on the 2011-2014 period), which could also influence positively the total number of separations for each motive.

Therefore, I focus on proportions of each motive relative to total separations in Table 29. Bunching firms resort more, proportionnaly, to end of temporary contract of trial periods, which are little costly forms of separations. They also exhibit a higher proportion of workers laid-off for economic reasons, which is in line with the justification of bunching as a way to escape administrative constraints related to the number of economis dismissals. Indeed, in firms with a higher number of workers laid-off for economic reasons in both absolute and relative terms, employers may choose to extend the work contract strategically to increase the probability of the workers choosing the CSP, therefore excluding them from the counting of the total number of workers laid-off for economic reasons.

Table 28: Impact of having bunched in the past on the number of different contract termination types

	Having bunched
Economic dismissals	1.7089***
	(0.4885)
End of fixed-term contract	3.7980**
	(1.4892)
End of temporary contract	0.1531
	(0.1192)
Mutually agreed terminations	0.5322**
	(0.2260)
Dismissals for personal motive	10.3763***
	(3.4218)
End of trial period (employer's initiative)	0.1657**
	(0.0698)
End of trial period (employee's initiative)	0.0030*
	(0.0016)
Quits	0.2522**
	(0.1071)
Other motives	1.4820
	(1.5633)
Total number of separations	18.4512***
	(5.5667)
Observations	12,719

Standard erros in parentheses.
** p<0.05, ** p<0.01, *** p<0.001*
Note: the sample is drawn from people having registered to UI and may not be representative of the distribution of contract termination motives in general. For example, people quitting are usually not entitled to receive UI benefits and may be underrepresented in this sample.

Table 29: Impact of having bunched in the past on the proportion of different contract termination types

	Economic dismissal (1)	End of fixed-term contract (2)	End of temporary contract (3)	Mutually agreed termination (4)	End of trial period (employer's initiative) (5)	End of trial period (employee's initiative) (6)	Quits (7)	Other motives (8)
Having bunched	0.0201**	0.0040	0.0022**	0.0098	0.0149***	0.0027**	0.0095**	0.0084***
	(0.0089)	(0.0070)	(0.0011)	(0.0061)	(0.0041)	(0.0012)	(0.0041)	(0.0033)
Observations	12,719	12,719	12,719	12,719	12,719	12,719	12,719	12,719

Standard erros in parentheses.
** p<0.05, ** p<0.01, *** p<0.001*
Note: the sample is drawn from people having registered to UI and may not be representative of the distribution of contract termination motives in general. For example, people quitting are usually not entitled to receive UI benefits and may be underrepresented in this sample.

Those results, which are in line with previous ones focusing on the pattern of separation within the same 60 days episode, point again to some interactions between different optimisation mechanisms.

Appendix I Nash bargaining over the supra-legal severance payment

I consider the standard Nash bargaining framework where employers and employees maximise the product of their net utilities weighted by their respective bargaining power over t.

As a result, the total surplus is split so that the firm gets a share β (capturing its bargaining power) and the worker a share $1-\beta$.

This can be written as

$$t = t^0 - \beta[(P - SB - \alpha)d + \Delta C] + d(P - w) \tag{7}$$

$$\Leftrightarrow t^0 - t = d(w - P) + \beta \underbrace{[(P - SB - \alpha) + \Delta C]}_{\text{Total surplus}}$$

The last equation indicates that the severance payment the employee foregoes against the extension is made of two elements: the compensation for the wage cost triggered by the extension as the contract is not profitable anymore ($(w-P)d$), and the part of the surplus from the extension that comes down to the employer ($\beta[(P - SB - \alpha) + \Delta C]$).

Similarly, we restrict the set of possible solutions to those such that $t \geq 0$. If this condition is fulfilled, as well as condition (1), the job is extended and equation (7) describes how the surplus is split.

To illustrate how t varies with the bargaining power, I consider the two polar cases:

If $\beta = 1$, $t = d(SB + \alpha - w) - \Delta C + t^0$. The employer has a full bargaining power and gets the whole surplus, whereas the employee is as well of as in the no extension scenario.

If $\beta = 0$, $t = (P - w)d + t^0$. The employee gets the whole surplus and the employer is as well of as in the no extension scenario.

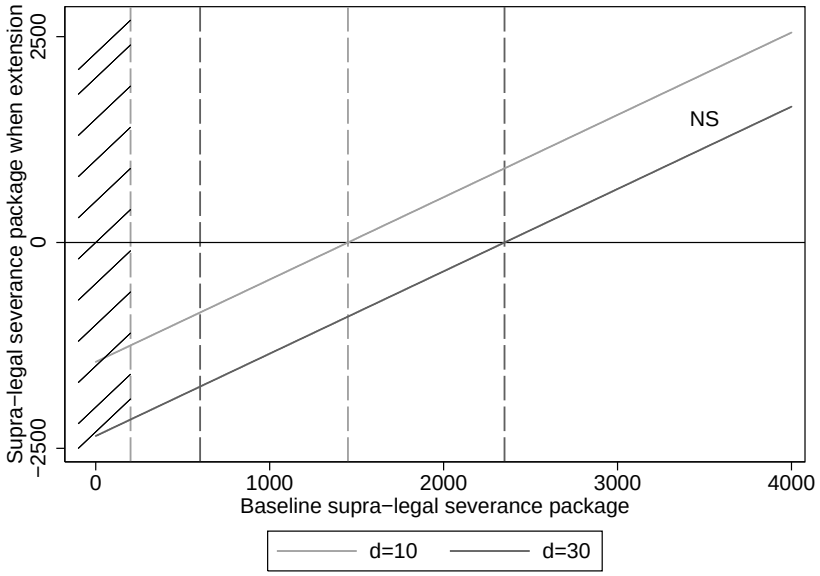
Conditions 1 and $t \geq 0$ imply that we necessarily have $t^0 + (P - w)d \geq 0$. It allows to characterise the boundary value of t^0 under which the extension is not possible for any value of β, and to highlight the role of t^0 in determining the propensity to bunch.

This boundary value writes:

