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Upward Nominal Wage Rigidity

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DISCUSSION PAPER SERIES

IZA DP No. 10510

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JANUARY 2017

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ABSTRACT

Upward Nominal Wage Rigidity*

In Portugal, as in many other countries in continental Europe, the collective wage agreements between trade unions and employer associations that define wage floors for specific job titles are systematically extended to the whole industry. This means that many firms are obliged to increase the wages of their workforce in order to comply with the newly-agreed bargained wages. With some trepidation, we call this phenomenon *upward nominal wage rigidity*, in close symmetry with the Keynesian notion of downward nominal wage rigidity. In this paper we provide evidence that firms that are more heavily affected by the change in the bargained wage floors decrease their hiring rates and, more importantly, significantly increase their separation rates. As a complement to our analysis, we suggest the estimation of a measure that attempts to disentangle the strength of internal and external wage conditions. Based on this measure we show that firms whose wages are more influenced by external wages exhibit much lower net job creation rates.

JEL Classification: J31, J52, J23

Keywords: wage rigidity, worker flows, collective bargaining, newly-hired workers

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1 Introduction

The role played by labor market institutions in molding the dynamics of employment and the structure of wages is a matter of considerable debate both empirically and conceptually. Even though there is an ample discussion about the role of labor market institutions and their potential contribution to the sluggish adjustment of employment, there is still scant empirical evidence at the micro level about the way collective agreements influence firms' hiring and firing decisions.

Many institutional factors may hamper the efficient allocation of workers and jobs. Caballero and Hammour (2000) stress that a number of distortions in product, input, and credit markets can introduce inefficiencies in the reallocation process. Aside from the impact on flows stemming from quantitative restrictions on labor market adjustment, wage-setting policies, such as legal provisions restricting wage adjustment, wage schedules determined at the sector level, or the presence of national minimum wages, also have an impact on the reallocation.

An additional factor that might affect the allocation of workers and jobs is the widespread practice of extending collective bargaining agreements to non-subscriber workers and employers. Since these agreements establish wage floors for most job titles, their frequent extension is equivalent to setting a wide range of compulsory minimum wages, which are regularly adjusted upward, even if the scope in most cases is restricted only to some sectors or industries. In some firms these extensions can result in a wage structure that may not be appropriate for some workers, causing fewer hirings and/or added dismissals. As pointed out by Cahuc and Zylberberg (2009) and Teulings and Hartog (2008), these potential job losses are the result of setting wage floors above the marginal productivity for some workers in firms that are bound by those extensions.

Legal provisions for mandatory extensions exist in several European countries such as Spain, France, Germany, Italy, the Netherlands, and Belgium, and they explain to a great extent the large gap observed between union density and union coverage.¹

¹See Visser (2013) for a comprehensive survey of wage bargaining institutions in a wide number of developed countries.

The extension of contracts is also an important feature of the Portuguese wage setting system. Martins (2014) shows that between 2007 and 2011 around 90 percent of the sectoral collective wage agreements in Portugal were extended by the Ministry of Employment. The extension of collective agreements were issued almost uniformly throughout the twelve months of the year.

The scattered timing of these extensions introduces a type of wage rigidity that is similar to that emphasized in some macroeconomic models. These models (see Olivei and Tenreyro (2007, 2010) and Card (1990)) underscore the importance of the timing of collective wage agreements for the employment fluctuations observed in some advanced economies. Due to contract staggering, they show that wage rigidity is toned down in periods when collective agreements are under negotiation: if the shock occurs at the time of wage negotiations, the wage bargaining process can reflect the impact of the shock and wages are set accordingly; if the shock occurs after wages have been settled by contracts, wages are unable to be adjusted and the risk of job losses is magnified.²

The impact of the (scattered) extension of collective agreements on employment is also examined by Martins (2014)³. Using data for Portugal covering the period between 2007 and 2011, this study analyzes the impact on employment over the four-month period following the extension of a collective agreement. The results show that over this time window the total number of workers in an industry fell by 1.7 percent. The detrimental effect of these extensions on employment is driven to a large extent by the fall in firms' hirings and not by an increase in separations, which remain largely unaffected. On the other hand, non-formal employment (the so-called service providers), which is not subject to the extension of wage floors, increased by 1.1 percent. In complement to this exercise the study also examines the impact of the extension of collective agreements on firm

²Diéz-Catalán and Villanueva (2014) test this hypothesis for Spain in the period surrounding the late-2008 economic decline. They show that the probability of job separation increased significantly for workers covered by contracts negotiated before the drop in economic activity. Their results also suggest that the automatic extension of collective agreements in Spain during this period accounted for 36 percent of the increase in the probability of job separation for low-skilled workers.

³See also Fougère et al. (2016) for France.

entry and exit. The evidence suggests that the entry of new firms is not affected by the extension of collective agreements, while the number of firms that leave an industry increases by 4 percent.

In this paper we examine the microeconomic link between the increase in bargained wage floors and the employment outcomes. As in Martins (2014), we measure the impact on firms' hirings and separations, and the probability of closure resulting from firms' obligations to adjust their wages upward in order to comply with the new wage floors. We call this phenomenon *upward nominal rigidity*. However, unlike the approach followed by Martins (2014), our focus is not on the timing of the increase in bargained wage floors but on the magnitude of their impact on each particular firm. For this purpose we compute for each firm (on the basis of each job title) the increase in the total wage bill necessary to comply with new collective wage agreements (*implied wage bill growth*).

The impact of the upward nominal wage rigidity on each particular firm will be conditional on its workers' positions in the wage distribution. In each firm we can distinguish between two major groups of workers: those who are already collecting a bargained wage equal to or above the newly-agreed wage floor and whose contribution to the implied wage bill growth is zero; and those who are receiving a bargained wage that is below the new wage floor and whose contribution to the implied wage bill growth is the difference between their current wage and the new wage floor. The impact of increasing the wage floors is potentially more acute in firms with a greater fraction of the latter group of workers.

