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The Microeconomic Impacts of Employee Representatives: Evidence from Membership Thresholds*

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Abstract

Employee representatives in firms are a potentially key but not yet studied source of the impact of unions and works councils. Their actions can shape multiple drivers of firm performance, including collective bargaining, strikes, and training. This paper examines the impact of union rep mandates by exploiting legal membership thresholds present in many countries. In the case of Portugal, which we examine here, while firms employing up to 49 union members are required to have one union rep, this increases to two (three) union reps for firms with 50 to 99 (100-199) union members. Drawing on matched employer-employee data on the unionised sector and regression discontinuity methods, we find that a one percentage point increase in the legal union rep/members ratio leads to an increase in firm performance of at least 7%. This result generally holds across multiple dimensions of firm performance and appears to be driven by increased training. However, we find no effects of union reps on firm-level wages, given the predominance of sectoral collective bargaining.

Keywords: Firm Performance, Union Delegates, Collective Bargaining.

JEL Codes: J51, J31, L25.

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1 Introduction

The performance of organisations can be strongly affected by the people that work in them. This applies in the case of businesses as well as in the case of trade unions. Employee representatives, given their dual affiliation as workers in a firm and members of a trade union or works council, can therefore play critical roles on both organisations. In particular, union representatives will thus be key drivers of the economic effects of trade unions upon firms.

In fact, union representatives (also commonly referred to as 'union delegates', 'shop stewards', or 'union stewards', and henceforth simply as 'union reps') can be influential, in a positive or negative way, in multiple business dimensions, with ultimately positive or negative effects upon firm performance. These dimensions include collective bargaining, training, innovation, health and safety, compliance with regulations, information dissemination, strikes, restructuring and dismissals. Union reps can also potentially contribute towards higher labour income levels, an important policy goal in many countries, faced with stagnant wages and declining labour shares. This union contribution can arise through the productivity channels above (if their positive effects exceed any negative contributions) and or by strengthening the bargaining power of workers in rent sharing. One may argue that the future of unions will depend more on their contributions towards rent generation than on their achievements in terms of rent extraction.

This study contributes to the large literature on unions as the first explicit examination of the impact of employee representatives.[1] In contrast to but complementing the existing research, in this paper we examine the entirely novel question of the (causal) impact of additional union reps in firms. Indeed, the quantity and quality of the union activities conducted by reps can depend critically on the number of workers that are not only recognised by the firm as legitimate representatives of (unionised) employees but also supported in terms of paid time off work (and greater employment protection) to conduct the union activities above. Importantly, while some of these activities will be directly aligned with the interests of employers, others will not, at least not in a short-run perspective.

Our empirical analysis of this question is based on labour law regulations common in

[1]This literature is surveyed in Doucouliagos et al. (2017), including DiNardo & Lee (2004), Lee & Mas (2012), Sojourner et al. (2015) and Barth et al. (2017) which present causal evidence of the impact of collective bargaining mandates for unions in the US and of union density in Norway. See also OECD (2017) for an international analysis of collective bargaining and social partners and Freeman & Lazear (1994) and Mueller & Stegmaier (2017) for early and recent studies of works councils.

many countries that establish the number of recognised and supported union reps and that do so as a (non-linear) function of the number of workers in the firm.[2] We consider the case of Portugal, in which the (non-linear) legal function determining the number of union reps is based exclusively on the number of unionised workers in the firm (and not all workers, unionised or not, as in France and Italy). Specifically, employers with up to 49 unionised workers are required to support at least one union rep, a number that increases to two in the case of firms with 50 to 99 unionised workers, three (100-199), six (200-499) and then one more for each 200 additional unionised workers (Figure 1).

We exploit empirically the legal requirements above using a regression discontinuity approach, considering the case of multiple cut-offs (see Angrist & Lavy (1999) for a similar application). Intuitively, our analysis is based on a comparison of firms within the unionised sector that happen to have small differences in their numbers of unionised workers around the legal thresholds above (such as 50, 100, and 200) to tackle the potential endogeneity that would otherwise confound our estimates. The fact that these thresholds are based on union members and not all workers is also important. Indeed, this virtually eliminates the possibility that these discontinuities are picking up the effect of regulations that are a function of the number of workers of the firm (Martins 2009*a*, Garicano et al. 2016), that could otherwise be based on the same threshold levels used for union reps (in our case this cold only be an issue in the very uncommon cases of 100% union density rates). Thresholds based on union reps also provide for greater stability in the characterisation of firms, in this case in terms of the number of union reps, given the lower volatility over time in union membership size compared to workforce size.

We then exploit the wide range of variables of our matched-employee data, covering all firms in the country with unionised workers, to evaluate the impact of the union reps legal mandates on a large number of firm- and worker-level outcomes. Our analysis of all unionised firms allows us to have a representative view of the effects of unions in firms within a country, rather than focus only on new unions (DiNardo & Lee 2004, Lee & Mas 2012). Our analysis is

[2]For instance, in France both the number of union reps in each firm and per union varies between one and five depending on the firm size. Moreover, the paid time off work for union activities that each union rep is entitled also varies depending on firm size, between 12 to 24 hours per month for union activities. (See Breda (2016) for a detailed description of union representatives in France.) In Italy, the number of union reps starts at three (firms with 16 to 200 employees), increasing by three more for each 300 additional employees up to 3,000 and then for each 500 additional employees. In contrast, in the UK, there is not a fixed amount of paid time off determined in law nor a fixed number of union reps per firm. Similar regulations are found in many other countries with respect to workers' councils. See CESifo DICE (2015) for more information.

also in contrast to earlier causal studies of the economic impacts of unions because of our focus on a novel, intensive margin of unionisation (Barth et al. 2017). Earlier studies (DiNardo & Lee 2004, Lee & Mas 2012) focus instead on an extensive margin driven by the legal mandate to conduct collective bargaining following a vote by workers to unionise.

Our results also differ from earlier research as we find that union reps have a significantly positive effect on many dimensions of firm performance, including sales, exports, profits, and survival. This is notwithstanding the costs incurred by firms with union reps, namely in (paid) time off work and greater employment protection. More specifically, we find that a one percentage point increase in the ratio between reps and union members translates into an increase of sales per worker of at least 7%. This effect appears to be driven, at least in part, by an increase in the volume of worker training (Dustmann & Schonberg 2009).

On the other hand, we do not find any impact from reps on wages either at the firm- or at the worker-level, despite their positive productivity effects on the firms where they work. The latter result can be explained by the predominance of sectoral-level collective bargaining and administrative extensions in Portugal (Martins 2014, Hijzen & Martins 2016), as in several other European countries. In this institutional context, productivity increases following from the contributions from union reps in firms (as from any other firm-level or, for that matter, sectoral-level factor) may translate into wage increases for all firms in the sector, and not only for the specific firms where additional union reps generate stronger productivity increases.

The structure of the remaining of the paper is as follows: Section 2 presents the institutional context. Section 3 presents our empirical model and the data used. The main results are presented in Section 4. Section 5 presents robustness checks and extensions. Finally, Section 6 concludes.

2 Institutional context

As in other Continental European countries, the Constitution of Portugal establishes that workers are free to create and join any type of trade unions (article 55). Trade unions are also considered responsible for the protection and promotion of the rights and interests of the workers that they represent, in particular through collective bargaining with employers (article 56). In this context, the Labour Code of the country establishes a number of norms regarding the specific rights and responsibilities of trade unions. For instance, the law defines

the union representative ('delegado sindical') as the worker elected to conduct union activities in the firm or establishment (article 442).[3] The law also determines that each rep is entitled to spend five to eight paid work hours per month to carry out firm-level union activities (article 467). Moreover, the rep is also entitled to greater protection against dismissals or workplace reallocation requirements by their employers (articles 410 and 411).