$$t^0 = (w - P)d$$

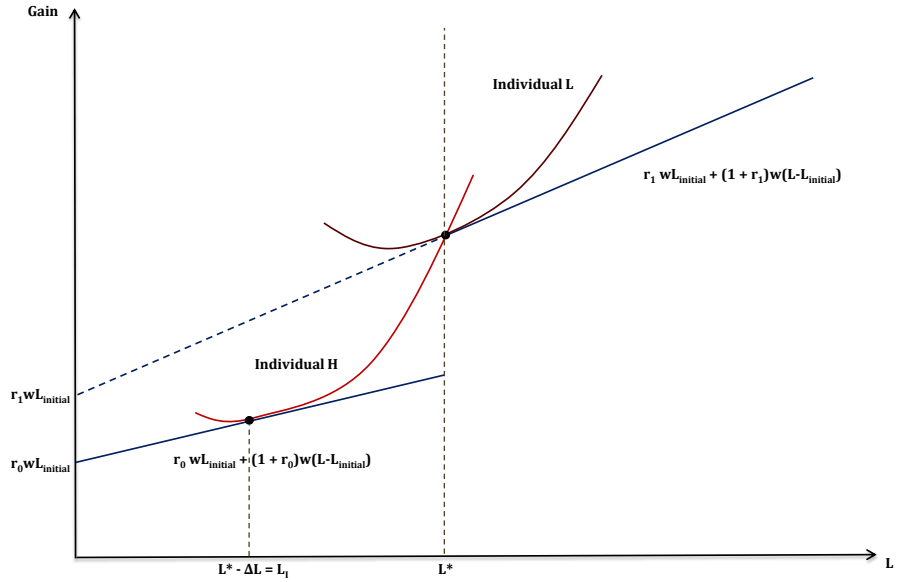
Graph I illustrates the restricted Nash bargaining solution such that $t \geq 0$. If we look at the light-grey lines ($d = 10$), we see that the dashed area corresponds to the area for which there is no solution such that $t \geq 0$, no matter the value of β. It corresponds to the cases where $t^0 < (w - P)d$. The area between the two light-grey dashed lines corresponds to cases where we could find a $t \geq 0$ but for lower values of β. The Nash solution cannot be implemented, whereas we can find a $t \geq 0$ such that the two parties will be at least as well-off with the extension than in the no extension scenario. In that sense, the model described in the core of the paper encompasses the Nash bargaining solutions. The light-grey solid line describes the Nash solution.

I reproduce the same lines for the case where $d = 30$, all other parameters being equal. It illustrates that, the higher the number of days of extension needed, the less likely it is that the employer and the employee settle an agreement.



Appendix J Upward Notch in the Budget Set

Figure 33: Notch in the budget set



The replacement rate jumps from r_0 to $r_0 + \Delta r = r_1$ at L^*, making all individuals located between $L^* - \Delta L^*$ and L^* on the pre-notch distribution bunch at the notch point. The marginal buncher is the one who is indifferent between the notch point L^* and the best interior solution L^I with $L^I < L^*$ after the introduction of the notch.

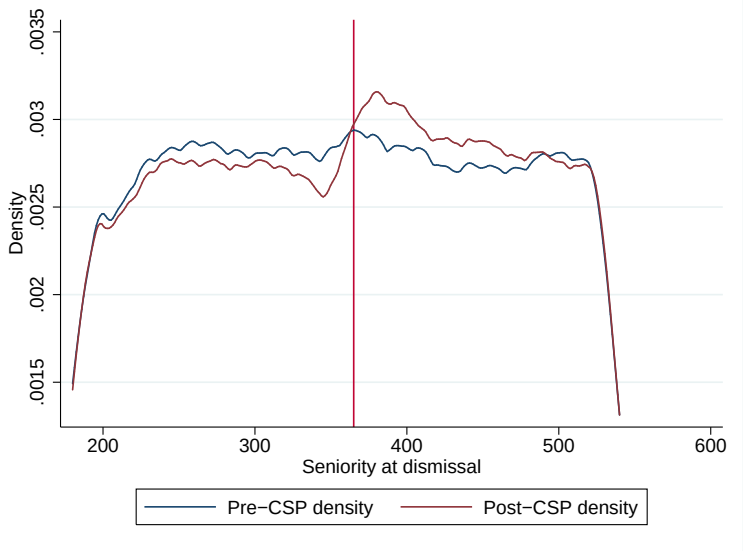
Table 30: Seniority count regression

Seniority	2.081***	2.105***	.598	.558	2.243***	1.308***
	(.227)	(.233)	(.342)	(.350)	(.114)	(.160)
$Seniority^2$	-.004**	-.004**	.002	.002	-.005***	-.003***
	(.001)	(.001)	(.002)	(.002)	(.0004)	(.001)
$Seniority^3$	1.68e-06	1.78e-06	-7.47e-06	-8.25e-06*	4.07e-06***	2.01e-06*
	(2.66e-06)	(2.79e-06)	(3.99e-06)	(4.20e-06)	(5.69e-07)	(7.97e-07)
$Seniority^4$	5.32e-10	5.15e-10	5.85e-09*	6.39e-09*	-1.20e-09***	-5.36e-10
	(1.81e-09)	(1.90e-09)	(2.72e-09)	(2.86e-09)	(2.56e-10)	(3.59e-10)
Bunching area below	-55.060***	-38.832**	-24.386	-18.560	-35.893***	-2.424
	(16.304)	(11.862)	(24.521)	(17.842)	(9.909)	(13.880)
Bunching area above	76.005***	43.048***	33.0277	5.216	44.572***	20.397
	(19.158)	(12.423)	(28.814)	(18.686)	(10.876)	(15.234)
Constant	-38.640**	-39.689***	32.551	33.477	-43.985***	7.974
	(11.828)	(11.905)	(17.789)	(17.907)	(8.976)	(12.572)
$L_u - L^*$	12	33	12	33	33	33
$L^* - L_l$	17	37	17	37	41	41
Period	Oct, 11 - Oct, 14	Oct, 11 - Oct, 14	Sep, 09 - Sep, 11	Sep, 09 - Sep, 11	Oct, 11 - Oct, 14	Sep, 09 - Sep, 11
Window	< 730	< 730	< 730	< 730	< 1100	< 1100

** p<0.05, ** p<0.01, *** p<0.001*

Appendix K Difference-in-bunching

Figure 34: Pre and Post-CSP seniority density around the notch (180-540 days)



Source: FNA. Seniority window: 180-540 days.
This graph shows that the density in the pre-CSP period is pretty flat in the bunching area, whereas we observe a clear hole before and a mass after the one-year threshold in the post-CSP density. It demonstrates that the pre-CSP density provides a good counterfactual distriution to measure the bunching exclusively related to the incentives created by the CSP.

Appendix L Heterogeneity by gain category

Table 31: Gain distribution of the sample under 2 years of tenure

Gain category	Number of observations	Share in total sample
$Gain < 10 ppts$	5,916	3.47%
$10 ppts \leq Gain < 15 ppts$	20,311	11.9%
$15 ppts \leq Gain < 20 ppts$	62,288	36.5%
$Gain \geq 20 ppts$	82,189	48.2%

This table presents the gain distribution of the sample under two years of tenure. The gain is defined as the difference in replacement rate between the standard benefit and the CSP benefit granted to those with a tenure of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. The majority of the sample would have a jump in replacement rate higher than 20 percentage points.

Table 32: Descriptive statistics by gain category

	$Gain < 10ppts$	$10ppts \leq Gain < 15ppts$	$15ppts \leq Gain < 20ppts$	$Gain \geq 20ppts$	Total
Sex					
Male	40.3	46.1	54.7	65.4	59.9
Female	59.7	53.9	45.3	34.6	40.1
Education level					
Not any education	7.7	7.6	5.4	3.6	4.6
Primary school	4.6	3.8	3.1	2.0	2.6
Primary school to 8^{th} grade	4.7	4.6	3.4	2.1	2.8
9^{th} grade	8.6	8.0	6.3	4.1	5.2
10^{th}-11^{th} grade	2.2	2.1	1.4	0.9	1.2
Vocational diploma (CAP/BEP)	39.2	40.9	45.1	35.8	39.3
High school diploma	18.8	19.9	20.3	18.1	19.0
2 years of higher education	8.1	8.1	9.9	16.6	13.6
3-4 years of higher education	2.2	1.6	1.5	8.8	5.7
5 years or more of higher education	3.9	3.4	3.4	7.9	6.0
Qualification					
Executives	0.6	0.4	1.0	17.9	10.7
Intermediate professions	0.4	0.6	1.2	5.4	3.5
Unskilled employees	22.0	16.7	10.2	3.7	7.2
Skilled employees	52.3	54.5	54.7	48.5	51.1
Unskilled workers	10.3	10.0	8.8	4.5	6.4
Skilled workers	14.5	17.8	24.0	20.1	21.1

This table presents descriptive statistics of the sample divided by gain categories. The gain is defined as the difference in replacement rate between the standard benefit and the CSP benefit granted to those with a tenure of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. Proportions of male, of highly educated and of highly skilled individuals increase with gain category.