In the second part of the paper we perform a different but somewhat complementary exercise by restricting the analysis to the newly-hired workers, i.e. workers with job tenure of less than one year. Most micro-level empirical research aimed at analyzing the degree of wage rigidity has been mostly concerned with wage changes of individual employees. This invariably restricts the focus of analysis to wages in ongoing employment relationships (see Haefke et al. (2007)). In contrast, the degree of rigidity of wages of newly-hired workers has received much less attention, despite the recognized importance of wages of this particular labor force group for job creation

and for understanding the behavior of wages over the business cycle (see Pissarides (2009) and Galuscak et al. (2012)): newly-hired workers are the “marginal” workers that affect the decision of firms to create new jobs.⁴

The purpose of this exercise is to identify the extent to which firms’ insider forces are important for the determination of wages of newly-hired workers. Bils et al. (2014) provide empirical evidence supporting the notion that the wages of new hires are partially determined by the prevailing wages of stayers. As Blanchard and Summers (1987) point out, if wage changes are essentially determined by insider factors (such as the internal wage schedule or the wages of workers with the same qualifications), this may generate hysteresis in the economy, so that the impact of shocks may last for long periods. We first analyze the relative importance of internal factors *vis-à-vis* the external factors (such as the wages of workers with similar qualifications and experience or the availability of workers with similar characteristics in the labor market) in the determination of entry wages. We then investigate the impact of the external wages on job flows (i.e. hirings and separations) of newly-hired workers as well as on the probability of firm closure.

The remainder of the paper is structured as follows. A description of the main institutional characteristics of the wage setting process in Portugal is presented in Section 2. In Section 3 we describe the main features of our database. Section 4 looks closely at the employment effects of increases in the wage floors for each specific job title and estimates the impact of externally driven wage increases on the probability of firm exit. In Section 5 we attempt to disentangle the internal and external drivers of the wages of newly-hired workers in order to reveal the link between external (internal) wages and job flows. Finally, in Section 6 we summarize the main

⁴Most empirical research that distinguishes entry wages from wages of ongoing jobs focuses on their different behavior over the business cycle. Such studies show that wages of newly-hired workers are considerably more volatile than the wages of incumbent workers. However, since the number of workers in ongoing jobs is higher than the number of new hires, the aggregate wage invariably becomes rigid. These studies have highlighted the idea that the wage response to aggregate labor conditions differs considerably between workers in ongoing jobs and newly-hired workers. Carneiro et al. (2012) use matched employer-employee data for Portugal 1986-2005 and find that after controlling for both firm and worker heterogeneity, entry wages are much more procyclical than wages of ongoing jobs.

results of our paper and suggest some economic implications.

2 Institutional Wage Setting in Portugal

In this section we succinctly describe some of the main institutional characteristics of the wage setting process in Portugal. The Portuguese Constitution provides the legal principles of collective bargaining and grants unions the power to negotiate. The effects of the agreements are formally recognized and considered valid sources of labor law. Concerning the bargaining mechanisms, two regimes can be distinguished: the conventional regime and the mandatory regime. Conventional bargaining results from the direct negotiation between employers' and workers' representatives. A mandatory regime, on the other hand, does not result from direct bargaining between workers and employers, but is dictated by the Ministry of Employment.

The systematic extension of industry-wide agreements by the Ministry of Employment is the most important mechanism shaping the formation of wages, indeed, even though by law the collective agreements achieved under the conventional regime are binding only for workers complying with the so-called double affiliation principle, *i.e.*, workers that are simultaneously members of the subscribing union(s) and that are employed by firms that are members of one of the subscribing employer associations. In the Portuguese case, the combination of these two dimensions would determine a very small coverage of collective agreements due to low union and employer associations' density rates. In such a scenario, most workers would have their employment relationships determined by individual agreements negotiated directly with their respective employers.

In this regard it is interesting to note that even though the agreements are binding only to workers who comply with the principle of double affiliation, there are no mechanisms in Portuguese law that oblige unions and employers to reveal their constituency. This legal conundrum has been resolved by various governments that resort to the mandatory regime by extending the collective

agreements to all the firms in each sector using the so-called Extension Ordinance (“Portarias de Extensão”)⁵. This means that wage agreements reached by trade unions and employers’ associations with even very low representation have a strong impact in setting wage floors.⁶ Indeed, in any given year collective bargaining sets around 30,000 minimum wages that correspond to 30,000 job-titles (see Carneiro et al. (2014), Torres et al. (2013), and Martins (2014)).

This mechanism has helped to accentuate the discrepancy between, on the one hand, the low union density (around 10 percent according to Addison et al. (2017)) and, secondly, the high coverage rate of collective agreements (about 90 per cent). It is true that the existence of extension mechanisms may act as an incentive for membership of employer associations, so that they can more directly influence the outcome of negotiations. However from the workers’ point of view incentives to become union members are reduced because the non-unionised workers would benefit from the same contractual conditions of their unionized colleagues without bearing the cost of the union fees.

Until 2004 – the year when the Labor Code entered into force – the number of extension ordinances was quite high. After a short-duration decline, this number increased again until seeing a drastic reduction from 2011 on in the context of the economic adjustment program, which initially froze the extensions and then made the criteria for their application more restrictive.

Most collective agreements are industry-wide, covering companies with very different sizes and economic conditions. Their contents tend to be general, setting minimum working conditions, especially the base monthly wage for each category of workers, overtime pay and the normal duration of work. Underlying the bargaining process, there is a mandatory minimum monthly

⁵Article 514 of the Portuguese labor code states that “a collective agreement [...] in force can be applied, entirely or partly, by an extension ordinance to employers and employees in the economic activity and profession considered in the collective agreement. The extension is possible after weighting the social and economic circumstances that may justify it, in particular the identity or economic social similarity of the cases in the extension and the underlying collective agreement.”

⁶In 2012 a Government resolution stated that the extension would be possible only when the employers’ subscribers to the agreements employ at least 50% of the workers of the relevant economic sector.

wage that sets the floor for wage negotiations.⁷ National legal minimum wages and pervasive wage floors set by collective bargaining coupled with the legal prohibition of nominal wage cuts (that survives since the 1950s) creates a *de facto* situation of extreme nominal wage rigidity.