Critically from the perspective of this paper, the Labour Code also defines the maximum number of union representatives per firm that are legally entitled to the rights and protection described above. According to article 463, the number of union reps in the firm varies with the number of union members in the firm in the following way: one rep in the case of one to 49 union members; two reps in the case of 50 to 99 union members; three reps in the case of 100 to 199 union members; six reps in the case of 200 to 499 union members; and then one additional union rep for each additional range of 200 union members (i.e. seven if 500 to 699, eight if 700 to 899, and so on) - see Figure 1 for a graphical presentation. Incidentally, this norm has been remarkably stable over time, having exactly the same wording since 1975, when it was first introduced, despite the many labour law reforms since then. Moreover, while the Labour Code allows collective bargaining to change the numbers above, we know of only one case in which this happened (in banking, in which the number of extra unions reps increases from 1 to 4, and not 2, at the 50 threshold (Martins & Saraiva 2019)). The same view was expressed by a number of union and employer association leaders with whom we discussed this matter. We also examined 15 of the main collective agreements in force in the year studied in this paper and could not find any instance in which this rule was changed. On top of the time allowances for union reps, the Labour Code (article 468) also establishes time allowances for the trade union board members, again to be provided by their employers.[4]

The relationship between union members and union reps can also be examined as a percentage (union rep mandates per union member) instead of levels. Figure 2 presents these regulations from this perspective, which highlights the major jumps in union rep density at the legal union member thresholds. For instance, in the first threshold (50 union members),

[3]The law also provides some room for workers' councils to participate in and contribute to social dialogue in firms but not to conduct (formal) collective bargaining, which may explain the relatively low number of workers' councils in the country.

[4]The allowances for trade union board members are of four days of work per month and the number of board members supported follows a similar union member schedule as in the case of union reps but is capped at twelve board members (for firms with 10,000 or more union members). We do not explore this dimension in this paper, as our focus is on firm-level effects, while union board members (in contrast to union reps) have a sectoral focus.

which, as we will see below, is the most relevant empirically, this density increases from nearly 2% to 4%. In the second threshold (100 union members), the density increases from 2% to 3%, and in the third (200 members) from 1.5% to 3%, while in the following thresholds the jumps are negligible. An alternative perspective would be that, in the first margin (from 49 to 50 union members), there is a 100% increase in union reps, while in the second (from 99 to 100 union members), the increase is of only 50%, followed by another increase of 100% in the third margin (199 to 200 union members).

In terms of labour market background, it is important to add that, as in other (continental) European countries, collective bargaining coverage in Portugal is high, despite low and declining levels of union density in the private sector, reaching 11% in 2010. This imbalance between coverage and density is explained by the widespread extension of sectoral collective agreements by the Government, so that these agreements cover all workers, in particular those that are not union members or those that are employed by firms that do not participate in collective bargaining (Martins 2014, Hijzen & Martins 2016, Addison et al. 2017). Given that labour law, which is applicable to all employees by default, is already fairly detailed in many if not all dimensions of employment relations (the Labour Code has over 560 articles), the impact of sectoral collective bargaining coverage is largely confined to increasing minimum wages of all occupations in each industry (and, occasionally, regions) over and above the national minimum wage. On a very small number of cases, collective bargaining is also conducted at the firm (or holding) level, to top-up the working conditions established in the relevant sectoral agreement. Both types of agreements can be interpreted as a form of rent sharing.[5]

Finally, and specifically with regards to trade unions, Portugal is characterised by two main union confederations (CGTP and UGT) and a smaller group of non-affiliated (independent) unions. For historical and political reasons, the two confederations typically do not work together. For instance, it is not uncommon that there are two collective agreements, in the same sector, with virtually the same content (including minimum wage tables) but that were bargained separately by a given employer association with the two trade unions present in the

[5]See Martins (2009*b*) for evidence of rent sharing in a sample of large firms and Addison et al. (2015) for an analysis of the effects of unions upon wages, in both cases based on the same data for Portugal that is used in this paper. See also Breda (2015) for an analysis of the effects of unions upon wages in the case of France. The incentives to become a union member in a context of widespread extensions are likely to be negatively affected, which is consistent with declining rates of union density in the country. However, there are still other services that unions provide (such as support during dismissals or conflicts with management), which can motivate and explain membership.

sector (each affiliated to a different confederation). In this context, union reps in firms will be members of trade unions that are affiliated with one of the two confederations (or the third, independent movement). Workers in each firm may be affiliated to a single trade union or, particularly in large firms, different workers may be affiliated to different trade unions. In the latter cases, union reps will be selected from each trade union on a proportional basis (unlike in the case of France, for instance).

At the level of the firm, union reps will typically be involved in a wide range of activities, including training, health and safety, compliance with regulations, information dissemination, strikes, restructuring and dismissals. Anecdotal evidence suggests that union reps will, in general, be older male workers, with open-ended contracts and long tenure levels in their firm, in intermediate job levels. These profiles may facilitate the collection and dissemination of information between employers or senior managers and all employees in the firm, with a view to the implementation of policies in the areas above. As to collective bargaining, the involvement of union reps may occur on a more direct level in the case of firm-level (or holding) collective agreements, of which there are only about 50 per year in the country, or more indirectly, in terms of inputs provided to the trade union board members when conducting sectoral collective bargaining.

3 Empirical model and data

Our empirical analysis of the impact of union rep mandates is based on the 'Quadros de Pessoal' (Personnel Records) data set, a comprehensive matched employer-employee panel collected by the Ministry of Employment. This data set provides detailed annual information on all private-sector firms based in Portugal that employ at least one worker and also on all their employees, including time-invariant firm and person identifiers. Worker information concerns the month of October of each year and includes gender, date of birth, date of entry in the firm, schooling, occupation, wages, hours of work, employment contract, and collective agreement. Firm information includes the industry (five-digit variable), location, sales, legal type, capital equity, ownership type, and training hours. We also merged firm-level information on the total annual value of exports from a different data set, collected by the National Statistics Agency (INE).

Critically for the purposes of our paper, the 'Quadros de Pessoal' data set made available

information on the number of unionised workers in each firm in 2010. This is the year in which we focus our analysis, an year of some stability, when the economy grew by 1.5%, following the financial crisis of 2008-2009 and before the Euro crisis that started in 2011. The availability of this variable, reported by firms, is related to the fact that it is common for firms to be responsible for the collection of union dues (typically 1% of the individual annual base wage) which firms then transfer to trade unions.[6] Firms also need to know the number of union members amongst their employees to be able to recognise and support the required number of union reps, given the legal context described in Section 2. Although the data set does not make available information on the actual number of union reps in each firm, we believe that it is highly likely that the number of reps in each firm will correspond exactly to the number that follows from the law. On the one hand, unions will want to have as many reps as possible given the law; on the other hand, firms will want to have as few reps as possible, again given the law. The solution to these two equations should imply that the actual number of union reps is exactly the one established by law and described above.

Given this institutional context, we adopt an intention-to-treat approach in our empirical analysis that is similar to some US studies (DiNardo & Lee 2004, Lee & Mas 2012). However, as indicated before and in contrast to these studies, we do not examine the extensive margin following from the legal mandate that requires employers to recognise unions under some circumstances and then potentially conduct collective bargaining. Instead, we consider the intensive margin related to the legal mandate that requires employers to increase the number of reps that they recognise and support in their firms. As in the case of the US studies, our analysis is based on a regression discontinuity approach (Hahn et al. 2001, Lee & Lemieux 2010), but adjusted for the fact that, in our context, firms are exposed to multiple cut-offs or thresholds (50, 100, 200 and more trade union members), rather than only one (e.g. of a voting share in favour of unionisation of 50% or above, as in the US studies mentioned above).

Moreover, as we are focused on the intensive margin of unions, we exclude from the 'Quadros de Pessoal' data all firms that do not employ unionised workers in 2010. Given the low union density rate in Portugal and the over-representation of unionised workplaces in large firms, this exclusion criterion eliminates 96% of the original number of firms and 64% of the total number of workers, while allowing us to focus entirely on the intensive margin

[6] We focus exclusively on the firm-level dimension and not the establishment or workplace as the law establishes union mandates in terms of the number of firm-level unionised workers. In any case, the data does not provide performance nor union membership information at the establishment level.

of employee representation. Together with our subsequent exclusion of the remaining very small firms (defined as those with fewer than ten employees) and those with missing values in key variables, we obtain a final sample of 6,489 firms, which correspond to 35% of the original total workforce. This sample is described in Table 1, where we find that, on average, these firms employ 125 workers, of which 27 are union members, and exhibit an union average density rate of 28%.

Given our particular context, we implement a different form of a normalise-and-pool regression discontinuity strategy, in which the different thresholds are recentered, the running variables correspondingly normalised and the resulting observations pooled for a single regression discontinuity analysis (Cattaneo et al. 2016). Instead, we define multiple treated union membership ranges that correspond to the values between each threshold and half of the distance until the next threshold. The outcomes of interest then follow from the contrast between these critical membership ranges (where firms are mandated to increase the number of union reps) and the membership ranges immediately to the left (where the mandate establishes a smaller number of union reps), while controlling for a polynomial of the running variable (the number of union reps).

