I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 13542

Wage Determination and the Bite of Collective Contracts in Italy and Spain: Evidence from the Metalworking Industry

Effrosyni Adamopoulou
Ernesto Villanueva

JULY 2020

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 13542

Wage Determination and the Bite of Collective Contracts in Italy and Spain: Evidence from the Metalworking Industry

Effrosyni Adamopoulou
University of Mannheim and IZA

Ernesto Villanueva
Banco de España

JULY 2020

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Wage Determination and the Bite of Collective Contracts in Italy and Spain: Evidence from the Metalworking Industry*

In several OECD countries employer federations and unions fix skill-specific wage floors for all workers in an industry. One view of those "explicit" contracts argues that the prevailing wage structure reflects the labor market conditions back at the time when those contracts were bargained, with little space for renegotiation. An alternative view stresses that only workers close to the minima are affected by wage floors and that the wage structure reacts to current labor market conditions. We disentangle both models using a novel dataset that combines more than 1,000 signature dates and 15,000 wage floors set in the metalworking industry with labor market histories of metalworkers drawn from Social Security records in Italy and Spain. An increase in the contemporaneous local unemployment rate of 1 p.p. diminished contemporaneous mean wages by about 0.45 p.p. between 2005 and 2013 in both countries. Instead, a 1 p.p. higher unemployment rate back at the time of contract renewal reduced wages by 0.07 p.p., an impact driven by wages close to the negotiated wage floors. Even though the evidence for earlier periods is mixed in Italy, the results do not support the view that the wage structure reflects labor market conditions at the time of bargaining. The response of wages to local unemployment was driven by reductions in complements and employee churning, although the elasticity falls short of the prediction of an off-the-shelf bargaining model.

JEL Classification: J31, J38, J52

Keywords: minimum wages, collective contracts, Social Security data, spot market, explicit contracts, wage cyclicality

Corresponding author:
Effrosyni Adamopoulou
University of Mannheim
Department of Economics
L7, 3-5
68161, Mannheim
Germany

Email: adamopoulou@uni-mannheim.de

* We thank Manuel Arellano, Samuel Bentolila, Pierre Cahuc, Florentino Felgueroso, Nicholas Giannakopoulos, Andreas Gulyas, Pedro Martins, Matthias Meier, Raffaella Nizzi, Raül Ramos, Hillel Rapoport, Thorsten Schank, Paolo Sestito, Oskar Skans, Eliana Viviano, the participants in the University of Mannheim internal seminar, in the University of Mainz brown bag seminar, in the 2019 IZA Workshop on Labor Market Institutions in Bonn, in the 31st EALE in Uppsala, in the Bank of Spain Workshop on Wage Flexibility and Its Macroeconomic Implications in Madrid, in the 2019 RES in Coventry, in the 43rd SAEe in Madrid, in the 30th EALE in Lyon, in the Workshop on Wages and the Labor Market in Helsinki, and in the CESifo LINER-AUEB Conference on the Minimum Wage Institution in Hydra for useful suggestions and help and Alvaro Carrillo, Marcos Delgado, Jesus Sanchez Carrero and especially María Rubio and Sabrina Montanari for excellent research assistance. Part of this research has been carried out while Adamopoulou was visiting the Bank of Spain (External Work Experience). The views expressed in this paper are the ones of the authors and do not necessarily reflect those of the Bank of Spain. All the remaining errors are ours. Financial support by the German Research Foundation through CRC TR 224 (Project A03) is gratefully acknowledged.

1 Introduction

In many economies unions and employer federations bargain skill-specific wage floors in collective contracts that are binding also for workers and employers not affiliated to any of the bargaining parties. For example, it is well known that the coverage of collective contracts in countries like France, Germany, Italy or Spain exceeds by far the fraction of workers affiliated to unions.[1] The implications of those wage setting institutions for labor market adjustment and macroeconomic performance are potentially important. A literature often assumes that as the whole structure of wages is bargained infrequently, collective contracts introduce widespread downward nominal and real wage rigidity that, in turn, helps to propagate adverse macroeconomic shocks.[2] An alternative view of collective contracts is that they only bind for the set of workers whose earnings are close to the bargained wage floors without necessarily hampering the responses of wages to the business cycle.[3] According to that view, minimum wages set in collective contracts would have localized effects in the labor market, without necessarily affecting the whole wage distribution, let alone the aggregate allocation of labor.[4] This study combines a novel dataset on more than 15,000 skill-specific wage floors and 1,000 signature dates of collective contracts in the Italian and Spanish metalworking industry with detailed longitudinal employment histories in Social Security data and proposes a way to test which of the models of the labor market is consistent with the evolution of worker's earnings over the business cycle. Wage setting institutions differ in both countries in their degree of centralization (complete in Italy, regional in Spain) and renegotiation frequency (fixed in Italy, variable in Spain). According to Calmfors and Drifill (1988) those differences have dramatic implications on employment outcomes.

The test is the following. If collective contracts shaped the whole distribution of earnings, and those wages were completely rigid between renegotiation periods, then wage

[1] See OECD (2019) and Visser (2013).

[2] In the labor-macro literature, Boeri and Burda (2009), Christiano, Eichenbaum, and Evans (2005), Faia and Pezone (2020), Gertler and Trigari (2009), Jimeno and Thomas (2013), and Olivei and Tenreyro (2007) model aggregate wages as set in infrequently negotiated collective contracts. On the empirical front, Björklund, Carlsson, and Skans (2019) estimate the impact of monetary policy shocks on wages and employment by examining their effectiveness when collective contracts are bargained, relying on the implicit assumption that most wages are affected by collective contracts.

[3] Cardoso and Portugal (2005) note that most workers in Portugal earned wages above the minimum wage floors, and that such cushion gives firms a margin of flexibility. Schulten, Eldring and Naumann (2015) also argue that multiemployer contracts provide ample scope to firm bargaining to set wages above and beyond the minimum wage floors.

[4] The most recent literature on the effects of minimum wages uses the so-called "bunching" approach, which focuses on the spike/bunching of jobs just around the minimum wage. For example Cengiz et al. (2019) estimate the employment effects of minimum wage increases by comparing the number of excess jobs paying at or slightly above the new minimum wage to the missing jobs paying below it and find that the overall number of low-wage jobs remained essentially unchanged after the increase in the minimum wage.

growth and the structure of wages should mainly reflect the labor market conditions back at the time when the prevailing collective contract was signed. A higher unemployment rate at the time of contract renegotiation would erode unions' bargaining power by lowering their outside option so wages would be lower than in the case labor market conditions had been more favorable. Conversely, if collective contracts affected only the earnings of workers close to wage floors, the compensation of employees well above those minima should reflect contemporaneous labor market conditions -i.e., any downward wage rigidity introduced by collective contracts would be then confined to workers earning amounts close to wage floors. Hence, our test regresses monthly earnings of workers on the current local unemployment rate and on the unemployment rate at the time of the collective contract renegotiation, allowing for heterogeneous responses depending on the distance between workers' earnings and their corresponding wage floor -and controlling for individual and establishment fixed effects that capture worker's innate ability and firm's compensation policy.[5] We therefore adapt the methodology of implicit contracts for the case of explicit contracts using the unemployment rate at renewal instead of that at entry. To obtain variation in labor market conditions, we analyze the period 2005-2013, spanning the Great Recession, which witnessed around 6 p.p. increase in the national unemployment rate in Italy and as much as 20 p.p. in Spain.

Despite differences in the structure of collective bargaining between Italy and Spain, many of our results are similar in both countries. First, we present graphical evidence on the distribution of the percentage difference between individual earnings and the (province)-skill-year specific wage floors to document that wages set in collective contracts are binding indeed (*the wage cushion*, see Cardoso and Portugal, 2005). We document concentration around negotiated minimum wages: in both countries 3-4% of workers have wages very close to (at most 2.5% above) the bargained wage floor that corresponds to their skill level and (in Spain) the province of the employer. Furthermore, only a small fraction of workers receive monthly earnings below the corresponding minima (non compliance). We also find that wage floors adjust somewhat over the business cycle: a 1 p.p. increase in the unemployment rate back at the time of renewal decreases wage floors bargained in collective contracts by about 0.2% in both countries, a fact qualitatively consistent with some previous findings in Italy (Rosolia, 2015), France (Gautier, Fougère, and Roux, 2018) and Spain (Bentolila, Jimeno, and Izquierdo, 2010). However, unemployment at the time of renewal has a limited impact on the full structure of monthly

[5]Those specifications are versions of the approach pioneered by Beaudry and Di Nardo (1991) and then used by Hagedorn and Manovskii (2008), Bellou and Kaymak (2012), and Martins, Solon and Thomas (2012) who use those specifications to disentangle between the competitive labor market hypothesis and the implicit contracts by regressing wages on current unemployment and unemployment at worker's entry in the firm.

earnings in the metalworking industry, and these effects are confined to workers with monthly earnings close to the wage floors. Namely, for workers earning at most 20% above the wage floors, a 1 p.p. increase in the unemployment rate back at the time of contract renewal reduces monthly earnings by about 0.1%. For this set of workers, wages could reflect the labor market conditions at contract renewal for several years up until the next renegotiation round takes place (see Kudlyak, 2014 for a similar mechanism). For workers earning at least 50% above the wage floors, however, unemployment at contract renegotiation plays a very small role. On the contrary, a 1 p.p. increase in current unemployment diminishes their nominal wages by between -0.6 and -0.8%, a response that is mostly driven by changes in wage complements.[6] Our estimates of the relationship between contemporaneous unemployment and wages for workers in the metalworking industry earning far from the minimum are close in magnitude to those found in other European countries (Verdugo, 2016).[7]

Since we find that collective bargaining introduces in both countries a mixture of wage determinants (i.e., contemporaneous unemployment matters for wages far from the minima, while unemployment back at the time of renegotiation is more important close to the minima), we then explore how contemporaneous changes in unemployment affect the full distribution of the average monthly (Spain) and daily (Italy) wage cushion within each year. To do this, we adapt previous work from Cengiz et al. (2019) on the impact of minimum wages and examine how changes in contemporaneous unemployment affect the fraction of workers at several points of the wage cushion -i.e., the difference between actual monthly earnings and the corresponding wage floor. The changes in the distribution of wages when unemployment increases are qualitatively similar across countries: an increase in the unemployment rate by 1 p.p. reduces the fraction of workers earning at least 1.5 times their corresponding wage floors by 0.6 p.p., and increases accumulation at wage floors by between 0.3 (in Italy) and 0.44 p.p. (in Spain). When we decompose various margins of the response across different types of workers and firms (stayers vs nonstayers, blue vs white collars, small vs large firms), we find that some adjustment mechanisms differ across the two economies. In Italy, all changes in the wage structure along the business cycle happen among stayers, while in Spain new entrants account for about

[6] Gautier, Roux, and Suarez-Castillo (2019) document larger spillover effects of minimum wage increases on wages close to the minimum but a rather homogeneous effect of indexation along the wage distribution in France. We focus instead on the labor market conditions that shape negotiated wage changes at contract renewal and find stronger impacts on wages close to the minimum but less so further up the wage distribution. By studying the heterogeneity of workers in different parts of the wage cushion distribution, our results complement recent evidence on the responsiveness of the variable part of wages based on firm-level survey data (Babecký et al. 2012 and 2019, Bodnár et al. 2018).

[7] Le Bihan et al. (2012) and Sirgudsson and Sigurdardottir (2016) model the frequency of wage changes in France and Iceland and find that unemployment over the wage spell plays an important role. On the contrary, we do not model the decision of changing minimum wage floors because the length of the agreements is pre-specified in the collective contract.

half of the observed cyclicality. Namely, in Italy, when unemployment increases by 1 p.p. the fraction of workers earning at most 20% away from the negotiated minima increases by 0.29 p.p. Of those, 0.55 are stayers while the fraction of new entrants actually decreases by 0.26 p.p. Conversely, in Spain the fraction of workers close to minimum wages increases by 0.44 p.p., 0.11 of which are new entrants. Similarly, we find that increases in unemployment increase the fraction of blue collar workers close to the negotiated minima more in Spain than in Italy. As we control for individual- and firm fixed-effects, this finding implies that there may be occupational churning along the business cycle, i.e., white collar workers are rehired as blue collars in recessions. Finally, we find that an increase in the unemployment rate increases accumulation at wage floors relatively more for workers in small firms than for those in larger ones.

Taken together, those results suggest that, while the determinants of wages vary over the earnings distribution, for most workers in the metalworking sector in Italy and Spain, earnings do adjust over the business cycle. Although the magnitude may fall short of what is predicted by canonical search and matching models (see the discussion in Section 7), the responses we obtain for most workers are in the range of estimates obtained for other economies in the Euro area with presumably higher degrees of wage cyclicality. In that sense, our results suggest that wage setting institutions like collective bargaining may introduce downward wage rigidity but mostly for workers whose monthly earnings are at most 1.2 times above wage floors (roughly 20% of the workforce in the sector in each country, according to our estimates). Secondly, there are differences between Italy and Spain in the margins of earnings adjustment, which suggests that, if anything, labor market institutions other than wage setting, such as the share of temporary contracts, play a more important role in the evolution of wages over the business cycle.

Methodologically, we depart from previous work on the effects of negotiated wages by exploiting worker level heterogeneity by distance to the minima. For example, Fanfani (2019) documents that average earnings growth greatly correlates with wage growth bargained in collective contracts -a finding that supports the notion that whatever the determinants of growth of negotiated minimum wages are, they spill over the full distribution of earnings.[8] Indeed, we provide visual evidence of an apparent stability of repeated cross-sectional distributions of the wage cushion in both countries between 2008 and 2013 -a period of increasing unemployment. That stability would suggest that all wages move with negotiated wage floors. However, once we exploit within-worker changes and account for the distance between workers' earnings and the minimum wage floor, most wages do

[8]Fanfani (2019) uses Italian Social Security data to regress the logarithm of the average wage in the interaction local labor market × collective contract × two digit industry on the average and median payscale set in a contract, local labor market characteristics (unemployment rate) and time fixed effects. The estimated coefficient of the average/median payscale in the collective contract is 0.45.

react to changes in contemporaneous unemployment.[9] The apparent stability of the wage cushion (i.e, the relative position of workers' earnings with respect to the skill-specific negotiated minimum wage) is the consequence of well-studied quality changes over the business cycle (see Carneiro et al., 2012).

Recent papers for the U.S. (e.g. Jardim, Solon, and Vigdor, 2019; Kurmann and McEntarfer, 2019) use administrative data on worker's compensation inclusive of non-base components and document frequent nominal wage cuts among job stayers. Grigsby, Hurst and Yildirmaz (2019) are able to distinguish between base and non-base pay components and show that while workers' contracts, which specify base wages and a bonus schedule are quite rigid, workers' realized compensation (base pay + bonuses) turns out to be quite flexible. We contribute to this literature by showing that this is the case also in economies where explicit contracts are thought to be binding due to the institutional framework of collective bargaining and by uncovering workers' heterogeneity in wage adjustment by their distance to the negotiated minima.

Our analysis also relates to the literature that studies the relationship between wages and local unemployment, the so-called "wage curve" (see Blanchflower and Oswald, 1995 and Card, 1995). Our findings indicate that a wage curve exists in both countries but mainly among workers far away from the minima. Given that these workers are the least likely to be affected by collective bargaining, our results suggest that factors other than collective bargaining lie behind the existence of the wage curve in the period 2005-2013.[10]

The paper is organized as follows. The next section provides an overview of the institutional setting in both countries. Section 3 presents the data on actual and negotiated wages and documents some aggregate responses. Section 4 defines the wage cushion and outlines the methodology we adopt to test different models of wage determination. Section 5 presents the main findings, while Section 6 shows various robustness checks, discusses the underlying mechanisms of wage adjustment and extends the period of analysis to the 90s. Finally Section 7 puts the main findings into perspective and Section 8 concludes.