In the context of the high inflation regime that characterized Portugal in the 1980s and 1990s, this restriction was not binding in real terms, as adjustments in real wages could be achieved by raising nominal wages at a rate below the inflation rate, or for firms paying wages above the corresponding new minimum, by reducing the wage drift. In such a setting, the higher the inflation rate the greater the leeway for manipulating the real wage. However, in the current low-inflation regime nominal wage rigidity becomes an active restriction. Indeed, in this environment employers' response on the wage margin is limited to the possibility of reducing the wage drift or going for the lowest nominal wage increase possible, ultimately freezing wages.

Hence, in a low-inflation regime negative shocks are expected to shift the employment distribution of nominal wage adjustment toward zero, the magnitude of real wage adjustment being conditional on the inflation rate. This is, in fact, what was observed during the last recession, in which the wage response was characterized as in the past by no (or limited) nominal negative variations (measured from base pay), but also (differently from the past) by a salient move toward zero in the distribution of wage variations, corresponding approximately to the expected inflation rate and accentuating even more the low distribution spread.⁸

⁷Currently there is a single legal national minimum wage that applies to all workers. Workers formally classified as apprentices receive just 80% of the full rate. The national minimum wage is updated based on a proposal by the government, usually taking into account past and predicted inflation and after consulting the trade unions.

⁸Dias et al. (2013) show that besides freezing the base wages, Portuguese firms make frequent use of a number of labor cost-cutting strategies, like freezing or cutting bonuses and other monetary or non-monetary benefits, slowing down or freezing the rate at which promotions are filled, or recruiting new employees at wages lower than those received by the employees that have left the firm. They provide evidence that the availability of these alternative labor-cost adjustment margins that firms can use in bad times makes dismissals a less likely outcome.

3 Dataset

3.1 Personnel Tables (*Quadros de Pessoal*)

The data used in this paper come from a longitudinal matched employer-employee dataset known as the Personnel Tables (*Quadros de Pessoal*).⁹ This unique dataset was created by the Portuguese Ministry of Employment and is constructed from a mandatory annual survey addressed to all firms with wage earners with headquarters in the mainland (Madeira and Azores are excluded). It has been conducted every year since 1982 with the exception of 1990 and 2001. The survey covers various firm and establishment characteristics, as well as a set of characteristics of the workforce. Being compulsory, it does not suffer from the non-response problems that often contaminate standard household and firm surveys. Furthermore, the survey covers almost all Portuguese employees, excluding only Public Administration.

The dataset includes information on the establishment (establishment identifier, location, industry, and employment), the firm (firm identifier, location, industry, legal form, ownership, year of start-up, employment, sales, and capital), and its workers (social security identifier, gender, age, education, skills, occupation, employment status, professional level, seniority, earnings, normal and overtime hours, time elapsed since the last promotion, and type of classification in the collective bargaining agreement).

3.2 Sample definition and general variables

Our sample covers the period from 1986 to 2013, excluding the years in which the Personnel Tables were discontinued (1990 and 2001). For the purposes of this paper a subset of variables was selected, certain new variables created, and some observations removed. The final set of variables retained for analysis is given in Appendix A. A number of general restrictions were

⁹In 2010, the *Quadros de Pessoal* was replaced *Relatório Único* that replicates its precursor except in one respect: it has information that allows to measure union density.

placed on the data used throughout the paper. Given the specific purpose of our investigation (i.e. the impact of externally-set wage increases), the analysis excludes firms that apply firm-level agreements as well as contracts with less than 1000 workers over the entire period. In addition, the data exclude those individuals who were not working full time, who were aged less than 16 years and more than 65 years, who earned a nominal wage less than the legal minimum wage in each year or above the 99.9 percent quantile in each year, and who recorded errors in admission/birth dates, duplicate social security codes, or other errors in their social security codes.¹⁰

The unique characteristics of our dataset with detailed information about the job title structure within each collective wage agreement provide the means to calculate the bargained wage floor with a great level of accuracy. To ensure a minimum of representativeness, only job titles with at least 100 workers were considered. The bargained wage floor for a given job title - a key variable in our paper - is proxied by the modal base wage for each job title within each collective agreement. As shown in Cardoso and Portugal (2005), the mode of the distribution of the base wage corresponds with remarkable accuracy to the contractual wage set by collective bargaining.

The analysis performed herein examines the impact of extensions upon workers' flows (hirings and separations), as well as upon the probability of firm exit (failure). Both hirings and separations were computed on the basis of social security identifiers: hirings correspond to the number of new social security identifiers reported by firms in each year (i.e. workers that are new in the database in a given year), and separations are the number of social security identifiers that were reported by firms in the previous year but not in the current year (i.e. workers that left the database in the current year). Both variables are divided by the number of workers in the previous year (hiring rate and separation rate). The variable "failure" that is used to gauge the impact of extensions on the probability of firm closure is a binary variable that is equal to 1 in year t for firms whose individual identifier left the database in that year and 0 otherwise.

¹⁰Individuals employed outside of mainland Portugal and those in agriculture, hunting, forestry, and fishing (as well as misclassified industries) were also excluded.

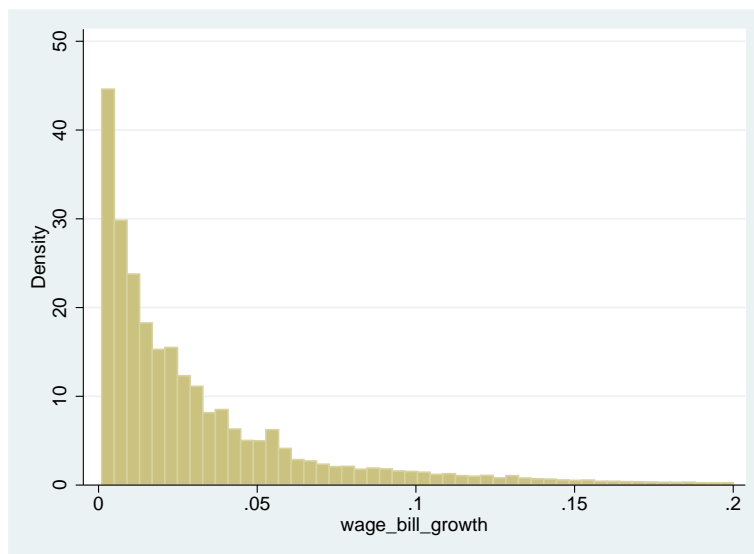


Figure 1: Distribution of the implied wage bill growth weighted by the number of workers