More specifically, in our benchmark specification, we estimate the following equation:

$$Y_i = \alpha + \beta AdditionalUnionRep_i + \lambda S(Z_i) + \epsilon_i, \tag{1}$$

in which Y_i is an outcome of interest, such as different measures of the performance of firm i, in particular the log of the ratio of firm sales in 2010 by the number of workers in that year. Moreover, $AdditionalUnionRep_i$ is a dummy variable equal to one for firms whose number of union members is immediately above the trade union member thresholds set by article 463 (50-74, 100-149, 200-249, 500-599, 700-799, 900-999 and 1,100-1,199 unionised workers). As explained above, these ranges were selected so that the first value corresponds to the union membership threshold itself (when the increase in the number of union reps is introduced by law) and the last value of the range is a figure halfway (or nearly halfway) between each pair of thresholds. Finally, $S(Z_i)$ is a polynomial and or non-linear function of the number of union members in the firm, such as a quadratic plus a number of dummy variables capturing the range of union members in the firm (1-74, 75-149, 150-249, 250-599, 600-799, 800-999 and 1,000-1,199 unionised workers), picking up other differences that do not arise at the critical

union rep thresholds. These differences will include the role of firm size, which is strongly correlated with the number of union members and also with firm performance itself. Moreover, the latter dummy variables (1-74, 75-149, 150-249, etc) center the analysis at what may be regarded as the relevant union membership ranges for evaluation purposes.

This flexible setup allows the data to express any differences (in firm performance or other variables) stemming from the key dummy variable ($AdditionalUnionRep_i$) that indicates union membership sub-ranges that imply one (or more) additional union reps.[7] In this context, the estimate of the parameter of interest (β) will indicate the average change in the outcome considered following from firms that happen to have a slightly higher number of union members at the relevant range of interest and are therefore mandated to recognise and support a higher number of union reps.

We also consider an alternative, more flexible model, in which we allow for different effects stemming from different union membership ranges that are associated to different numbers of union reps, in contrast to the average effect perspective from equation 1:

$$\begin{aligned} Y_i = \alpha + \beta_1 Membership(50,99)_i + \beta_2 Membership(100,199)_i + \\ + \beta_3 Membership(200,499)_i + \lambda S(Z_i) + \epsilon_i, \end{aligned} \tag{2}$$

in which Y_i is again the outcome of interest and $Membership(50-99)_i$ is a dummy variable equal to one if firms employ 50 to 99 union members and zero otherwise (and similarly for the following two variables). As before, $S(Z_i)$ is a polynomial and or non-linear function of the number of union members in the firm. In this context, and in a sample considering only firms with union members up to 499, the estimate of β_1, for instance, will indicate the average difference in the outcome of interest between firms employing 50 to 99 union members (which correspond to two union reps) with respect to the comparison group of firms with between one and 49 union members (and thus only one union rep). Similarly, the difference between the estimates of β_2 and β_1 will indicate the marginal effect of one additional union rep as firms employ 100 to 199 union members (compared to 50-99); while the difference between the estimates of β_3 and β_2 will indicate the marginal effect of three additional union reps as firms have 200 to 499 union members (compared to 100-199).

[7] As discussed before, all thresholds are associated to a one-rep increase except the 200-threshold, which leads to a three-rep increase. In union-rep density terms, the first three thresholds entail increases of between one and two percentage points.

The validity of a regression-discontinuity analysis as in the cases of the two equations above depends on a number of assumptions, in particular regarding potential manipulation in the number of observations around the thresholds and differences in the values of pre-determined variables around the same thresholds. To address the first point, we compute the distribution of the number of union members across the firms in our sample, presented in Figure 3, using bins of five workers. We find no visual evidence of manipulation, as in the case of a slump in the number of firms immediately to the left of the thresholds and a spike to the right (or the opposite). The former situation could arise in the case in which unions manage to increase their membership in firms where their number of members is just below the relevant threshold, as such change would increase the number of union reps. The latter case could be when employers successfully persuade a small number of workers to leave a union, so that the firm would no longer be above the legal threshold. This situation would lead to a spike in the distribution of unionised workers immediately to the left of the relevant thresholds. Moreover, using the test of McCrary (2008) and focusing on the 50 threshold, we obtain an insignificant estimate of the gap (a coefficient of .200, with a standard error of .206; other thresholds also lead to insignificant gaps, e.g. -.436 with a standard error of .357 at the 100 level). This result supports the case of no manipulation of the number of unionised workers at the threshold, possibly because any such efforts by unions and employers are not significant or simply cancel out. This evidence is also consistent with the fact that the actual number of unionised workers is subject to several sources of noise (e.g. early retirements) that create random fluctuations in such number over time.

Incidentally, Figure 3 indicates that most of any impact that our study may document will come from the threshold at 50 union members and, significantly less so, at 100 and 200 union members. These are also the thresholds at which the percentage increases in union-rep density are highest, as exhibited in Figure 2. This predictable concentration of firms at low sizes is consistent with the descriptive statistics in Table 1, as the average of our key regressor, $AdditionalUnionRep_i$ is 7%, four percentage points of which come from the 75-149 union membership range (and two from the 150-349 range).

In the case of the second validity concern, about differences in pre-determined variables at the union membership thresholds, we adapt equation 1 and use as dependent variables a total of 119 predetermined, in most cases time-invariant variables, indicating the industry of

the firm, its age range, its geographical location, its legal type and two additional dummy variables regarding foreign ownership and employer association membership. We find that, out of the 119 variables, and considering a 5% (10%) level, there are significant differences at the union member thresholds in 11 (13) dimensions, which is only slightly higher than in the case of strictly independent observations (Table A2). Moreover, when restricting this analysis to firms with between one and 100 unionised workers, we find five (11) dimensions that are significant (Table A3) considering a 5% (10%) level. We interpret these results as supportive of a good balancing in observables. Overall, these results imply that any differences in our outcome variables are not likely to be explained by different characteristics of the firms other than the mandate towards a different number of union reps. In any case, we also present below a number of robustness checks in which we add these and other variables as additional regressors.

For the benefit of a general description of our sample, a selection of these predetermined variables are presented in Table 1. We find that Manufacturing is the main industry in our sample (32% of all firms), followed by Retail and Wholesale, and Health and Social Support. Firms in our sample are also relatively mature, as the majority (43%) is between 20 and 49 years old. The main region is that of Porto (30% of firms), where manufacturing also tends to be prevalent. We also present a similar list of descriptive statistics for firms with 1-49 and 50-99 unionised workers (and for firms with 30-49 and 50-70 unionised workers) - Table A1 - which highlight the general similarity between these pairs of subsamples.

Finally, we plot the average log sales per worker by trade union members per firm, focusing on the 1-99 range - Figure 4. This figure suggests a positive effect of the threshold and its union rep mandate implications on firm performance, which we examine econometrically in the next sections.

4 Results

Table 2 presents our estimates of equation 1, using the log of sales per worker (in 2010) as our dependent variable, considering three different polynomials (linear, quadratic and cubic) of the number of unionised workers in the firm, and including industry fixed effects. The latter are added as firm performance tends to be highly heterogeneous across industries but we also investigate the robustness of our results with respect to a more parcimonious specification.

We find that, in all polynomial models, the range of unionised workers immediately after the thresholds established by law (which mandate firms to recognise and support one or more additional union reps) is positively and significantly associated with higher levels of performance. The magnitude of the effects is particularly stable across polynomials, ranging between 0.132 and 0.157 log points, translating into a percentage increase in firm performance associated with union reps of between 14% and 17%. Dividing these figures by the most relevant increase in union rep density, which occurs at the first threshold (50 union members), of two percentage points, we conclude from this first set of findings that union reps tend to increase firm performance by at least 7%.

We now turn to our estimates of equation 2, in which we allow for different effects of union members at different thresholds, rather than impose a single effect. In this model we also focus on the most relevant union membership range, up to 500, in contrast to the analysis above, that considers a range up to 1,200 union members (but with limited loss in observations, given the very small number of firms in the largest categories of union membership). Table 3 presents the results, in which we find marginal effects of the first increase of union reps (at 50) of 0.175, .186 and 0.192 log points, in increasing order of the polynomial of union membership adopted.