2 Institutional Setting

There is no statutory minimum wage in Italy. Collective bargaining takes place at the national level for each sector and contracts signed after 2009 usually have a duration

[9] Differently from studies of wage setting institutions and wage cyclicality at the firm level (e.g. Gartner et al., 2013, Martins, 2020), we are able to account for within firm heterogeneity in workers' wage adjustment.

[10] Similarly to earlier studies for Italy (Devicienti, Maida and Pacelli, 2008) and Greece (Daouli, Demoussis, Giannakopoulos and Laliotis, 2017), we find that a wage curve emerges as collective bargaining becomes less binding.

of three years (it used to be of two years before 2009 -see Brandolini et al., 2007 and D'Amuri and Nizzi, 2018 for more details). In the metalworking industry the main national collective contract covers two-thirds of workers and is the one that we use in the analysis (benchmark). There are also minor contracts (e.g. for SMEs or for artisans, each covering around one-fifth of workers), which tend to roughly follow the provisions of the main contract. Table A1 in the Online Appendix compares the negotiated wages for 2010 as set by the main collective contract and by the two minor ones and shows that the payscales of the three different contracts are pretty similar. Moreover, the renewals of minor contracts typically coincide or take place within few months after the renewal of the main contract. The minima of each sector are the same across the whole territory, despite the fact that economic conditions largely differ between the South and the North (see Boeri et al., 2019).

By contrast, collective bargaining in Spain takes often place also at the province level for each sector (there are 52 provinces in Spain, with an average of 900 thousand inhabitants in each). In that way local conditions can potentially be taken into account. The duration of collective contracts in Spain typically varies over the business cycle and tends to be shorter in recessions. In expansions the length of collective contracts usually exceeds two years. The national minimum wage during the period of analysis is always below the wage floors set in metalworking collective contracts.

Regarding coverage, there are no legal provisions for mandatory extensions in Italy but judges discretionally identify the "fair wage" level using the payscales defined by the national contracts signed by the main social partners in the relevant sector -see Visser, 2013. Therefore, formal coverage is actually close to 100%.[11] In Spain, contracts signed by employer federations and unions that are considered representative of the sector are automatically extended. Recent estimates suggest that 70% of workers are covered by any form of collective contracts. Among workers covered by multi-employer agreements, half of them are covered by province-level agreements. Bargaining at the firm level is rare in both countries and limited to few large firms. Moreover, in Italy firm level agreements can only envisage top-ups but not wage cuts below the minima set by the sectoral collective contract.[12] Therefore, they cannot act as an extra margin of wage flexibility as much as in other countries (see for example Blien at al., 2013 for the case of Germany).

There are cross-country differences with respect to the benchmark used during negotiations. In Italy the National Institute of Statistics (ISTAT) releases annually in May a

[11] Some recent papers show that there is a fair percentage of workers who are paid below the minima (Garnero, 2018; Lucifora, 2017). However, non-compliance is difficult to be identified in the Social Security data and is subject to measurement error in surveys that rely on self-reported earnings measures. Grigsby et al. (2019) also show that the use of administrative data in studies of wage rigidity is key so as to minimize measurement error.

[12] This used to be the case also in Spain until 2012.

forecast of HICP excluding energy for the following three years that constitutes a formal benchmark for collective bargaining since 2009. This forecast together with the general labor market conditions and sectoral developments guide wage negotiations at the sectoral level. Before 2009, social partners could take into account the one- and two-year ahead inflation targets announced by the government. In Spain there is no formal benchmark but pluriannual country-level recommendations at the industry level. Moreover, many provincial collective contracts in Spain state an inflation threshold of 2% above which clauses may apply. Therefore, the expected inflation at the time of renewal in Spain tends to be invariant at 2%.

Collective bargaining in Italy has been evolving in the last 25 years. In 1993 the wage indexation mechanism was abolished and collective performance-related-pay schemes were introduced (Casadio, 2003), which lowered the degree of downward wage rigidities (Devicienti, Maida and Sestito, 2007)[13] By contrast, the basic characteristics of the collective bargaining system in Spain have remained practically unchanged until 2012 as there was no relevant reform of its main institutional features before that (Bentolila et al., 2010). The Great Recession changed some aspects of collective bargaining in both countries. In Italy Article 8 of law 138/2011 gave the possibility to opt out at the local level from both National Contracts and law provisions concerning work organization, tasks and use of temporary contracts. However, opting-out was seldomly applied and the main social partners overtly announced they would not use it. In 2012, FCA-Fiat Chrysler Auto dropped its membership with its employers' organization and signed a company-level agreement. Moreover, starting in 2013, there was an increase in the so-called pirate agreements, i.e. collective agreements signed by unknown organizations (Lucifora and Vigani, 2020). These developments do not pose a threat to our analysis since we study the period 2005-2013. Moreover, the Italian Social Security data contain exact information on the national collective contract that covers each worker. This enables us to conduct a robustness check using detailed information on the negotiated wages and dates of renewals for each contract (main, SMEs, artisans, FCA), which gives results similar to the benchmark. In Spain the 2012 labor market reform established the priority of firm-level agreements and opened avenues for employers to unilaterally change the wage conditions in case of economic difficulties. The unilateral changes allowed employers to reduce workers' wages to the bargained minimum. Finally, the 2012 law also allowed firms to deviate from the collective contract in case of economic difficulties. Despite all those changes, there is no clear evidence of the use of those provisions. Our own results below suggest that deviations from wage floors were small and did not increase after 2012.

[13] See Manacorda (2004) and Leonardi et al. (2019) for the effects of the wage indexation scheme on inequality and Lucifora and Origo (2015) for an analysis of the performance related pay schemes.

In this paper we focus on metalworkers in order to study how binding the minimum wages are as well as their evolution over time. The choice of this sector is not random. First, it is an open, tradable sector and therefore not strictly linked to internal developments of each country. Second, it is a highly unionized sector whose collective contracts are well defined and likely enforced. Third, it represents a large part of workers especially in Italy (around 15 per cent of the private non agricultural sector) but also in Spain (around 7 per cent).

3 Data and aggregate responses

3.1 Data description

For the empirical exercise we bring together information from administrative data harmonized for the two countries as well as hand-collected data on collective contracts for the period 2005-2013. Data come from Social Security records (MCVL for Spain and INPS for Italy) and cover a random sample of the workforce in the private sector of each country (4% in Spain and 6.5% in Italy). We restrict the sample to metalworkers, i.e. to those employed in firms whose sector of activity is either C24, C25, C28, C29, or C33 (NACE, rev. 2) and focus on employees aged 20-64, with a temporary or permanent contract who work either full-time or part-time. The Italian Social Security data contain exact information on the national collective contract that covers each worker. In a robustness exercise, we obtain similar results when we restrict the sample further using this kind of information. We exclude managers and apprentices and we adjust the daily (in Italy) and monthly (in Spain) earnings of part-time employees according to the fraction of time they work. In the case of Italy we also exclude workers on short time work benefits. Social Security data in Spain contain monthly base wages excluding overtime pay or bonuses and are adjusted for the 14 monthly payments. Moreover, for workers outside the Basque Country and Navarra we are also able to observe yearly total wages of each worker (obtained from tax records matched with the Social Security data). Therefore, in the empirical analysis we use total wages both for Italy and Spain (i.e., including base wages but also personal complements such as overtime, shift work or other compensation agreed between the firm and the employee on top of the base wage). Moreover, in the case of Spain we are able to analyze separately the cyclicality of the base and total salary as in Grigsby et al. (2019), Jardim et al. (2019) and Kurmann and McEntarfer (2019). We focus on workers that worked 31 days in December and use the December wage (annualized). Instead, wages in the Italian Social Security data are observed at a yearly frequency and include overtime pay, bonuses and the 13th payment. We focus on

employees in Italy that have worked at least for 6 months during the year and convert annual wages into daily ones using information on the number of days worked during the year. In both countries, we use measures of nominal (rather than real) wages.[14] The reason is that we study responses to unemployment back at the time of renegotiation of actual wages and wages settled in collective contracts. Inflation is not known at that time.

The data on contracts are hand-collected minima by occupation (specified for up to 30 occupation/skill categories in Spain, depending on the province, and for 9 categories in Italy). Figures A1a and A1b in the Online Appendix show examples of payscales defined in collective contracts of the metalworking sector in the two countries. In Italy, the collective contract sets the number of monthly payments within the year (13) and defines monthly minima. We thus adjust the minima to include the corresponding amount of the 13th payment and transform them into daily dividing by the total number of working days during the year (312).[15] We also account for seniority bonuses, which are also determined in the collective contract.[16] In this way, the negotiated minima are comparable to the wages we observe in the Social Security data. In Spain, the collective contracts set in most cases both monthly and annual minima (depending on the province) and define top-ups (*C/S*, *complemento salarial* in Figure A1b) which often exceed the 13th and 14th payment. Therefore, we use the annual minima that include all top-ups and convert them into monthly to be comparable to the wages in the Social Security data.

In the Spanish Social Security data occupations are observed with some detail (12 occupation/skill categories) that enables us to attribute to each worker the corresponding minimum wage (see Table A2 in the Online Appendix for a detailed description of the method of assignment).[17]

In the Italian Social Security data occupations are much more aggregated into three main categories "middle managers", "white collars", and "blue collars". We address the issue by considering the two lowest minima that correspond to each aggregate category and choose the one that is closer to the actual wage. Differently from previous studies that considered one negotiated wage for all workers (either the minimum of the minima or the one corresponding to the average-occupation worker) we consider 6 out of the 9 payscales set in the metalworkers' collective contract. We validate this assumption using

[14] Also Grigsby et al. (2019), Le Bihan et al. (2012) and Sigurdsson and Sigurdardottir (2016) study wage rigidities and the frequency of wage changes using nominal rather than real wages.

[15] The 13th payment is paid fully only to workers who worked throughout the whole year. Therefore, for each worker we weigh the 13th payment with the number of days worked over the total number of working days.

[16] According to the collective contract, workers are entitled to an increase in negotiated wage of 0.02% after every two years of employment in the firm until they reach a maximum of 10 years of tenure.

[17] In particular, we define a set of occupations that are present in all 48 provinces and correspond to 10 groups in Social Security. We exclude from the analysis apprentices/workers aged below 18.

the Structure of Earnings Survey (SES) data where occupational categories are more disaggregated and we find similar concentration around the minima (Figure B6 in the Online Appendix).

Table A3 in the Online Appendix presents an illustrative example for 2010 to describe the method we use to assign minima to workers from the Social Security records. In the first step we define the possible set of minimum wages that correspond to each aggregate occupational category. For blue collars we consider the negotiated wages of categories 1 and 2, for white collars the negotiated wages of categories 3 and 4 and for middle managers the negotiated wages of categories 7 and 7Q. In a second step, for each worker we compare his/her actual wage in the Italian Social Security data to the set of minima identified in step 1, adjusted for the 13th payment and seniority bonuses. For example, suppose that in the Social Security data we observe a blue collar with monthly wage 1300. Then we attribute to him/her the negotiated wage of category 2 (1277.56) while to a blue collar with monthly wage 1200 we attribute the negotiated wage of category 1 (1165.31). We do allow for non-compliance below the minima of categories 7, 3, and 1. Therefore, a blue collar with monthly wage 1000 will be considered as non-compliance.

In this way we obtain a dataset with administrative employer-employee data matched with the corresponding minima set by collective bargaining in the Italian and Spanish metalworking industry. In a next step, we complement our dataset with information on the national and local unemployment rates provided by the National Institutes of Statistics of each country (ISTAT and INE) to test different models of wage determination. The final sample size ranges between 11,000 and 15,000 observations per year in the case of Spain and between 49,000 and 63,000 observations per year in the case of Italy. Table 1 presents some descriptive statistics. Both total and negotiated average wages are remarkably similar between the two countries (2300 and 1300 euros, respectively). Workers are 40 years old on average, and non surprisingly more than 80% of them are men as the metalworking industry is a predominantly male sector. The percentage of stayers is around 78% in both countries. However, the fraction of of blue collars is higher in Spain than in Italy (72 vs 64%) as well as that of temporary workers (15 vs 6%).[18] Lastly, the average firm size and unemployment rate in Spain are double those in Italy.

3.2 Aggregate responses

Both Italy and Spain had experienced the consequences of the Great Recession. The unemployment rates rose significantly (Figure B1 in the Online Appendix). In the Italian metalworking industry value added dropped by more than 25% in 2009 with

[18] Recall that we have restricted the sample to workers that have worked at least for 6 months during the year.

respect to 2008 (Figure B2 in the Online Appendix). The sector recovered by 2011 and value added remained fairly constant thereafter. Moreover, in 2013 inflation dropped abruptly reaching a historically low level in 2014 (Figure B3 in the Online Appendix). However, negotiated wages in the metalworking sector continued to rise by around 2% per year (Figure B4 in the Online Appendix). This is because negotiated wages in Italy are determined not only by cyclical developments but also by inflation expectations (Rosolia, 2015). Social parties upon the contract renewal in the end of 2012 did not anticipate the drop in inflation that took place in 2013.

In Spain aggregate developments in the metalworking industry followed a slightly different pattern. Value added decreased less than in Italy (by around 15% in 2009 with respect to 2008) but it took longer to recover. Inflation also reached a historical low in 2014. Contrary to Italy, negotiated wages did respond in Spain but the adjustment was not immediate. While increasing by around 3% until 2012, they fell abruptly to a median of 0% after 2012 (Díez-Catalán and Villanueva, 2015). That development is consistent with the differential impact of structural reform in collective bargaining in Spain in 2012, but also with other hypotheses such as the progressive renegotiation as long contracts during the previous expansion ceased to bind.

But how did the distribution of actual wages around the minima evolve? We first answer this question by looking at the wage cushion and its characteristics in both countries during the period 2007-2013. We then extend our analysis to 2005-2013 and estimate alternative models of wage determination.

4 Methods

We first decompose overall nominal wage into the wage settled in collective contracts by occupation category (and province in the case of Spain) and the distribution of actual wages around the minima set in those contracts. By proceeding this way, we can isolate movements in bargaining practices and differences in the distribution of actual wages (or "wage cushion" -see Cardoso and Portugal, 2005 and Dolado, Felgueroso and Jimeno, 1997).

In a second step, we study the relationship between different measures of wages (actual, negotiated, wage cushion) and measures of slack in the labor market by extending the model of Carneiro et al. (2012) and adapting the test of implicit contracts of Beaudry and DiNardo (1991) for the case of explicit contracts.