4 The impact of the upward nominal wage rigidity on employment

In this section we look closely at the employment effects of increases in the wage floors for each specific job-title. For this purpose we compute for each firm, based on each job title within the firm, the increase in the wage bill necessary to comply with the new collective agreement. For this we took the job-title structure of the workforce of firm i at year t . Assuming that the same exact job-title structure prevails at year $t+1$, we obtain the increases in the base wage that would place those workers at the new wage floors, and aggregated all positive wage increases to define the *implied wage bill growth*. Figure 1 shows the distribution of the implied wage bill growth weighted by the number of workers. The average implied wage bill growth in the sample period is 2.4 percent.

In the computation of the *implied wage bill growth* it is worth to distinguish between two types of workers: workers who are already collecting a wage equal to or above the newly-agreed wage (in this case the contribution to the implied wage bill growth will be zero); and workers who are

receiving a base wage that is below the new minimum (in this case, the contribution is, of course, the difference between the current base wage and the new wage floor). Within each firm both cases are possible. In general, the larger the fraction of workers that are paid below the new job title wage floor, the larger will be the implied wage bill growth. Collective agreements that settle higher wage increases will also, of course, engender higher wage bill increases.

The implied wage bill growth is thus our critical treatment variable. The identification of the employment effects of these externally imposed wage changes depends, of course, on the past wage policy of the firm, the job title structure of the workforce, and the size of the newly agreed wage floor increases. In this sense, this methodology is a straightforward generalization of the one suggested by Abowd et al. (2000) to study the impact of minimum wage increases in France and the USA. Portugal and Cardoso (2006) exploit a similar strategy to analyze the impact of a subminimum wage hike on the workers' accession and separation rates.

To measure the effect of an increase in the wage bill implied by the updating of the wage floors settled by collective agreement on the hiring and separation rates, we specified a simple labor demand equation in first differences:

$$\Delta y_{ft} = \xi \Delta wb_{ft} + \beta \log.age_{ft} + \lambda_t + \varepsilon_{ft} \quad (1)$$

where Δy_{ft} stands for the hiring rate or separation rate in firm f at time t . Δwb_{ft} represents the implied wage bill growth, $\log.age_{ft}$ denotes the log of firm age, to account for the fact that older firms typically have lower hiring and separation rates, λ_t represents a set of time (yearly) effects, and ε_{ft} is a conventional error term.

The results shown in columns (1) and (3) of Table 1 suggest a strong impact on the separation rate resulting from externally driven changes in the wage bill of the firms. According to our estimates, a 10 percent (real) increase in the wage bill leads to an increase in the separation rate of 2.1 percentage points. The presence of firm's age reveals that older firms tend to be less

Table 1: The impact of increases in bargained wage floors on firms' hirings and separations
OLS estimates

	Dependent variables			
	Hiring rate		Separation rate	
	(1)	(2)	(3)	(4)
Implied wage bill growth	-0.049 (0.019)	-0.022 (0.002)	0.206 (0.020)	0.319 (0.002)
Log of firm age	-0.038 (0.002)	-0.034 (0.000)	-0.041 (0.002)	-0.031 (0.000)
Number of obs.	8,350,405		16,551,719	
Contract dummies	-	YES	-	YES
Yearly dummies	YES	YES	YES	YES

Robust standard errors in parentheses. Results are weighted by firms' size based on the number of employees. The "implied wage bill growth" for each firm results from the aggregation of the changes between the actual base wage at time t and the new wage floor set by the collective wage agreement for $t+1$ for all workers in the firm assuming that the job title structure remains unchanged.

affected. The impact of exogenous changes in wages produced via changes in collective agreements on the hiring rate is negative but more modest (a 10 percent increase in the wage bill leads to a fall in the hiring rate of 0.5 percentage points).

The fact that firms operate in different sectors with distinct economic performances and are covered by dissimilar agreements is certainly a factor that potentially affects firms' hiring and firing decisions. A fully flexible way to consider this issue in the analysis is simply to include a full set of contract/year dummies, removing (filtering) contract heterogeneity and contract time variation from the estimation. The equation to be estimated is now:

$$\Delta y_{ft} = \xi \Delta wb_{ft} + \beta \log.age_{ft} + \lambda_{ct} + \varepsilon_{ft} \quad (2)$$

where λ_{ct} identifies the collective agreement ruling the bargained wages of firm f at time t .

Proceeding in this way, we obtain the results shown in columns (2) and (4) of Table 1. The coefficients on the implied wage bill growth suggest a strong impact on the net job creation rate resulting from externally driven changes in the wage bill. The impact on the hiring rate is now more modest than before but the impact on the separation rate is significantly stronger: a 10 percent increase in the wage bill produced via changes in collective agreements increases the separation rate by 3.2 percentage points.

A frequently neglected dimension of the employment adjustment is its corresponding extensive margin, that is, the entry and exit of firms (Addison et al. (2014)). In the current exercise any attempt to guess the effect of collective bargaining on the entry rates of firms would be a “*tour de force*”, despite the potential importance of such an inquiry. Nonetheless, our sampling plan allows us to estimate how externally driven wage increases impact the probability of firm exit. To this end we specified a simple probit regression model taking the same covariates as before.

The regression results on the determinants of the failure of firms are given in Table 2. The main thrust of the estimation is the indication that the estimate of the quasi-elasticity of labor demand through firm closure is equal to 0.22, meaning that a 10 percent increase in the wage bill generated by the increase in the bargained wage floor increases the probability of firm closure by 2.2 percentage points.

Table 2: The impact of increases in bargained wage floors on the probability of firm closure
probit estimates

Dependent variable: Failure		
	Probit estimates	Marginal effects
Implied wage bill growth	1.969 (0.075)	0.216 (0.008)
Log of firm age	-0.234 (0.007)	-0.026 (0.001)
Number of obs.	17,563,508	
Yearly dummies	YES	

Robust standard errors in parentheses.