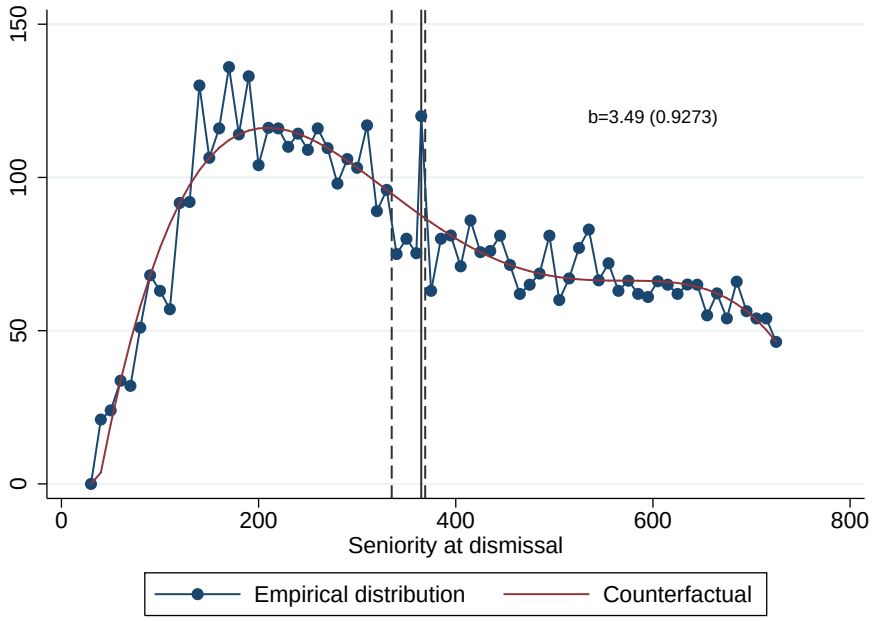
Table 33: Differences in observable characteristics by gain categories

	Age	Sex	Education level	Proportion of executives	Proportion of intermediate professions	Proportion of unskilled employees	Proportion of skilled employees	Proportion of unskilled workers	Proportion of skilled workers
2^{nd} gain category	1.0625*** (.1091)	-.0573*** (.0049)	.0202 (.0203)	-.0013 (.0033)	.0017 (.0021)	-.0526*** (.0029)	.0224*** (.0056)	-.0032 (.0027)	.0329*** (.0046)
3^{rd} gain category	2.0151*** (.1008)	-.144*** (.0046)	.279*** (.0188)	.0048 (.0031)	.0078*** (.0019)	-.1175*** (.0026)	.0246*** (.0052)	-.015*** (.0025)	.0954*** (.0042)
4^{th} gain category	5.8161*** (.0996)	-.2507*** (.0045)	1.0104*** (.0186)	.173*** (.0031)	.0496*** (.0019)	-.1827*** (.0026)	-.038*** (.0051)	-.0577*** (.0025)	.0557*** (.0042)
Constant	36.5246*** (.0980)	.5967*** (.0044)	5.6701*** (.01825)	.0055 (.003)	.0041* (.0019)	.2199*** (.0026)	.5228*** (.005)	.1029*** (.0025)	.1448*** (.0041)

** p<0.05, ** p<0.01, *** p<0.001*

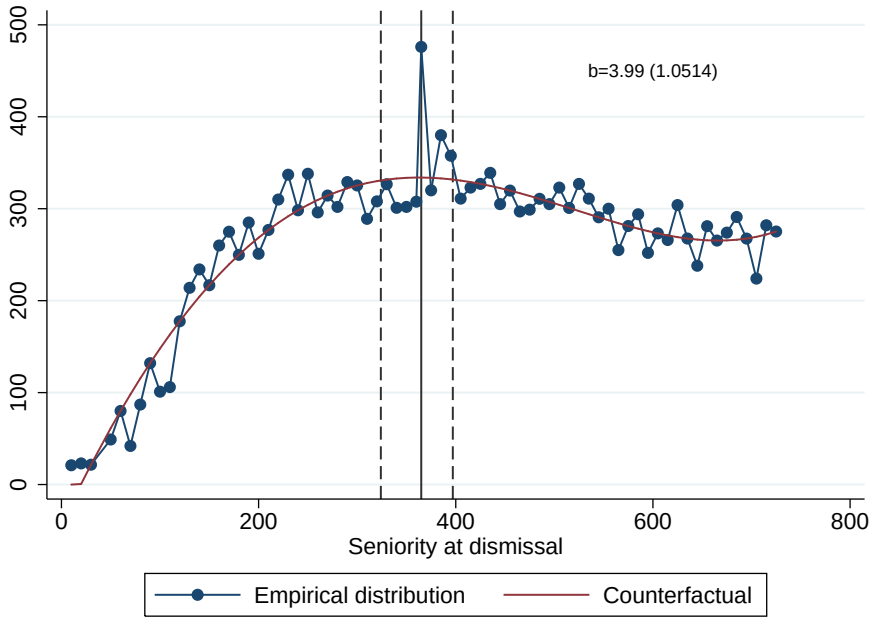
NOTE: The reference category is the "1^{st} gain category'. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings.

Figure 35: Empirical and counterfactual distributions of seniority at layoff, 1^{st} gain category (October 2011-September 2014)



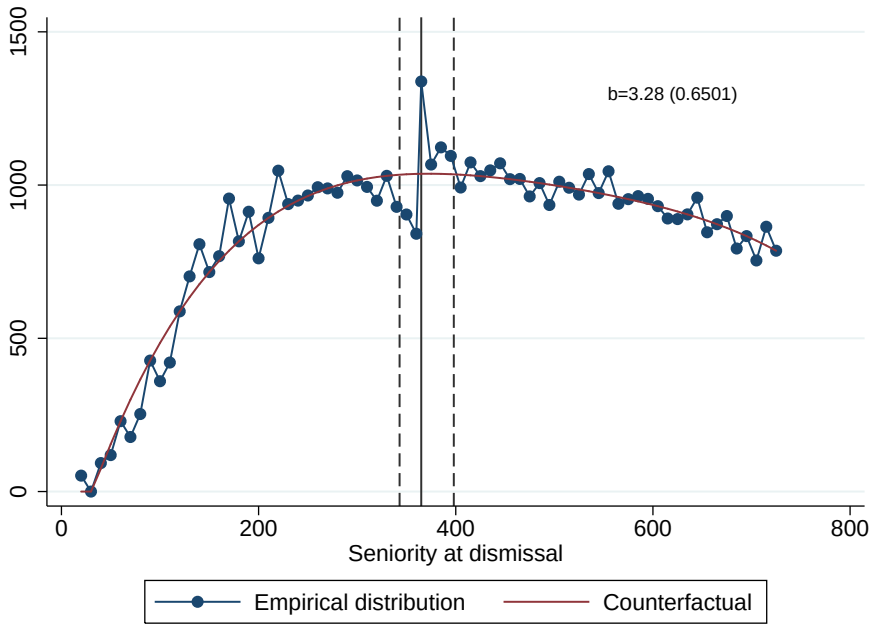
Source: FNA. Binsize: 10
The figure exhibits no significant bunching at the notch, other than related to a round-number effect. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. The first gain category corresponds to a gain lower than 10 percentage points. The bunching area upper bound is determined visually and corresponds to 369. The lower bound is found through an iterative process starting from the threshold value until the bunching and the missing masses equalise, and corresponds to 335.