In particular, we estimate variants of the following model

$$\log(Wage\ measure)_{ispt} = \beta_o + \beta_1 U_{pt} + \beta_2 U_{(p)t_0} + \beta_3 t + \beta_4 t^2 + \mu_i + \mu_f + \varepsilon_{ifpt}. \quad (1)$$

In this model i indexes worker, p indexes province/region, s indexes skill level, f indexes firm and t indexes time. The components μ_i and μ_f are time-invariant components capturing either the quality of the worker (the former) or any component related to time-invariant firm characteristics (such as the existence of firm-specific agreements or time-invariant profitability of the firm). The terms t and t^2 are a time trend and its square. The term U_{pt} is the current unemployment rate at the province level (region level in Italy).[19] As Figures B5a and B5b in the Online Appendix show, there is considerable variation in the level and evolution of unemployment rates across provinces/regions in both countries, which we exploit for identification. We cluster standard errors at the local level. The term $U_{(p)t_0}$ refers to the unemployment rate in the year of contract renewal and is at the national level for Italy and at the province level for Spain given the structure of collective bargaining in each country. More specifically, we use information on signature dates of the national main collective contract in Italy and of the provincial collective contracts in Spain to pin down the year of renewal and use as a regressor the corresponding yearly unemployment rate throughout the years of the validity of the collective contract.[20]

The coefficients of interest are β_1 and β_2. The latter measures how individual wages vary with measures of unemployment at (collective) contract renegotiation. The first one measures how individual wages vary over the business cycle. According to the collective contract view of the labor market, the full payscale is renegotiated infrequently, and wages are insensitive to labor market conditions between renegotiation periods. For example, Olivei and Tenreyro (2007) show that monetary policy shocks are less effective in Japan in the quarters when collective contracts are being negotiated -when bargained wages can respond to economic conditions- than in other quarters of the year -when bargained wages are rigid. Björklund et al (2019) provide similar evidence for Sweden.[21] On the other hand, the empirical evidence shows that upon renegotiation, wages react to lagged unemployment (see Rosolia, 2015 and Bentolila et al., 2010). Hence, β_2 must be negative. According to the spot theory of the labor market, instead, current wages reflect the situation of the labor market. These models emphasize that, while renegotiation may be costly, firms and workers eventually bargain (see Koenig, Manning and Petrongolo, 2016). The presence of minimum wage floors in collective contracts may mitigate the response

[19] Spain is divided into 52 provinces with an average population of 900,000 each (INE, 2014). Italy is divided into 20 regions with an average population of 2,900,000 each and into 110 provinces with an average population of 550,000 each (Istat, 2014). In our benchmark we use the regional unemployment rate for Italy and the provincial unemployment rate for Spain. We conduct a robustness check using the provincial unemployment rate also for Italy and the results are similar.

[20] Typically, the year of renewal of the collective contract coincides with the start of its validity period.

[21] Card (1990) uses Canadian data on manufacturing firms to document real employment to wage rigidity induced by collective contracts that do not fully take inflation into account. Altonji and Devereux (2000) find, on the contrary, that the presence of union workers in a firm does not explain wage rigidity in the United States.

of wages (for example, because some workers earn wages close to the wage floors), but there may be responses in other parts of the wage distribution (see Cardoso and Portugal, 2005). That is, wages reflect the cost of labor in every moment, so that in periods of high unemployment the price of labor falls, resulting in a negative β_1. The relative magnitude of β_1 versus β_2 is then informative about which wage determination model is closer to the data.[22]

Two comments apply. The first is that different regimes may apply along the distribution of earnings. For example, even if wages were mostly determined by the current status of the labor market (i.e., the fluctuations in earnings along the business cycle were better described by the spot market view), they cannot fall short of negotiated minima - either by law (in Spain) or because of the threat of judicial control (in Italy). For that reason, we study how changes in the local unemployment rate affect wages at different points of the distribution.

Secondly, we study the impact of collective contracts on measures of wage cyclicality decomposing wages into two terms. The first are negotiated minima, which are province-specific in Spain but nationally set in Italy. By definition, those minima can only be altered in renegotiation periods, so when we use negotiated wages as a dependent variable in a model like (1), β_1 should be zero. Then, we study the "wage cushion": i.e., the log difference between workers' actual wage and the wage floor in the corresponding skill group-year (and also province in Spain), as that is the component of earnings that firms could in principle adjust over the business cycle.

5 Findings

5.1 The distribution of wages around negotiated minima

In order to get an idea of the distribution of actual wages around the negotiated minima in Italy and Spain we compute the degree of wage concentration around wage floors in the period 2007-2013. As mentioned, a possible explanation of why collective contracts shape the whole wage distribution is that a substantial share of workers earn wages close to the minimum. Table 2 reports the results. We first focus on 2008, the year before the crisis hit Italy and Spain. The wage cushion is around 46% and is remarkably similar between the two countries. The distribution of actual wages around the minima is also similar although it is less smooth in the case of Spain. This is due to the smaller sample size as well as the numerous collective agreements at the province level. As Figure 1 shows there is some bunching around 0, where the actual wage is exactly equal to the

[22] See Beaudry and Di Nardo (1991), Bellou and Kaymak (2012) or Hagedorn and Manovskii (2008) for tests of the spot market hypotheses against the alternative of implicit contracts.

negotiated wage, in both countries. The bunching is more evident in the case of Spain since the wage measure recorded in the Social Security data is the base one and does not include bonuses and overtime pay like in the case of Italy. Furthermore, the fraction of employees earning wages at most 20% above the negotiated minimum was 18.3% in Italy in 2008 (the sum of 9.5 between the minimum and 1.1 times the minimum and 8.8 between 1.1 times the minimum and 1.2 times in Table 2, Panel A column 2). In Spain 21.3% of workers earned at most 1.2 times the minimum floor corresponding to their skill and province in 2008 (the sum of 12.6 and 8.7 in Panel B of Table 2, second column).

Secondly, wage floors in collective contracts in both countries have been binding throughout the period spanning 2007 and 2013, i.e., there is no strong evidence of non-compliance. In particular, at most 3% of workers in the Spanish metalworking industry earn wages below the minimum while the estimate is negligible in Italy. This finding counters recent discussions about collective contracts being non-binding in both countries, at least in the metalworking industry.

Our measure of the degree of accumulation around the minimum wages is heterogeneous across different groups. As expected, the wage cushion is smaller for blue-collars and it increases with skill in both countries (Table 3). It increases more in Italy since the wage measure we use in this descriptive analysis is the one recorded in the respective Social Security data, i.e. total for Italy and base for Spain. In the empirical analysis that follows we use total wages also for Spain (obtained from tax records).[23] New hires, i.e. employees with at most two years of tenure have a much lower wage cushion than the overall group of employees (39% versus 46%) and are therefore more concentrated around the minima (Figure 2). These results are quantitatively in line with those in Cardoso and Portugal (2005), who proxy wage floors in collective contracts by the mode of the distribution of earnings.

Given that occupations in the Social Security data are more aggregate than in the collective contracts, we resort to the Italian Structure of Earnings Survey (SES) in order to validate our results. The SES data contain detailed information on the occupation of each worker (39 occupational categories ISCO-08) as well as information both on monthly and hourly wages. However, the SES data are not longitudinal and do not report the province of employment.[24] Therefore, they do not allow us to match them to the negotiated minima and perform any analysis for Spain. We use the 2010 wave for

[23] Total wages from the tax records are less precise in monthly terms. Therefore, base wages are our preferred wage measure when we study bunching.

[24] The Structure of Earnings Survey (SES) is conducted every four years in the Member States of the European Union (EU) and provides comparable information at EU level on relationships between the level of earnings, individual characteristics of employees (sex, age, occupation, length of service, educational level) and their employer (economic activity, size of the enterprise, etc.) for reference years 2002, 2006, 2010, 2014 and 2018.

Italy and match them to collective contracts for a robustness exercise. Figure B6 in the Online Appendix shows that the distribution of wages around the negotiated minima is similar to the one we obtained with the Social Security data. Concentration around zero is again low (around 2%). Moreover, results do not change if we use the hourly instead of the monthly wage.

As collective bargaining takes place at the national level in Italy and at the province level in Spain it is worth examining geographical differences in the two countries. We observe considerable heterogeneity across the South and the North in Italy (33% and 47%) while in Spain the wage cushion is more similar across different areas (between 37% and 42%).[25] This is true although economic conditions largely differ between the South and the North in both countries. Figure B7 in the Online Appendix depicts the fraction of workers earning at most 20% above the minimum wage over the Italian and Spanish territory. We observe that in Italy the bite of collective contracts is much more evident in the South than in the North as the national level bargaining sets the same negotiated wage in the whole territory. By contrast, in Spain there is not such an evident South-North gradient. Presumably, the province level bargaining may take into account part of the geographical differences.

Comparing repeated cross-sections of the distribution of the wage cushion between 2007 and 2013 one notices that the distribution is remarkably stable during a recessionary period (see Figure 3). Despite different aggregate wage adjustments across countries, wages did not move much in relation to collective contract minima, apparently suggesting that changes in negotiated minima reverberate all over the distribution of actual wages and not just at the bottom. As we see momentarily, that stability disappears when we take into account worker fixed-effects.

Interestingly, and despite higher wage growth in the metal collective contract in Italy, the wage cushion and the fraction of workers who earn at most 10% above the minimum wage have remained constant between 2007 and 2013 while have increased in Spain (Figures B8 and B9 in the Online Appendix). This is surprising given that the growth in negotiated wages departed in the two countries starting in 2012 (Figure B4 in the Online Appendix). If wage growth in union contracts bites only at the minima, one would expect more bunching at the bottom in Italy. However, when negotiated minima go up, firms in Italy are required to increase the negotiated part of wages of all workers and not just of those that earn close to the minimum. This would not necessarily translate into an increase in total wages of workers if firms cut top-ups and other elements of wages.[26]

[25] The only exception in Spain is Bizkaia where the wage cushion is very high. However, the collective agreement in this province ceased to be legally binding in 2000.

[26] The apparent stable evolution of the wage cushion in Italy and the increase observed in Spain could also mask compositional changes. As the upper panel of Figure B10 in the Online Appendix shows, there

5.2 Testing alternative models of wage determination

The comparison of cross-sectional distributions of the wage cushion in Italy and Spain during the period 2007-2013 suggest very little compression of earnings around wage floors during the recession. However, the cross-sectional distribution is the result of new workers entering the labor market and a large fraction of workers being laid-off. As those workers may enter in different parts of the distribution of wages, a comparison of cross-sections does not reflect well the dynamics of earnings. Figure 4 shows OLS coefficients of the first-difference of the logarithm of earnings on a set of year dummies using separate regressions for workers whose earnings in 2008 were at most 1.2 times the wage floor (blue line) and whose earnings were at least 1.5 times the wage floor in 2008 (red line). For illustrative purposes, we focus on workers who remained employed during the period 2007-2013. Italian metalworkers with earnings in 2008 at most 1.2 times the wage floor experienced 2% positive real wage growth in 2009 and 2010, and then modest falls of about 1% between 2011 and 2013.[27] The small response of the earnings of that group to the increase in unemployment mirrors the tiny response of wage floors to changes in unemployment seen in Figure 3. However, workers who initially had earnings in 2008 at most 1.5 times their corresponding wage floor (more than 50% of the Italian workforce in metal) saw their wages cut by between 4 and 6% per year during the period. The results in Spain are qualitatively similar. The stark difference between both groups suggests that earnings of the majority of workers whose earnings in 2008 were at least 1.5 times above the corresponding wage floor did adjust to increases in the unemployment rate, a result that is not consistent with the view that collective contracts shape the full distribution of earnings in the metalworking industry. We provide a formal test below.

is a "hollowing out" of the fraction of workers below 35 years old in both countries. Moreover, in Spain the fraction of workers in very large firms has increased monotonically since 2008 (Figure B10, lower panel). These factors suggest that, adjusting for composition effects, accumulation may have increased since workers for whom wages are binding "disappear" from the sample by entering into unemployment. In order to understand how the wage cushion would look like had the composition of the workforce stayed as it was prior to the recession we conduct a counterfactual exercise as in DiNardo, Fortin and Lemieux (1996) and we reweight the whole distribution of the wage cushion along age, tenure and firm size. Figures B8 and B9 in the Online Appendix report the counterfactual wage cushion as well as the counterfactual fraction of employees earning close to the minimum. Even after adjusting for changes in the composition of the workforce, the wage cushion and the fraction of workers with wages close to the minima do not change much in both countries.

[27] The regressions include worker and establishment fixed effects. The standard errors are clustered at the region/province level for Italy/Spain. Total wages are deflated with the yearly CPI into 2011 euros.

5.2.1 Mean responses

We now study the relationship between different measures of wages (actual, negotiated, wage cushion) and measures of slack in the labor market.[28] Table 4 shows estimates of versions of Model (4) with three different dependent variables. The top panel shows the coefficients of an OLS regression that has as a dependent variable the logarithm of the level of the negotiated wage for each skill-group and year (Italy) and province-skill group and year (Spain). The key regressors are both current local unemployment U_{pt} (provincial in Spain and regional in Italy) and unemployment in the year of the last renewal of the collective contract $U_{(p)t_0}$ (provincial in Spain and national in Italy given the institutional features of collective bargaining in each country). As sectoral bargaining imposes the same negotiated wage levels for all firms, this specification does not include firm fixed-effects. Due to infrequent negotiations, the level of the current unemployment rate does not affect negotiated wages in either country. However, in both countries an increase in the unemployment rate during the year when the collective contract was bargained diminishes negotiated rates by a similar amount: 0.25% in Italy (standard error: 0.02) and 0.20% in Spain (standard error: 0.08).[29,30] As wage scales within each agreement are very stable over time, minimum wage scales update earnings at most during contract renegotiation. Next, we test whether these infrequent changes spill over to the rest of the wage distribution.

Panel B in Table 4 examines the mean response of individual earnings to the current local unemployment rate and to unemployment at the time of collective contract renegotiation. The pattern of the results is similar across countries and suggests a completely different pattern from that of negotiated wages. An increase in the current local unemployment rate by 1 p.p. decreases wages in the metalworking sector in Italy by 0.45% (standard error: 0.23) and by 0.47% in Spain (standard error: 0.05). On the other hand, earnings respond little to changes in unemployment back at the time of renewal: holding constant current unemployment, an increase in unemployment at the time of the collective contract renegotiation by 1 p.p. diminishes current wages by between 0.07% (in Italy) and 0.06% (in Spain). The magnitude, while negative, is in absolute value approxi-

[28] All regressions exclude workers in the Basque Country and Navarra as we are able to observe yearly total wages (obtained from tax records matched with the Social Security data) only for workers outside these provinces.

[29] Standard errors are clustered at the region level in Italy and at the province level in Spain, as the main regressor (local unemployment) is measured at that level.

[30] As a robustness check, we also included in the regression for Italy the inflation forecast released by ISTAT since 2009 (announced by the government as a target before 2009) that serves as a benchmark during negotiations. The coefficient of unemployment rate at renewal continues to be negative and statistically significant despite the limited variation (solely time but not cross sectional) as renewals take place at the national level. For Spain instead, the expected inflation stated in many provincial collective contracts tends to be constant at 2%.

mately a sixth of the estimated response of wages to current unemployment. Overall, the estimates in Panel B support the notion that average worker's earnings do adjust during the business cycle rather than being shaped by the structure of collective bargaining.

Finally, Panel C in Table 4 uses as a dependent variable the percent difference between worker's earnings and the skill-group province minimum (the wage cushion). A negative average response of the variable to changes in the unemployment rate over the business cycle indicates that worker's earnings adjust relatively more along the business cycle than negotiated wages. An increase by 1 p.p. in the local unemployment rate diminishes the wage cushion by 0.86 p.p. in Italy (standard error: 0.32) and by 0.97 p.p. in Spain (standard error: 0.20). Those results suggest that in regions and periods with high unemployment the distribution of earnings becomes more concentrated around wage floors -i.e. the log difference between earnings and wage floors diminishes. The apparent stability of the cross-sectional distribution of the wage cushion during the sample period shown in Figure 3 is the consequence of not conditioning for individual and firm fixed effects.

Instead, changes in unemployment back at the time of renewal of the collective contract explain a very small fraction of the variation in the wage cushion. An increase of 1 p.p. in the unemployment rate at the time of the collective contract renegotiation actually increases the wage cushion by 0.28 p.p. in Italy and 0.26 p.p. in Spain. Coefficients are positive in both countries -contrary to the basic prediction that collective bargaining shapes the whole distribution of earnings- and their absolute magnitude is about a fifth that of current unemployment rate.