“Failure” is a binary variable that is equal to 1 for firms whose individual identifier left the database and 0 otherwise.

See notes to Table 1 for additional details.

5 The impact of external wages on hirings and separations of newly-hired workers

5.1 How important are external wages for the determination of wages of newly-hired workers?

So far we have focused on the wage behavior of workers that were assumed to stay in the same firm, that is, of (potential) job stayers. Given the nature of the exercise we neglected by construction the wage behavior of new hires. But as discussed above, the determinants of entry wages are critical at both the theoretical and the empirical levels. In this section we attempt to disentangle the internal from external drivers of the wages of newly-hired workers. Once we succeed distinguishing between firms with different degrees of externally and internally-driven entry wages, we should be able to unveil the link between external (internal) wages and job flows.

The importance of internal wages driving entry wages has a number of implications. First, by negotiating wages above the external option of the worker, firms are more likely to avoid worker

turnover and retain those workers, thereby diminishing the number of worker separations.

Second, it may signify that firms more often than not choose to negotiate entry wages above the wage floors defined by the collective agreements. This may be due to fairness considerations or other strategic considerations (e.g., incentive contracting). In any case, such a finding would provide direct empirical evidence supporting the notion that the wages of new hires are partially determined by the prevailing wages of stayers, as hinted at in *Bils et al. (2014)*.

Third, because a significant fraction of firms offer wages above the minimum defined at the bargaining table (typically sectoral), they may benefit from the wage cushion (*Cardoso and Portugal (2005)*) engendered by the difference between the actual wage paid and the bargained wage. Confronted with a negative shock in the product demand or in the costs of inputs, those firms are able to make wage adjustments unlike firms that are remunerating their workers at the established minimum. If this argument has some value, one should expect lower failure rates and less employment volatility among firms that are less constrained by external wages. On the other hand, if the bargaining power of the workers, that is, the union power, is strong enough, wage floors agreed through collective negotiations may not leave space for firms to settle wages above the external wages. In this case, in which external wages are binding (as in, for example, *Dolado et al. (1997)* for unskilled workers) the wage cushion will be small and the firms may lack room for maneuver to successfully adjust to negative product demand shocks.

Finally, there is convincing empirical evidence showing that the wage policy of firms is notoriously heterogeneous. The fact that firm fixed effects account for a large fraction of the wage variation (*Torres et al. (2013)*) is a clear sign that firms often cannot be taken as wage takers. *Webber (2013)* argues forcefully that the labor supply elasticities faced by the firms are relatively low, indicating that firms enjoy significant monopsony power (*Manning (2003)*). If, indeed, monopsony power plays an important role, it should influence the relative strength of internal and external factors in the determination of wages.

To better understand the nexus between entry wages and employment adjustments, we first

provide a measure of the importance of inside and outside wages to next investigate, as before, the impact of externally driven wages on job flows. The exercise is restricted to the newly-hired workers, i.e. workers with a job tenure of less than 12 months. Furthermore, the analysis is restricted to those cases where for each newly-hired worker there is at least one worker in the same firm and job title but with a job tenure of more than 12 months. A minimum of 10 hirings over the entire period is also imposed as a threshold for a firm to be included in the sample. In order to disentangle the internal from the external drivers of the wages of newly-hired workers, for each newly-hired worker in a particular firm we compute an *internal wage* and an *external wage*. The latter is simply the bargained wage floor that corresponds to the job title of the new hire in each year, whereas the *internal wage* is the modal base wage of all ongoing workers in the same job title, firm and year.

The way we measure the relative importance of internal and external wages driving the wages of new hires is simple but unconventional. In essence, what we do is run a regression of the entry wage on the internal and external wages as well as on a set of time dummies. Because we need to distinguish the wage policy of the firms, we allow the regression coefficients on the two wage regressors to change from one firm to another. In other words, the model we wish to estimate relates the entry wages of workers to the “internal” and “external” wages in the same job title. Specifically, our model consists of:

$$w_{ifjt} = w_{fjt}^I \beta_f^I + w_{fjt}^o \beta_f^o + \alpha_f + \lambda_t + \varepsilon_{ifjt} \quad (3)$$

where w_{ifjt} is the (log of) entry wage of worker i in firm f , in job j at time t , w_{fjt}^I is the corresponding “internal” wage (the modal wage of ongoing workers in the same job title, firm and year) and w_{fjt}^o is the “external” wage (the bargained wage floor for the same job title and year). The α_f is a standard firm fixed-effect that accounts for unique firm (or industry) characteristics that affect all entry wages alike (firm internal organization, higher productivity, etc.) and λ_t is

a time fixed effect. Note that the β coefficients in the above equation are specific to each firm, reflecting the fact that firms place different weights on “internal” and “external” wages when setting entry level wages. Direct estimation of the above model cannot be implemented using the standard procedure to deal with a model with one fixed effect because the firm fixed effect is interacted with the “internal” and the “external” wage. In Appendix B we detail the procedure to find the exact least squares solution for the parameters of the above model.

The regression coefficients of the (internal and external) wage variables can straightforwardly be interpreted as the weights attached to such drivers in the formation of starting wages.¹¹ Figures 2 and 3 show the distribution of the estimates of the coefficients associated with the interaction of the firm fixed effect and the internal and external wages, and Table 3 reports how the mean of the distribution for the external interacted wage fixed effect varies according to gender, sector, and worker age.

Results in Table 3 show that firm internal wage structure is relatively more important for the determination of wages of new workers: it accounts on average for 51 percent of the determination of base wages of newly-hired workers. Using survey data for 15 European countries, Galuscak et al. (2012) provide evidence that also suggests that the internal pay structure is more important for determining hiring wages than the external wage constraints. The importance attached to the role of internal wages seems to vindicate the notion that entry wages are largely driven by the wages of job stayers, as forcefully argued by Bils et al. (2014). More generally, it is also consistent with the hysteresis narrative of Blanchard and Summers (1987). However, the importance of externally-set wages is far from being negligible, as it accounts on average for 31 percent. Externally-set wages seem to be much more important in financial services and less so in trade.