Figure 36: Empirical and counterfactual distributions of seniority at layoff, 2^{nd} gain category (October 2011-September 2014)



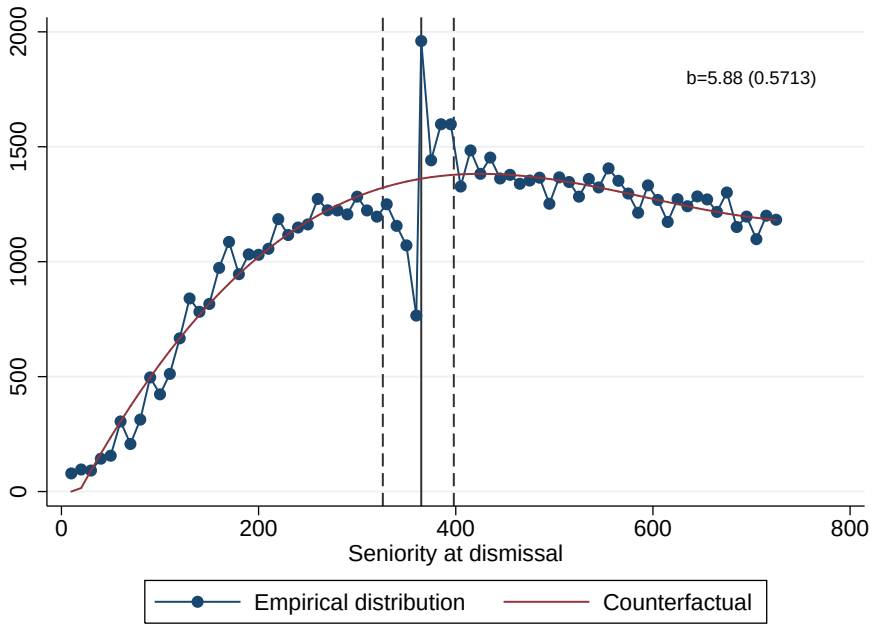
Source: FNA. Binsize: 10. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. The second gain category corresponds to a gain higher or equal to 10 percentage points and lower than 15 percentage points. The bunching area upper bound is determined visually and corresponds to 397. The lower bound is found through an iterative process starting from the threshold value until the bunching and the missing masses equalise, and corresponds to 324.

Figure 37: Empirical and counterfactual distributions of seniority at layoff, 3^{rd} gain category (October 2011-September 2014)



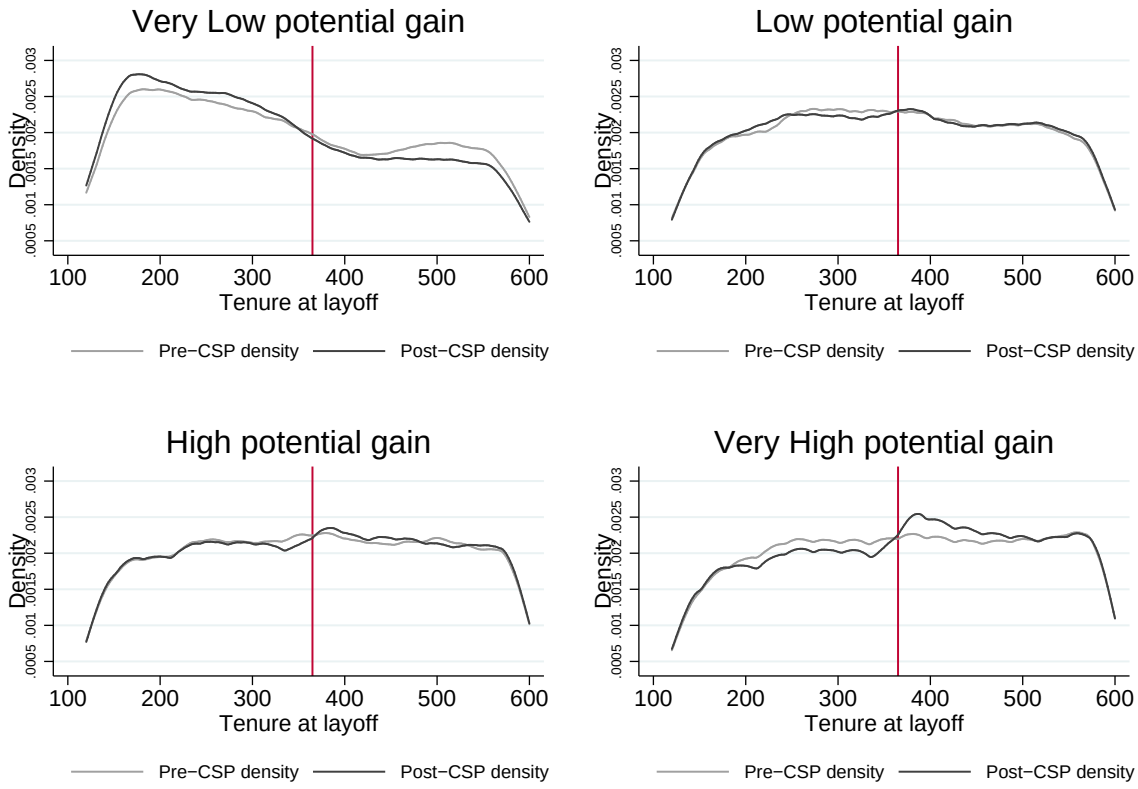
Source: FNA. Binsize: 10. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. The third gain category corresponds to a gain greater or equal to 15 percentage points and lower than 20 percentage points. The bunching area upper bound is determined visually and corresponds to 398. The lower bound is found through an iterative process starting from the threshold value until the bunching and the missing masses equalise, and corresponds to 343.