5.2.2 Heterogeneous responses

Collective contracts set minimum wages that are binding both in the Italian and Spanish metalworking industry, and those negotiated wages react mainly to changes in unemployment at the time of contract renewal (see Table 4, panel A). So, even if the results in Table 4, panels B and C imply that average earnings do not reflect the business cycle conditions at the time of the renegotiation of the corresponding collective contract, the earnings of workers close enough to the minimum wage in the collective contract may do. For that reason we use a sample of stayers to examine the response of earnings to business cycle indicators distinguishing by the distance between their previous year earnings and the negotiated wage for their skill level.

Table 5 presents the separate impact on actual earnings of current unemployment and unemployment back at the time of contract renewal depending on each worker's one-year lagged wage cushion. We study the effect of unemployment on workers with previous year earnings at most 1.2 times the negotiated wage in the collective contract (for their group

and province) and, separately, on workers whose lagged earnings exceeded 1.5 times the negotiated wage.

Table 5 shows common patterns across both countries. Firstly, the impact of current unemployment is larger in absolute value for workers with lagged earnings 1.5 times above the minimum than for those whose earnings are at most 1.2 times above the minimum. In Italy, for workers far away from the minimum, a 1 p.p. increase in current unemployment decreases earnings by 0.81% (standard error: 0.353) while the response in Spain is 0.56% (standard error: 0.079). However, close to the negotiated minimum wage the response to changes in contemporaneous local unemployment is smaller: it is even positive in Italy (0.175%) while in Spain the response is -0.22 (standard error: 0.062), less than half that in the upper part of the distribution of the wage distribution. Conversely, near the negotiated minimum wage a 1 p.p. increase in unemployment back at the time of contract renewal diminishes wages in Spain by 0.11% (standard error: 0.023). The estimate in Italy (0.10%) is similar, but much less precisely estimated.

An interpretation of those results is that the presence of collective bargaining has heterogeneous impacts over the distribution of earnings. Collective contracts introduce binding minimum wages, thus limiting the variability of earnings over the business cycle for workers whose earnings are close to those minima. The fact that minimum wages are renegotiated infrequently induces the degree of inertia in the distribution earnings that previous authors have identified as supporting an explicit contract model of the labor market. However, for a large share of workers (more than 50% of stayers in the metal working industry), monthly earnings are responsive to business cycle conditions.

6 Robustness, mechanisms and extensions

6.1 Robustness exercises

In this section we perform a set of exercises to test the robustness of our main estimates. One possible concern is the endogeneity of the local unemployment rate at *t*. We address this issue by re-estimating our main specification (4) using the lagged local unemployment rate as a regressor. Table 6, columns 2 and 6 report these results together with the ones of the benchmark (columns 1 and 5) for Italy and Spain. The coefficients are fairly stable across the two specifications. We then focus on Italy and perform two additional robustness checks. Given that Italian regions have an average population of 2,9 million and provinces of 550,000 there is no equivalent counterpart of Spanish provinces, whose average population is 900,000. In our benchmark exercise we use the regional unemployment rate in Italy and the provincial in Spain. We therefore

perform a robustness check using the provincial unemployment rate for Italy as well. Column 3 reports the estimates. The coefficients are qualitatively similar but smaller compared to those of the benchmark exercise for Italy and also to the estimates for Spain. Therefore, Italian regions seem to be a more adequate counterpart of Spanish provinces. Lastly, we address possible concerns on collective contract coverage in Italy by using the information contained in the Social Security data on the exact collective contract of coverage. As we described in the Institutional Setting Section, two thirds of all metalworkers are covered by the main collective contract while the remaining one third is covered by minor contracts for SMEs and artisans with similar payscales to the main contract (Table A1 in the Online Appendix), whose renewals either coincide or take place within few moths after the renewal of the main contract. In this robustness exercise we restrict the sample to workers who are covered by the main, SMEs, artisans and FCA contracts as recorded in the social security data and use detailed hand-collected information on the payscales and dates of renewal for each contract.[31] To further increase accuracy, we use the quarterly unemployment rate at renewal instead of the yearly one. Column 4 displays the results. The coefficients of the current unemployment rate are very much in line with those of the benchmark. The coefficients of the unemployment rate at renewal increase in relative size but continue to be much smaller than those of the current unemployment rate. All in all, these additional exercises show that our results are neither sensitive to the measure of local unemployment used in the analysis nor influenced by endogeneity or differential contract coverage of workers.

Another frequent concern in the wage cyclicality literature is changes in workers' composition (see Solon et al., 1994). Indeed, as Figure B10 in the Online Appendix shows, there has been a "hollowing out" of the share of younger workers while the fraction of workers in very large firms has increased monotonically since 2008. To address this concern, we run a similar regression as the benchmark with the probability of job loss as the dependent variable.[32] Table B1 in the Online Appendix presents the results. None of the coefficients are statistically significant, suggesting that the inclusion of worker and establishment fixed effects is able to account for compositional changes.

6.1.1 Accounting for implicit contracts

A third competing model for the determination of earnings is the implicit contracts version of the job market (see Beaudry and DiNardo, 1991). According to that model, an important determinant of current wages is the labor market conditions at entry. The

[31] In this way we also exclude "pirate" contracts.

[32] The dummy job loss takes the value 1 if the social security data record a termination of the worker-firm match in the previous year and 0 otherwise.

information on the year of entry is only available in the Spanish Social Security data.[33] We are thus able to rerun the regression for Spain only including the unemployment at the year of entry for each worker-firm match along with the unemployment at the year of the collective contract renewal and the current unemployment. We also control for the quality of the match by including the worker's cushion at entry. As Table 7 shows labor market conditions at entry do not seem to matter while current unemployment keeps on being the most important determinant of wages.

6.2 Mechanisms of earnings adjustment

6.2.1 The role of wage complements

A key implication of models of explicit contracts is that full remuneration is fixed over the life cycle due to downward wage rigidity. To obtain further insights on the role of wage adjustments, it is convenient to examine the responses of base and full wages along the business cycle. This information is again available in the Spanish Social Security data only. The results in Table 8 clearly show that for workers whose last year earnings were near the negotiated minima (i.e., were at most 1.2 times the minimum) a 1 p.p. increase in local unemployment decreases base earnings by 0.38% and full earnings by 0.33%. However, for workers whose earnings were above 1.5 times the minimum, the response of base wages is 0.25%, less than half that of total compensation. The fact that complements vary so much over the business cycle runs counter the explicit contracts hypothesis and is in line with recent evidence from the U.S. (Grigsby et al., 2019; Jardim et al., 2019; and Kurmann and McEntarfer, 2019).

6.2.2 Current unemployment rate and the distribution of the wage cushion

Next, we turn to study how earnings adjust to business cycle dynamics in the presence of collective contracts. The results in the previous section suggested that the determinants vary along the distribution of earnings. For a majority of workers, earnings vary with current unemployment. However, we cannot discard the hypothesis that the evolution of earnings over the business cycle for workers closer to negotiated minimum wages is described by a mixture of the spot market model and explicit contracts -especially in Spain. Given the heterogeneity of responses detected, we focus on changes in the distribution of the wage cushion. In particular, we use models of the following form

$$1(\frac{W_{ispt}}{\underline{W}_{ispt}} - 1 < k) = \beta_o^k + \beta_1^k U_{pt} + \beta_2^k t + \beta_3^k t^2 + \mu_i^k + \mu_f^k + \varepsilon_{ifpt}, \quad (2)$$

[33] The Italian Social Security data report the hiring date only for new hires starting in 2005.

that is, we study how the fraction of workers in a particular bin of the wage cushion changes with contemporaneous local unemployment, holding individual- and firm- invariant characteristics constant. Some notes are in order. Firstly, we do not condition on unemployment at contract renewal because the results in the previous section indicate that it is not really a strong determinant of earnings for most of the distribution.

Secondly, some authors have stressed the role of job-title fixed effects in models like (5). Those studies focus on recovering the behavior of the price of labor along the business cycle, holding constant occupational changes -see Gertler and Trigari (2009) or Carneiro et al. (2012). We do not follow that route. The main point of our study is to understand how institutions such as collective bargaining shape movements of the wage distribution along the business cycle. Given the conflicting evidence associated to the facts that (a) the spot market best explains the distribution of the wage cushion, while (b) the cross-sectional distribution of the cushion has basically remained constant during the recession, we focus on assessing the channels that underlie the response of earnings to current unemployment while generating a distribution of the wage cushion that is apparently stable over time. Such mechanisms may include occupational changes.

In what follows, our methods are the following. First, we estimate variants of Model (5). Then we decompose the fraction of workers earning below a particular fraction of the negotiated minimum wage into separate worker and firm characteristics, including new entrants versus stayers, blue versus white collars or small versus large firms. Namely, we use the identity

$$1(\frac{W_{ispt}}{\underline{W}_{ispt}} - 1 < k) = 1(\frac{W_{ispt}}{\underline{W}_{ispt}} - 1 < k,\ D_i = 0) + 1(\frac{W_{ispt}}{\underline{W}_{ispt}} - 1 < k,\ D_i = 1), \quad (3)$$

and then run versions of Model (5) for each component of the RHS of (6). In that manner, we can decompose β_1^k into the contribution of the subgroups of the population D_i=1 and D_i=0 .

To fix ideas, consider the subgroup of new entrants, whose contribution to cyclicality has been discussed extensively. To understand the contribution of new entrants to the cyclicality of the wage cushion we estimate the following model

$$1(\frac{W_{ispt}}{\underline{W}_{ispt}} - 1 < k,\ new = 1) = \beta_{o,new}^k + \beta_{1,new}^k U_{pt} + \beta_{2,new}^k t + \beta_{3,new}^k t^2 + \mu_i^k + \mu_f^k + \varepsilon_{ifpt}. \quad (4)$$

The difference between Model (7) and Model (5) is that in the former the dependent variable takes the value 1 if the individual is a new entrant and his or her earnings are at most 1.2 times the minimum negotiated wage. Imagine that in recessions all stayers keep their cushion unaltered but that all new entrants enter at jobs very close to the

negotiated minimum wage. In that case, $\beta^k_{1,new}$=β^k_1, and all the cyclicality would be due to the behavior of new entrants. Alternatively, assume that new entrants are a very small set of the workforce and their share does not change much with the cycle. In that case, $\beta^k_{1,stayer}$=β^k_1. Hence, decompositions tell us which of those extremes reflects better the cyclicality of earnings.

Table 9 shows the estimates of Model (5) in Italy (left column) and Spain (right one). An increase in the local unemployment rate by 1 p.p. increases the fraction of workers earning at most 1.2 times the negotiated minimum wages by 0.29 p.p. in Italy while it diminishes the fraction of workers earnings more than 1.5 times the negotiated minimum wage by 0.63 p.p.. The remaining share of workers are those earning between 1.2 and 1.5 times the negotiated minimum wage, which can be computed as 0.34 (0.34=-0.63+0.29). Hence, increases in the unemployment rate have impacts all over the distribution of earnings, diminishing large levels of the wage cushion (above 1.5 times the minimum negotiated wage) while inducing some accumulation close to negotiated minima. The responses are similar in Spain, but follow a slightly different pattern. A 1 p.p. increase in unemployment also diminishes the fraction of workers earning more than 1.5 times the wage floor, but induces accumulation of 0.44 p.p. of workers near the negotiated wage. The estimate in Italy was 0.29, slightly lower than that for Spain. The larger degree of accumulation at wage floors in Spain as a response of an increase in the local unemployment rate is consistent with the finding of a larger degree of bunching of wages at negotiated levels in Spain than in Italy. However, the difference in the responses is not statistically different from zero.

6.2.3 The contribution of stayers versus new entrants

Table 10, upper panel, shows the results of decomposing the contribution to the cyclicality of earnings between stayers and new entrants. We implement this by estimating versions of Model (7) using the full sample but where the dependent variable is the cushion bin interacted with being a new entrant or stayer. The coefficient $\beta^k_{1,new}$ captures two components. The first is the fact that the probability of being a new entrant may vary across recessions and expansions. Secondly, the coefficient captures whether earnings of new entrants are relatively more cyclical than those of stayers. We do not attempt to distinguish between both components, because new entrants may differ from stayers in dimensions that are hard to observe -see Grigsby et al. (2019) for a discussion.

The results in Table 10, upper panel, suggest very different contributions of stayers in Italy and Spain to the cyclicality of earnings. In Italy, the compression of the wage cushion during recessions is due to the changes in the wages of job stayers. Namely, an increase in the local unemployment rate of 1 p.p. increases the share of stayers close to

the negotiated minimum wage by 0.55 p.p., while it diminishes the fraction of workers earning more than 1.5 times the negotiated minimum wage by 0.69 p.p. Both estimates exceed those for the full population of metal workers (0.29 and 0.63 in Table 9), which implies that new entrants actually contribute to *widen* the wage distribution in recessions in Italy.

Conversely, new entrants in Spain do contribute to the compression of the wage distribution in recessions. A 1 p.p. increase in the unemployment rate in Spain increases the share of stayers close the negotiated minimum wage by 0.33 p.p. and reduces the shares of stayers far from the minimum by 0.347 p.p. (see Table 10, column 5). Both estimates are below those obtained for the overall share of metal workers in Table 9 (0.44 p.p. and 0.63 p.p., respectively).

Overall, the results suggest that new entrants play a more important role in the compression of the wage cushion in recessions in Spain than in Italy. A possible explanation of the difference is that fixed-term contracting is more prevalent in Spain (14% of the metalworking workforce-see Table 1) than in Italy.[34] For example, during recessions firms may hire workers using fixed term contracts offering wages closer to the negotiated minimum wages than in expansions. Conversely, that possibility may be less used in Italy, where fixed term contracts account only for 6% of the metalworking workforce.

6.2.4 The contribution of white versus blue collars and small versus large firms

Next, we focus on differences by occupation and decompose the contribution of white and blue collars to the compression of the wage distribution in recessions. The results in Table 10, lower panel, suggest a different degree of cyclicality of the wage cushion among blue collar workers in Italy and Spain. A 1 p.p. increase in local unemployment rate increases the fraction of blue collar workers at most 1.2 times above the negotiated minimum wage by 0.19 p.p. in Italy, while the estimate is 0.37 in Spain. Remarkably, for white collars, the estimates are very similar in both countries.[35]

A possible channel to understand why blue collar workers contribute more to the compression of earnings during recessions in Spain than in Italy is to examine the cyclical

[34]This finding is in line with De la Roca (2014) who finds that wage cyclicality in Spain is mainly driven by workers under temporary contracts and newly hired workers. However, de la Roca (2014) documents a lower semi-elasticity (for all industries) than we do for metal. There are two differences: De la Roca considers base wages, and he does not differentiate by distance to the minimum negotiated wage.

[35]Minimum wages in the Italian metalworking collective contract seem less binding for white collars than in Spain. In Italy, only 6% of white collar workers have earnings at most 1.1 times the minimum negotiated wages, while the estimate is 13% for blue-collar workers (Table 3). Conversely, in Spain 13% of both blue and white collar workers have monthly earnings below 1.1 times the minimum negotiated wages.

behavior of occupations in both countries. To that end, one can run versions of Model (4) using as a dependent variable a binary variable indicating whether the worker works as a blue-collar worker in that particular year. Interestingly, the results of that model differ in both countries (Table 10b). In Spain, an increase in local unemployment increases the share of blue collar workers, while in Italy the share decreases. As Model (4) holds constant worker- and firm- fixed effects, one interpretation of the results is that in recessions, Spanish metalworkers are more likely to be hired using a blue collar contract in a recession than in an expansion. To the extent that blue collar minimum wages fall short of white collar ones, the higher degree of churning in the Spanish labor market may facilitate downgrading positions as a means of adjusting workers' wages downwards.

Much of the discussion about the impacts of collective bargaining on wages and employment refers to its heterogeneous impacts on small and large firms. Table 11 decomposes the distributional response of earnings along the business cycle distinguishing between firms with size above the 75^{th} percentile (more than 190 employees in Italy and 400 employees in Spain, which are considered "large" firms in Southern European economies) and smaller firms. On the other hand, our estimates suggest that, in both countries, the median wage cushion increased with the size of the firm.