The marginal effects at the next threshold (at 100 union members) drop, to 0.063, 0.07 and .145 (these are the differences between the coefficients of the 100-200 membership range from the coefficients of the 50-100 membership range), but remain statistically significant at the 10% level in all cases. Finally, we find that the marginal effects associated to the third union membership level (200-499 members), corresponding to a jump from three to six union reps, are .12, .109 and .268, in all cases significant at the 10% level. This U-shaped pattern in marginal effects at the thresholds mirrors closely the magnitudes of the changes in the union rep densities, of two, one and 1.5 percentage points (2% to 4%, 2% to 3%, and 1.5% to 3%; or 100%, 50% and 100% increases in the total number of union reps), respectively, as presented in Figure 2 and discussed in Section 2. We interpret this close correspondence between the magnitudes of the marginal effects and of the changes in union density as important additional evidence of causality. Moreover, dividing these marginal effects by the percentage changes in union rep density at the thresholds, we find again positive impacts on firm performance of at least 7% per percentage point of union rep density, highlighting the robustness of the results,

which we investigate further below.

4.1 Robustness

We now turn our attention to additional checks of the resilience of our main findings. Table 4 presents the results from a number of additional specifications. First, Panel A is concerned with the role of different sets of control variables: the first column drops industry controls, the second considers instead two-digit (rather than five-digit) industry controls, the third includes collective-bargaining level industry controls, and the fourth considers a large set of control variables on top of industries, such as regions, firm legal type, firm age and foreign ownership status.

We find very similar coefficients across the four specifications, in all cases statistically significant at the 5% or 10% levels (the latter only when excluding all controls, other than the union membership linear effect). Moreover, the coefficients are very similar to those of the benchmark specification presented in Table 2, at 0.157, ranging between 0.128 and 0.16. While the polynomial specification considered here is the linear one, the same qualitative results (available upon request) are found when considering the quadratic and cubic models.

Panel B of Table 4 presents further robustness checks, in this case based again on equation 2 but dropping the union member range dummy variables used before, i.e. that separately indicate firms just below and above the legal thresholds (1-74, 75-149, 150-249, 250-599, 600-799, 800-999 and 1,000-1,199 unionised workers). In other words, this specification relies exclusively on the polynomials of the union membership number to control for differences between firms. We find that, even these very parsimonious specifications also generate very similar results regarding the impact of the mandates towards additional union reps in firms. In this case, the coefficients range between 0.088 and 0.146 and are always significant, at least at the 10% level. Finally, Panel C adopts again the benchmark specification as in Table 2 except that it does not adjust for any clustering. We find that all coefficients are significant at the 5% level.

In addition, we conduct a number of falsification or placebo exercises. Our motivation is that our measures of the union rep mandates may be picking up the role of other variables, even if these are unknown to us, that may happen to coincide or be strongly correlated with the relevant thresholds. In particular, it may be that differences in the definition of

these thresholds also lead to firm performance effects, a result that would cast doubts on the causal interpretation of our findings. We address this possibility but considering alternative threshold variables, defined at similar but different ranges of the union membership variables. Specifically, we push the threshold rightward, considering for instance the range 75-100 instead of the range 50-75 - Panel A of Table 5 - and 85-110 - Panel B. We find in all cases, considering the three main polynomials of union membership, coefficients that are always statistically insignificant (and small and negative). We find these results as important additional evidence in support of our causal interpretation of our main findings.

Finally, we also pursue a number of additional robustness checks (available in the Appendix). The first one concerns the roles of employer association affiliation. Here we consider extended versions of equation 1, in which we investigate if the effects of the union rep mandates differ depending on the characteristics of firms along this dimension. In particular, we add an interaction between union rep mandates and employer association affiliation. We find that the firm performance effects of union rep mandates are not affected by the status of the firm with respect to employer association affiliation, even if the latter is associated with significantly higher performance levels.

A second additional robustness domain concerns differences in firm characteristics. We find that the results are generally robust when splitting the sample in different ways. The exceptions that we could identify (i.e. the subsets where we do not find significant effects) are older firms, namely those that were established at least twenty years before the year when the firms are observed (2010); foreign firms; and multi-establishment firms. However, we note that, in the latter two cases, these categories involve a smaller number of firms, which can affect the precision of the estimates. On the other hand, we find that the union rep effects are strongest in manufacturing (and retail and wholesale). The effects tend to be weaker or non-significant in other industries, although again their sample sizes are smaller as unionisation is typically stronger in manufacturing. We also find that our results are robust to the inclusion in the main specifications of firm controls capturing variables that were found not to be entirely balanced, when conducting our RD on a sample of matched firms using a propensity score matching approach,[8] or indeed when using matching instead of the regression discontinuity

[8]Here we conducted Propensity Score Matching on the 1-99 range, where the treated group is made up of firms with 50-99 unionised workers. The propensity score is established using region, industry and firm age dummy variables. The matching process eliminated 558 observations that could not be matched using a specific nearest-neighbour caliper.

methods adopted so far, consistent with the results without controls for the running variable.

A third area of robustness concerns the range of firm sizes considered, in terms of our running variable. We find that our main results are robust even when excluding a large range of the left tail of the distribution of the running variable, between one to 30 union members (e.g. considering only firms with 30 or more union members and the resulting much smaller sample of 1221 firms), although the coefficients tend to not be significant when considering higher-order polynomials, as predicted in Gelman & Imbens (2018). This can address concerns that our firm performance results may be picking up differences in firm size, namely the contrast in performance between very small and larger firms, despite previous findings of robustness when controlling for firm size directly.

We also find similar results when restricting our analysis to the 1-99 union members range and using a simple (single-threshold) RD approach, with different types of polynomials, with the exception of the number of workers, which exhibits some volatility across specifications. We also find similar results when adopting local linear regressions although in this case only when considering very long bandwidth choices.[9]

5 Additional outcomes and mechanisms

Having established the positive effects on firm performance (as measured by sales per worker) of the legal mandate towards additional union reps, we now turn our attention to complementary variables and potential mechanisms behind the main results. Regarding the first case, Table 6 presents our findings from equation 1 when considering five new outcomes, profits, exports, capital equity, workers, and firm survival, using a polynomial based on a linear measure of the number of union members.

Panel A presents the results in the case of profits and exports. The former variable is constructed as total annual sales minus the value of the annual gross wage bill (the average wage times the number of workers times the number of salaries paid per year - 14 - times one plus the social security payments due by firms -23.75%) minus a proxy for capital costs (assumed to correspond to 5% of the firm's capital equity). We then take the log of the ratio

[9]When considering increasingly wider ranges around the key threshold (in steps of five extra unionised workers in both directions) in simple models without a running variable, we find increasingly more precise point estimates, significant at the 5% level in the 25-75 range. In the case in which we also consider a running variable, the point estimates are not significant but are positive and of similar magnitude levels as the benchmark results based on much larger sample sizes (except in the narrower 35-65 range).

of this proxy of annual profits by the number of workers. We find that, for the resulting sub-sample of firms with positive profits, the effect of additional union reps is again positive and large, at 0.235. These results strengthen the previous findings of positive effects on firm performance.

Panel A also considers two measures of exports, first in terms of their extensive margin (a dummy variable equal to one if the firm is exporting in 2010) and then in terms of the intensive margin (about how much the firm exports, measured in log exports per worker). In both cases we find statistically significant positive effects, of 0.081 in the case of the extensive margin and of 0.46 in the case of exports per worker. These results indicate that union reps can not only contribute positively towards overall firm performance but may also enhance the international competitiveness of the firm, in the sense that it is able to start selling or to increase sales to typically more demanding international markets.

Panel B of Table 6 finds equally positive and statistically significant effects on complementary variables such as capital equity, firm size (number of workers) and the probability that the firm remains in business over the following three years (2013 is the last year of the QP data set that we currently have access to). The coefficients are, respectively, 0.213, 0.177 and 0.058 and are all significant at the 1% level except capital equity, which is only significant at the 10% level. While capital equity will be correlated with capital investments, it is a crude proxy namely because it is adjusted only seldom, which will explain both its large coefficient and standard error.[10] The positive effects on employment further support our main results on firm performance (defined as sales per worker), as they indicate that the improvement in that ratio is not coming about from a reduced value of the denominator (i.e. cuts in workforce size, through dismissals of marginal, typically less productive workers). Quite on the contrary, increases in the number of workers are to be expected in firms that become more productive, as the value of additional workers is greater, especially if wages do not increase correspondingly. This last point will be discussed below, when we examine the effects of union reps upon wages.