Figure 38: Empirical and counterfactual distributions of seniority at layoff, 4^{th} gain category (October 2011-September 2014)



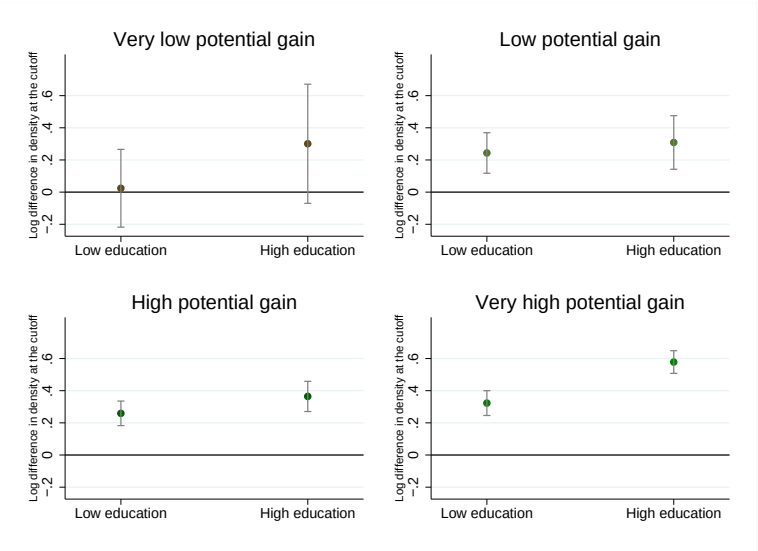
Source: FNA. Binsize: 10. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. The fourth gain category corresponds to a gain greater or equal to 20 percentage points. The bunching area upper bound is determined visually and corresponds to 398. The lower bound is found through an iterative process starting from the threshold value until the bunching and the missing masses equalise, and corresponds to 326.

Figure 39: Pre and Post-CSP seniority density around the notch by gain category



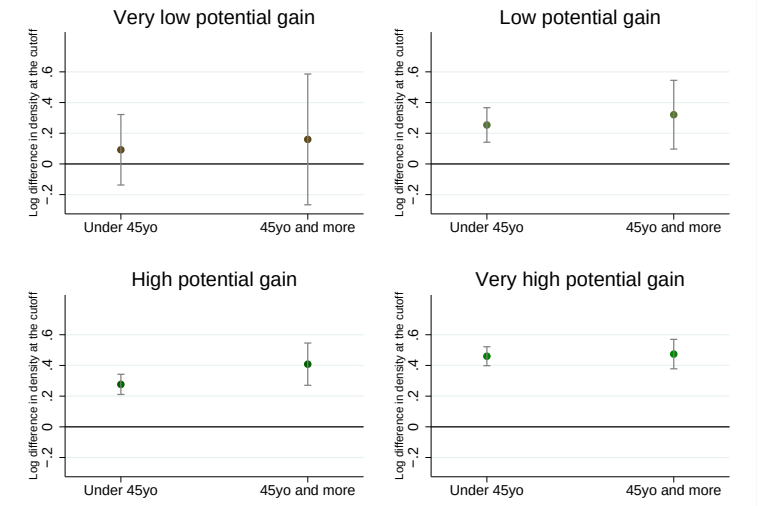
Source: FNA. Seniority window: 120-600 days.
This graph shows the density in the pre-CSP and post-CSP periods decomposed by gain categories. Consistently with elasticity estimates computed by gain category, it shows no bunching for the 1^{st} gain category, and a more and more pronounced bunching as the gain category increases. It means that the heterogeneity in bunching by gain categories highlighted by the elasticity estimates reflects a true heterogeneity in reponse, and not a heterogeneity in the counterfactual distribution.

Figure 40: Magnitude of the bunching by gain × education categories



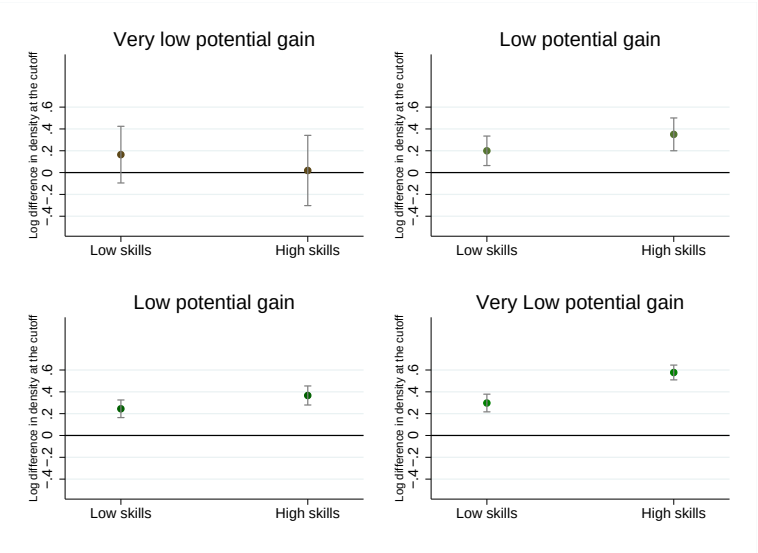
Source: FNA. Low education means less than the high school diploma. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. Very low potential gain stands for a gain lower than 10 percentage points, low potential gain for a gain between 10 and 15 percentage points, high potential gain for a gain between 15 and 20 percentage points, and very high potential gain for a gain higher than 20 percentage points.

Figure 41: Magnitude of the bunching by gain × age categories



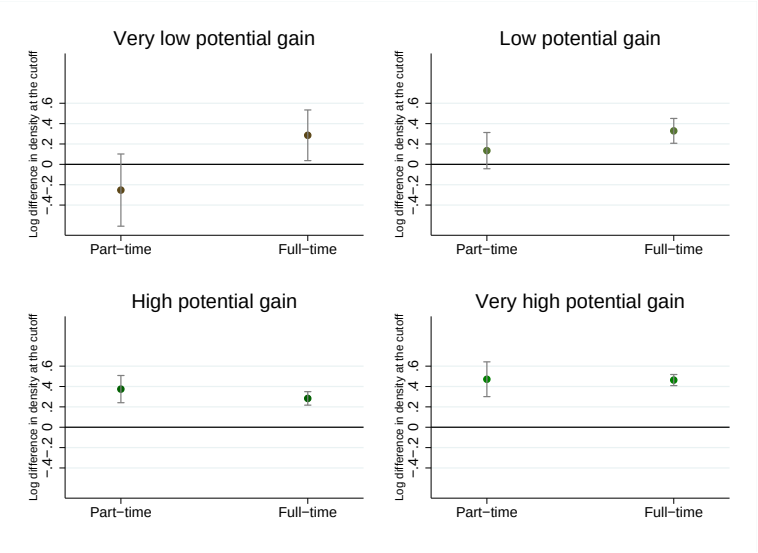
Source: FNA. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. Very low potential gain stands for a gain lower than 10 percentage points, low potential gain for a gain between 10 and 15 percentage points, high potential gain for a gain between 15 and 20 percentage points, and very high potential gain for a gain higher than 20 percentage points.