The results are shown in Table 11. In this case, the results are similar in both countries and suggest that the compression of the wage distribution during recessions has a different form in small and in large firms. The compression happens principally at the top of the distribution in large firms, with very little bunching at the negotiated minimum. Conversely, in small firms recessions increase bunching at negotiated minima.

6.3 Extending the period of analysis back in time

Our results so far suggest considerable cyclicality of wages among workers away from the minima in both countries, and thus a limited role of collective bargaining in the period 2005-2013. This contrasts previous evidence for Italy focusing on earlier years (e.g. Devicienti, Maida and Fanfani, 2019) and runs against the explicit contract hypothesis applying to all workers, typically assumed in papers like Olivei and Tenreyro (2007). One possibility is that the role of collective bargaining in explaining wage adjustments was more prominent in the years before 2005. We thus extend the period of our analysis back in time first up to 2000 and then up to 1995.

Table 12 presents the results. In Italy, when we extend the sample up to 2000, the unemployment rate at renewal emerges as the main determinant of wages (column 2) and becomes the sole determinant as we reach 1995 (column 3).[36] This is in line with the

[36]In the Italian data we are not able to exclude workers on short time work benefits before 2005 as this information is not available for that period. However, the inclusion of workers on short time

empirical analysis of Devicienti, Fanfani and Maida (2019) who study the evolution of wage inequality in Italy between 1982 and 2001 and find that the growth in pay dispersion occurred entirely between the occupations defined by sectoral collective contracts. Therefore, in the case of Italy we observe a gradual fading of the explicit model of bargaining over time, consistent with the evidence of increased wage cyclicality during the Great Recession in Italy and in the rest of the euro area (Verdugo, 2016).[37] By contrast, the current unemployment rate continues to play the most important role in Spain even in the extended period as wages of workers away from the minima respond predominantly to current labor market conditions (columns 5 and 6).[38,39]

7 Discussion

7.1 A comparison to existing empirical estimates

How far are our estimates of the degree of wage cyclicality from other existing estimates? A possible benchmark comes from the Portuguese economy, that features a system of industrial relations similar to the Spanish one -less so to the Italian one. Namely, contracts agreed between unions and employer federations are extended automatically. Carneiro et al. (2012) estimate a coefficient of national unemployment in a wage regression similar to (4) of about -1.85 for stayers and -2.60 for new entrants.

However, the patterns in Portugal differ from those in our study in two respects. The first is that we consider local, rather than national, unemployment rate and nominal, rather than real, wages. When we use real wages (deflated using the CPI with 2011 as base year) and the national unemployment rate, the coefficient in the wage regression in Spain is -0.24 (standard error: 0.236) for workers whose lagged earnings were at most 1.2

work schemes is by definition acting against explicit contracts and in favor of increased wage cyclicality as these workers earn only a fraction of their original salaries. Therefore, the estimated coefficient of unemployment rate at renewal is a lower bound. We can thus infer that explicit contracts were an appropriate description of wage determination in Italy before 2005.

[37] Daly and Hobjin (2016) and Elsby et al. (2016) document a similar finding in the U.S.

[38] The information on total wages from the Spanish tax records is not available before 2005. Therefore, in the extended period of analysis for Spain we use base wages. As is commonly the case with administrative records, the available measure of earnings pre-2005 was top-coded. In the case of the metalworking industry this means that for 17% of workers we only observe a lower bound of their actual earnings. The fraction is obviously larger among workers whose earnings are well above the collective contract minimum. For example, the degree of topcoding exceeds 33% between 1995 and 1998 for workers with earnings 1.5 times above their collective contract. To mitigate the problem, we condition on the previous years' difference between earnings and collective contract minimum wages. In that sense, we estimate the influence of unemployment at contract renewal and current unemployment in subsamples of workers with a similar degree of censoring. The negative and statistically significant coefficient of current unemployment rate that we find even though we use base wages does not leave much room in support of the explicit contract hypothesis in Spain.

[39] Given that the only available wage measure for this robustness check is base wages, these regressions also include workers in the Basque Country and Navarra.

times their corresponding wage floor and -0.66 (standard error: 0.211) for workers whose lagged wage was above 1.5 times their wage floor. The corresponding numbers for Italy are positive but not statistically significant for workers close to the wage floor and -0.80 (standard error: 0.563) for workers with a large lagged cushion.

The second crucial difference is the pattern of the adjustment. Carneiro et al. (2012) document that most of the adjustment among stayers actually comes from the negotiated wage (a response of -1.99), while the cushion does not respond at all. On the other hand, both in Spain and Italy, for workers earning at least 1.5 times the wage floor, (i) the response of wages to unemployment increases is substantially larger than for those close to the wage floors and (ii) negotiated wages do not react much to changes in unemployment. This suggests a much bigger cyclical component of wage complements in Italy and Spain than in Portugal.

A second comparison is the Euro-area evidence in Verdugo (2016), who provides evidence of the cyclical response of wages for EU countries (Belgium, France, Italy, the Netherlands, Portugal and Spain). Verdugo (2016) estimates a response of log wages to unemployment among stayers in the range between -0.6 and -1.0 using national unemployment rate, a magnitude similar to US estimates. On the contrary, he documents responses of about -0.22 using regional unemployment rate. Our estimates for workers far from the wage floors are definitely in the range [-0.6,-1.0] for national unemployment. On the other hand, our estimated coefficients using local unemployment rate are higher than the ones of Verdugo (2016), but he uses a coarser definition of geographic units than ours.[40] Furthermore, he finds higher cyclicality at the bottom, a surprising finding in countries with collective bargaining that establishes wage floors. We interpret that lack of information on wage floors (which can be high in industries like construction or metalworking, at the central part of the distribution) drives the finding. The results suggest that for most workers in the metalworking sector, wages appear to move with the cycle in a similar manner as the whole Euro-area, reinforcing the result that the presence of collective contracts introduces rigidity only for wages close to the wage floors.

Koenig, Manning, and Petrongolo (2016) present estimates of the cyclicality of earnings of -0.17 in the United Kingdom and -0.03 in West Germany. If we convert our estimates into elasticities by multiplying them with the national unemployment rate in each country (say, 20% in Spain and 10% in Italy), we have estimates near the wage floors of about -0.038=(-0.19×0.2) in Spain and 0.025=(0.25×0.1) in Italy. However, far from wage floors, the estimates are -0.062=(-0.62×0.1) in Italy and -0.094=(0.47×0.2) in Spain. The Spanish estimate in particular is not so far from the UK benchmark (a

[40] Verdugo (2016) considers between 7 and 19 geographical areas for Spain and between 5 and 11 for Italy depending on the period of analysis. We consider instead 50 provinces for Spain and 20 regions for Italy.

country viewed as one with very flexible wages).

7.2 Some theoretical benchmark

Our estimates of the semi-elasticity of wages to changes in local unemployment support the notion that current unemployment, rather than unemployment back at the time of contract renewal, was the most important determinant of wages in the Italian and Spanish metalworking industry during the 2005-2013 period. However, that finding does not necessarily imply that the magnitude of the responses we estimate are completely consistent with the predictions of a spot market model of the labor market. To see this, we build on Koenig, Manning, and Petrongolo (2016), who derive analytically the elasticity of (real) wages to unemployment as a function of the unemployment benefit replacement rate, the steady state arrival rate of new offers, the frequency of wage bargaining and the persistence of unemployment. Namely, we use their formulae to derive a benchmark for the estimates of the responses of wages to unemployment at various points of the worker's wage distribution. Also in this case, we use real wages in order to obtain comparable estimates.

First we consider the theoretical case when wages are continuously renegotiated -i.e., the case when the elasticity of wages to unemployment would be largest in absolute value. Koenig, Manning, and Petrongolo (2016) show that in the steady state of their model the elasticity of wages to unemployment is roughly one minus the unemployment benefit replacement rate, which would be -0.30=1-0.7 in Italy and -0.21=1-0.79 in Spain in 2010 (see Table 13, Panel A). Once one takes into account a first order approximation around the steady state, the frequency of wage negotiation shapes the response of wages to unemployment -see Table 13, Panel B. There, we find that the theoretical benchmark of continuous wage renegotiation (Table 13, row 1, Panel B) is 8.6 times as large the average elasticity estimated in Italy (-0.30 vs -0.035) and 3.3 as large that in Spain (–0.21 vs -0.063). Hence, the average response we estimate is not consistent with the predictions of a model where wages are continuously renegotiated. Assuming renegotiations are not instantaneous, but happen every two and a half years in Italy and two years in Spain (the average duration of collective contracts) narrows the gap between the theory, but not much. The benchmark elasticity is -0.254 in Italy (7.3 times the estimate of -0.035) and -0.176 in Spain (2.8 times the estimate of -0.063). However, two notes are in order.

The first is that once one focuses on metalworking workers whose lagged wage cushion is at least 50%, the gap between the elasticity of wages to unemployment in the *continuous* renegotiation benchmark and the empirical estimate falls from 8.6 to 4.8 in Italy. In Spain, the gap between the theoretical prediction and the estimated elasticity is reduced from 3.3 to 2.6 times. That is, a nontrivial share of the gap between the elasticity in the

canonical model and the average estimated one is accounted by the fact that there is a fraction of workers earning wages close to industry-skill minima that, by definition, are modestly cyclical. However, that is a small group (20% of the metalworking industry workforce). The second note is that, as mentioned above, the elasticity of wages to unemployment estimated on micro data is well below the theoretical benchmark also in the case of the UK or Germany -see Koenig, Manning and Petrongolo (2016). Those are economies where sectoral bargaining is either very limited (the UK) or much less binding than in Italy and Spain (Germany). Those reasons lead us to think that factors other than collective bargaining play a role in explaining the low estimated response of wages to unemployment -at least in the metalworking industry.

8 Conclusions

Multi-employer contracts signed by employer federations and unions and imposing industry-specific wage floors are often considered as the cause of widespread downward wage rigidity that amplify the aggregate consequences of macroeconomic shocks in European economies but also in Japan or South Africa -see OECD, 2019. As a consequence, macroeconomic studies have thus modelled the full distribution of earnings as shaped by collective contracts that establish rigid wages between bargaining periods. The implicit hypothesis is that, while collective bargaining imposes wage floors only, the bargained growth in wages of these floors spills over the rest of the wage distribution. However, and possibly because of data limitations, not much is known about whether the full distribution of wages are shaped by infrequent changes in bargained wage floors -what we term the explicit contract hypothesis. The contribution of our study is then to provide a simple empirical test to disentangle whether the distribution of earnings in the metalworking industry is best explained by the economic conditions back at the time of collective contract renewal or, alternatively, by the current state of the economy -as implied by the spot model of the labor market. To that end, we collect unique comparable data on signature dates and skill-province specific minimum wage floors in the metalworking industry between 1995 and 2013 in Italy and Spain, two countries with large coverage of collective contracts but different frequency of bargaining and degree of centralization (federal in Italy, provincial in Spain). We then link that information to samples of longitudinal working histories from Social Security records to test whether the distribution of earnings is better explained by the economic conditions prevailing at the moment when the collective contract was signed or, alternatively, by current labor market conditions -measured by the local unemployment rate.

First, we document that wage floors in the metalworking industry of both countries are

binding: non-compliance is very small, there is accumulation at the skill-specific minimum wage floors and about 20% of metal workers receive earnings at most 1.2 times above those minima. However, for the period 2005-2013 the data do not support the hypothesis that minimum wages set in collective contracts spill over the full wage distribution in Italy or Spain. The economic conditions at the time of bargaining had substantial explanatory power only for the evolution of earnings close to the wage floors (around 20% of the metalworking industry). For the rest of the distribution, we find that earnings respond predominantly to changes in current economic conditions. In that sense, we reject the hypothesis that the conditions set in collective contracts introduce wage rigidities along the full distribution of earnings. Despite the differences in the frequency and geographical scope of collective bargaining between the two countries, the mean wage response to labor market conditions (contemporaneous and back at the time of contract renewal) as well as among workers with a large cushion, turns out to be remarkably similar in both countries.

Of course, the results are specific of the metalworking industry, a unionized sector with a higher-than-average presence of large firms both in Italy and Spain. In that sense, the metal industry should be a sector in which the full wage distribution is most likely to be shaped by collective contracts. For example, food and accommodation or retail are sectors with either smaller firms or a lower presence of unions, so it is a priori unlikely that lower bargaining power results in less cyclical earnings. Still, it is an area of further research. Secondly, while we consider it unlikely that collective bargaining institutions introduce pervasive rigidities along the distribution, our results indicate that wage floors are binding for some workers. Our current research agenda examines the balance between the success of the institution in preserving the earnings of low skilled workers and their possible negative allocative consequences.

References

[1] Adamopoulou, E., E. Bobbio, M. De Philippis, F. Giorgi (2016). "Wage Rigidities and Business Cycle Fluctuations: A Linked Employer-Employee Analysis", *IZA Journal of Labor Policy*, 5:22.

[2] Altonji, J., and P. Devereux (2000). "The Extent and Consequences of Downward Nominal Wage Rigidity, in (ed.) Research in Labor Economics, Vol. 19, Emerald Group Publishing Limited, 383 - 431.

[3] Babecký, J., C. Berson, L. Fadejeva, A. Lamo, P. Marotzke, F. Martins, and P. Strzelecki (2019). "Non-Base Wage Components as a Source of Wage Adaptability to Shocks: Evidence from European Firms, 2010–2013," *IZA Journal of Labor Policy*, Vol. 8(1).

[4] Babecký, J., P. Du Caju, T. Kosma, M. Lawless, J. Messina, T. Rõõm (2012). "How Do European Firms Adjust their Labour Costs when Nominal Wages Are Rigid?," *Labour Economics*, Vol. 19, 792-801.

[5] Barattieri, A., S. Basu, and P. Gottschalk (2014). "Some Evidence on the Importance of Sticky Wages," *American Economic Journal: Macroeconomics*, Vol. 6, 70-101.

[6] Beaudry, P. and J. DiNardo (1991) "The Effect of Implicit Contracts on the Movement of Wages over the Business Cycle: Evidence from Micro Data," *Journal of Political Economy*, Vol. 99, 665-688.

[7] Bellou, A. and B. Kaymak (2012). "Wages, Implicit Contracts and the Business Cycle: Evidence from a European Panel," *Labour Economics*, Vol. 19, 898-907.

[8] Bentolila, S., J. Jimeno and M. Izquierdo (2010), "Negociación colectiva: La gran reforma pendiente", *Papeles de Economía Española* No 124, 176-192.

[9] Björklund, M., M. Carlsson, and O. Skans (2019). "Fixed-Wage Contracts and Monetary Non-neutrality," *American Economic Journal: Macroeconomics*, Vol. 11, 171-92.

[10] Blanchflower, D. and A. Oswald (1995). "An Introduction to the Wage Curve," *Journal of Economic Perspectives*, Vol. 9, 153-167.

[11] Blien, U., W. Dauth, T. Schank, and C. Schnabel (2013). "The Institutional Context of an 'Empirical Law': The Wage Curve under Different Regimes of Collective Bargaining," *British Journal of Industrial Relations*, Vol. 5, 59-79.

[12] Bodnár, K., L. Fadejeva, M. Hoeberichts, M. Izquierdo Peinado, C. Jadeau, and E. Viviano (2018). "Credit Shocks and the European Labour Market," *European Central Bank Working Paper* No. 2124.

[13] Boeri, T., and M., Burda (2009). "Preferences for Collective versus Individualised Wage Setting," *Economic Journal*, Vol 119, 1440-1463.

[14] Boeri, T., A. Ichino, E. Moretti, and J. Posch (2019). "Wage Equalization and Regional Misallocation: Evidence from Italian and German Provinces," *NBER Working Paper* No 25612.

