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ABSTRACT

The Wage Effects of Employers' Associations: A Case Study of the Private Schools Sector*

Does employers' association (EA) membership affect wages? Such effects, positive or negative, could follow from increased productivity, employer collusion, or other channels. We analyse this question drawing on matched employer-employee panel data, including time-varying EA affiliation and worker mobility. We consider the case of private schools in Portugal, 2010-2020, and its single EA, and develop a method to define the sector's scope. We find that school fixed effects reduce the EA wage premium considerably. However, such positive premium remains, especially when focusing on the key occupation of the industry (teachers) and when considering EA firms that follow firm-specific (non-EA) collective agreements. We also find that there is an EA wage premium for schools that join the EA, while the EA premium does not disappear for schools that leave the EA.

JEL Classification: J53, J62, L40

Keywords: employers organisations, worker mobility, social dialogue

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1 Introduction

Employers' associations (EAs) are a key player in social dialogue (OECD (2019)) and may shape different economic variables. Indeed, EAs play critical roles in many countries in areas such as collective bargaining, training, lobbying, and different forms of employer coordination. However, the roles and effects of EAs remain poorly understood in both research and policy. This paper expands the evidence base in this area by studying EA wage effects. We do so while controlling for other firm characteristics, including their workforce and collective bargaining engagement. Specifically, we ask if EA affiliation prompts firms towards different, higher or lower, wage levels, compared to similar firms that are not affiliated and that employ similar workers. We argue that the sign of this effect could depend on the relevance of different forces, including productivity and rent sharing, on the one hand, and employer collusion, on the other.

We address this question by exploiting a detailed matched employer-employee panel data. Such rich data is critical in order to disentangle worker and firm wage effects from EA effects. For instance, if EA firms systematically recruit workers that are more productive (and therefore typically more expensive) or if EA members tend to be firms that offer more generous wages over time, regardless of EA membership status, then such selection needs to be taken into account. If such potential selection is disregarded, any EA wage 'effects' could simply be a result of composition differences, when EA firms recruit and retain particular types of workers.

Specifically, in our analysis, we draw on time variation from both worker mobility across firms and firm EA affiliation switches to identify EA affiliation wage effects. Such identification is based on an assumption of exogenous mobility. Moreover, our empirical study is only possible given our access to comprehensive data, including time-varying firms' EA affiliation, and collective bargaining information. This data covers all private schools in Portugal, over a long period (2010-2020), allowing for both considerable worker mobility *and* EA affiliation changes. Portugal is an interesting case in our context also given the prominence of sectoral (EA-led) collective bargaining - in contrast to countries where most collective bargaining is conducted at the firm level, typically without EA involvement.

In this context, we also propose a methodology to delimit the sector's scope, as we need to establish the relevant subset of non-affiliated firms that can serve as a comparison group. We

also show that simple measurements based on industry classification or collective bargaining coverage may not be adequate. Our methodology is based on the employment, or not, by firms, of individuals conducting the key occupation of the industry, in this case teachers. Our methodology also highlights an important practical and policy challenge in the measurement of individual EA representativeness. This contrasts to the case of simpler, country-level EA density indicators, in which the industry definition is not important.

As to our main results, we find initially that EA firms pay economically and statistically significantly up to 8% higher wages than their non-affiliated counterparts. This is the case even when controlling extensively for worker characteristics, including worker fixed effects. However, when considering firm heterogeneity in greater detail, these wage differences virtually disappear, except when focusing on the key occupation of the industry (teachers). The latter result points to the potential greater positive wage effects of EAs on their key occupation(s). While self-selection issues may be relevant, we also find positive EA wage effects for EA firms that join EAs, unlike in the opposite case of firms that leave the EA. This asymmetry may suggest that the experience in the EA leads to better wage practices. Such improved wages are not reversed once the firm leaves the EA. In more detailed analysis, we also find that EA firms pay slightly more than non-EA firms without a collective bargaining agreement of their own. When focusing on teachers, firm-level agreements of EA firms offer the higher wages. This result highlights the potential diversity of wage practices even within the group of EA firms and their interactions with different collective bargaining arrangements.

As far as we know, this is the first study that examines empirically the wage effects of EAs. Moreover, we try to conduct our analysis from a causal perspective, by addressing selection or sorting mechanisms using the rich data set described above. However, we assume exogenous mobility of firms across EA statuses and of workers across firms, which may not be the case. Future research may draw on quasi-experiments, driven by legal reforms or particular events that prompt exogenous changes in firms' (or workers') EA status.

This study also contributes, even if only marginally, to a number of additional literatures. First, we contribute to research on collective bargaining and teacher pay, including Marianno & Strunk (2018), Willen (2021), Biasi & Sarsons (2021), and Han (2023). We highlight the variety of collective agreements that may be applicable in the education sector and their frequent changes over time, as well as the roles of wage setting structures in influencing wages

(and possibly student achievement). Second, we also add to the emerging literature on the micro analysis of collective agreements and their effects, including Card & Cardoso (2022), Gautier et al. (2022), and Adamopoulou & Villanueva (2022), by contributing to the definition of coverage of each collective bargaining agreement. Finally, we contribute indirectly to the recent research on labour market power, including Azar et al. (2022) and Bassanini et al. (2023).[1]

The remaining of the paper is as follows: the next section sketches theoretical ideas on the potential effects of EAs on wages; Section 3 highlights the key characteristics and institutions of private schools in Portugal; Section 4 presents the background to our empirical analysis (data sets, sector definition approach, and descriptive statistics); Section 5 presents our main results, considering the full sample of all employees; Section 6 presents a number of extensions, including an analysis of the subset of teachers only. Finally, section 7 concludes and presents ideas for further research.

2 Theoretical mechanisms

From a theoretical perspective, we argue that positive wage effects from EA affiliation could follow from increased productivity fostered by EAs through access to new technology, including better management practices and improved worker training. Indeed, the coordination role played by EAs place them in a good position to facilitate productivity improvements amongst member firms. However, this perspective would also require that firms share at least part of such productivity gains with workers through wage increases and wages rates above market levels. Such rent sharing could be mediated by trade unions in collective bargaining. A related but different approach that would also lead to positive EA wage effects could involve a greater willingness, by EA firms, to experiment with or strengthen efficiency wages. This could include offering higher wages to motivate workers, increasing productivity or reducing turnover costs.

On the other hand, negative EA wage effects can be driven by employer collusion fostered by EA affiliation. Indeed, EAs may promote employer monopsony in the labour market

[1] These papers find evidence of local labour markets characterised by high levels of employer concentration and that such concentration is associated with lower wages. Concentration is measured using the number of employers in a given local labour market (a combination of a region, such as a commuting zone, and an occupation). This approach disregards the potential coordination between these employers through EAs. Our results suggest that the effective number of prospective employers may be lower that the observed number.

(Bassanini et al. (2023)), for instance by restricting poaching amongst affiliated firms (Martins & Thomas (2023)) or by promoting covenants not to compete (Krueger & Ashenfelter (2022)). By reducing the scope for job offers for their employees from other EA firms in the same industry, each EA firm would be able to pay their workers less than in a counterfactual scenario of no EA collusion. Greater dissemination of information on pay across firms may also foster pay compression. The collective bargaining agreements negotiated by the EA could also play a direct role in this regard. Note that such potentially negative EA wage effects would not necessarily translate into lower wages in an absolute, unconditional sense. While EA *unconditional* wages could still be higher, the EA effect could be negative after partialling out firm and worker heterogeneity.

The overall net EA effect on wages would then depend on the relative magnitude of these two potential mechanisms: productivity and rent sharing, on the one hand, and collusion, on the other. For instance, if the negative collusion effects are stronger than the positive productivity effects, EAs could have overall negative wage effects. In both cases, collective bargaining could be an important pathway. Presumably, collective bargaining would push firms to share the rents from increased productivity - although employer collusion could also dampen such rent sharing. Note that, under administrative extensions towards non-EA firms, positive EA wage effects would probably involve larger wage 'cushions' (wages paid minus collective bargaining minimum wages) in EA firms. Alternatively, collective bargaining could also involve wage compression, especially for more skilled occupations, compared to a counterfactual scenario of no collusion.

All the mechanisms above could apply in the particular context of private schools that we examine in our empirical analysis. One particular area of interest is any differences between specific occupations to the industry (teachers) and other, more general occupations (psychologists, nurses, receptionists, security staff, secretaries, etc). It may be the case that teachers receive particular attention by EAs, given their importance in the industry. Teachers may be overrepresented amongst education sector trade unions and their representatives in collective bargaining, potentially leading to higher wages for this occupation in this industry.[2]

It is also important to separate the role of collective agreements from those of EAs, de-

[2] Additional mechanisms may be tested in our particular context but are left for future research. For instance, management practices may be assessed through surveys or analysis of personnel data. Productivity gains from EAs may follow from an analysis of student scores in national examinations or related measures of teacher or school value added (Koedel et al. (2015)). Collusion arrangements may be examined through worker mobility between EA and non-EA schools (Martins & Thomas (2023)).

spite potential concerns about selection. A few points need to be taken into account in this context. First, EA firms may establish separate, firm-level collective agreements that can deviate from the working conditions offered in the EA collective agreement.[3] Second, non-EA firms may also follow the collective agreement of the EA. This may happen voluntarily or through administrative extensions. Third, non-EA firms may have their own firm-level agreement. Fourth, firms that follow a collective agreement (though EA affiliation or some other mechanism described above) may decide to pay above the minimum wages established in that collective agreement for specific job categories.

These points may lead to potentially complex interactions between EA affiliation and collective bargaining. A particular ranking of wage premiums for the different combinations between EA affiliation status and EA or non-EA collective bargaining agreement (plus the potential case of uncovered non-EA firms) is difficult to predict from theory. In the context of positive EA wage premiums, one hypothesis may be that the highest premiums are paid by EA firms (led either by those EA firms following the EA collective agreement or EA firms following firm-level agreements). The wage ranking would be followed by non-EA firms (again led either by those following the EA collective agreement, for instance through administrative extensions, or their firm-level agreement). Uncovered non-EA firms would presumably rank last in terms of wage premiums.

3 The private schools sector

This section offers a short institutional background on the private schools sector in Portugal. Our focus here is exclusively on primary and secondary education, excluding kindergarten and higher education which are not covered by the EA under analysis in this paper. Primary and secondary education in the country are delivered both by private and public schools. The former account for approximately 15% of all 1.2 million primary and secondary students in the country (increasing to 21% of all 1.6 million pre-school, primary and secondary students). While public (i.e., State-run) schools are free for students and their families as they are paid from general taxation, private schools are funded by fees paid by students and their families.