Finally, the last result, indicating positive effects of union reps on firm survival, is also important given that the period over which it is measured (2011-2013) was characterised by

[10]In the appendix, we examine the robustness of these findings to different polynomials and the subsample defined by firms with between one to 99 unionised workers. We find that the results on profits and survival hold in virtually all specifications. In the cases of the remaining variables, we find insignificant coefficients in some specifications, even if the point estimates in those cases tend to be similar to our benchmark results.

a large recession in Portugal (GDP fell by over 6% in cumulative terms over those three years) in contrast to the main year of our study (2010), when the economy grew by 1.5%. This finding suggests that union reps can also promote firm resilience during difficult times, possibly by better conveying to the workforce the challenges faced by the firm and obtaining counterfactually higher levels of work intensity over those periods.

5.1 Potential mechanisms

What specific channel of the intervention of union reps in firms may be driving the performance effects documented above? As in all other research, we cannot test all areas that have been suggested to be relevant in the delivery of effects of trade unions, such as collective bargaining, training, health and safety, compliance with regulations, information dissemination, strikes, restructuring and dismissals, even if some suggestive evidence is already provided by some of the robustness checks and extensions above. One additional channel we examine concerns collective bargaining, taking into account the institutional context of Portugal, in which sectoral bargaining is dominant (and typically applies to all firms in nearly all industries through administrative extension), as discussed before. Specifically, we investigate if firms with additional union reps are more likely to be under firm- or holding-level collective agreements, in addition to (i.e. topping up) the ubiquitous sectoral agreements. However, we do not find any significant effects of this (results available upon request), which can also be explained by the very low number of firm-level agreements in the country. Indeed, our sample covers nearly all of them and indicates that they are present in only 3% of firms.

We then turn our attention to investments in the human capital of the workforce, drawing on firm-level information on the number of hours of worker training in 2010. As mentioned above, training is a subject valued by unions, which have a strong preference towards gains in firm competitiveness through improvements in productivity compared to alternatives based on cuts in labour costs. Training is also a domain that can be incentivised by the more compressed wage distributions that follow from sectoral collective bargaining (Acemoglu & Pischke 1999).

As in the case of exports, our analysis of the role of training considers both extensive and intensive margins - if there is or not training and any increases in the quantity of training, respectively. The results, presented in Table 7, indicate that the extensive margin is not

affected by union reps, possibly because firms are already required by law to invest a minimum number of hours in the training of each worker - an average of 35 hours per year per full-time worker -, although only over a three-year period (which creates some scope for variation across firms). On the other hand, we find that both the total amount of training per firm and the amount of training per worker increase significantly in firms mandated to have a high number of union reps. The coefficients in these cases are of 0.275 and 0.414, respectively. On the other hand, hen focusing on the most relevant measure, concerning training per worker, we find that these point estimates are generally unchanged but tend to lose precision and in some cases become insignificant when considering different polynomials or smaller ranges of the data set (Appendix). Moreover, while we cannot measure training quality, we believe it is reasonable to expect this to be positively correlated with training quantity.

Overall, we argue that these results suggest that mandates that increase the number of union reps in firms can lead to stronger investments in training, which can then lead to higher levels of firm performance. These results are also consistent with the effects of sectoral bargaining, earlier research (Dustmann & Schonberg 2009, Almeida & Carneiro 2009, Martins & Saraiva 2019) as well as with the focus of many trade unions on investments in workers' productivity through training, as mentioned above. An additional interpretation is that training can correspond, to some extent, to a form of rent sharing: training can increase the worker's labour market opportunities in other firms, generate less disutility than working, while training organisations hired by firms may be owned by trade unions or their members.

Our findings on training may also be related to the quality of management practices: Bloom et al. (2017) presents survey evidence that the average quality of these practices in Portugal is ranked 8th out of the 12 European countries that they examine. Relatively poor management practices may undermine the planning and operational activities that nare required so that training can be conducted and be successful. Managers may also make use of higher discount rates when evaluating the uncertain future benefits of training against their certain present costs, in particular the foregone production during the period in which the training takes place. On the other hand, trade unions would not value the direct and indirect costs of training faced by the firm to the same extent or at all, while they would appreciate the gains in productivity of their workers as well as the increased bargaining power and hold-up scope that would follow from the increased specificity of their skills. Moreover, additional

union reps in firms could play an important role in making the case for additional investment in training (both in its quantity, as measured here, and in its quality), ensuring its success by improving the fit of the training with workers' needs and increasing workers' engagement, therefore counteracting any negative bias of managers towards training.

5.2 Wages

The last additional variable that we consider is one of the most important for unions and their reps: wages. Unlike in our previous analyses, we examine the effect of union reps both at the firm- and the worker-level, exploiting the richness of our matched data. Moreover, we also create different measures of wages at the firm-level, in addition to the average wage, in particular the median wage, a measure of low wages (the 25th percentile) and of wage inequality (the ratio between the 75th and the 25th percentiles).[11] Panel A of Table 8 presents our findings, again using the benchmark equation (1) and a linear polynomial in the number of union members. We find, in all cases, no evidence of statistically significant effects. Coefficients are small in general and standard errors are always higher than the coefficients. We also conduct an individual-level analysis, drawing on the matched dimension of 'Quadros de Pessoal' and the over 800,000 workers employed by the 6,489 firms in our sample. We consider the log of the hourly pay of the worker (including all four items of pay available in the data, such as base pay, overtime pay, bonuses and other components, which can be more responsive to rent sharing (Martins 2009*b*)). Panel B of Table 8 shows that, again, we do not find evidence that union reps mandates increase the wages of workers across firms, in contrast to the abundant evidence on firm-level performance.

While possibly paradoxical at first, this result can be explained by the dominant sectoral structure of collective bargaining in Portugal, as in many other countries. In this context, wage increases are driven largely by the changes in the minimum wages of different occupations and job levels following the introduction or the revision of a collective agreement and their extensions within firms and across the industry (Martins 2014). Therefore, there is a very limited scope for union wage differentials as they have been discussed in the cases of countries with decentralised collective bargaining (Card 1996, Lanot & Walker 1998).[12] More

[11] Using the same data set as in this paper, Martins (2008) finds that within-firm pay inequality is significantly associated to lower firm performance.

[12] Breda (2015) finds a positive even if very small union wage premium at the workplace level in France in spite of the similar institutional context as Portugal in terms of widespread extensions. This premium in

importantly here, productivity increases following from firm-level developments (including the mandates towards additional union reps examined in this paper) will presumably lead to wage increases across all firms in the sector, given the nature of collective bargaining, and not necessarily only those firms where the productivity increases have emerged. This would lead to a disconnect between productivity and wages at the firm level and the absence of wage differentiation that we document in our sample of firms, in contrast to our findings of firm performance increases. This result may also explain, at least in part, why we observe higher levels of employment in the firms subject to the mandate thresholds compared to those that fall just short of them, as wages growth may exceed productivity growth in the latter group.

6 Conclusions

Employee representatives in firms are a potentially key element of the economic impact of unions and works councils. Indeed, the actions of these individuals involve multiple worker-related dimensions which are also potential drivers of firm performance. Depending on the institutional context, these dimensions may include collective bargaining, health and safety practices, restructuring procedures, strikes, and training. However, the effect of employee representatives has not yet been studied, in contrast to other research areas where attention has already been paid to the roles of the people behind the institutions, such as managers, politicians, teachers or doctors.

Our causal examination of the impact of a major type of employee representatives, union delegates, is based on the analysis of the mandated variation in their number in each firm. We focus on the case of Portugal, where - similarly to other countries - labour law establishes union membership thresholds for union representation in firms: while firms employing between one and 49 union members are required to have one union rep, this figure increases to two (three) for firms with 50 to 99 (100-199) members. Drawing on rich matched employer-employee data and regression discontinuity methods, we examine a sample of over 6,000 firms that includes virtually all firms in the country that employ at least one unionised worker. In our analysis of this novel intensive margin of unions, we find that a one percentage point increase in the legal union rep/union members ratio leads to a significant increase in firm performance (sales per worker), of at least 7%. This result also holds across a large number of complementary

France could be driven by the additional legal requirements in France regarding bargaining also at the firm level.

dimensions of firm performance (including exports) and in several robustness checks.