¹¹To mitigate the unavoidable sampling error that results from firms with very low recruitments, we excluded weights below zero and above one.

Table 3: The determinants of wages of newly-hired workers
internal vs. external factors

	Internal wage	External wage	Number of recruitments
Full sample	0.512	0.306	2,949,529
Men	0.517	0.307	1,764,746
Women	0.504	0.304	1,184,783
Manufacturing	0.537	0.322	754,383
Energy	0.480	0.289	4,156
Construction	0.548	0.337	444,735
Trade	0.556	0.262	508,864
Non-financial services	0.463	0.297	1,155,404
Financial services	0.484	0.407	66,073
Workers older than 30	0.511	0.304	1,431,489
Workers under the age of 30	0.513	0.307	1,518,040

The “external wage” for a given newly-hired worker is the bargained wage floor for the corresponding job title and year, whereas the “internal wage” is the modal base wage of all ongoing workers in the same job title, firm and year. In both cases the values are expressed in logarithms.

The sample excludes firms that apply firm-level collective agreements.

Observations: 2,949,529 newly hired workers.

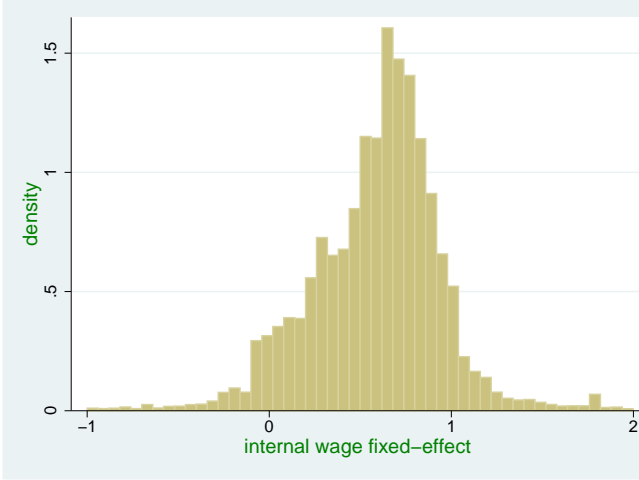


Figure 2: Distribution of the internal wage fixed-effect (weighted by the number of recruitments)

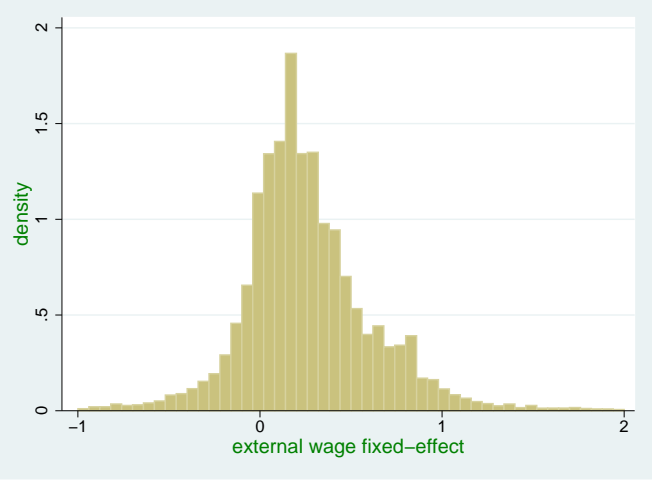


Figure 3: Distribution of the external wage fixed-effect (weighted by the number of recruitments)

5.2 How externally-set wages impact on firms' hirings and separations of newly-hired workers

The evidence that internal wages are good predictors of the wages of new hires should not lead us to conclude that external wage constraints, such as those defined by wage floors, do not play a role. To shed some light on this issue we estimate a regression model on the determinants of job flows. In particular, we specify the following equation:

$$\Delta y_{ft} = \theta ew_f + \beta \log.age + \lambda_t + \varepsilon_{ft} \quad (4)$$

where ew_f is the estimated external wage weight for firm f obtained from equation 3, that is $\hat{\beta}_f^o$, Δy_{ft} stands for the hiring rate or separation rate in firm f at time t , λ_t represents a set of time (yearly) effects, and ε_{ft} is a conventional error term.

The estimation results are shown in columns (1) and (3) of Table 4. Here the critical parameter is the regression coefficient for the external wage variable: a 10 percent increase in the external wage weight generates a 0.24 percentage point decrease in the hiring rate. Interestingly, the

Table 4: The impact of externally set wages on firms' hirings and separations of newly-hired workers
 OLS/IV estimates

	Dependent variables			
	Hiring rate		Separation rate	
	(1)	(2)	(3)	(4)
External wage weight	-0.024 (0.002)	-	0.005 (0.002)	-
Estimated external wage weight	-	-0.054 (0.008)	-	0.219 (0.007)
Log of firm age	-0.115 (0.001)	-0,123 (0.001)	-0.063 (0.001)	-0.064 (0.001)
Number of obs.	357,564	371,809	345,671	357,564
Method	OLS	IV	OLS	IV
Yearly dummies	YES	YES	YES	YES

Robust standard errors in parentheses. Results are weighted by the number of recruitments in each firm.

The sample excludes firms that apply firm-level collective agreements.

The “external wage weight” measures the contribution of external wages (see definitions above) to the formation of entry wages. To mitigate the sampling error that results from firms with a low number recruitments, we excluded firms with weights below zero and above one.

Table 5: The impact of externally set wages on the probability of failure

	Dependent variable: failure			
	Probit estimates		Marginal effects	
	(1)	(2)	(3)	(4)
external wage weight	0.152 (0.010)	-	0.012 (0.001)	-
estimated external wage weight	-	1.003 (0.071)		0.077 (0.005)
Log of firm age	0.083 (0.004)	-	0.090 (0.005)	-
number of firms	385,645	358,071	385,645	358,071
yearly dummies	YES			

Robust standard errors in parentheses.

The sample excludes firms that apply firm-level collective agreements.

“Failure” is a binary variable that is equal to 1 for firms whose individual identifier left the database and 0 otherwise.