[3] In the context of Portugal, such deviations from firm-level agreements can only be upward, i.e., more generous conditions, at least in a global sense. In other words, particular provisions may be less generous but other provisions must have to be more generous and more than compensate for the provisions that are less generous. Ultimately, the more generous nature of firm-level agreements is established by the decision of trade unions to sign the firm-level collective agreement.

In a small number of cases (and only up to 2016), some private schools were partly subsidised by the Ministry of Education.

Given the alternative of free public schools, the fact that a significant percentage of families prefer private schools can be explained by a number of factors. These include perceptions of higher quality of the teaching provided in private schools, possibly following better management (Bryson & Green (2018)), as suggested by national exams performance. Shorter commuting with respect to the best alternative public school and perceptions of better student peers may also matter. Some private secondary schools are also believed to inflate their grades, which may influence positively a student's chances in higher education placement.

As to the teachers (and any other employees) of private schools, their pay and other working conditions are determined as any other job in the private sector. Specifically, teachers' pay is subject to the private-sector Labour Code and any applicable collective bargaining agreement (see Appendix 7 for additional background on labour market institutions). An important element concerns the large percentage of teachers that are employed by the Ministry of Education in public-sector labour contracts. The latter contracts can serve as a benchmark and influence teachers' wage determination in the private sector. Moreover, a small number of teachers in public schools may have part-time contracts with private schools.

The key institutional player in the private schools sector is its single employers' association, the EA studied in this paper. This EA is the 'Association of private education establishments', or AEEP in its Portuguese acronym. AEEP was founded in 1974 and has been responsible for the representation of the sector since then.[4] A key activity conducted by AEEP is collective bargaining, which is typically established with two key trade unions (FENPROF and FNE). Collective bargaining agreements are routinely administratively extended to non-affiliated firms, except in the case of schools that have their own firm-level agreements or operate in the context of the social sector (which has a different collective agreement). Since 2015, AEEP has been bargaining only with the FNE trade union, in a 'defensive' agreement that sought to protect jobs in exchange of wage moderation. Since 2017, AEEP is a leading member of the Education and Training Confederation (which also includes the vocational schools association and other smaller associations), a confederation which is now responsible for collective bargaining in the sector. Interestingly, there is limited union membership in

[4]We thank the board of AEEP for their availability to discuss these issues and preliminary findings of this paper over five interviews and meetings throughout 2021.

private schools. Indeed, the two trade unions that have bargained with AEEP are much more active in the public sector. We note that this may be an important point when assessing the external validity of our findings and any potential differences in future research.

Besides collective bargaining, AEEP conducts a number of additional activities. All or many of these activities can influence the productivity of these firms and have an effect upon the wages paid to their workers. These activities include: the provision of information to members; national and international representation of the sector; promotion of cooperation between schools (including public schools); legal support; management support; management and pedagogical training; and schools' sport projects. These activities, which fit with the categories proposed in Martins (2020), can have both productivity and coordination effects. As such, EA membership can lead to either positive or negative wage premiums, when compared to non EA members.

4 Empirical analysis

4.1 Data

Our empirical study is based on all private-sector firms and establishments in Portugal and all their individual employees. These data are made available in Personnel Records ('Quadros de Pessoal', QP), a compulsory survey of all firms with at least one employee, conducted annually by the Ministry of Employment.

This census also includes a number of additional variables about firms, establishments and employers, such as identifiers, geographical location, industry (five-digit code), sales, employee headcount, and individual wages of each employee. This data set, QP, has been used extensively in industrial relations and labour economics research, including Martins (2021), Card & Cardoso (2022) and Bassanini et al. (2023).

In our study, we consider the period 2010-2020. For each one of these years, we have information provided by AEEP on its annual membership. This is a time-varying list, allowing us to consider firms that leave and join the EA. Using common firm identifiers, we were able to merge the two data sets, in order to establish if each QP firm is affiliated or not to EA in each year over the period.

The number of affiliated firms varies between 427 in 2010 and 349 in 2019 (and 351 in 2020), leading to a total of 4,165 firm-years over the period. Considering the 3,588 firm-years

(and 412 firms) that can be merged, 63% are EA affiliated over the entire 2010-2020 period.[5] The remaining 37% of firms are affiliated between 1 and 10 years. For instance, 21 firms are affiliated in only one year and 16 firms are affiliated in only two years.[6] Such variation of EA affiliation, from joiners and leavers, is important from the perspective of our econometric identification, towards disentangling firm fixed effects and the EA wage effect.

4.2 Domain identification

A question that remains concerns the identification of the domain of the EA (Eurofound (2020)). This is an important practical challenge in the context of a comparison between affiliated and non affiliated firms regarding a particular EA (e.g., EA density analysis in an industry). In contrast, our present question would not be relevant in a more general study about EA density analysis in a country (contrasting affiliated and non affiliated firms regardless of their specific EA).

While a simple approach would be based on the consideration of the industry code in which the EA operates (primary and secondary education - code 85 of the Portuguese industry code), this would leave out a large number of firms that have their main activity in other industries. Given this challenge, we opted for a different approach. We considered the key occupation in the industry, that of teachers, and the establishments[7] where this occupation is based - presumably schools. More specifically, we identified in our data all the establishments that employed at least five primary and or secondary education teachers (as defined by the corresponding four-digit occupation codes, 2330 and 2341). While the specific number of five teachers is arguably somewhat arbitrary, we regarded it as adequate in ensuring the minimum staff for a small school. For instance, the lower primary level involves four years of schooling, each led by a teacher with additional support for foreign languages, physical exercise or other activities.

Under this approach, we find that over 30% of firms in our final sample (created as explained above) have a different industry code. Even when considering the industry of the establishment, 24% of establishments have a different industry code. (Both percentages are

[5] 577 of the total firm-years (corresponding to 74 different firms) cannot be merged to QP for data reasons. These are in most cases (very) small firms. Note we only consider only firms with unique identifiers and not multiple schools of the same firm.

[6] Virtually all firms are either affiliated in 2010 or affiliated in 2020 (or both, in the case of the case of the 63% firms that are always affiliated). In other words, there are very few cases of firms with gaps in membership, whereby they leave the EA at some point and then resume membership after two or more years.

[7] See Cahuc et al. (2023) for a recent study focused on the establishment dimension in the QP data.

weighted by employment, e.g., the number of employees in all firms or establishments.) Most of these alternative industries are in the social care sector (industry codes 87 and 88) and religious sector (industry code 94) but include schools. Indeed, many (although certainly not all) of these schools in the alternative industry codes above are affiliated with the EA.[8]

4.3 Descriptive statistics

Table 1 presents the descriptive statistics of our worker-level data set, covering nearly 270,000 worker-years. As indicated above, this data set follows from the identification of all establishments (and their firms) in the QP data set that employ at least five teachers. 152,000 of these 270,000 workers are in EA firms, corresponding to a coverage rate of 56.3%. We consider multiple variables, each one separately for affiliated and non-affiliated firms. We also present the difference of the means between the two groups and a t-test of its significance.

We find that all the wage variables indicate large and statistically significant differences between the two types of firms, with EA-affiliated firms paying higher wages. For instance, while the average monthly salary of EA workers is 1,361 euros, that of non-EA workers is 1,115 euros. (All nominal variables have been deflated to 2020 euros.) As monthly hours are slightly lower amongst EA firms, the hourly wage is even relatively higher than in the case of the monthly wage. This can be documented in the comparison of log monthly and hourly wages, with a gap of 0.19 log points in the former case and 0.21 log points in the latter. This analysis supports the view that EA firms tend to pay higher wages. In the case of private schools in Portugal, this premium is of about 20%.

We now consider a number of worker characteristics, finding that EA firms employ slightly more educated workers (13.26 vs 13.03 years of schooling). EA workers, i.e., observations of workers employed in EA firms in the year considered, are also slightly less female (77% vs 78%), older (43 vs 41), more experienced, more tenured (12.1 vs 9.2 years), less likely to be on part-time contracts (13% vs 17%) or fixed-term contracts (24% vs 35%). 56% of EA workers are teachers, while only 44% are so in the case of non-EA workers. This is an important difference that may explain a significant part of the gross wage differential, given that most non-teachers are likely to be paid lower wages.

[8] As to the final data set, including both affiliated and non-affiliated firms in the relevant private schools industry as defined here, we find 643 different firms in total. 202 firms are always EA affiliated, while 402 are always non-EA affiliated. The remaining 39 firms switch EA affiliation status over the eleven-year period covered, the majority of which (38) switch status only once. 15 of these 38 firms become EA affiliated while the remaining 23 leave the EA.

Finally, we consider whether these workers are subject to the EA collective agreements. As explained before, this could follow from direct application in the context of EA membership or indirect application through administrative extensions. As detailed collective bargaining coverage information is not available for 2019 and 2020, we construct an alternative measure to also consider these years, extrapolating from the information in 2017 and 2018. In the two cases, we find that 89% of all workers in EA firms are in EA collective agreements. This means that the remaining 11% of workers are in other collective agreements (most likely from related sectors, e.g., administrative staff) or in occupations not covered by any collective agreement. In contrast, as many as 49% to 50% of workers in non-EA firms are also subject to EA collective agreements. This large percentage can be explained by administrative extensions of collective agreements.[9]

The distribution of workers across years is very similar for the two types of workers, as its mean is 2014.7 in both cases. This value also reflects a downward trend in the total number of workers in the sector, especially during the first years of the sample period, which coincided with a recession and increased demand for public schools.

5 Results

Our main analysis is based on the estimation of the following wage equation:

$$y_{i,t} = \beta_1 EA_{j(i,t),t} + \beta_2 NonEACBA_{i,t} + \beta_3 X_{i,t} + \alpha_i + \tau_{j(i,t)} + \delta_t + u_{i,t}. \quad (1)$$

The dependent variable, $y_{i,t}$, is the logarithm of the monthly total salary of worker i in (October of) year t. The monthly salary is the key reference compensation figure in the country; the total salary includes base salary and other payments (regular or irregular), such as bonuses or allowances. In robustness checks, the hourly salary is also used, dividing the monthly salary by the total number of hours worked in the month.[10]

The key explanatory variable is $EA_{j(i,t),t}$, a dummy variable equal to one if firm $j(i,t)$

[9] Conversely, our descriptive statistics indicate that 50% to 51% of non-EA workers are in firms that do not follow the EA agreement. These include firm-level agreements, sectoral agreements of related sectors (e.g. administrative staff), and workers not covered by any agreement. We also find that 14% of non-EA workers are in firms that were EA affiliated in at least one year over the 2010-2020 period. By definition, all EA workers are in firms that were EA affiliated in at least one year.