Figure 42: Magnitude of the bunching by gain × skills categories



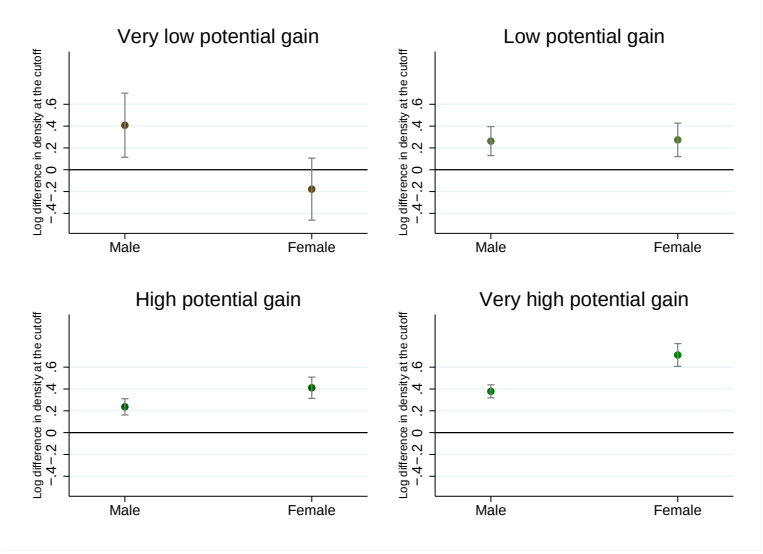
Source: FNA.
High skills include executives, intermediate occupations and skilled employees. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. Very low potential gain stands for a gain lower than 10 percentage points, low potential gain for a gain between 10 and 15 percentage points, high potential gain for a gain between 15 and 20 percentage points, and very high potential gain for a gain higher than 20 percentage points.

Figure 43: Magnitude of the bunching by gain × working times categories



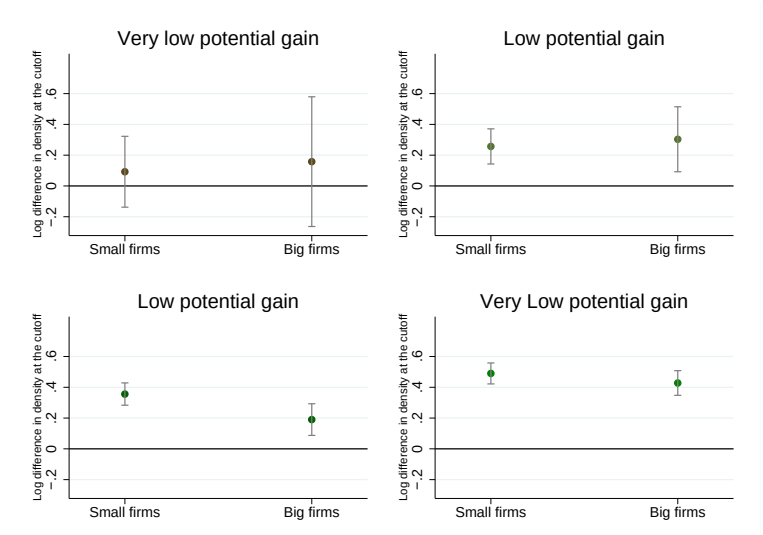
Source: FNA. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. Very low potential gain stands for a gain lower than 10 percentage points, low potential gain for a gain between 10 and 15 percentage points, high potential gain for a gain between 15 and 20 percentage points, and very high potential gain for a gain higher than 20 percentage points.

Figure 44: Magnitude of the bunching by gain × gender categories



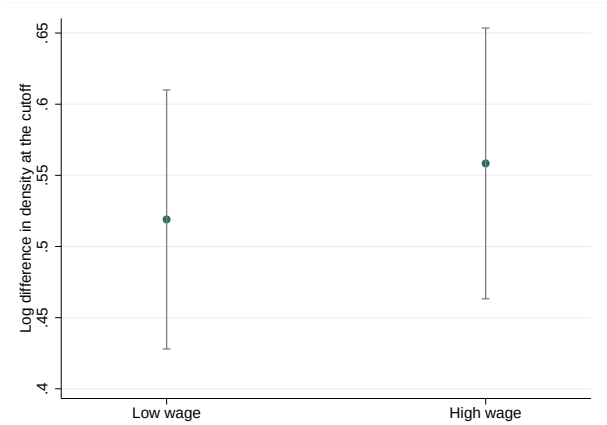
Source: FNA. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. Very low potential gain stands for a gain lower than 10 percentage points, low potential gain for a gain between 10 and 15 percentage points, high potential gain for a gain between 15 and 20 percentage points, and very high potential gain for a gain higher than 20 percentage points.

Figure 45: Magnitude of the bunching by gain × firm size categories



Source: FNA. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. Very low potential gain stands for a gain lower than 10 percentage points, low potential gain for a gain between 10 and 15 percentage points, high potential gain for a gain between 15 and 20 percentage points, and very high potential gain for a gain higher than 20 percentage points.

Figure 46: Magnitude of the bunching by wage half



Source: FNA.
The subpopulation with a wage above the threshold where the gap in replacement rates between the two types of benefits does not vary anymore is divided into wage half. The log difference in the seniority density is computed for each half.

Table 34: Elasticity estimates by gain and representation categories

		Gain category			
		$gain < 0.1$	$0.1 \leq gain < 0.15$	$0.15 \leq gain < 0.2$	$0.2 \geq gain$
Probability of having no representative within the firm	$p \leq 0.05$	.0154	.185	.0355	.0495
		(.3487)	(2.1677)	(.18)	(.2526)
	$0.05 < p \leq 0.1$	–	.011	.0062	.1074*
		–	(.1294)	(.015)	(.0642)
	$0.1 < p \leq 0.5$	–	–	.072	.0612*
		–	–	(.0568)	(.0329)
	$p > 0.5$	–	–	.0289	.0682*
		–	–	(.0316)	(.0359)

** p<0.05, ** p<0.01, *** p<0.001*
NOTE: The bunching boundaries change with gain category. The area used for estimating the counterfactual is included between 180 and 540 days. The polynomial fitting the seniority bin count is of order 4. Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling. 200 replications. The empty cells are those for which I could not find a value for M and B to converge.

Appendix M Heterogeneity by supra-legal severance payment category

The choice of a zero-inflated negative binomial model has been guided by the pattern of the data. Indeed, supra-legal severance payment is a necessarily positive amount, with a high frequency on the value 0,[39] and a variance much higher than the average. The Vuong (1989) test as well as the likelihood ratio test of $\alpha = 0$ both yield a significant output, indicating that the zero-inflated negative binomial model is better suited than the standard negative binomial model and the zero-inflated poisson model.

Table 35: Zero-inflated negative binomial regression tests

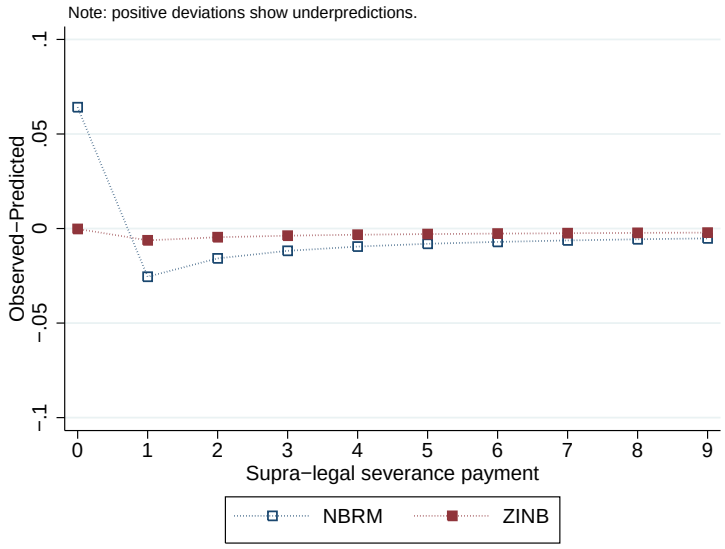
Likelihood-ratio test of $\alpha = 0$	7.1e+09
	(0.000)
Vuong test	250.54
	(0.000)

p-value in parenthesis
This table displays results from the Vuong (1989) and the likelihood-ratio test of $\alpha = 0$, showing that the zero-inflated negative binomial model is better suited than the standard negative binomial model and the zero-inflated poisson model.