See notes to Table 4 for additional details.

impact on the separation rate is still positive but much more modest (0.5 percentage points).

When we turn our attention to the effect of external wages on the failure rate, we find that firms whose wage policies are more driven by external wages face higher probabilities of failure, but this effect is modest. A 10 percent increase in the external wage weight is associated with a 1.2 percentage point increase in the probability of firm closure (Table 5).

A thorny problem that emerges from our approach comes directly from the assumption that the wage policy of the firm is exogenous. The notion that the wage policy of the firm regarding the definition of entry wages is independent from the error term is clearly questionable. Whereas the definition of the external wages is largely exogenous to the firm, the decision to pay above the external wage floors can hardly be argued to be exogenous. Fortunately we can rely on the information regarding the identification of each collective agreement that binds each firm to construct a valid instrument. In other words, we shall replace the external weight variable by its estimated value from an auxiliary regression that simply regresses the external weight on a set of

dummy variables identifying the ruling wage agreement. The estimating equation is now:

$$\Delta y_{ft} = \theta \hat{e}w_f + \beta \log.age + \lambda_t + \varepsilon_{ft} \quad (5)$$

where $e\hat{w}_f$ is the predicted estimated external wage weight for firm f obtained from an auxiliary regression that regresses the external wage weight on a set of dummy variables identifying the ruling wage agreement.

Columns 2 and 4 of Tables 4 and 5 show the results from this two-stage approach. The most notable difference *vis-à-vis* the previous approach is the sizable increase in the separation rate equation: a 10 percent increase in the external wage weight generates a 2.2 percentage point increase in the separation rate. The impact on the hiring rate is also larger than before: a 10 percent increase in the external wage weight generates a 0.5 percentage point decrease in the hiring rate. More generally, these results clearly indicate that the internal and external wage weights contain information that is relevant for helping us to predict employment outcomes. The impact of the external wage weight on firms' failure is greater than in the previous formulation: a 10 percent increase in the external wage weight is associated with a 0.8 percentage point increase in the probability of firm closure (columns 2 and 4 of Table 5).

6 Conclusions

In Portugal collective agreements rule the wage floors of around 30,000 job titles. Given the widespread use of extension mechanisms (“*portarias de extensão*”), the coverage of those “minimum wages” is close to 90 percent of all wage-earners in the private sector. This occurs despite the fact that the union density rates are very low.

This means that in the Portuguese labor market firms confront not only severe downward nominal wage rigidity because nominal wage cuts are forbidden, but also because of what we tentatively call “upward nominal wage rigidity”. This phenomenon is similar in nature to the frictions generated by nationwide mandatory minimum wages, in the sense that many firms are forced to increase their wages to comply with the updated wage agreements.

In this paper we explore an unusually rich matched employer-employee data set, one that provides for each worker the identification of the collective agreement (and the corresponding job title) binding the formation of base wages. In this setup we estimate for each firm the wage bill growth that is implied by the signing of a new contract. We then present evidence showing that the firms that are more strongly affected by the change in the bargained wage floors decrease their hiring rates and, more importantly, significantly increase their separation rates, leading to fairly sizeable higher job destruction rates. Furthermore, higher-wage impacts are also associated with greater failure rates of firms.

Focusing on the stock of employed workers, we observe the impact of externally driven wage increases being largely concentrated on (higher) worker separations. This is also true if we restrict the analysis to the newly-hired. Indeed, when we look at the determinants of the wages of new hires, what we see is that the role of external wages is more intense among (higher) worker separations.

The empirical results collected in the current essay call into question the functionality of the architecture of the Portuguese wage setting system. In particular, it raises very serious concerns

with respect to the widespread use of extension mechanisms. Also, the limited role played by the workers councils in the Portuguese legal framework seriously hinders any moves toward a decentralized (firm based) system of wage negotiations (Martins (2015)). Furthermore, given the low representativeness of the unions and of the employer associations, it may well be possible that higher wage firms and higher wage workers engage in a strategic behavior, seeking to avoid the competition of lower wage firms and lower wage workers.

In this framework it seems to be justified to limit the extension of wage agreements to criteria based on the representativeness of the negotiation partners, as recently approved in Portugal. The praised German experience (Dustmann et al. (2014)) favoring opting out clauses and decentralized mechanisms in which worker councils play an important role should also be given serious consideration, even though the governance structure of the Portuguese system of industrial relations is, unlike the German one, firmly rooted in legislation and overwhelmingly governed by the political process.

Appendix A - Description of variables

Table 6: Description of the variables used in the paper

Variables	Description
Hiring rate	number of new social security identifiers reported by firms in each year divided by the number of workers in the previous year
Separation rate	number of social security identifiers that were reported by firms in the previous year but not in the current year divided by the number of workers in the previous year
Failure	binary variable that is equal to 1 in a given year t for firms whose individual identifier left the database in that year and 0 otherwise
Implied wage bill growth	sum for each firm of the changes between the new wage floor set by the collective wage agreement for $t+1$ and the current base wage at time t for all workers, assuming that the job title structure remains unchanged
External wage weight	contribution of external wages to the formation of entry wages; it is the firm-level coefficient of the external wage that results from a model that regresses entry wages on the internal and external wages in the same job title
External wage weight estimate	predicted estimated external wage weight for each firm obtained from an auxiliary regression that regresses the external wage weight on a set of dummy variables identifying the ruling wage agreement
Firm age	number of years since start-up expressed in logs

Appendix B - Least squares solution to the model presented in Section 5.1

The estimation of the model shown in Section 5 cannot be implemented using the standard procedure to deal with a model with one fixed effect. This is because the number of β coefficients that would need to be estimated ($2 \times 15,787$) is too large to allow for the application of the within estimator. However, it is still possible to find the exact least squares solution to the model (equation 3).