[10] Fewer than 2% of the total observations correspond to workers that have more than one employment in a given year. We thus simplify the notation and simply refer to each observation using a combination of i and t and not referring to the firm of the worker in that year.

(the firm j of worker i in year t) is affiliated in the private schools EA (AEEP) in year t. As discussed above, EA affiliation is time-varying over the eleven-year period considered, 2010-2020. Moreover, as workers move between firms over time, their exposure to the EA affiliation status of their firms may also change.

Another important explanatory variable is $NonEACBA_{i,t}$, a dummy variable equal to one if worker i in year t is subject to a collective agreement not bargained by the EA. As discussed before, there are several collective agreements in force in the private schools sector, and not all involve the AEEP private schools EA. Other collective agreements are either established at the firm-level or involve related sectors that partially overlap with private schools (administrative occupations, social care, religious organisations). A third category that is also covered by this dummy variable are workers that are not subject to any collective agreement. These latter cases are referred to as the 'white zone' ('zona branca').

Finally, we also consider a number of additional control variables. $X_{i,t}$ includes a large number of human capital variables that may influence wages and may also be correlated with EA status. In the main specification, $X_{i,t}$ includes years of education, a female dummy variable, years of labour market experience (and square), years of tenure with the firm (and square), a dummy variable for teachers, the number of hours worked in the month, a fixed-term contract dummy variable, and a dummy variable for each year (δ_t). Depending on the specification, we also include worker fixed effects, α_i, and firm fixed effects, $\tau_{j(i,t)}$.

The coefficient estimated for the β_1 parameter will therefore inform us of the average difference of the wages paid by EA firms compared to non-EA firms. When not controlling for $NonEACBA_{i,t}$ (in the first model of each table presented next), the coefficient will be drawn from a comparison with all non-EA firms; when including such control, the comparison group will be exclusively made up of workers in non-EA firms that follow the EA collective agreement.

5.1 All workers

Our first set of results are presented in Table 2 and concern all workers in the industry. In this case, we do not control for firm or worker time-invariant heterogeneity through firm or worker fixed effects but include all other items of the $X_{i,t}$ vector. The results are in line with the descriptive statistics presented above, with large positive wage premiums paid by EA firms.

Depending on the specification, the EA premium ranges between 6% and 8%. In contrast, the coefficient regarding non-EA firms and non-EA collective agreements is negative, ranging between -4% and -8%. These results indicate that workers in EA firms are paid the highest wages (conditional on worker observable characteristics), followed by workers in non-EA firms following the EA collective agreement (the reference group). The lowest wages are paid by workers in non-EA fims that do not follow the EA collective agreement.

The remaining coefficients presented in Table 2 also deserve a brief discussion. The schooling premium is found to be high, at nearly 10%, indicating that the sector values higher levels of education. This is despite the specification already controlling for the teacher occupation and its coefficient being particularly large, with premiums of over 40%. The gender pay gap in the sector appears to be large, at over 11%, despite (or because of) the large share of women employed in these schools. Experience and tenure have the expected positive but decreasing association with wages. Each additional hour of work appears to translate into an 1% higher total salary. Fixed-term contracts predict lower wages, at about 8% less.[11]

We now turn to a second model, which includes worker fixed effects. This addition implies that all time-invariant heterogeneity will be controlled for. This could be important if EA firms tend to attract more skilled workers, which could then explain the EA premiums uncovered in Table 2. We find that the EA affiliation premium is much lower than before but still significant, both in economical and statistical terms - see Table A1. The EA premiums range between 2% and 3%. These results, from Tables 2 and A1, suggest that the selection of more productive workers by EA firms may indeed be part of the EA premium. Such selection may in itself be a contribution of EAs, if any training or the dissemination of good practices provided by EAs helps member firms in their personnel recruitment. In any case, the premiums documented after controlling for worker heterogeneity may also follow from productivity increases or more generous working conditions prompted by EA affiliation.

A remaining dimension of heterogeneity that we consider now is that of the firm itself. Different firms may have systematically different reward practices and it is important to try to disentangle such differences from EA affiliation. Indeed, it may be the case that firms that offer higher wages to otherwise similar workers are more likely to join EAs. Drawing on the time variation of EA affiliation in our data, we can separate the firm fixed effect from the EA effect. This is what we do in Tables A2 and 3: in the first case we control for firm fixed effects

[11] These results are also largely unchanged when controlling for three-digit industry effects - Table A3.

while in the second we also control for worker fixed effects.

The findings of the two tables are similar as both indicate that the EA affiliation premium disappears when firm fixed effects are considered in the wage equation. All six coefficients are lower than 1% (five of which are lower than 0.5%). Moreover, as these coefficients are fairly precisely estimated, we can rule out in most cases wage premiums of more than 1% at the 5% statistical significance level.

We test the robustness of these results with respect to a number of changes in our analysis. We seek the assess the extent to which our main results change when analysing the data in different ways. We consider multiple changes, each one is introduced separately, departing from our main specifications and samples above. These changes are: excluding 2020 (potentially a different year following the pandemic) - Table A5; clustering standard errors at the firm level - Table A4; considering the case of hourly wages instead of monthly wages (there may be important differences in the set up of hourly pay, especially for part-time teachers responsible for a small number of courses) - Table A6; different subsets of the control variables - Table A7[12]; considering only firms with at least 20 teachers (small schools may have significantly different wage practices) - Table A8; considering only firms that switch EA affiliation status (from affiliated to not affiliated and vice-versa; such different directions of change may generate different wage effects, for instance if new EA firms improve their productivity from doing so while exiting EA firms do not lose such productivity differentials) - Table A18; and considering only firms that switch EA affiliation status once - Table A19.[13]

All these analyses support the robustness of our previous main findings. These analyses indicate very small or zero EA wage effects in the more detailed specifications that control for both worker and firm fixed effects. For instance, only in the first two columns of Table A7 there is evidence of significant EA wage differentials, and in both cases not higher than 2% or as small as 1%.

[12]In the firm column, we do not consider any other control variables; in the second, we consider schooling, experience and tenure; in the third, we add hours and contract type; and in the fourth, we control only for hours and the teacher dummy variable.

[13]Tables A15, A16 and A17 present descriptive statistics on the workers of different groups of firms, namely those that switch or not their EA status, those that never switch (either always EA or not EA), and those that switch (while EA or not EA affiliated) either becoming EA or leaving the EA), respectively.

5.2 The case of teachers

Following the general analysis of the entire sector above, covering all its occupations, we now focus on the case of the key job in (private) schools: teachers. It may be the case that the wages of non-teacher occupations in schools (e.g. staff responsible for administration, security, meals, etc) follow general labour market standards, set mostly in other sectors than education. This would imply less potential differentiation between EA and non-EA firms. Such possibility could bias downward our estimates of the EA effect.

As before, we start by presenting descriptive statistics of our worker-level data set but now considering exclusively the case of teachers - Table A10. We find that this subsample covers 136,000 worker-years, almost exactly half the total sample described in Table 1, which was of 270,000 worker-years. In the case of teachers, 84,000 of these workers are in EA firms, corresponding to an EA coverage rate of 61.8% (higher than the 56.3% found for the entire sector, reflecting the higher percentage of teachers in EA schools that was documented before).[14]

We find that, as before, all the wage variables indicate large and statistically significant differences between the two types of firms, with EA-affiliated firms paying higher wages. However, in the case of teachers, salaries are generally higher and the gross wage premiums of EA affiliation also increases. The comparison of log monthly and hourly wages indicates gaps of 0.27 and 0.25 log points, larger than 0.19 and 0.21 log points in the case of all workers. This analysis supports the view that EA firms tend to pay higher wages as it was the case when we analysed the descriptive statistics of the entire sector. Moreover, the larger wage premiums (in unconditional terms) for the case of teachers than for the entire workforce of the sector supports the hypothesis above of greater differentiation in teacher pay. This could pave the way for EA wage effects amongst teachers, in contrast to our main results above.

We also find that some of the differences between EA and non-EA workers documented before for all workers also arise in the specific context of teachers. EA teachers are older, have more labour market experience, more tenured, and less likely to be on part-time contracts or

[14]Table A11 presents a comparison of public and private schools, including their students, and several characteristics of public school teachers. This table was constructed from the MISI data set, with detailed information on all (public and private) schools and students in the country up to 2017/18 - see Catela Nunes et al. (2018) and Ferreira & Martins (2023) for descriptions of this data set. These results suggest that public schools pay on average higher salaries than private schools. On the other hand, public schools are larger and have students with worse grades in national exams. The latter items may amount to compensating differentials from the perspective of teachers.

fixed-term contracts. Schooling levels are virtually the same, reflecting the similar minimum requirements for admission into the teaching occupation.[15]

We now turn to our estimations, following again equation 1. We consider the cases of models including always worker and firm fixed effects and either monthly or hourly wages. The results are presented in Tables 4 and A12, respectively. In contrast to our benchmark findings for the full sector, here we find significant EA premiums for teachers. This is the case in five of the six estimations. However, the magnitude of these effects is relatively small, as the largest premium is of only 1.6%.

Moreover, when restricting our sample further, considering only full-time teachers (see Tables A13 and A14), we do not find significant results. This is the case both when measuring wages on monthly or hourly terms. Full-time teachers may be more comparable across firms as the measurement of working time may be different for part-time workers in the education sector. For instance, registered working time for full-time teachers may include teaching hours, preparation time, school meetings and other activities. In contrast, registered and paid working time for part-time teachers may include only teaching hours.

6 Extensions

6.1 Different collective agreements

We now turn to an analysis of the potentially different wages paid to (all) workers under different collective agreements. This follows from the fact that some EA firms (and some non-EA firms) have collective agreements of their own. Our updated and extended wage model is as follows:

$$\begin{aligned} y_{i,t} =& \beta_1 EA_{j(i,t),t} + \beta_2 EACBA_{i,t} + \beta_3 NonEACBA_{i,t} + \\ &+ \beta_4 EA_{j(i,t),t} * EACBA_{i,t} + \beta_5 EA_{j(i,t),t} * NonEACBA_{i,t} + \\ &+ \beta_6 X_{i,t} + \alpha_i + \tau_{j(i,t)} + \delta_t + u_{i,t}. \end{aligned} \tag{2}$$

We introduce new variables, namely $EACBA_{i,t}$, a dummy variable for a EA collective agreement, and interactions between the $EA_{j(i,t),t}$ dummy variable, on the one hand, and the

[15] Finally, we consider whether these workers are subject to the EA collective agreements. We find that 92% of all workers in EA firms are in EA collective agreements (an increase from 89% in the case of all workers). In contrast, as many as 58% of workers in non-EA firms are also subject to EA collective agreements, which can be explained again by administrative extensions of collective agreements.