Figure 47 shows that, at least for the first 10 values, the zero-inflated negative binomial model does better at predicting the value of the supra-legal severance payment than its standard equivalent.

[39] I am only considering here the *extra* amoun paid to the worker, in addition to the legal minimum severance payment.

Figure 47: Comparison of the zero-inflated and standard negative binomial models



Source: FNA.
The graph plots the difference between the observed and predicted values for the zero-inflated and the standard negative binomial models, for the values from 0 to 10. It shows, especially for the value zero, that the zero-inflated model better fits the data.

Table 36 displays the regression output.

Table 36: Zero-inflated negative binomial regression on supra-legal severance payment

	Supra-legal severance payment
Gender	0.1781
	(0.1578)
Age	0.4132*
	(0.1941)
Age^2	-0.0099
	(0.0053)
Age^3	0.0001
	(0.0000)
Level of education	0.3612
	(0.4766)
$Levelofeducation^2$	-0.1136
	(0.0940)
$Levelofeducation^3$	0.0080
	(0.0054)
Sector of activity	0.0061
	(0.0171)
Unskilled employee	0.6187*
	(0.2756)
Skilled worker	1.0540***
	(0.2502)
Skilled employee	0.5086**
	(0.1901)
Intermediate occupation	0.0783
	(0.2008)
Executive	0.7196*
	(0.3139)
Daily wage	-0.0002
	(0.0101)
$Dailywage^2$	0.0001
	(0.0001)
$Dailywage^3$	-0.0000
	(0.0000)
Firm size	-0.0001***
	(0.0000)
$Firmsize^2$	0.0000***
	(0.0000)
$Firmsize^3$	-0.0000***
	(0.0000)
Constant	2.0343
	(2.3626)
	Inflation equation
Level of education	0.0853*
	(0.0405)
$Levelofeducation^2$	-0.0293***
	(0.0082)
$Levelofeducation^3$	0.0015**
	(0.0005)
Unskilled employee	-1.1926***
	(0.0298)
Skilled worker	-0.2547***
	(0.0255)
Skilled employee	-1.2791***
	(0.0268)
Intermediate occupation	-1.3648***
	(0.0545)
Executive	-1.5476***
	(0.0400)
Age	0.1852***
	(0.0236)
Age^2	-0.0038***
	(0.0006)
Age^3	0.0000***
	(0.0000)
Constant	-3.2129***
	(0.2943)
$ln\alpha$	0.7568***
	(0.0601)
Observations	271,230

** p<0.05, ** p<0.01, *** p<0.001*

This table displays results from the regression of supra-legal severance payment on several covariates. The model used is a zero-inflated negative binomial regression to accomodate the specificity of the dependent variable, which takes only positive values with a large number of zeros. The regression is estimated on a sample of workers laid-off for non economic reasons after an open-ended contract, with seniority below 2 years. Reference category for qualification is unskilled worker.
Standard errors in parenthesis.

Appendix N Impact of individual and firms' characteristics on the propensity to bunch

Table 37: Characteristics of compliers, eligible and never-takers

	Compliers	Never-takers	Eligibles	Difference (2)-(1)	Difference (2)-(3)
Age	36.34	35.57	35.58	-0.763***	-0.001
	(1.801)	(0.112)	(0.042)	(0.128)	(0.008)
Gender	0.41	0.31	0.33	-0.095***	-0.017***
	(0.027)	(0.004)	(0.002)	(0.002)	(0.000)
Education	7.13	6.22	6.31	-0.908***	-0.084***
	(0.313)	(0.022)	(0.008)	(0.022)	(0.002)
Skills	2.89	3.52	3.47	0.631***	0.050***
	(0.182)	(0.013)	(0.005)	(0.013)	(0.001)
Working time	0.95	0.94	0.94	-0.007*	-0.002***
	(0.046)	(0.002)	(0.001)	(0.003)	(0.000)
Firm size	17.32	28.73	29.63	11.411***	-0.899***
	(4.645)	(0.938)	(0.472)	(0.335)	(0.074)

** p<0.05, ** p<0.01, *** p<0.001*

NOTE: The bunching boundaries are located at 324 days and 397 days. The area used to estimate the counterfactual is included between 0 and 1100 days. The polynomial fitting the seniority bin count is of order 4. Standard errors are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling (200 replications).

Î Skills are given from a scale from 1 (high skills) to 6 (low skills). Education ranges from 1 (no education) to 10 (5 years or more of higher education).

Table 38: Logit model on propensity to bunch

	Propensity to bunch	Propensity to bunch	Propensity to bunch
Potential gain	1.403638***	1.397635***	1.249442*
	(.2514381)	(.2529513)	(.4913836)
Education level	.0567225***	.0574443***	.0531391***
	(.0055986)	(.0056078)	(.01009)
Age	.0042388***	.0042643***	.0018906
	(.0009846)	(.0009859)	(.0017692)
Gender	.1165235***	.116092***	.115917**
	(.0221166)	(.0221874)	(.0400252)
Being an executive	.1716293***	.1730862***	.1103645
	(.0402472)	(.040391)	(.0617812)
Workforce size	-.0004814***		
	(.0000876)		
Workforce size category		-.0117347**	
		(.0044994)	
Proba of having a unionised representative			-.1132072
			(1.504067)
Proba of having a work council			-.6683384
			(5.085477)
Proba of having at least one staff representative			-.2669206
			(1.284029)
Proba of having at least one unique representative body			.2559616
			(2.397695)
Proba of having a health and safety committee			.470253
			(3.34815)
Constant	-3.06808***	-3.055762***	-2.800797***
	(.0646402)	(.065114)	(.4052817)
Observations	115,203	114,840	38,550

** p<0.05, ** p<0.01, *** p<0.001*
Propensity to bunch is defined as the probability of having a seniority between 365 and 397 days, relative to having a seniority lower than 365 or between 397 and 540 days. The different representation probabilities have been imputed based on data from the REPONSE survey (Statistics department of the Ministry of Labour, DARES), according to firm size.

Appendix O Bunching response at the two-years cutoff

As a robustness check, I use the existence of bunching at the two-years threshold during the pre-CSP period to measure similar elasticities and to determine whether I get consistent estimates of the behavioural response over time. Table 39 shows that the elasticity estimates based on the average response are similar in both periods, though the bunching is more fuzzy at the two-years threshold, which makes the missing mass area larger and the upper bound elasticity higher.

These findings give more strength to the idea that the bunching I measure during the post-CSP period is not related to some specificities at the one-year threshold or to something happening only from September, 2011. The fact that it appears with the same magnitude at both threshold and both periods suggests that it indeed captures a behavioural responses to the UI design incentives.