While these are large marginal effects, they can be explained by the relatively small number of reps and hours off work per rep (five hours per month) that the law requires firms to recognise and support. Given this low baseline, it is more understandable that an increase in the number of hours for union activities that follows from an additional union rep can lead to a large marginal effect in the intensity of the interaction between workers and firm owners mediated by union reps and subsequently a large effect on firm performance. This interpretation also implies that one would not necessarily expect similarly large effects from additional union reps in countries where they are already entitled to generous provisions, either in terms of numbers or time for union activities. These results also may not hold in countries or firms with high-quality management practices, where union-rep intermediation may not add as much value: Bloom et al. (2017) presents survey evidence that the average quality of management practices in Portugal is ranked 8th out of the 12 European countries examined.

We also find evidence that the positive effects on firm performance that we document may be driven by stronger investments by firms in the training of their workers, a result that is consistent with the focus placed by most unions on the investment in the human capital of their members. However, we cannot rule out the possibility that other dimensions of union activities are also important. These would include more qualitative aspects such as the type of industrial relations inside the firm, as workers' voice is potentially made more cohesive through the intermediation of union reps and the resulting dialogue with employers can become more productive.

On the other hand, despite the significant effects on firm-level performance, we find no effects of union reps on the wages of their co-workers. This result can be explained by the institutional context considered here, which is characterised by sectoral-level collective bargaining and widespread extensions of agreements to non-affiliated firms and their workers. In other words, while the gains in productivity from (additional) union reps arise at the firms where they are based, most of the wage bargaining (rent sharing) takes place at the sectoral level. The wage levels of different firms in the same sector would therefore not necessarily be significantly different, and would not respond to differences in union reps, even if some firms experienced stronger increases in performance driven by union reps. The importance of

wages defined at sectoral agreements can also explain part of the positive effects on training that we find, as rigid wages can amount to a further incentive for firms to invest in training, magnifying the push in that direction from union reps. Moreover, the heterogeneity in performance across firms combined with the common wage levels can in turn lead to within-sector mismatches between productivity growth and wage growth. These potential mismatches are also consistent with some of our findings about the positive effects of union reps on firm-level employment.

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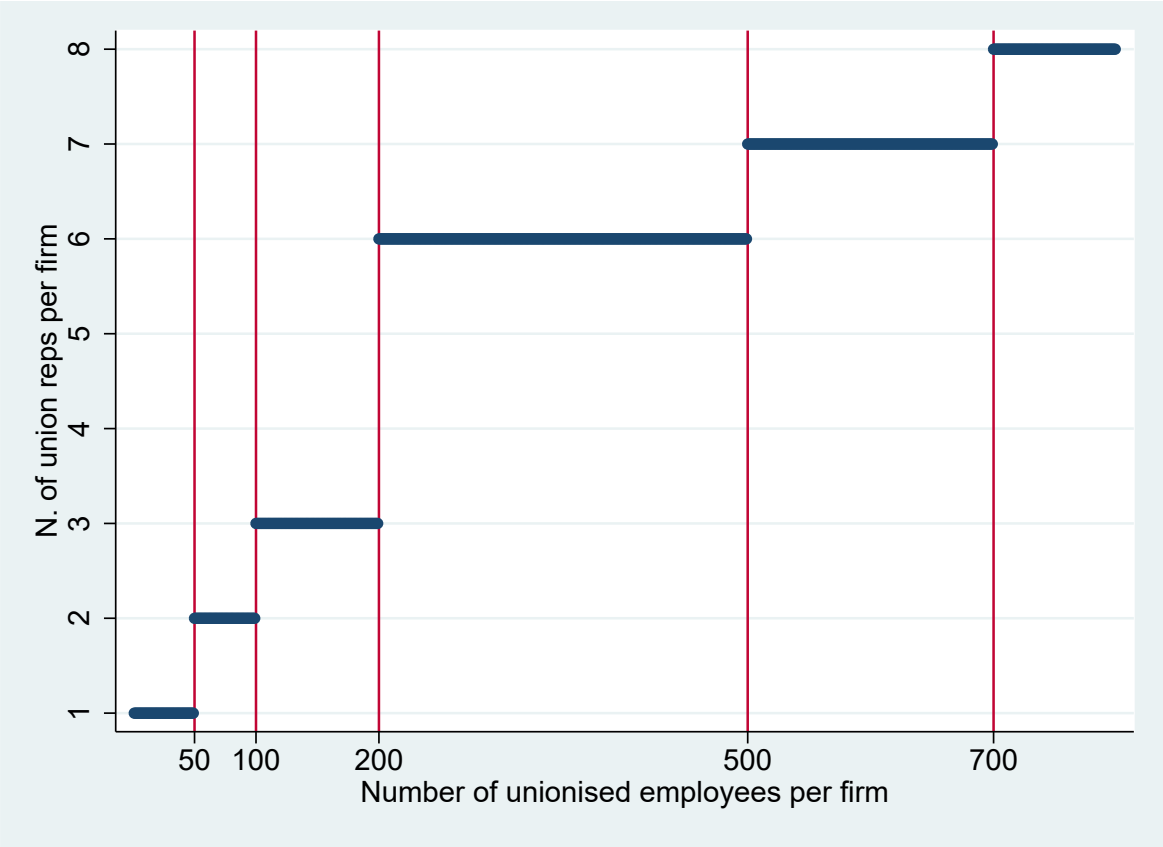
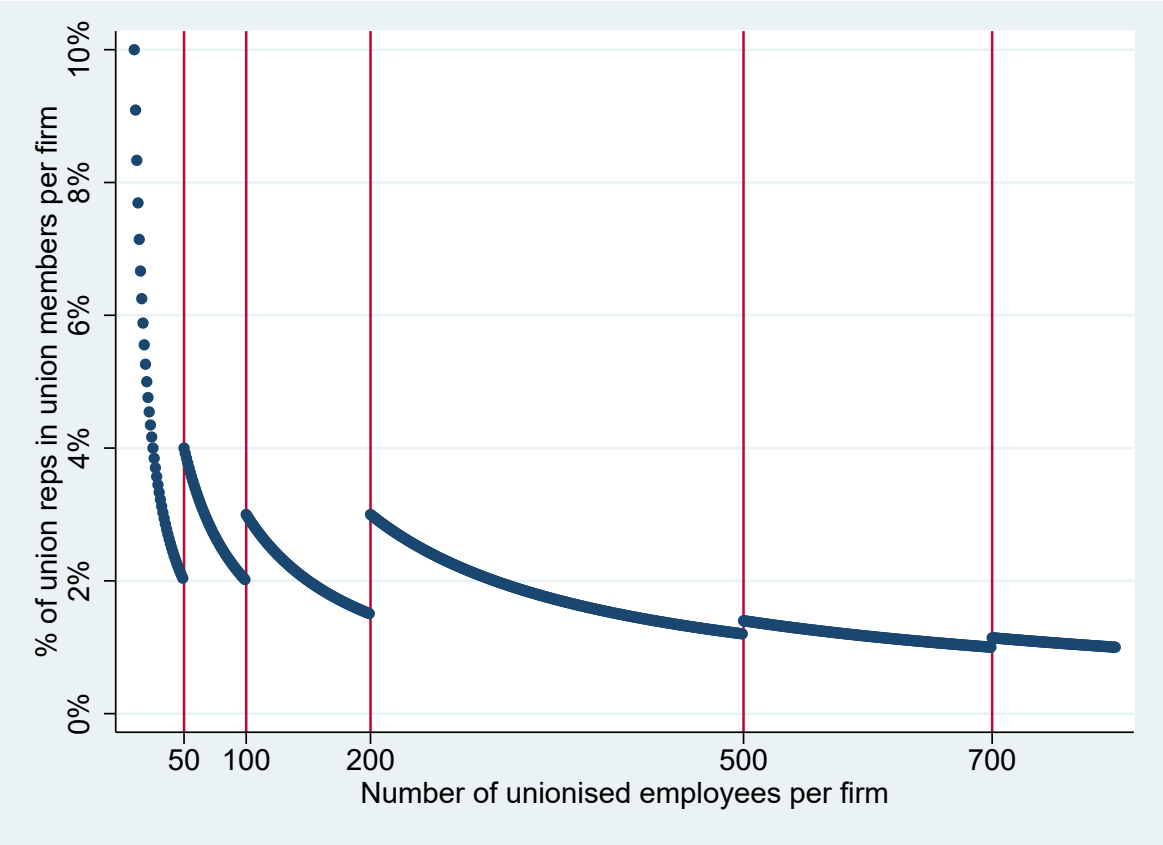
Figure 1: Legal requirements on the number of union delegates by union members