$EACBA_{i,t}$ and $NonEACBA_{i,t}$ dummy variables. In this extended specification, we allow for the EA collective agreement to have an independent effect on wages. Moreover, we also allow for the EA effect to differ depending on the type of collective agreement that may be applicable to the worker.

In this extended specification, we are thus considering six different sets of workers, depending on the combination of the EA affiliation status of their firms and their applicable collective agreement. The latter can be of three types: a collective agreement of the EA, a collective agreement outside of the EA, and no collective agreement.[16] We focus the results of the last specification, corresponding to equation 2, including worker and firm fixed effects, in column 4 of Table 5. From this specification, we can establish an upward ranking of wage differentials depending on the characteristics of the firm and the worker's collective agreement type.

The lowest wage level is that of workers in not affiliated firms and who are not subject to any collective agreement (this is also the reference category and amounts to only 16k worker-years, in a total of 269k worker-years). Next are workers in EA affiliated firms and that are subject to EA collective agreements, with a premium of 0.8% (2.7+1.5-3.4%). This is the largest category, corresponding to 112k worker-years.

The third category is that of workers that are not in EA affiliated firms but that follow the EA collective agreement (premium of 1.5%). This is the second largest category, corresponding to 48k worker-years. These cases correspond to extensions of the EA collective agreements to non-affiliated firms. Next are workers in EA affiliated firms but that do not follow a collective agreement (2.7%) or follow other collective agreement (2.8% = 2.7+3.9-3.8%). Note that these two groups are relatively small, representing 29k and 10k worker-years, respectively. Finally, the highest wages are paid to workers in not EA affiliated firms and in non-EA collective agreements (3.9%). This is the third largest category, corresponding to 36k worker-years.

The diversity of these results underlines the findings presented before that indicated a small or insignificant EA effect in the case of the set of all workers of these schools. Indeed, while EA firms pay more than non-EA firms without a collective agreement, EA firms pay less than non-EA firms with non-EA collective agreements. In other words, non-EA collective agreements appear to be more generous than EA collective agreements. However, the EA

[16] Table A9 presents descriptive statistics on non-EA firms, comparing those that follow EA collective agreements and those that follow non-EA collective agreements. The wages paid in the first cases are higher than those under non-EA collective agreements.

collective agreement is more generous than the case of no collective agreement, as one would expect.[17]

When we turn to the analysis of the case of teachers only, we find some differences compared to the results above - Table 6. Again focusing on the more stringent case including both worker and firm fixed effects (column 4), we find that non-EA-affiliated and uncovered teachers are paid the lowest (conditional) wages. However, non-affiliated schools following non-EA (EA) collective agreements now come next, with premiums of 3.6% (3.8%). EA-affiliated firms pay their teachers the highest wages, with premiums of either 4.6% (the case of those following EA collective agreements; 7.8%+3.8%-7%) or 7.8% (those following their own EA collective agreements; 7.8%+3.6%-3.6%).

Overall, these results highlight again the potential differences in the EA wage effects concerning workers that play a more distinctive role in the industry where the EA operates (teachers in our case) than the general workforce. As discussed in our theoretical section, EA effects can be stronger for these occupations, perhaps because of greater involvement of teachers in trade unions during collective bargaining. Another important result concerns the potential relevance of non-EA (presumably firm-level) collective agreements that some EA firms establish. In both our analysis (all workers or teachers only), we find that EA wage effects are stronger in the case of non-EA collective agreements. This also makes sense from a legal perspective, as a firm-level agreement should always top up an existing sectoral-level agreement in the institutional context of Portugal, which presumably will imply higher wage levels for the same worker profiles. Of course, these results may not apply in different institutional contexts in which firm-level agreements may deviate downwards from sectoral agreements.

6.2 Heterogeneity: EA joiner and leaver firms

If EAs generate positive productivity effects on their affiliates, these effects may not disappear after a firm leaves the EA. Indeed, EA productivity effects (better management practices in particular) may be absorbed by participating firms to such an extent that they do not disappear when firms discontinue their affiliation status. This may lead to an asymmetric

[17] Another interesting result from this analysis is that, for firms following the EA agreement, not-EA firms pay slightly more (0.7% = 1.5-0.8%) than EA firms. This may suggest that EA firms are more likely to follow closely the occupational minimum wages set in their agreements while non-EA firms sometimes pay above these minimum wages.

effect on wages, in which firms that join an EA pay higher wages once they join and are exposed to better productivity practices. Moreover, firms that leave an EA do not cut their wages or at least not by the same amount (for instance, if the effects of such EA exposure may not disappear immediately after EA affiliation comes to an end). We conduct additional analyses on these mechanisms, namely allowing for different wage differentials for firms that become affiliated and firms that terminate their affiliation.

Specifically, we allow the EA effect to be different for firms that join EAs (with respect to firms that leave EAs) by including, in equation 1, an interaction between the EA dummy variable and a 'New member' dummy variable. This variable is equal to one for firms that join EAs and can only be identified from the interaction with the EA status variable in models with firm fixed effects. Moreover, we restrict our sample to consider only firms that switch their EA status over time and that do so only once over the eleven-year period considered.

Our empirical results here indicate evidence of heterogeneity. Specifically, the regression results - see Tables 7 and A20 - support the view that there is a positive EA affiliation premium for firms that join EAs (and a negative premium for firms that terminate their EA affiliation). These last results indicates that EAs may indeed have a positive contribution to the wages of their employees, which highlights the potential role of the productivity channel of EA affiliation. Methodologically, an aggregate perspective that does not allow one to differentiate between firms that join an EA and firms that leave an EA may miss out on important heterogeneity in EA effects.

7 Conclusions

Employers' associations (EAs) are a key actor in social dialogue which has remained relatively ignored in both research and policy. In this context, this paper investigates the role of EAs in shaping the wage distribution, namely by prompting affiliated firms towards higher wages. Such positive wage effects from EA affiliation could follow from increased productivity or different management practices promoted by EAs. However, one should also acknowledge the possibility that EAs promote employer coordination or even collusion in the labour market (Martins & Thomas (2023)), leading to negative wage effects.

We test these contrasting hypothesis about EA wage effects by exploiting a detailed matched employer-employee panel data, including time-varying firms' EA affiliation data.

Such rich data is critical in order to disentangle worker from firm effects through worker mobility across firms over time and zoom in on any EA affiliation wage effects, despite potential lingering endogenous mobility issues. We also propose a methodology to determine the sector's scope, as we need to establish the relevant subset of non-affiliated firms that serve as a comparison group.

We find that, even when controlling extensively for worker characteristics, including worker fixed effects, EA firms pay significantly - up to 8% - higher wages than their non-affiliated counterparts. However, firm fixed effects reduce these wage differences significantly. On the other hand, positive premium remains, especially when focusing on the key occupation of the industry (teachers). We also find that there is a sizable EA premium for firms that join EAs but not for firms that leave EAs; and that collective agreements matter, as firm-specific (non-EA) collective agreements can be associated to the highest wages.

Our evidence therefore indicates that the large unconditional EA wage premium can be explained to some extent by the selection of high-wage firms into EA membership. In contrast, the potential selection of high-wage workers into EA firms is not a major driver of the large EA wage premium. Our results also indicate asymmetry in the EA wage effects, consistent with some positive contributions from EAs to affiliated firms. We also find that collective bargaining matters, even in a context of widespread administrative extensions to non-EA firms. Both EA and non-EA firms can adopt firm-level agreements or agreements from other sectors that can affect at least part of their employees. Indeed, the highest wages are paid in non-EA firms and in collective agreements other than those bargained by the EA. Note that we also find cases of both EA and non-EA firms that do not adopt any collective agreement for some of their workers - this may follow from specific occupations that fall outside of collective bargaining, non compliance with existing agreements (or their administrative extensions), or measurement error.

A large number of additional research can build on the findings and approaches of this paper. We mention here three examples. First, it would be interesting to investigate further the extent to which EA firms follow closely the wages established in the EA collective agreements - or if these minimum levels are generally exceeded. Second, a related question is if EAs have positive effects on productivity and profits of firms. Indeed, the absence of large wage effects does not preclude the possibility that EAs make firms more productive and profitable

- the nature of sectoral collective bargaining may disrupt the link between productivity and wages at the firm level. Third, a complementary and original dimension of productivity that could also be considered in the context of this study is student achievement or value added, as measured from student-level national exam data.

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Table 1: **Descriptive statistics, full data set, 2010-2020**

	(1)		(2)		(3)	
	EA affiliated		Non-EA affiliated		Difference	
	Mean	SD	Mean	SD	b	t
Monthly salary	1360.67	841.88	1114.53	685.73	246.14***	(83.58)
Monthly total hours	132.58	41.89	137.29	44.01	-4.71***	(-28.13)
Hourly salary	12.53	20.51	9.57	9.88	2.96***	(49.28)
Log monthly salary	7.06	0.67	6.88	0.65	0.19***	(73.40)
Log hourly salary	2.26	0.70	2.05	0.61	0.21***	(82.97)
Schooling years	13.26	4.07	13.03	4.02	0.24***	(15.05)
Female	0.77	0.42	0.78	0.41	-0.01***	(-6.85)
Age	43.15	10.31	41.17	10.24	1.98***	(49.63)
Experience	23.87	12.30	22.14	12.34	1.73***	(36.05)
Tenure	12.16	10.00	9.22	8.93	2.93***	(80.19)
Part time	0.13	0.34	0.17	0.38	-0.04***	(-29.91)
Monthly total hours	132.58	41.89	137.29	44.01	-4.71***	(-28.13)
Teacher	0.56	0.50	0.44	0.50	0.11***	(57.92)
Fixed-term contract	0.24	0.42	0.35	0.48	-0.12***	(-65.87)
EA coll agreement	0.89	0.31	0.50	0.50	0.39***	(215.21)
EA coll agreement (B)	0.89	0.32	0.49	0.50	0.40***	(239.97)
EA affiliation (once)	1.00	0.00	0.14	0.35	0.86***	(852.66)
Non EA aff, coll agreement	0.00	0.00	0.50	0.50	-0.50***	(-314.28)
Non EA aff, coll agreement (B)	0.00	0.00	0.51	0.50	-0.51***	(-353.14)
Year	2014.75	3.21	2014.77	3.22	-0.01	(-1.01)
Observations	151642		117590		269232	

Notes: The table considers all worker-year observations of the main data set used the estimations presented below. The sample covers all employees of firms in the private schools sector in Portugal. The 'EA affiliated' column considers only firms and their workers that are affiliated in the year considered. Salary variables are deflated to 2020 euros and refer to October of each year. 'Experience' is labour market experience (Age-Schooling years-6). 'Tenure' is the number of years with the present employer. 'Part time' is a dummy variable for workers working part time as defined by the employer, typically representing fewer than 35 hours per week. 'Fixed-term contract' is a dummy variable for workers without open-ended contracts. 'Teacher' is a dummy variable for workers whose occupation is teacher (CPP code). 'EA coll agreement' is a dummy variable equal to one if the worker is subject to a collective agreement bargained by the EA (AEEP). 'EA collective agreement (B)' considers also the years of 2019 and 2020 through an imputation procedure. 'EA affiliation (once)' is a dummy variable equal to one if the firm has been affiliated with the EA at least in one year. 'Non EA aff, coll agreement' is a dummy variable equal to one if the worker is not working for a firm affiliated in the EA and is not subject to a collective agreement bargained by the EA. Source: QP data (2010-2020).