[15] Brandolini A., P. Casadio, P. Cipollone, M. Magnani, A. Rosolia, R. Torrini (2007). "Employment Growth in Italy in the 1990s: Institutional Arrangements and Market Forces". In: Acocella N., Leoni R. (eds) Social Pacts, Employment and Growth. AIEL Series in Labour Economics. Physica-Verlag HD.

[16] Calmfors, L. and J. Driffill (1988). "Bargaining Structure, Corporatism and Macroeconomic Performance", *Economic Policy*, Vol. 3, 13-61.

[17] Card, D. (1990). "Unexpected Inflation, Real Wages, and Employment Determination in Union Contracts," *American Economic Review*, Vol. 80, 669-688.

[18] Card, D. (1995). "The Wage Curve: A Review," *Journal of Economic Literature*, Vol. 33, 285-299.

[19] Card, D. and A. Krueger (1994). "Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania," *American Economic Review*, Vol. 84, 772-793.

[20] Carneiro, A., P. Guimaraes, and P. Portugal. (2012). "Real Wages and the Business Cycle: Accounting for Worker, Firm, and Job Title Heterogeneity," *American Economic Journal: Macroeconomics*, Vol. 4, 133-152.

[21] Cardoso, A., and P. Portugal (2005). "Contractual Wages and the Wage Cushion under Different Bargaining Settings," *Journal of Labor Economics*, Vol. 23, 875-902.

[22] Casadio, P. (2003). 'Wage formation in the Italian private sector after the 1992–93 income policy agreements'. In G. Fagan, F. P. Mongelli and J. Morgan (eds.), Institutions and Wage Formation in the New Europe. Cheltenham, UK: Edward Elgar, pp. 122–33.

[23] Cengiz, D., A., Dube, A., Lindner and B., Zipperer (2019). "The Effect of Minimum Wages on Low-Wage Jobs," *Quarterly Journal of Economics*, Vol. 134, 1405–1454.

[24] Christiano, L., M. Eichenbaum, and C. Evans (2005). "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy," *Journal of Political Economy*, Vol. 113, 1-45.

[25] Daly, M. and B. Hobjin (2016). "The Intensive and Extensive Margins of Real Wage Adjustment," *Federal Reserve Bank of San Francisco Working Paper* No 2016-04.

[26] Daouli, J., M. Demoussis, N. Giannakopoulos and I. Laliotis (2017). "The Wage Curve Before and During the Greek Economic Crisis," *Empirical Economics*, Vol. 52, 59-77.

[27] D'Amuri, F. and R. Nizzi (2018). "Recent Developments of Italy's Industrial Relations System," *E-Journal of International and Comparative Labour Studies*, Vol. 7.

[28] De la Roca J. (2014). "Wage Cyclicality: Evidence from Spain Using Social Security Data," *SERIEs: Journal of the Spanish Economic Association*, Vol. 5, 173-195.

[29] Devicienti, F., B. Fanfani and A. Maida (2019). "Collective Bargaining and the Evolution of Wage Inequality in Italy," *British Journal of Industrial Relations*, Vol. 57, 377-407.

[30] Devicienti, F., A., Maida and L. Pacelli (2008). "The Resurrection of the Italian Wage Curve," *Economics Letters*, Vol. 98, 335-341.

[31] Devicienti, F., A. Maida, and P. Sestito. (2007). "Downward Wage Rigidity in Italy: Micro-based Measures and Implications," *Economic Journal*, Vol. 117, F530–F552.

[32] Dickens W., Goette L., Groshen E., Holden S., Messina J., Schweitzer M., Turunen J., Ward M. (2007). "How Wages Change: Micro Evidence from the International Wage Flexibility Project," *Journal of Economic Perspectives*, Vol. 21, 195–214.

[33] Diéz-Catalán, L. and E. Villanueva (2015). "Contract Staggering and Unemployment during the Great Recession: Evidence from Spain," *Banco de España Working Paper* No. 1431.

[34] DiNardo, J., N. Fortin, and T. Lemieux (1996). "Labor Market Institutions and the Distribution of Wages, 1972-1992: A Semiparametric Approach", *Econometrica*, Vol. 64, 1001-1044.

[35] Dolado, J. J. , F. Felgueroso, and J.F. Jimeno (1997). "The Effects of Minimum Bargained Wages on Earnings: Evidence from Spain," *European Economic Review*, Vol. 41, 713-721.

[36] Elsby, M., D. Shin, and G. Solon (2016). "Wage Adjustment in the Great Recession and Other Downturns: Evidence from the United States and Great Britain," *Journal of Labor Economics*, Vol. 34, S249-S291.

[37] Faia, E. and V. Pezone (2020). "The Heterogeneous Cost of Wage Rigidity: Evidence and Theory", *SAFE Working Paper* No. 242.

[38] Fanfani (2019). "The Employment Effects of Collective Bargaining", *University of Torino Working paper* No. 064.

[39] Garnero, A. (2018). "The Dog that Barks Doesn't Bite: Coverage and Compliance of Sectoral Minimum Wages in Italy," *IZA Journal of Labor Policy*, Vol. 7:3.

[40] Gartner, H., T. Schank, and C. Schnabel (2013). "Wage Cyclicality Under Different Regimes of Industrial Relations," *Industrial Relations: A Journal of Economy and Society,* Vol. 52, 516-540.

[41] Gautier E., D. Fougère, and S. Roux (2018). "The Impact of the National Minimum Wage on Industry-Level Wage Bargaining in France," *Labour Economics*, Vol. 55, 72-97.

[42] Gautier E., S. Roux, and M. Suarez-Castillo (2019). "Do Minimum Wages Make Wages More Rigid? Evidence from French Micro Data," *Banque de France Working paper* No. 720.

[43] Gertler, M., and A. Trigari (2009). "Unemployment Fluctuations with Staggered Nash Wage Bargaining", *Journal of Political Economy*, Vol. 117, 38–86.

[44] Gertler, M., C. Huckfeldt, and A. Trigari (2020). "Unemployment Fluctuations, Match Quality and the Wage Cyclicality of New Hires", *Review of Economic Studies*, Vol. 87, 1876–1914.

[45] Grigsby, J., E. Hurst and A. Yildirmaz (2019). "Aggregate Nominal Wage Adjustments: New Evidence from Administrative Payroll Data," *NBER Working Paper* No. 25628.

[46] Hagedorn, M. and I. Manovskii (2008). "The Cyclical Behavior of Equilibrium Unemployment and Vacancies Revisited," *American Economic Review*, Vol. 98, 1692-1706.

[47] Jardim, E., G. Solon, and J. Vigdor (2019). "How Prevalent Is Downward Rigidity in Nominal Wages? Evidence from Payroll Records in Washington State", *Journal of Economic Perspectives*, Vol. 33, 185-201.

[48] Jimeno, J., and C., Thomas (2013). "Collective Bargaining, Firm Heterogeneity and Unemployment," *European Economic Review*, Vol. 59, 63-79.

[49] Koenig, F., A. Manning, and B. Petrongolo (2016). "Reservation Wages and the Wage Flexibility Puzzle," *CEP Discussion Pape*rs No. 1406.

[50] Kudlyak, M. (2014). "The Cyclicality of the User Cost of Labor," *Journal of Monetary Economics*, Vol. 68, 53-67.

[51] Kurmann, A. and E. McEntarfer (2019). "Downward Wage Rigidity in the United States: New Evidence from Administrative Data," Working Paper 19-07, U.S. Census Bureau.

[52] Le Bihan, H., J. Montornès, and T. Heckel (2012). "Sticky Wages: Evidence from Quarterly Microeconomic Data." *American Economic Journal: Macroeconomics*, Vol. 4, 1-32.

[53] Leonardi, M., M. Pellizzari, and D. Tabasso (2019). "Wage Compression within the Firm: Evidence from an Indexation Scheme", *Economic Journal*, Vol. 129, 3256–3291.

[54] Lucifora, C., and F. Origo (2015). "Performance-Related Pay and Firm Productivity," *ILR Review*, Vol. 68, 606-632.

[55] Lucifora (2017). "Il Salario Minimo: Contrattazione o Minimo Legale?" in Dell'Aringa, Lucifora, Tren (eds.) Salari, Produttività, Diseguaglianze, AREL, Il Mulino.

[56] Lucifora, C., and D. Vigani (2020). "Losing Control? Unions' Representativeness, "Pirate" Collective Agreements and Wages," DISCE Working Paper No 87.

[57] Martins, P. (2020). "30,000 Minimum Wages: The Economic Effects of Collective Bargaining Extensions," *British Journal of Industrial Relations*, forthcoming.

[58] Martins, P., G. Solon, and J. Thomas (2012). "Measuring What Employers Do about Entry Wages over the Business Cycle: A New Approach," *American Economic Journal: Macroeconomics*, Vol. 4, 36-55.

[59] OECD (2019). Negotiating Our Way Up: Collective Bargaining in a Changing World of Work, OECD Publishing.

[60] Olivei, G., and S. Tenreyro (2007). "The Timing of Monetary Policy Shocks," *American Economic Review*, Vol. 97, 636-663.

[61] Rosolia, A. (2015). "On the Response of Italian Wages to the Unemployment Rate", *Questioni di Economia e Finanza (Occasional Papers)* No. 287, Bank of Italy.

[62] Solon, G., Barsky, R., and Parker, J. (1994). "Measuring the Cyclicality of Real Wages: How Important is Composition Bias," *Quarterly Journal of Economics*, Vol. 109, 1-25.

[63] Sigurdsson, J., and R. Sigurdardottir (2016). "Time-Dependent or State-Dependent Wage-Setting? Evidence from Periods of Macroeconomic Instability," *Journal of Monetary Economics*, Vol. 78, 50-66.

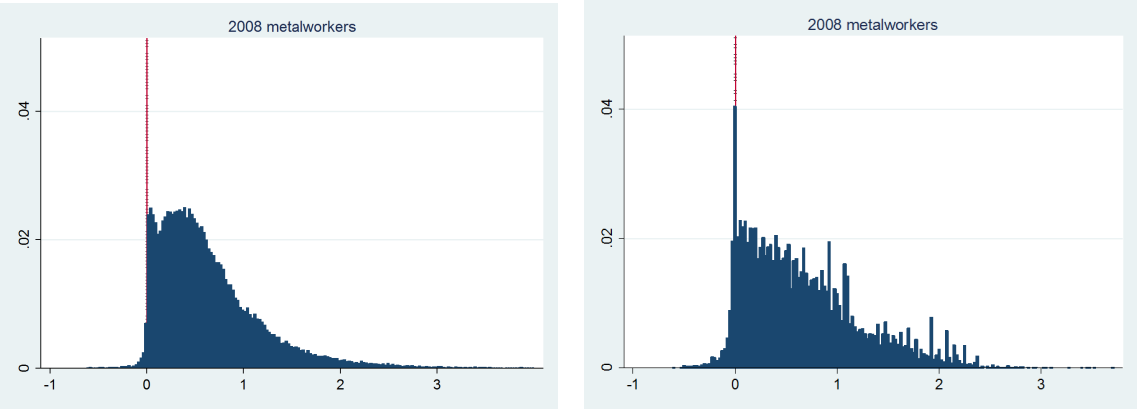
[64] Schulten T., L. Eldring and R. Naumann (2015) "The Role of Extension for the Strength and Stability of Collective Bargaining in Europe" in G. Van Gyes and T. Schulten edds *Wage bargaining under the New European Economic Governance.*

[65] Verdugo, G. (2016). "Real Wage Cyclicality in the Eurozone Before and During the Great Recession: Evidence from Micro Data", *European Economic Review*, Vol. 82, 46-69.

[66] Visser, J. (2013). "Wage Bargaining Institutions: from Crisis to Crisis", *European Comission Economic Papers* No. 488.

Figures

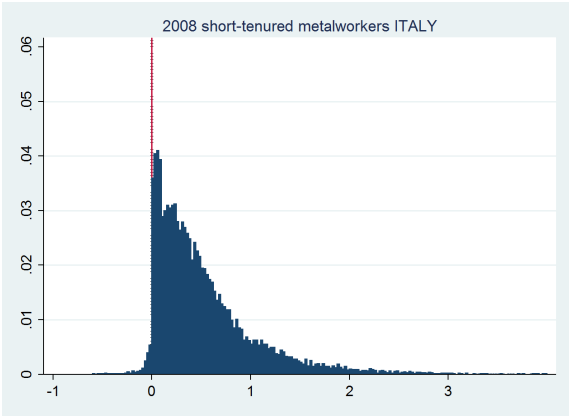
Figure 1. Distribution of wages around minima in 2008 in Italy and Spain



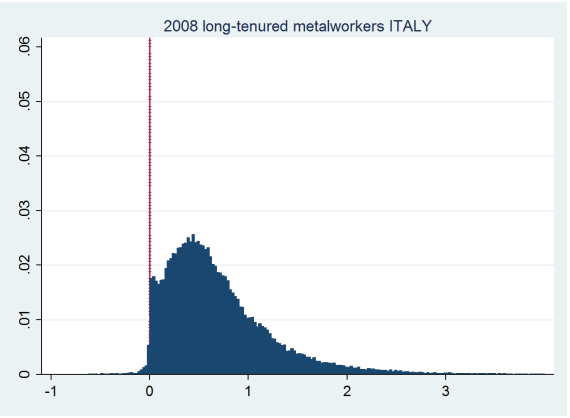
Italy Spain

Data source: INPS for Italy and MCVL for Spain. The graphs show the distribution of wages around the negotiated minima in 2008. The Italian data are computed via nominal daily wages and their distance to the collective contract minima (varying by 3 skill levels) using the formula $(wage\ cushion)_{ist}$=log($actual\ W_{ist}/negotiated\ W_{ist}$), where i denotes worker, s skill and t year. The Spanish data are computed via annualized nominal base wages in December of each year and their distance to the collective contract minima (varying by 10 skill levels and 48 provinces) using the formula $(wage\ cushion)_{ispt}$=log($actual\ W_{ispt}/negotiated\ W_{ispt}$), where i denotes worker, s skill, p province and t year. The red vertical line at zero denotes the cases for which the wage is equal to the negotiated minima. Cases to the left of the vertical line denote non compliance. Cases to the right of the vertical line denote wages far from the minima.