This setting with two different thresholds under two different periods could possibly be used to measure optimisation frictions noticeable at the two-years threshold under the post-CSP period. Indeed, the presence of bunching - although very small – at seniority values that used to be relevant for optimisation when incentives were different is a sign of imperfect optimisation, and can serve as a measure of optimisation frictions.

Figure 2 shows however that no significant bunching is present at the two-years cutoff after

Table 39: Reduced-form elasticity estimates at the two-years threshold during the pre-CSP period

L_u	765
L_l	586***
	(9.4)
Seniority window	[0;1090]
b	6.38***
	(0.4535)
m	5.61***
	(0.4494)
Average change in replacement rate	11.99***
	(0.0003)
ϵ_{RF}^{ub}	0.5229***
	(0.0522)
ϵ_{RF}^{lb}	0.0082***
	(0.0007)

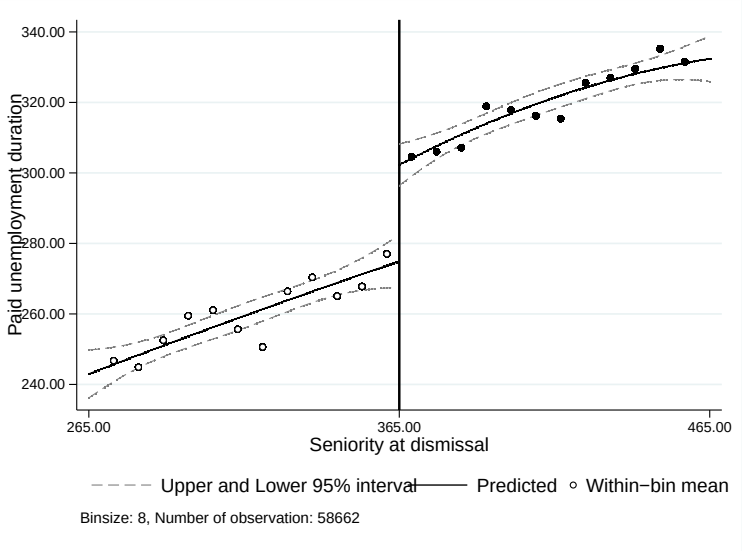
** p<0.05, ** p<0.01, *** p<0.001*

NOTE: Elasticity estimates are computed using the same formula as in Chetty et al. (2011) adjusted for the notch ($\frac{(m/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*)}$) for the lower bound, and using $\frac{(\Delta L^*/L^*)^2}{\Delta r/(1+r_0+L^*\Delta r/\Delta L^*}$ with ΔL^* measured as the distance between the point of divergence and the notch point for the upper bound. Standard errors of L_l are calculated using a bootstrap procedure generating seniority distributions and associated estimates by random resampling. 100 replications.

September, 2011. This is confirmed by the fact that, when trying to estimate bunching at this cutoff, it is not possible to find any value for the missing mass lower bound that equalizes the missing and excess areas. It highlights the fact that most fictions in the bunching I observe come from negotiation frictions – seniority at dismissal is the result of a bargaining process and is not entirely under the control of the worker.

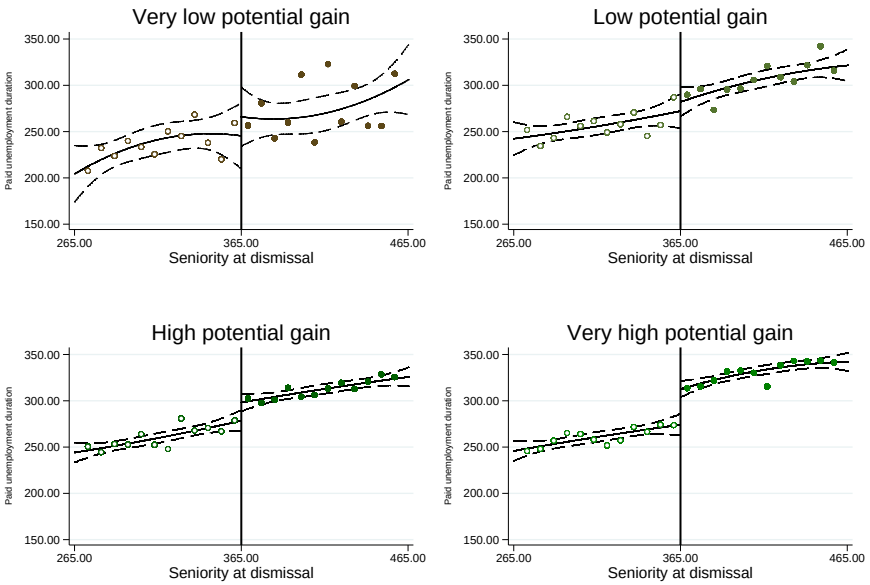
Appendix P Compensated Unemployment Duration

Figure 48: Effet of CSP on paid unemployment spell duration



Source: FNA.
This figure shows the average unemployment spell duration with respect to seniority at layoff, with a sharp jump at the one-year threshold. It indicates that taking the CSP is associated with a higher unemployment spell duration, although the selection effect underlined by the existence of bunching cannot be distinguished from pure moral hazard. An unemployment spell has been defined as the addition of days on benefits with no interruption of more than 4 months, as 4 months is the minimum working time necessary to open a new UI entitlement.

Figure 49: Effect of CSP on paid unemployment duration by gain category



Source: FNA.
This figure shows the average unemployment spell duration with respect to seniority at lay-off by gain category. An unemployment spell has been defined as the addition of days on benefits with no interruption of more than 4 months, as 4 months is the minimum working time necessary to open a new UI entitlement. As we observe bunching at the threshold, we cannot disentangle the selection effect from pure moral hazard when analysing the relationship between seniority and unemployment duration. The gain is defined as the difference in replacement rate between the standard benefit and the ASP granted to those with a seniority of one year of more. This difference increases with previous earnings, as the replacement rate associated with the standard benefit decreases with earnings. Very low potential gain stands for a gain lower than 10 percentage points, low potential gain for a gain lying between 10 and 15 percentage points, high potential gain for a gain lying between 15 and 20 percentage points, and very high potential gain for a gain higher than 20 percentage points.
The decomposition by gain category suggests that when no significant bunching is observed (1^{st} gain category), no significant jump in unemployment is observed neither. On the reverse, the 4^{th} gain category where bunching is the most sizeable also shows the sharpest jump in unemployment.

Table 40: Parameters used in the cost-benefit computation

w	77.33
	(3.858)
$ASP_{compliers}$	69.20
	(2.431)
$D_{compliers}$	441.32
	(26.965)
$D_{eligibles}$	405.54
	(1.326)
$SB_{compliers}$	45.66
	(2.259)
$t^{CSP}_{compliers}$	0.95
	(0.028)
$t^{CSP}_{eligibles}$	0.42
	(0.002)
ΔL	4.94
	(0.422)
B	1475.45
	(112.074)

Standard deviations have been obtained by bootstrapping (100 replications). The compliers' and eligibles' characteristics are computed using the methodology in Diamond and Persson (2016), as in section 5.2. I compare the cost of bunching in terms of higher daily benefits and longer unemployment duration with the benefits in terms of additional contributions.