Table 2: **Collective agreement and EA affiliation wage differentials - Year fixed effects only**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	0.082***		0.062***	0.058***
	(0.002)		(0.002)	(0.002)
Non EA aff, coll agreement		-0.084***	-0.041***	
		(0.002)	(0.003)	
Non EA aff, coll agreement (B)				-0.048***
				(0.003)
Schooling years	0.096***	0.098***	0.099***	0.096***
	(0.000)	(0.000)	(0.000)	(0.000)
Female	-0.114***	-0.116***	-0.116***	-0.113***
	(0.002)	(0.002)	(0.002)	(0.002)
Experience	0.014***	0.014***	0.014***	0.014***
	(0.000)	(0.000)	(0.000)	(0.000)
$(\text{Exp}^2)/100$	-0.007***	-0.007***	-0.007***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.022***	0.023***	0.022***	0.022***
	(0.000)	(0.000)	(0.000)	(0.000)
$(\text{Tenure}^2)/100$	-0.024***	-0.024***	-0.024***	-0.024***
	(0.001)	(0.001)	(0.001)	(0.001)
Teacher	0.419***	0.422***	0.418***	0.416***
	(0.003)	(0.003)	(0.003)	(0.003)
Monthly total hours	0.008***	0.008***	0.008***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.084***	-0.086***	-0.084***	-0.083***
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	4.025***	4.056***	4.010***	4.051***
	(0.010)	(0.011)	(0.011)	(0.010)
Observations	268,629	222,776	222,776	268,629
R-squared	0.583	0.585	0.587	0.584

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table 3: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	-0.002		-0.004	-0.006
	(0.004)		(0.004)	(0.004)
Non EA aff, coll agreement		0.002	0.000	
		(0.004)	(0.005)	
Non EA aff, coll agreement (B)				-0.012***
				(0.004)
Schooling years	0.009***	0.009***	0.009***	0.009***
	(0.002)	(0.003)	(0.003)	(0.002)
Experience	-0.002	-0.003	-0.003	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
$(\text{Exp}^2)/100$	0.007***	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.016***	0.015***	0.015***	0.016***
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Tenure}^2)/100$	-0.037***	-0.037***	-0.037***	-0.037***
	(0.002)	(0.002)	(0.002)	(0.002)
Teacher	0.080***	0.093***	0.093***	0.079***
	(0.008)	(0.008)	(0.008)	(0.008)
Monthly total hours	0.009***	0.010***	0.010***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.024***	-0.020***	-0.020***	-0.024***
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	5.486***	5.453***	5.456***	5.490***
	(0.071)	(0.086)	(0.086)	(0.071)
Observations	249,756	205,871	205,871	249,756
R-squared	0.897	0.907	0.907	0.897

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table 4: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Teachers only**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	0.015***		0.012**	0.006
	(0.006)		(0.006)	(0.006)
Non EA aff, coll agreement		-0.031***	-0.027***	
		(0.008)	(0.008)	
Non EA aff, coll agreement (B)				-0.045***
				(0.008)
Schooling years	0.008**	0.009**	0.009**	0.008**
	(0.004)	(0.004)	(0.004)	(0.004)
Experience	0.002	-0.001	-0.001	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
$(\text{Exp}^2)/100$	-0.011***	-0.008**	-0.008**	-0.011***
	(0.003)	(0.004)	(0.004)	(0.003)
Tenure	0.020***	0.020***	0.020***	0.020***
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Tenure}^2)/100$	-0.042***	-0.043***	-0.043***	-0.042***
	(0.003)	(0.004)	(0.004)	(0.003)
Monthly total hours	0.009***	0.009***	0.009***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.025***	-0.023***	-0.023***	-0.025***
	(0.004)	(0.005)	(0.005)	(0.004)
Constant	5.977***	5.995***	5.986***	5.990***
	(0.106)	(0.109)	(0.109)	(0.105)
Observations	125,517	104,483	104,483	125,517
R-squared	0.864	0.875	0.875	0.864

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table 5: **Collective agreement and EA affiliation wage differentials - Extended collective bargaining controls**

	(1)	(2)	(3)	(4)
VARIABLES	Log m. salary	Log m. salary	Log m. salary	Log m. salary
EA affiliation (in year)	0.057***	0.111***	-0.004	0.027***
	(0.002)	(0.008)	(0.004)	(0.009)
EA coll agreement	0.014***	0.012***	0.002	0.015**
	(0.004)	(0.004)	(0.005)	(0.006)
Non-EA coll agr	-0.074***	-0.041***	0.026***	0.039***
	(0.004)	(0.004)	(0.006)	(0.007)
EA affiliation * EA coll agr		-0.036***		-0.034***
		(0.009)		(0.009)
EA affiliation * Non-EA coll agr		-0.148***		-0.038***
		(0.009)		(0.011)
Constant	4.019***	4.006***	5.450***	5.437***
	(0.012)	(0.012)	(0.086)	(0.086)
Observations	222,776	222,776	205,871	205,871
R-squared	0.588	0.589	0.907	0.907

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. 'Non-EA coll agr' is a dummy variable equal to one when the worker is subject to a non-EA collective agreement. Source: QP data (2010-2020). All models include year fixed effects. The last two columns also include worker and firm fixed effects. Same worker controls as in previous tables but omitted to save space. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table 6: **Collective agreement and EA affiliation wage differentials - Extended collective bargaining controls - Teachers only**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	0.141***	0.171***	0.019***	0.078***
	(0.003)	(0.012)	(0.006)	(0.016)
EA coll agreement	0.005	0.006	0.003	0.038***
	(0.005)	(0.006)	(0.010)	(0.012)
Non-EA coll agr	-0.158***	-0.136***	0.023*	0.036***
	(0.006)	(0.007)	(0.012)	(0.014)
EA affiliation * EA coll agr		-0.022*		-0.070***
		(0.012)		(0.016)
EA affiliation * Non-EA coll agr		-0.095***		-0.036*
		(0.014)		(0.019)
Constant	4.318***	4.316***	5.975***	5.946***
	(0.036)	(0.036)	(0.110)	(0.110)
Observations	113,843	113,843	104,483	104,483
R-squared	0.551	0.551	0.875	0.875

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. 'Non-EA coll agr' is a dummy variable equal to one when the worker is subject to a non-EA collective agreement. Source: QP data (2010-2020). All models include year fixed effects. The last two columns also include worker and firm fixed effects. Same worker controls as in previous tables but omitted to save space. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table 7: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Allowing for heterogeneity in affiliation changes**

	(1)	(2)	(3)
VARIABLES	Log m. salary	Log m. salary	Log m. salary
EA affiliation (in year)	-0.009	-0.010	-0.012**
	(0.006)	(0.006)	(0.006)
EA affiliation * New member	0.036***	0.026**	0.035***
	(0.011)	(0.011)	(0.011)
Non EA aff, coll agreement		0.002	
		(0.007)	
Non EA aff, coll agreement (B)			-0.011
			(0.007)
Constant	5.570***	5.670***	5.574***
	(0.255)	(0.312)	(0.255)
Observations	22,650	19,159	22,650
R-squared	0.909	0.918	0.909

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. 'New member' is a dummy variable for firms that switch from non-EA membership to EA membership. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Same worker controls as in previous tables but omitted to save space. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Appendix: Portugal - institutional background

The labour market of Portugal and its institutions share many similarities to those of other continental European countries, in particular in Southern Europe. One important dimension concerns the relevance of sectoral collective bargaining, which covered 86% of private-sector employees as of 2010. (On top of collective bargaining minimum wages, there is also a national, statutory minimum wage. This minimum wage is relatively large in relative terms over the period considered in the study, with a Kaitz index of approximately 60%.) Sectoral collective bargaining is conducted by over 300 EAs and an even larger number of trade unions. Martins (2020) provides a detailed description of EA activities and their potential effects, with a particular focus on the case of Portugal. Martins & Saraiva (2020) finds that a large share of the contents of collective agreements other than minimum wages overlap with the contents of the Labour Code. This results warrants a focus on wages when considering the value added of collective agreements.

EA affiliation is estimated at 43%, a figure in line with the OECD mean, but much below the coverage rate of sectoral agreements. This gap is explained by the pervasive nature of administrative extension schemes, which widen the coverage of collective agreements to all firms and employees in each sector (Martins (2021)). One or both parties that bargain a sectoral collective agreement can ask the Ministry of Employment to extend the collective agreement to the entire sector. This extension implies that both non-unionised employees in EA affiliated firms as well as all employees of non-EA-affiliated firms are subject to the provisions of the collective agreement. However, any organisation (namely a competing trade union or employers' association) may oppose such extension, at least its part that may overlap with the members of the opposing organisation.

Finally, from a macroeconomic perspective, we mention that 2011-2013 were years of recession, while during 2014-2019 the economy grew. 2020 was again an year of recession, following the onset of the pandemic crisis.