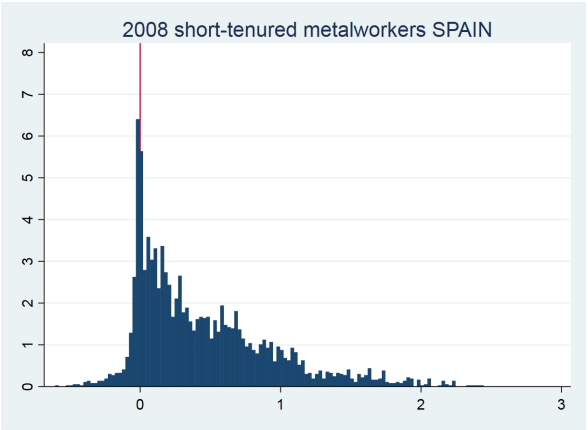
Figure 2. Distribution of wages around minima in 2008 in Italy and Spain, by tenure



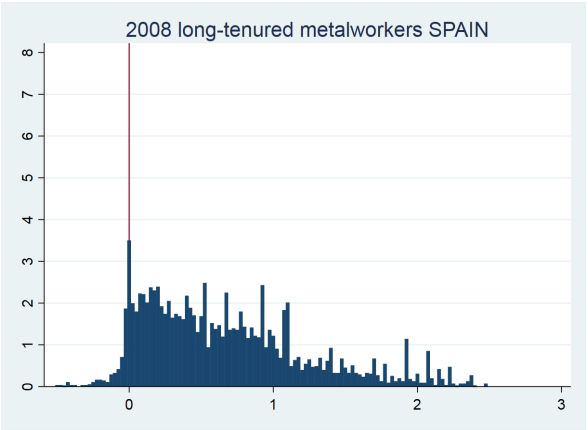
Workers with $\leq$ 2 years of tenure-Italy



Workers with $>$ 2 years of tenure-Italy



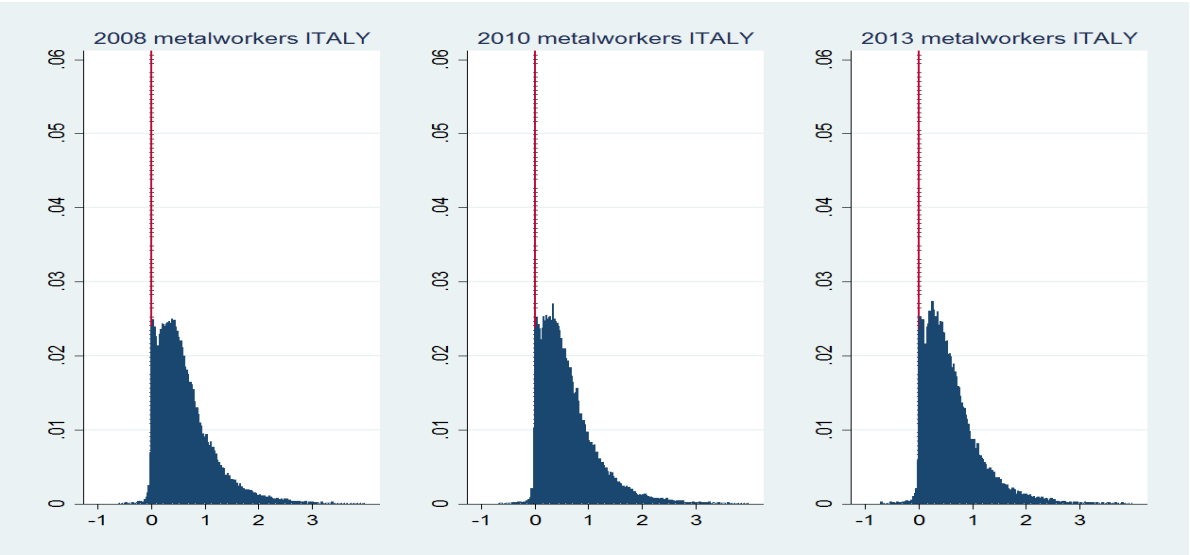
Workers with $\leq$ 2 years of tenure-Spain



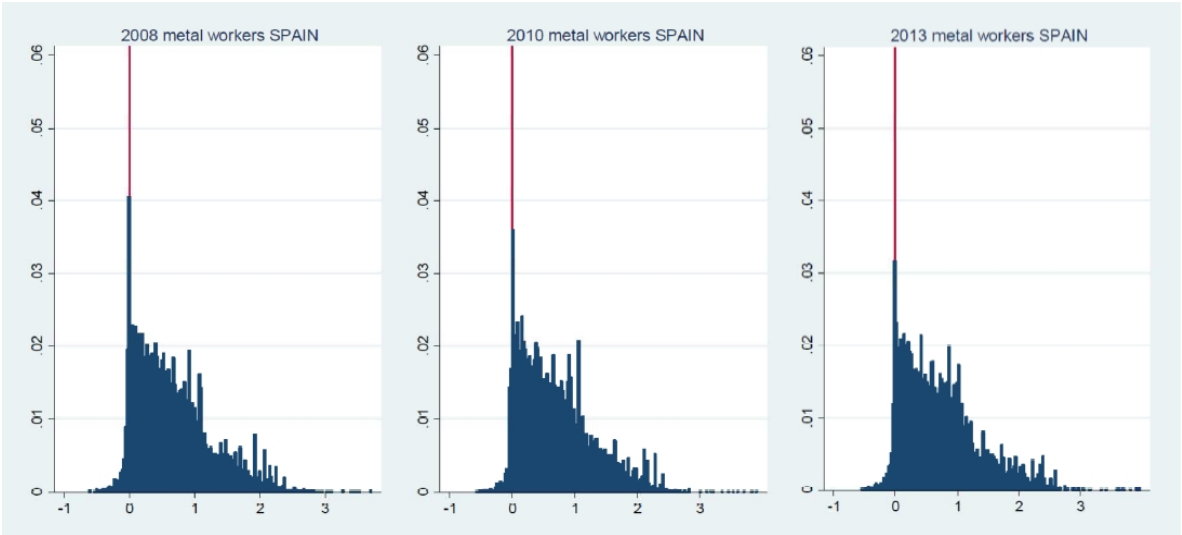
Workers with $>$ 2 years of tenure-Spain

Data source: INPS for Italy and MCVL for Spain. The graphs show the distribution of wages around the negotiated minima in 2008 for workers with at most 2 years of tenure and workers with more than 2 years of tenure. The Italian data are computed via daily nominal wages and their distance to the collective contract minima (varying by 3 skill levels) using the formula $(wage\ cushion)_{ist}$=log($actual\ W_{ist}/negotiated\ W_{ist}$), where i denotes worker, s skill and t year. The Spanish data are computed via annualized nominal base wages in December of each year and their distance to the collective contract minima (varying by 10 skill levels and 48 provinces) using the formula $(wage\ cushion)_{ispt}$=log($actual\ W_{ispt}/negotiated\ W_{ispt}$), where i denotes worker, s skill, p province and t year. The red vertical line at zero denotes the cases for which the wage is equal to the negotiated minima. Cases to the left of the vertical line denote non compliance. Cases to the right of the vertical line denote wages far from the minima.

Figure 3. Evolution of the wage cushion in Italy and Spain



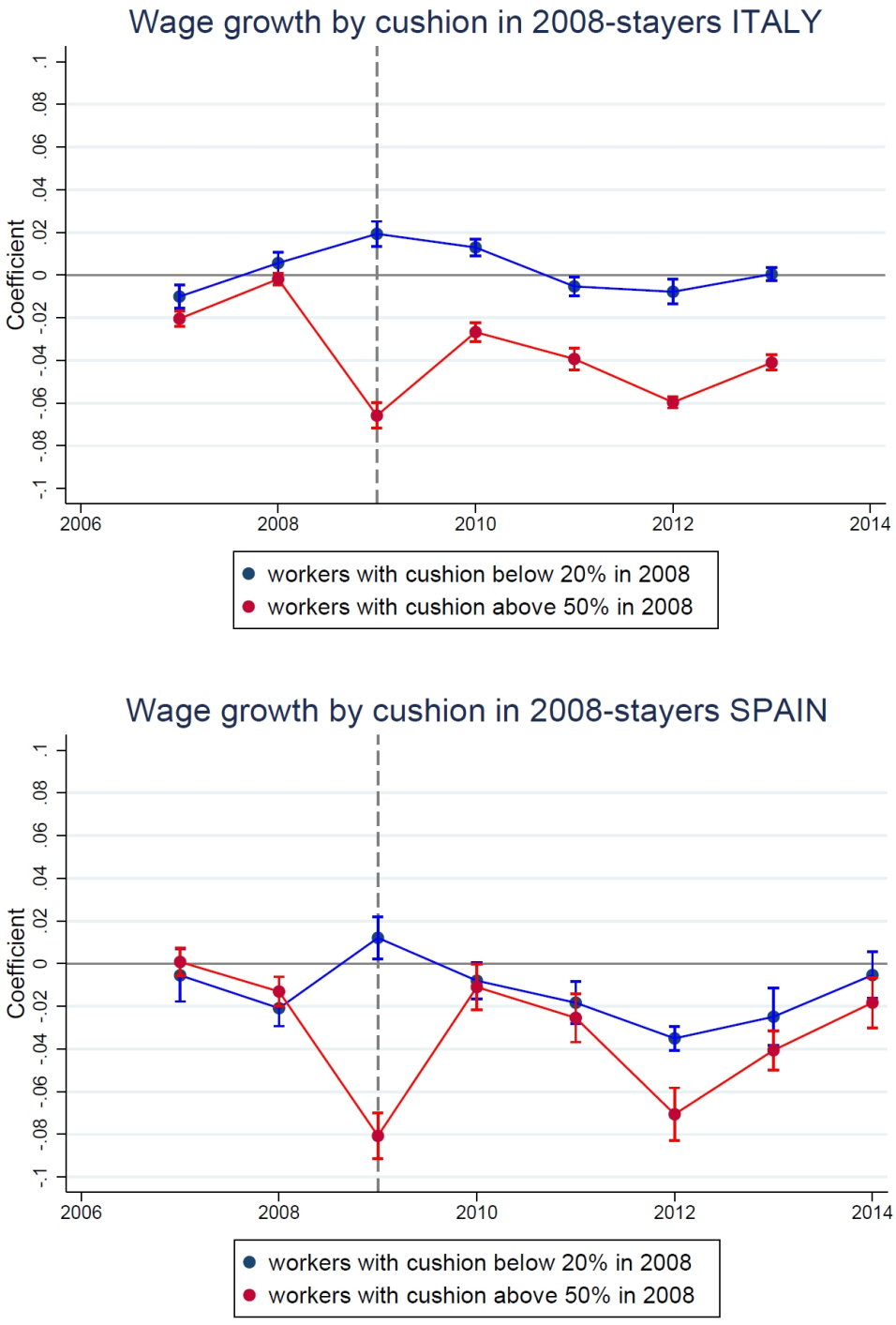
Italy



Spain

Data source: INPS for Italy and MCVL for Spain. The graphs show the distribution of wages around the negotiated minima in 2008, 2010 and 2013. The Italian data are computed via nominal daily wages and their distance to the collective contract minima (varying by 3 skill levels) using the formula $(wage\ cushion)_{ist}$=log($actual\ W_{ist}/negotiated\ W_{ist}$), where i denotes worker, s skill and t year. The Spanish data are computed via annualized nominal base wages in December of each year and their distance to the collective contract minima (varying by 10 skill levels and 48 provinces) using the formula $(wage\ cushion)_{ispt}$=log($actual\ W_{ispt}$ over $negotiated\ W_{ispt}$), where i denotes worker, s skill, p province and t year. The red vertical line at zero denotes the cases for which the wage is equal to the negotiated minima. Cases to the left of the vertical line denote non compliance. Cases to the right of the vertical line denote wages far from the minima.

Figure 4. Wage adjustments over time in Italy and Spain



Data source: INPS for Italy and MCVL for Spain. The graph shows the regression coefficients of real total % wage growth on year dummies. Total wages are deflated with the yearly CPI into 2011 euros. Regressions include worker and establishment fixed effects. Standard errors are clustered at the region/province level for Italy/Spain. Workers with cushion below 20% are those, whose actual wage in 2008 was lower that 1.2 times the negotiated wage that corresponded to their skill (and province in Spain) and workers with cushion above 50% are those, whose actual wage in 2008 was higher than 1.5 times the negotiated wage that corresponded to their skill (and province in Spain).

Tables

Table 1. Descriptive statistics: Sample means (standard deviations)

	Italy	Spain
unemployment rate at t	6.38 (3.37)	15.3 (7.62)
unemployment rate at renewal	7.99 (1.57)	13.7 (7.54)
total monthly wage	2386 (1047)	2248 (893)
base monthly wage	-	2122 (643)
negotiated monthly wage	1372 (202)	1310 (279)
% stayers	78.5	77.8
% blue collars	64.1	72.3
% part time	5.2	1.8
% permanent	93.8	85.2
% males	83.8	86.0
age	40.2 (9.4)	40.1 (8.9)
firm size	670 (2518)	1181 (2833)

Data source: INPS 2005-2013 for Italy and MCVL 2005-2014 for Spain. Unemployment rate at t is regional for Italy and provincial for Spain. Unemployment rate at renewal is national for Italy and provincial for Spain.

Table 2. The distribution of wages around collective contract minima in Italy and Spain

	2007	2008	2009	2010	2011	2012	2013
Panel A: Italy							
Wage cushion	0.457	0.455	0.447	0.448	0.454	0.451	0.446
Wages below agreement	0.013	0.017	0.018	0.018	0.018	0.019	0.020
Wage 0%-10% above minimum	0.084	0.095	0.103	0.096	0.092	0.093	0.097
Wage 10%-20% above minimum	0.085	0.088	0.102	0.092	0.084	0.090	0.090
Wage 20%-50% above minimum	0.303	0.289	0.288	0.296	0.297	0.294	0.298
Wage 50%-100% above minimum	0.327	0.318	0.294	0.312	0.322	0.318	0.314
Wage 100% above minimum	0.189	0.193	0.195	0.186	0.187	0.186	0.181
Panel B: Spain							
Wage cushion	0.443	0.458	0.477	0.479	0.479	0.484	0.499
Wages below agreement	0.051	0.037	0.032	0.031	0.025	0.031	0.030
Wage 0%-10% above minimum	0.137	0.126	0.118	0.120	0.126	0.117	0.112
Wage 10%-20% above minimum	0.085	0.087	0.081	0.083	0.083	0.082	0.079
Wage 20%-50% above minimum	0.214	0.218	0.218	0.213	0.206	0.201	0.205
Wage 50%-100% above minimum	0.269	0.285	0.285	0.286	0.307	0.306	0.289
Wage 100% above minimum	0.245	0.247	0.266	0.267	0.254	0.262	0.285

Sample of employees with a link to the Social Security system in Italy (upper panel) and Spain (lower panel). The Italian data are computed via nominal daily wages and their distance to the collective contract minima (varying by 3 skill levels) using the formula $(wage\ cushion)_{ist}$=log($actual\ W_{ist}/negotiated\ W_{ist}$), where i denotes worker, s skill and t year. The Spanish data are computed via annualized nominal base wages in December of each year and their distance to the collective contract minima (varying by 10 skill levels and 48 provinces) using the formula $(wage\ cushion)_{ispt}$=log($actual\ W_{ispt}/negotiated\ W_{ispt}$), where i denotes worker, s skill, p province and t year.

Table 3. Wage cushion in 2008 in Italy and Spain, by characteristics

	Italy		Spain	
	Wage cushion	0-10% above min	Wage cushion	0-10% above min
Total	45	9.4	46	12
By occupation				
Middle managers	75	0.3	52	4.2
White collars	56	6.6	50	12.7
Blue collars	38	11.3	43	13.2
By tenure				
New hires (with tenure <=2 years)	39	14.8	39	21.3
By geographical area				
North-west			36	15.2
North-East (*)	47	8.2	59	4.3
Center			37	21.9
Madrid			37	11.4
East			42	12.6
South	33	17.4	42	20.2

Sample of employees with a link to the Social Security system in Italy and Spain. The Italian data are computed via nominal daily wages and their distance to the collective contract minima (varying by 3 skill levels) using the formula $(wage\ cushion)_{ist}$=log($actual\ W_{ist}/negotiated\ W_{ist}$), where i denotes worker, s skill and t year. The Spanish data are computed via annualized nominal base wages in December of each year and their distance to the collective contract minima (varying by 10 skill levels and 48 provinces) using the formula $(wage\ cushion)_{ispt}$= log($actual\ W_{ispt}/negotiated\ W_{ispt}$), where i denotes worker, s skill, p province and t year.

(*) North in Spain includes Bizkaia, whose agreement ceased to be legally binding in 2000 but is still published in employer's publications.