The trick is to estimate the model in two steps making use of the Frisch-Waugh-Lovell (FWL) theorem and the fact that for a subset of variables the firm-level observations are independent. In the first step we expurgate from w_{ifjt} and x_t the effect of the other variables in the model. This amounts to calculating the residual of regressions on w_{fjt}^I and w_{jt}^o for each individual firm. Then we regress the residual of w_{ifjt} on the residual of the x_t and obtain $\hat{\gamma}$, the OLS estimate of γ . To obtain the OLS estimates of β_f^I , β_f^o and α_f we need only to regress $w_{ifjt} - x_t \hat{\gamma}$ on w_{fjt}^I and w_{jt}^o again for each individual firm. The constant term in firm level regressions are the OLS estimates of the α_f , and the standard errors obtained by this procedure are correct as long as we adjust the degrees of freedom.¹²

¹²The Stata user-written program *regintfe* programmed by one of the authors implements this method. The code is available in the Statistical Software Components (SSC) Archive.

References

- Abowd, J. M., Kramarz, F., Margolis, D. N. and Philippon, T. (2000), The Tail of Two Countries: Minimum Wages and Employment in France and the United States, IZA Discussion Papers 203, Institute for the Study of Labor (IZA).
- Addison, J. T., Portugal, P. and Varejão, J. (2014), ‘Labor demand research: Toward a better match between better theory and better data’, *Labour Economics* **30**(C), 4–11.
- Addison, J. T., Portugal, P. and Vilarés, H. (2017), ‘Unions and Collective bargaining in the Wake of the Great Recession: Evidence from Portugal’, *forthcoming in British Journal of Employment Relations* .
- Bils, M., Chang, Y. and Kim, S.-B. (2014), How Sticky Wages in Existing Jobs Can Affect Hiring, NBER Working Papers 19821, National Bureau of Economic Research, Inc.
- Blanchard, O. J. and Summers, L. H. (1987), ‘Hysteresis in unemployment’, *European Economic Review* **31**(1-2), 288–295.
- Caballero, R. J. and Hammour, M. L. (2000), Institutions, restructuring, and macroeconomic performance, NBER Working Papers 7720, National Bureau of Economic Research, Inc.
- Cahuc, P. and Zylberberg, A. (2009), *The Natural Survival of Work: Job Creation and Job Destruction in a Growing Economy*, MIT Press Books, The MIT Press.
- Card, D. (1990), ‘Unexpected Inflation, Real Wages, and Employment Determination in Union Contracts’, *American Economic Review* **80**(4), 669–88.
- Cardoso, A. R. and Portugal, P. (2005), ‘Contractual wages and the wage cushion under different bargaining settings’, *Journal of Labor Economics* **23**(4), 875–874.

- Carneiro, A., Guimarães, P. and Portugal, P. (2012), ‘Real Wages and the Business Cycle: Accounting for Worker, Firm, and Job Title Heterogeneity’, *American Economic Journal: Macroeconomics* **4**(2), 133–52.
- Carneiro, A., Portugal, P. and Varejão, J. (2014), ‘Catastrophic job destruction during the Portuguese economic crisis’, *Journal of Macroeconomics* **39**(Part B), 444–457.
- Dias, D. A., Marques, C. R. and Martins, F. (2013), ‘Wage rigidity and employment adjustment at the firm level: Evidence from survey data’, *Labour Economics* **23**, 40–49.
- Diéz-Catalán, L. and Villanueva, E. (2014), Contract staggering and unemployment during the Great Recession: evidence from Spain, Working Papers 1431, Banco de España.
- Dolado, J. J., Felgueroso, F. and Jimeno, J. F. (1997), ‘The effects of minimum bargained wages on earnings: Evidence from Spain’, *European Economic Review* **41**(3-5), 713–721.
- Dustmann, C., Fitzenberger, B., Schönberg, U. and Spitz-Oener, A. (2014), ‘From Sick Man of Europe to Economic Superstar: Germany’s Resurgent Economy’, *Journal of Economic Perspectives* **28**(1), 167–88.
- Fougère, D., Gautier, E. and Roux, S. (2016), Understanding Wage Floor Setting in Industry-Level Agreements: Evidence from France, IZA Discussion Papers 10290, Institute for the Study of Labor (IZA).
- Galuscak, K., Keeney, M., Nicolitsas, D., Smets, F., Strzelecki, P. and Vodopivec, M. (2012), ‘The determination of wages of newly hired employees: Survey evidence on internal versus external factors’, *Labour Economics* **19**(5), 802–812.
- Haefke, C., Sonntag, M. and van Rens, T. (2007), Wage rigidity and job creation, Economics Working Papers 1047, Department of Economics and Business, Universitat Pompeu Fabra.

- Manning, A. (2003), *Monopsony in Motion: Imperfect Competition in Labour Markets*, Princeton, NJ: Princeton University Press.
- Martins, F. (2015), ‘On the wage bargaining system in Portugal’, *Economic Bulletin and Financial Stability Report Articles* .
- Martins, P. S. (2014), 30,000 Minimum Wages: The Economic Effects of Collective Bargaining Extensions, IZA Discussion Papers 8540, Institute for the Study of Labor (IZA).
- Olivei, G. and Tenreyro, S. (2007), ‘The timing of monetary policy shocks’, *American Economic Review* **97**(3), 636–663.
- Olivei, G. and Tenreyro, S. (2010), ‘Wage-setting patterns and monetary policy: International evidence’, *Journal of Monetary Economics* **57**(7), 785–802.
- Pissarides, C. A. (2009), ‘The unemployment volatility puzzle: Is wage stickiness the answer?’, *Econometrica* **77**(5), 1339–1369.
- Portugal, P. and Cardoso, A. R. (2006), ‘Disentangling the minimum wage puzzle: An analysis of worker accessions and separations’, *Journal of the European Economic Association* **4**(5), 988–1013.
- Teulings, C. and Hartog, J. (2008), *Corporatism or Competition?*, Cambridge Books, Cambridge University Press.
- Torres, S., Portugal, P., Addison, J. T. and Guimarães, P. (2013), The Sources of Wage Variation: A Three-Way High-Dimensional Fixed Effects Regression Model, IZA Discussion Papers 7276, Institute for the Study of Labor (IZA).
- Visser, J. (2013), Wage Bargaining Institutions – from crisis to crisis, European Economy - Economic Papers 488, Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

Webber, D. A. (2013), Firm Market Power and the Earnings Distribution, IZA Discussion Papers 7342, Institute for the Study of Labor (IZA).