Appendix: Additional empirical results

Table A1: **Collective agreement and EA affiliation wage differentials - Worker and year fixed effects only**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	0.030***		0.020***	0.025***
	(0.004)		(0.005)	(0.004)
Non EA aff, coll agreement		-0.010**	-0.002	
		(0.005)	(0.005)	
Non EA aff, coll agreement (B)				-0.013***
				(0.005)
Schooling years	0.008***	0.008***	0.008***	0.008***
	(0.002)	(0.003)	(0.003)	(0.002)
Experience	-0.004*	-0.004	-0.004	-0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
$(\text{Exp}^2)/100$	0.007***	0.008***	0.008***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.017***	0.017***	0.017***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Tenure}^2)/100$	-0.037***	-0.039***	-0.039***	-0.037***
	(0.002)	(0.002)	(0.002)	(0.002)
Teacher	0.094***	0.115***	0.115***	0.093***
	(0.008)	(0.009)	(0.009)	(0.008)
Monthly total hours	0.009***	0.010***	0.010***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.024***	-0.021***	-0.021***	-0.024***
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	5.506***	5.454***	5.439***	5.511***
	(0.074)	(0.085)	(0.085)	(0.074)
Observations	249,791	205,904	205,904	249,791
R-squared	0.893	0.903	0.903	0.893

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A2: **Collective agreement and EA affiliation wage differentials - Firm and year fixed effects only**

	(1)	(2)	(3)	(4)
VARIABLES	Log m. salary	Log m. salary	Log m. salary	Log m. salary
EA affiliation (in year)	-0.004		-0.004	-0.003
	(0.005)		(0.006)	(0.006)
Non EA aff, coll agreement		0.023***	0.021***	
		(0.006)	(0.007)	
Non EA aff, coll agreement (B)				0.005
				(0.007)
Schooling years	0.090***	0.093***	0.093***	0.090***
	(0.000)	(0.000)	(0.000)	(0.000)
Female	-0.087***	-0.087***	-0.087***	-0.087***
	(0.002)	(0.002)	(0.002)	(0.002)
Experience	0.010***	0.011***	0.011***	0.010***
	(0.000)	(0.000)	(0.000)	(0.000)
$(\text{Exp}^2)/100$	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.001)	(0.001)	(0.000)
Tenure	0.023***	0.023***	0.023***	0.023***
	(0.000)	(0.000)	(0.000)	(0.000)
$(\text{Tenure}^2)/100$	-0.028***	-0.028***	-0.028***	-0.028***
	(0.001)	(0.001)	(0.001)	(0.001)
Teacher	0.454***	0.461***	0.461***	0.454***
	(0.003)	(0.003)	(0.003)	(0.003)
Monthly total hours	0.008***	0.009***	0.009***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.074***	-0.076***	-0.076***	-0.074***
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	4.117***	4.061***	4.063***	4.115***
	(0.011)	(0.012)	(0.012)	(0.011)
Observations	268,629	222,776	222,776	268,629
R-squared	0.661	0.668	0.668	0.661

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A3: **Collective agreement and EA affiliation wage differentials - Industry and year fixed effects**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	0.066***		0.065***	0.060***
	(0.002)		(0.002)	(0.002)
Non EA aff, coll agreement		-0.051***	-0.005	
		(0.002)	(0.003)	
Non EA aff, coll agreement (B)				-0.014***
				(0.003)
Schooling years	0.095***	0.097***	0.097***	0.095***
	(0.000)	(0.000)	(0.000)	(0.000)
Female	-0.096***	-0.096***	-0.096***	-0.096***
	(0.002)	(0.002)	(0.002)	(0.002)
Experience	0.012***	0.013***	0.013***	0.012***
	(0.000)	(0.000)	(0.000)	(0.000)
$(\text{Exp}^2)/100$	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.021***	0.022***	0.021***	0.021***
	(0.000)	(0.000)	(0.000)	(0.000)
$(\text{Tenure}^2)/100$	-0.024***	-0.023***	-0.023***	-0.024***
	(0.001)	(0.001)	(0.001)	(0.001)
Teacher	0.415***	0.421***	0.418***	0.415***
	(0.003)	(0.003)	(0.003)	(0.003)
Monthly total hours	0.008***	0.008***	0.008***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.091***	-0.095***	-0.093***	-0.091***
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	4.059***	4.074***	4.027***	4.065***
	(0.010)	(0.011)	(0.011)	(0.010)
Observations	268,629	222,776	222,776	268,629
R-squared	0.594	0.597	0.598	0.594

Notes: Dependent variable: Logarithm of the hourly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with (three-digit) industry and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A4: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Firm-level clustering**

	(1)	(2)	(3)	(4)
VARIABLES	Log m. salary	Log m. salary	Log m. salary	Log m. salary
EA affiliation (in year)	-0.002		-0.004	-0.006
	(0.018)		(0.019)	(0.019)
Non EA aff, coll agreement		0.002	0.000	
		(0.017)	(0.017)	
Non EA aff, coll agreement (B)				-0.012
				(0.020)
Schooling years	0.009***	0.009**	0.009**	0.009***
	(0.003)	(0.004)	(0.004)	(0.003)
Experience	-0.002	-0.003	-0.003	-0.002
	(0.003)	(0.004)	(0.004)	(0.003)
$(\text{Exp}^2)/100$	0.007**	0.007**	0.007**	0.007**
	(0.003)	(0.004)	(0.004)	(0.003)
Tenure	0.016***	0.015***	0.015***	0.016***
	(0.003)	(0.003)	(0.003)	(0.003)
$(\text{Tenure}^2)/100$	-0.037***	-0.037***	-0.037***	-0.037***
	(0.007)	(0.010)	(0.010)	(0.007)
Teacher	0.080***	0.093***	0.093***	0.079***
	(0.021)	(0.015)	(0.015)	(0.021)
Monthly total hours	0.009***	0.010***	0.010***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.024***	-0.020**	-0.020**	-0.024***
	(0.008)	(0.008)	(0.008)	(0.008)
Constant	5.486***	5.453***	5.456***	5.490***
	(0.108)	(0.143)	(0.143)	(0.109)
Observations	249,756	205,871	205,871	249,756
R-squared	0.897	0.907	0.907	0.897

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors, clustered at the firm level.

Table A5: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Excluding 2020**

	(1)	(2)	(3)	(4)
VARIABLES	Log m. salary	Log m. salary	Log m. salary	Log m. salary
EA affiliation (in year)	-0.006		-0.004	-0.010**
	(0.004)		(0.004)	(0.004)
Non EA aff, coll agreement		0.002	0.000	
		(0.004)	(0.005)	
Non EA aff, coll agreement (B)				-0.012***
				(0.004)
Schooling years	0.009***	0.009***	0.009***	0.009***
	(0.002)	(0.003)	(0.003)	(0.002)
Experience	-0.002	-0.003	-0.003	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
$(\text{Exp}^2)/100$	0.007***	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.015***	0.015***	0.015***	0.015***
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Tenure}^2)/100$	-0.037***	-0.037***	-0.037***	-0.037***
	(0.002)	(0.002)	(0.002)	(0.002)
Teacher	0.094***	0.093***	0.093***	0.094***
	(0.008)	(0.008)	(0.008)	(0.008)
Monthly total hours	0.010***	0.010***	0.010***	0.010***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.023***	-0.020***	-0.020***	-0.023***
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	5.461***	5.453***	5.456***	5.465***
	(0.074)	(0.086)	(0.086)	(0.074)
Observations	227,451	205,871	205,871	227,451
R-squared	0.903	0.907	0.907	0.903

Notes: Dependent variable: Logarithm of the hourly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2019). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A6: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Hourly wages**

VARIABLES	(1) Log h. salary	(2) Log h. salary	(3) Log h. salary	(4) Log h. salary
EA affiliation (in year)	-0.003		-0.001	-0.001
	(0.003)		(0.003)	(0.003)
Non EA aff, coll agreement		0.016***	0.015***	
		(0.004)	(0.004)	
Non EA aff, coll agreement (B)				0.006*
				(0.004)
Schooling years	0.010***	0.009***	0.009***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
Experience	0.002	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
$(\text{Exp}^2)/100$	0.004***	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.014***	0.013***	0.013***	0.014***
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Tenure}^2)/100$	-0.036***	-0.036***	-0.036***	-0.036***
	(0.001)	(0.002)	(0.002)	(0.001)
Teacher	0.065***	0.070***	0.070***	0.065***
	(0.006)	(0.007)	(0.007)	(0.006)
Monthly total hours	-0.004***	-0.003***	-0.003***	-0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.021***	-0.017***	-0.017***	-0.021***
	(0.002)	(0.003)	(0.003)	(0.002)
Constant	2.367***	2.381***	2.382***	2.365***
	(0.064)	(0.073)	(0.073)	(0.064)
Observations	248,676	205,067	205,067	248,676
R-squared	0.939	0.946	0.946	0.939

Notes: Dependent variable: Logarithm of the hourly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A7: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Different specifications**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	0.019***	0.011**	-0.004	0.001
	(0.005)	(0.005)	(0.004)	(0.004)
Non EA aff, coll agreement	0.019***	0.017***	0.000	0.002
	(0.006)	(0.006)	(0.005)	(0.005)
Schooling years		0.007**	0.010***	
		(0.003)	(0.003)	
Experience		-0.003	-0.003	
		(0.002)	(0.002)	
$(\text{Exp}^2)/100$		0.005***	0.007***	
		(0.002)	(0.001)	
Tenure		0.026***	0.015***	
		(0.001)	(0.001)	
$(\text{Tenure}^2)/100$		-0.056***	-0.038***	
		(0.002)	(0.002)	
Monthly total hours			0.010***	0.010***
			(0.000)	(0.000)
Fixed-term contract			-0.020***	
			(0.003)	
Teacher				0.102***
				(0.008)
Constant	6.994***	6.771***	5.484***	5.627***
	(0.004)	(0.087)	(0.087)	(0.014)
Observations	206,432	205,871	205,871	206,432
R-squared	0.835	0.836	0.907	0.906

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A8: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Only firms with at least 20 teachers**