Table 4. Wage determinants in Italy and Spain

	Italy	Spain
	(1)	(2)
A. Dependent variable: log(negotiated wage)		
Unemployment rate at t	0.010	0.064
	(0.082)	(0.100)
Unemployment rate at renewal	-0.249***	-0.204**
	(0.018)	(0.079)
B. Dependent variable: log(total wage)		
Unemployment rate at t	-0.453*	-0.470***
	(0.229)	(0.047)
Unemployment rate at renewal	-0.073*	-0.061
	(0.037)	(0.048)
C. Dependent variable: cushion		
Unemployment rate at t	-0.858**	-0.968***
	(0.323)	(0.200)
Unemployment rate at renewal	0.279***	0.261
	(0.074)	(0.180)
N	443,436	103,090

Data source: INPS for Italy and MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by region/province in parentheses. Regressions include worker and establishment fixed effects and a quadratic trend. Unemployment rate at t is regional/provincial for Italy and Spain. Unemployment rate at renewal is national for Italy and provincial for Spain. The cushion is defined as the difference between the actual and the negotiated wage over the negotiated wage.

Table 5. Wage determinants in Italy and Spain-stayers, by distance to the minimum

	Italy	Spain
	(1)	(2)
Dependent variable: log(total wage)		
A. Workers with cushion below 20% at t-1		
Unemployment rate at t	0.175	-0.223***
	(0.130)	(0.062)
Unemployment rate at renewal	-0.096	-0.113***
	(0.081)	(0.023)
N	36,722	9,034
B. Workers with cushion between 20-50% at t-1		
Unemployment rate at t	-0.263	-0.444***
	(0.276)	(0.078)
Unemployment rate at renewal	0.130*	-0.106***
	(0.064)	(0.028)
N	65,824	17,618
C. Workers with cushion above 50% at t-1		
Unemployment rate at t	-0.808**	-0.559***
	(0.353)	(0.079)
Unemployment rate at renewal	0.130*	-0.075
	(0.063)	(0.067)
N	142,671	49,457

Data source: INPS for Italy and MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by region/province in parentheses. Regressions include worker and establishment fixed effects and a quadratic time trend. Unemployment rate at t is regional/provincial for Italy and Spain. Unemployment rate at renewal is national for Italy and provincial for Spain. Workers with cushion below 20% are those, whose actual wage in the previous year was lower than 1.2 times the negotiated wage that corresponded to their skill (and province in Spain), workers with cushion between 20 and 50% are those, whose actual wage in the previous year was equal or higher than 1.2 times but lower than 1.5 times the negotiated wage that corresponded to their skill (and province in Spain), and workers with a cushion above 50% are those, whose actual wage in the previous year was higher than 1.5 times the negotiated wage that corresponded to their skill (and province in Spain).

Table 6. Wage determinants in Italy and Spain-robustness

	Italy				Spain	
	(1)	(2)	(3)	(4)	(5)	(6)
	Benchmark Regional unemp. at t	Robustness I Regional unemp. at t-1	Robustness II Provincial unemp. at t	Robustness III Info for each metal contract	Benchmark Provincial unemp. at t	Robustness I Provincial unemp. at t-1
A. Dep. var.: log(neg. wage)						
Unemployment rate at t	0.010	0.074	0.001	0.184***	0.064	-0.006
	(0.082)	(0.053)	(0.046)	(0.055)	(0.100)	(0.097)
Unemployment rate at renewal	-0.249***	-0.273***	-0.249***	-0.399***	-0.204**	-0.188**
	(0.018)	(0.021)	(0.018)	(0.016)	(0.079)	(0.087)
B. Dep. var.: log(total wage)						
Unemployment rate at t	-0.453*	-0.420**	-0.230**	-0.448*	-0.470***	-0.429***
	(0.229)	(0.155)	(0.088)	(0.236)	(0.047)	(0.046)
Unemployment at renewal	-0.073*	-0.047	-0.077**	-0.202**	-0.061	-0.055
	(0.037)	(0.065)	(0.030)	(0.076)	(0.048)	(0.038)
C. Dep. var.: cushion						
Unemployment rate at t	-0.858**	-0.854**	-0.441***	-1.103**	-0.968***	-0.765***
	(0.323)	(0.318)	(0.131)	(0.464)	(0.200)	(0.174)
Unemployment rate at renewal	0.279***	0.525***	0.272***	0.272*	0.261	0.244
	(0.074)	(0.143)	(0.062)	(0.132)	(0.180)	(0.187)
N	443,436	443,436	443,436	422,879	103,090	103,090

Data source: INPS for Italy and MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by region/province in parentheses. Regressions include worker and establishment fixed effects and a quadratic trend. The benchmark exercise for Italy (column 1) considers all workers in the metal sector and uses regional unemployment rate at t and national at renewal. The first robustness exercise for Italy (column 2) considers all workers in the metal sector and uses regional unemployment rate at t-1 and national at renewal. The second robustness exercise for Italy (column 3) considers all workers in the metal sector and uses provincial unemployment rate at t and national at renewal. The third robustness exercise for Italy (column 4) considers workers covered by the main, SMEs, artisans and FCA contracts and uses detailed information on negotiated wages and dates of renewal of each contract, regional unemployment rate at t and national (quarterly) at renewal. The benchmark exercise for Spain (column 5) uses provincial unemployment rate both at t and at renewal. The first robustness exercise for Spain (column 6) uses provincial unemployment rate at t-1 and provincial unemployment in the year of contract renewal. The cushion is defined as the difference between the actual and the negotiated wage over the negotiated wage.

Table 7. Accounting for implicit contracts

	Spain
	(1)
Dependent variable: log(total wage)	
Unemployment rate at t	-0.464***
	(0.054)
Unemployment rate at renewal	-0.049
	(0.039)
Unemployment rate at entry	0.015
	(0.087)
N	75,082

Data source: MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by province in parentheses. Regressions include worker and establishment fixed effects, a quadratic trend, and the wage cushion at entry as a control of the quality of the worker-firm match. All unemployment rates (at t, at renewal and at entry) are provincial.

Table 8. Base versus total wages

	Spain	
	(1)	(2)
Dependent variable:	log(base wage)	log(total wage)
A. Workers with cushion below 20% at t-1		
Unemployment rate at t	-0.304***	-0.222***
	(0.07)	(0.062)
Unemployment rate at renewal	-0.092**	-0.113***
	(0.037)	(0.023)
N	9,034	
B. Workers with cushion above 50% at t-1		
Unemployment rate at t	-0.217***	-0.560***
	(0.053)	(0.079)
Unemployment rate at renewal	-0.034	-0.075
	(0.026)	(0.067)
N	49,457	

Data source: MCVL. *p<0.10, **p<0.05, ***p<0.01. Robust standard errors clustered by province in parentheses. Regressions include worker and establishment fixed effects and a quadratic trend. Unemployment rate at t and at renewal are provincial. See also notes of Table 5.

Table 9. Distributional effects in Italy and Spain

	Italy	Spain
	(1)	(2)
A. Dependent var.: Fraction of workers with cushion below 20%		
Unemployment rate at t	0.291***	0.441***
	(0.095)	(0.155)
B. Dependent var.: Fraction of workers with cushion above 50%		
Unemployment rate at t	-0.635**	-0.626***
	(0.282)	(0.220)
N	443,436	123,890

Data source: INPS for Italy and MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by region/province in parentheses. Regressions include worker and establishment fixed effects and a quadratic time trend. Unemployment rate at t is regional/provincial for Italy and Spain. Unemployment rate at renewal is national for Italy and provincial for Spain. See also notes of Table 5.

Table 10. Wage adjustments over the business cycle in Italy and Spain: stayers vs new entrants and blue- vs white-collars

	Italy				Spain			
	(1)	=	(2)	+ (3)	(4)	=	(5)	+ (6)
	Full		Stayers	New entrants	Full		Stayers	New entrants
A. Dep. var.: Wage cushion below 20% interacted with whether a stayer/new entrant								
Unemployment rate at t	0.291***		0.550***	-0.259*	0.441***		0.331***	0.110*
	(0.095)		(0.145)	(0.125)	(0.155)		(0.116)	(0.055)
B. Dep. var.: Wage cushion above 50% interacted with whether a stayer/new entrant								
Unemployment rate at t	-0.635**		-0.691***	0.057	-0.626***		-0.347	-0.279***
	(0.282)		(0.230)	(0.199)	(0.220)		(0.209)	(0.071)
	Full		Blue collars	White collars	Full		Blue collars	White collars
A. Dep. var.: Wage cushion below 20% interacted with whether a blue/white collar								
Unemployment rate at t	0.291***		0.187**	0.103***	0.441***		0.368***	0.073*
	(0.095)		(0.076)	(0.031)	(0.155)		(0.123)	(0.037)
B. Dep. var.: Wage cushion above 50% interacted with whether a blue/white collar								
Unemployment rate at t	-0.635**		-0.439*	-0.196**	-0.626***		-0.461**	-0.165***
	(0.282)		(0.224)	(0.096)	(0.220)		(0.180)	(0.046)
N			443,436				123,900	

Data source: INPS for Italy and MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by region/province in parentheses.

Each entry is the coefficient of provincial unemployment rate in a different OLS regression. Other regressors (not shown) are a quadratic time trend as well as worker-level and establishment-level fixed effects. Regressions in columns (2) and (5), upper panel, have as dependent variable a binary variable that is the product of two binary variables: whether the wage cushion is below 20% (above 50%) and the worker stays in the same job as last year. Regressions in columns (3) and (6), upper panel, have as dependent variable a binary variable that is the product of two binary variables: whether the wage cushion is below 20% (above 50%) and the worker is a new entrant. Regressions in columns (2) and (5), lower panel, have as dependent variable a binary variable that is the product of two binary variables: whether the wage cushion is below 20% (above 50%) and the worker is in a blue collar position (crafts, laborer). Regressions in columns (3) and (6), lower panel, have as dependent variable a binary variable that is the product of two binary variables: whether the wage cushion is below 20% (above 50%) and the worker is in a white collar position (administrative, officer). Unemployment rate at t is regional/provincial for Italy and Spain. See also notes of Table 5.

Table 10b. Cyclicality of occupations in Italy and Spain

	Italy	Spain
	(1)	(2)
Dependent var.: Probability of being a blue collar		
Unemployment rate at t	-0.063**	0.030**
	(0.024)	(0.015)
N	443,436	123,890

Data source: INPS for Italy and MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by region/province in parentheses. Regressions include worker and establishment fixed effects and a quadratic time trend. Unemployment rate at t is regional/provincial for Italy and Spain.

Table 11. Wage adjustments over the business cycle in Italy and Spain: Small versus large firms

	Italy				Spain			
	(1)	= (2)	+ (3)		(4)	= (5)	+ (6)	
	Full	Small firm	Large firm		Full	Small firm	Large firm	
A. Dep. var.: Wage cushion below 20% interacted with whether a small/large firm								
Unemployment rate at t	0.291***	0.286***	0.005		0.441***	0.375***	0.067**	
	(0.095)	(0.084)	(0.021)		(0.155)	(0.139)	(0.032)	
B. Dep. var.: Wage cushion above 50% interacted with whether a small/large firm								
Unemployment rate at t	-0.635**	-0.383	-0.252**		-0.626***	-0.340**	-0.284***	
	(0.282)	(0.231)	(0.112)		(0.220)	(0.164)	(0.073)	
N		443,436				122,970		

Data source: INPS for Italy and MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by region/province in parentheses.

Each entry is the coefficient of provincial unemployment rate in a different OLS regression. Other regressors (not shown) are a quadratic time trend as well as worker-level and establishment-level fixed effects. Regressions in columns (2) and (5) have as dependent variable a binary variable that is the product of two binary variables: whether the wage cushion is below 20% (above 50%) and the the firm is small (size below the 75^{th} percentile, i.e. 190 employees in Italy and 400 employees in Spain). Regressions in columns (3) and (6) have as dependent variable a binary variable that is the product of two binary variables: whether the wage cushion is below 20% (above 50%) and the firm is large (size above the 75^{th} percentile, i.e. 190 employees in Italy and 400 employees in Spain). Unemployment rate at t is regional/provincial for Italy and Spain. See also notes of Table 5.

Table 12. Wage determinants in Italy and Spain-extending the analysis back in time

	Italy			Spain		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	log(total wage)			log(base wage)		
	Benchmark 2005-2013	2000-2013	1995-2013	Benchmark 2005-2014	2000-2014	1995-2014
A. Workers with cushion below 20% at t-1						
Unemployment rate at t	0.175	0.016	0.100	-0.306***	-0.053	0.021
	(0.130)	(0.054)	(0.083)	(0.061)	(0.048)	(0.069)
Unemployment rate at renewal	-0.096	-0.165**	-0.138*	-0.101**	-0.173***	-0.174***
	(0.081)	(0.058)	(0.077)	(0.036)	(0.037)	(0.050)
N	36,722	85,133	132,624	10,311	16,881	23,134
B. Workers with cushion between 20 and 50% at t-1						
Unemployment rate at t	-0.263	-0.225	0.305	-0.286***	-0.086**	0.045
	(0.276)	(0.131)	(0.229)	(0.049)	(0.043)	(0.049)
Unemployment rate at renewal	0.130*	-0.558***	-0.520***	-0.096***	-0.137***	-0.151***
	(0.064)	(0.091)	(0.133)	(0.030)	(0.027)	(0.024)
N	65,824	184,373	309,383	18,801	26,754	33,388
C. Workers with cushion above 50% at t-1						
Unemployment rate at t	-0.808**	-0.609***	-0.054	-0.184***	-0.211***	-0.085*
	(0.353)	(0.200)	(0.223)	(0.063)	(0.042)	(0.045)
Unemployment rate at renewal	0.130*	-0.668***	-0.721***	-0.044	-0.037	-0.072
	(0.063)	(0.100)	(0.078)	(0.026)	(0.032)	(0.047)
N	142,671	303,097	470,031	47,089	69,241	92,239

Data source: INPS for Italy and MCVL for Spain. * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered by region/province in parentheses. Regressions include worker and establishment fixed effects and a quadratic time trend. Unemployment rate at t is regional/provincial for Italy and Spain. Unemployment rate at renewal is national for Italy and provincial for Spain. Wages are total for Italy and base for Spain (total wages are not available before 2005). See also notes of Table 5.

Table 13. The elasticity of wages to local unemployment: a comparison of the empirical results to the canonical search model

	Italy		Spain	
Panel A: Parameters				
Unemployment replacement rate	0.70		0.79	
Job separation rate	0.04		0.14	
Interest rate	0.04		0.04	
Steady state unemployment rate	0.10		0.17	
Persistence of unemployment	0.04		0.06	
Renegotiation frequency of existing matches	0.40		0.50	
Panel B: Predictions of canonical model of search on the elasticity of wages to unemployment (Koenig et al., 2016)				
	Elasticity of wages to unemployment		Elasticity of wages to unemployment	
1. Continuous wage renegotiation	-0.300		-0.210	
2. Infrequent renegotiation of continuing matches	-0.254		-0.176	
Panel C: Empirical estimates of the elasticity of real wages to unemployment				
	Semi-elasticity of wages	Elasticity of wages to unemployment	Semi-elasticity of wages	Elasticity of wages to unemployment
Mean response	-0.354	-0.035	-0.37	-0.063
Responses by distance to the minimum at t-1				
Workers with cushion below 20%	0.248	0.025	-0.19	-0.032
Workers with cushion between 20 and 50%	-0.136	-0.014	-0.38	-0.065
Workers with cushion above 50%	-0.616	-0.062	-0.47	-0.080

Data sources: replacement rates are those of year 2010 for Italy and Spain from `https://stats.oecd.org/Index.aspx?DataSetCode=NRR`, separation rates are computed as the average involuntary separation rate in Social Security data for the metalworking industry, unemployment rates (average unemployment rate during the period of analysis) come from ISTAT and INE, unemployment persistence is the coefficient of AR(1) of national unemployment on its lag, the frequency of contract negotiations is one over the average duration of collective contracts in the metalworking industry (2.5 years in Italy, 2 in Spain).