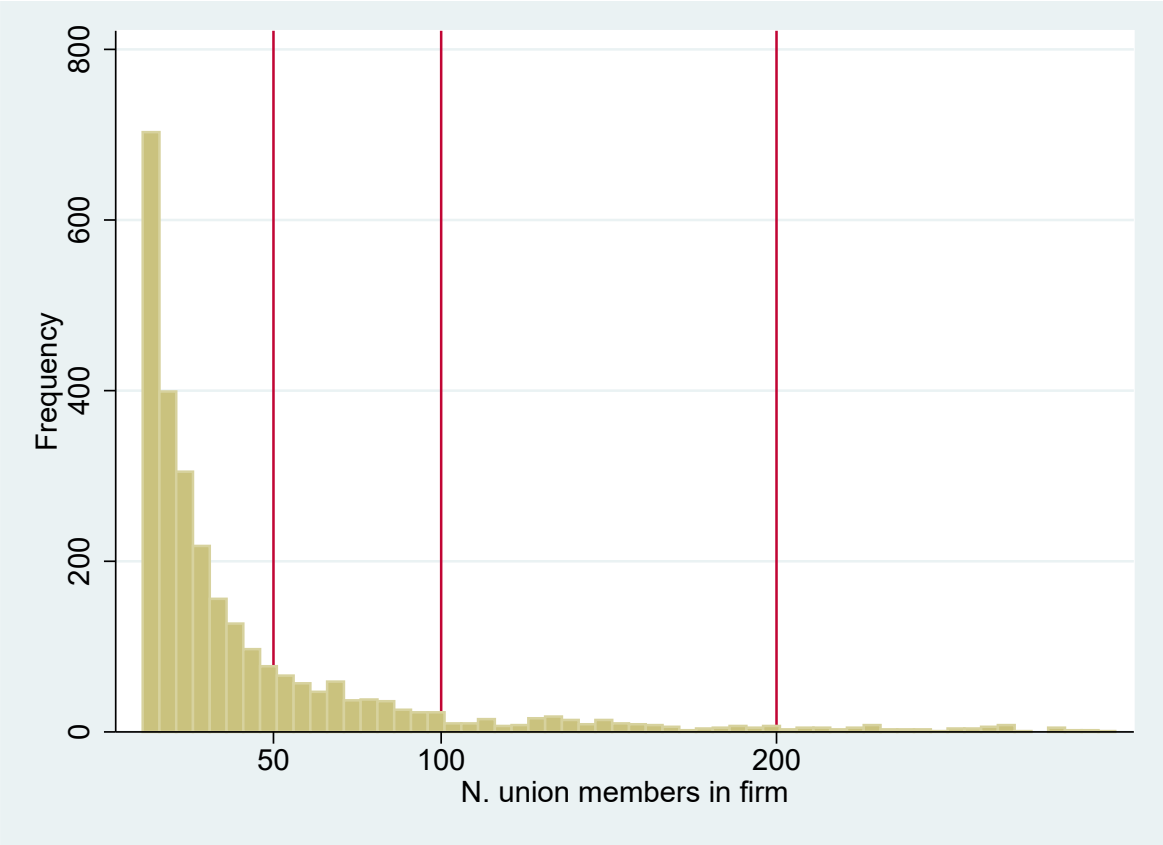
Source: Labour Code of Portugal (Article 463). Range of unionised workers considered between 10 and 800.

Figure 2: Percentage of union delegates per union members and number of union members



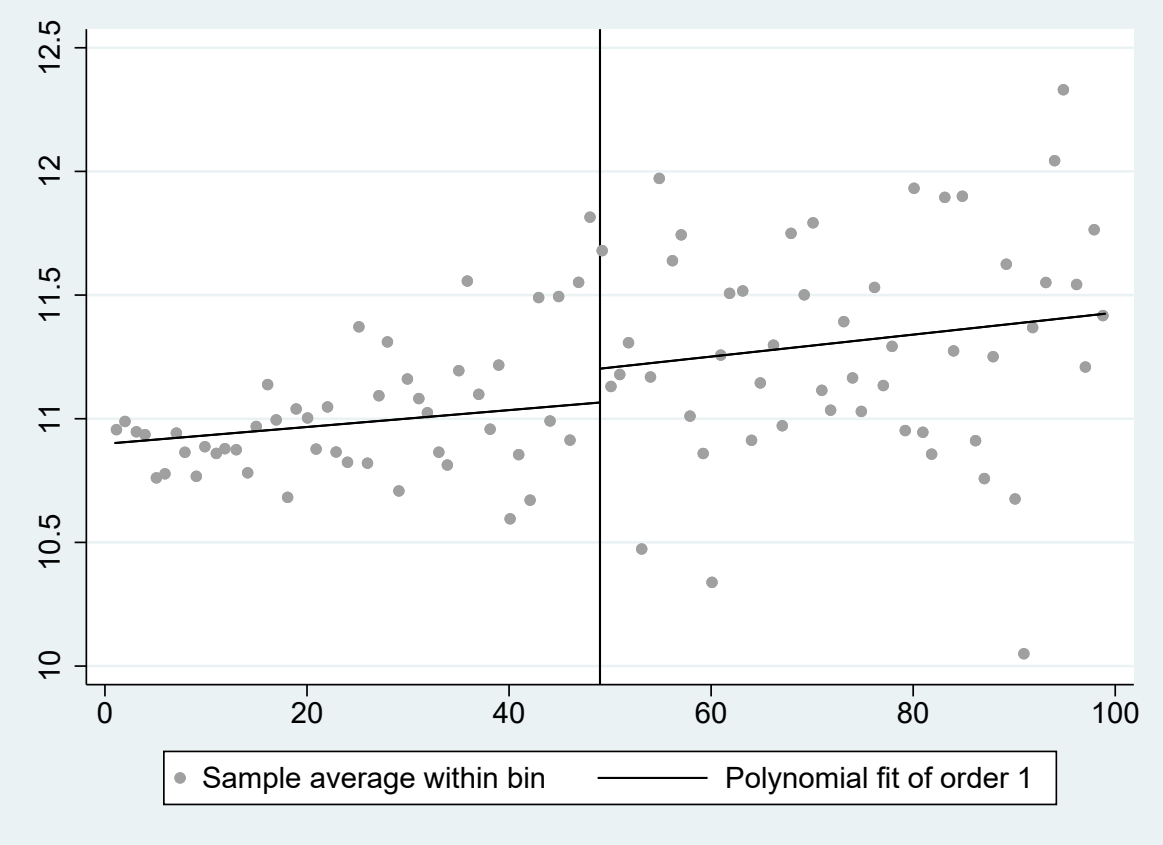
Source: Own calculations based on Labour Code of Portugal (Article 463). The range of unionised workers considered between 10 and 800.

Figure 3: Distribution of firms by number of union members



Notes: The sample is all firms in Portugal employing at least ten workers and between one and 300 union members, as measured in October 2010. Own calculations based on the 'Quadros de Pessoal' data set.

Figure 4: Scatterplot of average firm performance by number of union members



Notes: The sample is all firms in Portugal employing at least ten workers and between one and 100 union members, as measured in October 2010. Firm performance is measured as the log of total sales divided by the number of workers. Own calculations based on the 'Quadros de Pessoal' data set.