	(1)	(2)	(3)	(4)
VARIABLES	Log m. salary	Log m. salary	Log m. salary	Log m. salary
EA affiliation (in year)	-0.004		-0.004	-0.010**
	(0.004)		(0.004)	(0.004)
Non EA aff, coll agreement		-0.003	-0.005	
		(0.005)	(0.006)	
Non EA aff, coll agreement (B)				-0.020***
				(0.005)
Schooling years	0.009***	0.009***	0.009***	0.009***
	(0.002)	(0.003)	(0.003)	(0.002)
Experience	-0.003	-0.003	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
$(\text{Exp}^2)/100$	0.007***	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.016***	0.015***	0.015***	0.016***
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Tenure}^2)/100$	-0.036***	-0.038***	-0.038***	-0.036***
	(0.002)	(0.002)	(0.002)	(0.002)
Teacher	0.119***	0.121***	0.121***	0.119***
	(0.010)	(0.010)	(0.010)	(0.010)
Monthly total hours	0.009***	0.010***	0.010***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.027***	-0.023***	-0.023***	-0.027***
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	5.549***	5.526***	5.529***	5.556***
	(0.075)	(0.082)	(0.082)	(0.075)
Observations	192,898	159,839	159,839	192,898
R-squared	0.900	0.910	0.910	0.900

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A9: **Descriptive statistics, Non-EA firms applying or not the EA collective agreements**

	(1)		(2)		(3)	
	EA coll agr		Non-EA coll agr		Difference	
	Mean	SD	Mean	SD	b	t
Monthly salary	1195.69	721.66	990.21	630.32	205.48***	(43.88)
Monthly total hours	131.44	44.63	144.46	41.85	-13.02***	(-43.31)
Hourly salary	10.87	10.80	7.83	6.55	3.04***	(50.39)
Log monthly salary	6.94	0.66	6.77	0.64	0.17***	(38.32)
Log hourly salary	2.17	0.64	1.89	0.55	0.28***	(68.42)
Schooling years	13.49	3.85	12.07	4.32	1.42***	(49.42)
Female	0.75	0.43	0.82	0.38	-0.07***	(-24.79)
Age	40.86	9.97	40.75	10.49	0.11	(1.51)
Experience	21.37	11.88	22.68	13.10	-1.32***	(-14.98)
Tenure	9.21	8.73	9.45	9.00	-0.24***	(-3.93)
Part time	0.18	0.38	0.15	0.35	0.03***	(12.63)
Monthly total hours	131.44	44.63	144.46	41.85	-13.02***	(-43.31)
Fixed-term contract	0.34	0.47	0.35	0.48	-0.01**	(-2.78)
EA coll agreement	1.00	0.00	0.00	0.00	1.00	(.)
EA coll agreement (B)	0.98	0.13	0.01	0.11	0.97***	(1166.96)
EA affiliation (once)	0.18	0.38	0.12	0.33	0.05***	(20.82)
Non EA aff, coll agreement	0.00	0.00	1.00	0.00	-1.00	(.)
Non EA aff, coll agreement (B)	0.02	0.13	0.99	0.11	-0.97***	(-1166.96)
Year	2013.65	2.58	2014.08	2.62	-0.43***	(-23.64)
Observations	48251		35697		83948	

Notes: See the notes to Table 1 for a description of the variables.

Table A10: **Descriptive statistics, Teachers only**

	(1)		(2)		(3)	
	EA affiliated		Non-EA affiliated		Difference	
	Mean	SD	Mean	SD	b	t
Monthly salary	1731.04	795.57	1389.33	687.51	341.71***	(83.91)
Monthly total hours	115.08	38.86	117.64	45.63	-2.57***	(-10.67)
Hourly salary	17.19	24.21	13.32	11.96	3.86***	(39.14)
Log monthly salary	7.37	0.61	7.10	0.70	0.27***	(71.47)
Log hourly salary	2.72	0.45	2.47	0.46	0.25***	(97.40)
Schooling years	15.91	0.85	15.92	0.86	-0.00	(-0.96)
Female	0.74	0.44	0.76	0.43	-0.02***	(-8.72)
Age	41.54	9.38	39.16	8.97	2.38***	(46.69)
Experience	19.59	9.52	17.23	9.09	2.36***	(45.59)
Tenure	11.90	9.54	8.40	8.48	3.50***	(70.57)
Part time	0.17	0.37	0.28	0.45	-0.12***	(-49.38)
Monthly total hours	115.08	38.86	117.64	45.63	-2.57***	(-10.67)
Fixed-term contract	0.24	0.43	0.40	0.49	-0.15***	(-59.35)
EA coll agreement	0.92	0.26	0.58	0.49	0.34***	(134.21)
EA coll agreement (B)	0.92	0.28	0.57	0.50	0.35***	(147.94)
EA affiliation (once)	1.00	0.00	0.15	0.36	0.85***	(544.19)
Non EA aff, coll agreement	0.00	0.00	0.42	0.49	-0.42***	(-177.76)
Non EA aff, coll agreement (B)	0.00	0.00	0.43	0.50	-0.43***	(-200.28)
Year	2014.67	3.20	2014.55	3.23	0.12***	(6.42)
Observations	84183		52131		136314	

Notes: The subsample considered here includes only teachers. See the notes to Table 1 for a description of the variables.

Table A11: **Descriptive statistics, Public and private schools**

	Public schools	**Private schools**
Schools		
Schools x Year (average)	4871.729	1320.061
	(353.233)	(237.921)
Teachers per school	23.117	
	(36.107)	
Students per school	229.162	162.098
	(312.437)	(276.441)
Teachers		
Female	0.757	
	(0.429)	
Age	46.939	
	(8.476)	
Experience	20.760	
	(9.467)	
Years pre-tenure	3.103	
	(3.874)	
Substitute teacher	0.054	
	(0.225)	
Index pay	2030.776	
	(542.001)	
Students		
Portuguese 9^{th} grade exam score	54.647	61.865
	(16.400)	(16.854)
Math 9^{th} grade exam score	46.373	60.984
	(25.194)	(25.244)
Portuguese 12^{th} grade exam score	101.376	101.878
	(33.732)	(36.830)
Math 12^{th} grade exam score	92.485	102.285
	(49.689)	(52.994)

Notes: Primary and secondary schools only. Standard deviations in parentheses. Pay is based on the teachers' tenure and the applicable grade rates. Values with respect to 8 consecutive school years (2010/2011 to 2017/2018, inclusive). 9^{th} grade exams are graded out of 100 points while 12^{th} grade exams are graded in a 0-200 scale (average national exam results for all non-public schools are presented in the second column). Sources: MISI data set (Ministry of Education, Portugal).

Table A12: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Teachers only - Hourly pay**

VARIABLES	(1) Log h. salary	(2) Log h. salary	(3) Log h. salary	(4) Log h. salary
EA affiliation (in year)	0.014***		0.016***	0.014***
	(0.004)		(0.005)	(0.005)
Non EA aff, coll agreement		0.007	0.012*	
		(0.007)	(0.007)	
Non EA aff, coll agreement (B)				0.001
				(0.006)
Schooling years	0.008**	0.006	0.006	0.008**
	(0.003)	(0.004)	(0.004)	(0.003)
Experience	0.004*	0.003	0.003	0.004*
	(0.002)	(0.003)	(0.003)	(0.002)
$(\text{Exp}^2)/100$	-0.009***	-0.009***	-0.010***	-0.009***
	(0.002)	(0.003)	(0.003)	(0.002)
Tenure	0.017***	0.015***	0.015***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Tenure}^2)/100$	-0.039***	-0.037***	-0.037***	-0.039***
	(0.003)	(0.003)	(0.003)	(0.003)
Part time	-0.076***	-0.068***	-0.068***	-0.076***
	(0.006)	(0.007)	(0.007)	(0.006)
Monthly total hours	-0.005***	-0.005***	-0.005***	-0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.023***	-0.022***	-0.022***	-0.023***
	(0.003)	(0.004)	(0.004)	(0.003)
Constant	2.982***	3.047***	3.036***	2.981***
	(0.087)	(0.093)	(0.093)	(0.087)
Observations	125,039	104,097	104,097	125,039
R-squared	0.858	0.869	0.869	0.858

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A13: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Full-time teachers only**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	-0.001		-0.000	-0.005
	(0.005)		(0.005)	(0.005)
Non EA aff, coll agreement		-0.003	-0.003	
		(0.008)	(0.009)	
Non EA aff, coll agreement (B)				-0.027***
				(0.008)
Schooling years	0.008**	0.012***	0.012***	0.008**
	(0.004)	(0.004)	(0.004)	(0.004)
Experience	0.007**	0.007**	0.007**	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)
$(\text{Exp}^2)/100$	-0.017***	-0.016***	-0.016***	-0.017***
	(0.003)	(0.004)	(0.004)	(0.003)
Tenure	0.012***	0.010***	0.010***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)
$(\text{Tenure}^2)/100$	-0.030***	-0.026***	-0.027***	-0.030***
	(0.004)	(0.005)	(0.005)	(0.004)
Monthly total hours	0.008***	0.008***	0.008***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.014***	-0.018***	-0.018***	-0.014***
	(0.004)	(0.005)	(0.005)	(0.004)
Constant	6.179***	6.096***	6.096***	6.185***
	(0.109)	(0.115)	(0.114)	(0.109)
Observations	99,951	82,496	82,496	99,951
R-squared	0.772	0.785	0.785	0.772

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A14: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Full-time teachers only - Hourly wages**

	(1)	(2)	(3)	(4)
VARIABLES	Log h. salary	Log h. salary	Log h. salary	Log h. salary
EA affiliation (in year)	0.003		0.004	0.003
	(0.004)		(0.004)	(0.004)
Non EA aff, coll agreement		0.015**	0.016**	
		(0.007)	(0.007)	
Non EA aff, coll agreement (B)				0.000
				(0.006)
Schooling years	0.007**	0.008**	0.008**	0.007**
	(0.003)	(0.004)	(0.004)	(0.003)
Experience	0.005*	0.005*	0.006*	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
(Exp^2)/100	-0.011***	-0.012***	-0.013***	-0.011***
	(0.002)	(0.003)	(0.003)	(0.002)
Tenure	0.012***	0.009***	0.009***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)
(Tenure^2)/100	-0.033***	-0.027***	-0.026***	-0.033***
	(0.003)	(0.003)	(0.003)	(0.003)
Monthly total hours	-0.005***	-0.005***	-0.005***	-0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.018***	-0.020***	-0.020***	-0.018***
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	3.111***	3.102***	3.099***	3.111***
	(0.099)	(0.103)	(0.103)	(0.099)
Observations	99,534	82,161	82,161	99,534
R-squared	0.891	0.901	0.901	0.891

Notes: Dependent variable: Logarithm of the hourly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A15: **Descriptive statistics, Only firms that either switch or do not switch EA status**

	(1)		(2)		(3)	
	EA status constant		EA status switcher		Difference	
	Mean	SD	Mean	SD	b	t
Monthly salary	1258.16	794.00	1205.14	715.30	53.02***	(11.12)
Monthly total hours	134.31	43.22	137.85	39.49	-3.55***	(-13.49)
Hourly salary	11.34	17.39	10.31	9.16	1.02***	(15.11)
Log monthly salary	6.98	0.68	6.96	0.62	0.02***	(4.81)
Log hourly salary	2.18	0.67	2.11	0.65	0.07***	(15.35)
Schooling years	13.19	4.03	12.86	4.26	0.33***	(11.70)
Female	0.77	0.42	0.82	0.38	-0.05***	(-19.82)
Age	42.29	10.31	42.19	10.51	0.10	(1.50)
Experience	23.09	12.28	23.32	12.96	-0.23**	(-2.67)
Tenure	10.80	9.64	11.56	9.82	-0.76***	(-11.73)
Part time	0.15	0.36	0.12	0.32	0.03***	(16.15)
Monthly total hours	134.31	43.22	137.85	39.49	-3.55***	(-13.49)
Fixed-term contract	0.29	0.45	0.25	0.43	0.04***	(13.24)
EA coll agreement	0.72	0.45	0.66	0.47	0.06***	(19.11)
EA coll agreement (B)	0.72	0.45	0.64	0.48	0.08***	(25.83)
EA affiliation (once)	0.58	0.49	1.00	0.00	-0.42***	(-415.98)
Non EA aff, coll agreement	0.22	0.42	0.19	0.39	0.03***	(12.30)
Non EA aff, coll agreement (B)	0.23	0.42	0.19	0.39	0.04***	(15.83)
Year	2014.75	3.22	2014.80	3.15	-0.05*	(-2.41)
Observations	243864		25368		269232	

Notes: The subsample considered here includes only firms that either switch or do not switch their EA status over time. See the notes to Table 1 for a description of the variables.

Table A16: **Descriptive statistics, Firms that are always EA affiliated or are always not EA affiliated, All workers or teachers only**

	(1)		(2)		(3)	
	Always not EA		Always EA		Difference	
	mean	sd	mean	sd	b	t
Monthly salary	1373.01	849.43	1102.37	681.69	-246.14***	(-83.58)
Monthly total hours	132.05	42.13	137.36	44.48	4.71***	(28.13)
Hourly salary	12.73	21.19	9.44	9.83	-2.96***	(-49.28)
Log monthly salary	7.07	0.68	6.86	0.66	-0.19***	(-73.40)
Log hourly salary	2.28	0.71	2.04	0.60	-0.21***	(-82.97)
Schooling years	13.29	4.05	13.05	3.98	-0.24***	(-15.05)
Female	0.77	0.42	0.78	0.42	0.01***	(6.85)
Age	43.32	10.28	40.90	10.17	-1.98***	(-49.63)
Experience	24.01	12.25	21.85	12.21	-1.73***	(-36.05)
Tenure	12.30	10.04	8.77	8.65	-2.93***	(-80.19)
Part time	0.13	0.34	0.18	0.39	0.04***	(29.91)
Monthly total hours	132.05	42.13	137.36	44.48	4.71***	(28.13)
Fixed-term contract	0.23	0.42	0.37	0.48	0.12***	(65.87)
EA coll agreement	0.91	0.29	0.47	0.50	-0.39***	(-215.21)
EA coll agreement (B)	0.91	0.29	0.46	0.50	-0.40***	(-239.97)
EA affiliation (once)	1.00	0.00	0.02	0.15	-0.86***	(-852.66)
Non EA aff, coll agreement	0.00	0.00	0.53	0.50	0.50***	(314.28)
Non EA aff, coll agreement (B)	0.00	0.00	0.54	0.50	0.51***	(353.14)
Year	2014.81	3.19	2014.68	3.27	0.01	(1.01)
Observations	140381		103483		269232	

Notes: The subsamples considered here includes only firms that never switch their EA status over time. See the notes to Table 1 for a description of the variables.

Table A17: **Descriptive statistics, Only firms that switch EA status**

	(1)		(2)		(3)	
	EA affiliated		Non-EA affiliated		Difference	
	Mean	SD	Mean	SD	b	t
Monthly salary	1206.88	723.90	1203.75	708.38	3.13	(0.35)
Monthly total hours	139.21	38.24	136.77	40.43	2.44***	(4.92)
Hourly salary	10.04	7.69	10.53	10.18	-0.49***	(-4.33)
Log monthly salary	6.96	0.61	6.97	0.63	-0.01	(-1.83)
Log hourly salary	2.09	0.65	2.13	0.65	-0.05***	(-5.64)
Schooling years	12.86	4.26	12.87	4.26	-0.01	(-0.13)
Female	0.83	0.37	0.81	0.39	0.02***	(4.61)
Age	40.97	10.35	43.16	10.53	-2.19***	(-16.61)
Experience	22.10	12.78	24.29	13.01	-2.19***	(-13.44)
Tenure	10.33	9.27	12.54	10.14	-2.21***	(-18.09)
Part time	0.13	0.34	0.11	0.31	0.02***	(4.60)
Monthly total hours	139.21	38.24	136.77	40.43	2.44***	(4.92)
Fixed-term contract	0.27	0.44	0.24	0.43	0.03***	(5.30)
EA coll agreement	0.67	0.47	0.66	0.48	0.01	(1.56)
EA coll agreement (B)	0.61	0.49	0.66	0.47	-0.06***	(-9.38)
EA affiliation (once)	1.00	0.00	1.00	0.00	0.00	(.)
Non EA aff, coll agreement	0.00	0.00	0.34	0.48	-0.34***	(-78.37)
Non EA aff, coll agreement (B)	0.00	0.00	0.34	0.47	-0.34***	(-84.74)
Year	2014.10	3.40	2015.37	2.80	-1.27***	(-31.87)
Observations	11261		14107		25368	

Notes: The subsamples considered here includes only firms that switch their EA status over time. See the notes to Table 1 for a description of the variables.

Table A18: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Only EA firm movers**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	0.009**		0.007*	0.006
	(0.004)		(0.004)	(0.004)
Non EA aff, coll agreement		-0.001	0.004	
		(0.006)	(0.007)	
Non EA aff, coll agreement (B)				-0.011
				(0.007)
Schooling years	0.008	0.005	0.006	0.008
	(0.008)	(0.010)	(0.010)	(0.008)
Experience	-0.008	-0.011	-0.012	-0.008
	(0.007)	(0.009)	(0.009)	(0.007)
$(\text{Exp}^2)/100$	0.005	0.003	0.003	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
Tenure	0.009***	0.012**	0.012**	0.010***
	(0.003)	(0.005)	(0.005)	(0.003)
$(\text{Tenure}^2)/100$	-0.009**	-0.009**	-0.009**	-0.009**
	(0.004)	(0.004)	(0.004)	(0.004)
Teacher	0.080***	0.058**	0.058**	0.080***
	(0.025)	(0.027)	(0.027)	(0.025)
Monthly total hours	0.010***	0.011***	0.011***	0.010***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.063***	-0.059***	-0.059***	-0.062***
	(0.008)	(0.009)	(0.009)	(0.008)
Constant	5.474***	5.553***	5.548***	5.478***
	(0.256)	(0.314)	(0.315)	(0.256)
Observations	23,757	20,024	20,024	23,757
R-squared	0.910	0.919	0.919	0.910

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A19: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Only EA firm movers that move only once**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary	(4) Log m. salary
EA affiliation (in year)	0.005		-0.000	0.002
	(0.004)		(0.005)	(0.004)
Non EA aff, coll agreement		0.001	0.000	
		(0.006)	(0.007)	
Non EA aff, coll agreement (B)				-0.012*
				(0.007)
Schooling years	0.002	-0.002	-0.002	0.002
	(0.008)	(0.010)	(0.010)	(0.008)
Experience	-0.009	-0.013	-0.013	-0.009
	(0.007)	(0.009)	(0.009)	(0.007)
$(\text{Exp}^2)/100$	0.005*	0.004	0.004	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
Tenure	0.009***	0.013**	0.013**	0.010***
	(0.003)	(0.005)	(0.005)	(0.003)
$(\text{Tenure}^2)/100$	-0.007*	-0.009**	-0.009**	-0.007*
	(0.004)	(0.005)	(0.005)	(0.004)
Teacher	0.057**	0.036	0.036	0.057**
	(0.025)	(0.026)	(0.026)	(0.025)
Monthly total hours	0.010***	0.011***	0.011***	0.010***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.061***	-0.057***	-0.057***	-0.061***
	(0.008)	(0.009)	(0.009)	(0.008)
Constant	5.570***	5.670***	5.671***	5.575***
	(0.256)	(0.312)	(0.313)	(0.255)
Observations	22,650	19,159	19,159	22,650
R-squared	0.909	0.918	0.918	0.909

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.

Table A20: **Collective agreement and EA affiliation wage differentials - Worker, firm and year fixed effects - Allowing for heterogeneity in affiliation changes - Separate EA variables**

VARIABLES	(1) Log m. salary	(2) Log m. salary	(3) Log m. salary
EA affiliation * New member	0.027***	0.017*	0.023***
	(0.008)	(0.009)	(0.008)
EA affiliation * Resigning member	-0.009	-0.010	-0.012**
	(0.006)	(0.006)	(0.006)
Non EA aff, coll agreement		0.002	
		(0.007)	
Non EA aff, coll agreement (B)			-0.011
			(0.007)
Schooling years	0.002	-0.002	0.002
	(0.008)	(0.010)	(0.008)
Experience	-0.009	-0.013	-0.009
	(0.007)	(0.009)	(0.007)
$(\text{Exp}^2)/100$	0.005*	0.005	0.006*
	(0.003)	(0.003)	(0.003)
Tenure	0.009***	0.013**	0.009***
	(0.003)	(0.005)	(0.003)
$(\text{Tenure}^2)/100$	-0.006	-0.009*	-0.006
	(0.004)	(0.005)	(0.004)
Teacher	0.057**	0.036	0.057**
	(0.025)	(0.026)	(0.025)
Monthly total hours	0.010***	0.011***	0.010***
	(0.000)	(0.000)	(0.000)
Fixed-term contract	-0.062***	-0.057***	-0.061***
	(0.008)	(0.009)	(0.008)
Constant	5.570***	5.670***	5.574***
	(0.255)	(0.312)	(0.255)
Observations	22,650	19,159	22,650
R-squared	0.909	0.918	0.909

Notes: Dependent variable: Logarithm of the monthly salary (October of each year). See the notes to Table 1 for a description of the control variables. Source: QP data (2010-2020). Models with worker, firm and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%. Robust standard errors.