Table 1: Descriptive statistics

	Mean	SD
Union members	26.89	73.47
Additional union rep(s)	0.07	0.26
75 <= Union Membership < 150	0.04	0.20
150 <= Union Membership < 250	0.02	0.13
250 <= Union Membership < 600	0.01	0.11
600 <= Union Membership < 800	0.00	0.05
800 <= Union Membership < 1000	0.00	0.02
1000 <= Union Membership < 1200	0.00	0.03
Workers	124.69	343.48
Log sales per worker	10.99	1.34
Firm age: 10-19 years	0.24	0.43
Firm age: 20-49 years	0.43	0.49
Firm age: 50+ years	0.16	0.37
Foreign-owned firm	0.16	0.36
Aveiro district	0.09	0.29
Braga district	0.08	0.27
Porto district	0.30	0.46
Lisbon district	0.16	0.37
Setubal district	0.06	0.24
Incorporated firm	0.77	0.42
Foreign-owned firm	0.16	0.36
Training provided	0.64	0.48
Log training hours	6.59	1.86
Log training (+1) per worker	0.26	3.01
Exporter	0.32	0.47
Log exports	12.98	3.26
Log exports per worker	8.61	3.05
Log equity per worker	8.69	2.03
Log workers	3.97	1.14
Log average total pay	6.81	0.46
Log 25th percentile total pay	6.49	0.43
Log median total pay	6.71	0.42
Ratio between 75th and 25th percentiles of total pay within each firm	1.67	1.49
Artificial additional union rep(s) (1)	0.05	0.21
Artificial additional union rep(s) (2)	0.03	0.18
N	6489	

Notes: 6,489 observations. 'Workers' ('Union members') are the numbers of workers (union members) in each firm (October 2010); 'Additional union rep(s)' is a dummy variable (dv) equal to one if the union members number is just above the thresholds at which the law establishes that firms should have one (or more) additional union reps (50-75, 100-150, 200-250, 500-600, 700-800, 900-1000); '75 <= U. Membership < 150' is a dv equal to one for firms with membership ranges of 75 to 150 workers (similarly for the other dv's); 'Log sales per worker' is the log of 2010 total sales divided by the number of workers; 'Firm age: 10-19 years' is a dv equal to one for firms founded 10-19 years before 2010; 'Foreign-owned firm' is a dv equal to one for firms in which 50% of more of equity is owned by foreign investors; 'Aveiro district' is a dv equal to one for firms based in the Aveiro region; 'Training provided' is a dv equal to one if at least one hour of training is provided by the firm in 2010; 'Log training hours (+1) per worker' is the log of 2010 training hours (plus one) divided by the number of workers; 'Exporter status' is a dv equal to one for firms that export in 2010; 'Log average total pay per worker' includes base pay plus other available items; 'Artificial add. union rep(s) (1) and (2)' are dv's equal to one if for firms in which the number of union members is 25 or 50 workers above the legal thresholds (eg 75-100, 120-175, 250-300, 600-700, etc). Own calculations based on the 'Quadros de Pessoal'.

Table 2: Firm performance effects: main specification

	(1)	(2)	(3)
Additional unions rep(s)	.157	.132	.140
	(.063)**	(.066)**	(.067)**
Union members	-.00003	.001	.0005
	(.0008)	(.001)	(.001)
(Union members)^2		-.0002	.0001
		(.0001)	(.0003)
(Union members)^3			-.003
			(.003)
75 <= U. Membership < 150	.139	.084	.093
	(.084)*	(.095)	(.096)
150 <= U. Membership < 250	.285	.197	.186
	(.150)*	(.166)	(.165)
250 <= U. Membership < 600	.383	.335	.247
	(.281)	(.285)	(.286)
600 <= U. Membership < 800	.155	.562	.499
	(.586)	(.623)	(.632)
800 <= U. Membership < 1000	.607	1.417	1.667
	(.756)	(.902)	(.953)*
1000 <= U. Membership < 1200	.138	1.665	2.827
	(.943)	(1.342)	(1.666)*
Const.	10.961	10.950	10.954
	(.014)***	(.016)***	(.017)***
Obs.	6489	6489	6489
R^2	.62	.62	.62

Notes: The columns present different specifications of a (sharp) regression discontinuity model. The dependent variable is the log of 2010 sales per worker. The running variable (total number of unionised workers in 2010). The key regressor ('Additional union rep(s)') is a dummy variable taking value one for firms employing ranges of unionised workers just above the threshold established by labour law corresponding to one or more additional union representatives: 50-75, 100-150, 200-250, 500-600, 700-800, 900-1000 and 1100-1200 unionised workers. The sample is all firms in Portugal employing at least ten workers (unionised or not) and between one and 1,200 unionised workers, as measured in October 2010. All specifications include 635 industry fixed effects defined at the five-digit level. The first (second, third) column consider a linear (quadratic, cubic) specification in the number of unionised workers. Own calculations based on the 'Quadros de Pessoal' data set. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table 3: Firm performance effects: alternative specification

	(1)	(2)	(3)
50 <= U. Membership < 100	.175	.186	.192
	(.063)***	(.075)**	(.075)**
100 <= U. Membership < 200	.238	.256	.337
	(.124)*	(.141)*	(.172)*
200 <= U. Membership < 500	.358	.364	.605
	(.209)*	(.211)*	(.327)*
Union members	.0002	-3.76e-06	.0008
	(.0008)	(.001)	(.001)
(Union members)^2		.00007	-.001
		(.0003)	(.001)
(Union members)^3			.021
			(.025)
Const.	10.953	10.955	10.950
	(.014)***	(.016)***	(.017)***
Obs.	6454	6454	6454
R^2	.619	.619	.619

Notes: See notes to Table 2 for explanation of results. The main regressors are a list of range of unionised workers at which the minimum number of union reps is increased: 50-100, 100-200, and 200-500.The sample is all firms in Portugal employing at least ten workers (unionised or not) and between one and 1500 unionised workers, as measured in October 2010. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table 4: Firm performance effects: robustness checks

Panel A (controls)	(1)	(2)	(3)	(4)
Additional union rep(s)	.158	.140	.160	.128
	(.090)*	(.065)**	(.067)**	(.062)**
Union members	.001	.0009	-.0001	-.0002
	(.001)	(.0009)	(.0009)	(.0008)
Const.	10.925	10.947	10.957	12.000
	(.021)***	(.016)***	(.015)***	(.587)***
No industry controls	X			
Two-digit industry controls		X		
Collective agreement FEs			X	
Firm-level controls				X
Obs.	6489	6489	6489	6489
R^2	.014	.496	.504	.639

Panel B (no range controls)	(1)	(2)	(3)
Additional union rep(s)	.146	.094	.088
	(.048)***	(.051)*	(.053)*
Union members	.0007	.002	.002
	(.0002)***	(.0004)***	(.0006)***
(Union members)^2		-.0002	-.0002
		(.00005)***	(.0002)
(Union members)^3			.0006
			(.001)
Const.	10.959	10.944	10.942
	(.012)***	(.013)***	(.014)***
Obs.	6489	6489	6489
R^2	.619	.619	.619

Panel C (no clustering)	(1)	(2)	(3)
Additional union rep(s)	.157	.132	.140
	(.064)**	(.066)**	(.067)**
Union members	-.00003	.001	.0005
	(.0008)	(.001)	(.001)
(Union members)^2		-.0002	.0001
		(.0002)	(.0004)
(Union members)^3			-.003
			(.003)
Const.	10.961	10.950	10.954
	(.014)***	(.016)***	(.017)***
Obs.	6489	6489	6489
R^2	.62	.62	.62

Notes: See notes to Table 2 for explanation of results. Panel A includes either no industry controls (column 1) or different types of industry and or firm controls (two-digit industry controls, collective agrement fixed effects, and a large set of firm-level controls - industry, region, firm legal type, firm age, and foreign ownership status). Panel B excludes controls for union membership ranges. Panel C includes these controls (not reported) but does not include any clustering of standard errors. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table 5: Firm performance effects: falsification checks

Panel A	(1)	(2)	(3)
False additional union rep(s) (1)	-.025	-.031	-.031
	(.078)	(.078)	(.078)
Union members	.002	.002	.002
	(.0007)***	(.0008)***	(.0009)**
(Union members)^2		-.0001	-.0001
		(.0001)	(.0004)
(Union members)^3			.00007
			(.004)
Const.	10.945	10.940	10.940
	(.014)***	(.015)***	(.016)***
Obs.	6489	6489	6489
R^2	.62	.62	.62

Panel B	(1)	(2)	(3)
False additional union rep(s) (2)	-.050	-.057	-.057
	(.074)	(.075)	(.076)
Union members	.002	.002	.002
	(.0006)***	(.0007)***	(.0008)***
(Union members)^2		-.0001	-.0002
		(.0001)	(.0004)
(Union members)^3			.0004
			(.004)
Const.	10.945	10.940	10.940
	(.014)***	(.015)***	(.015)***
Obs.	6489	6489	6489
R^2	.62	.62	.62

Notes: Panel A considers the falsified 'additional union rep(s)' ranges at 75-100, 120-175, 250-300, 600-700, 800-900, and 1000-1100. Panel B considers the falsified 'additional union rep(s)' ranges at 85-110, 130-185, 270-325, 625-725, 825-925, and 1050-1150. The controls for union membership ranges are adjusted correspondingly. See the notes to Table 2 for additional explanations of the results. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table 6: Additional firm-level outcomes: equity, exports, and workers

Panel A	(1) Log profits per worker	(2) Export status	(3) Log exports per worker
Additional union rep(s)	.235 (.076)***	.081 (.025)***	.460 (.249)*
Union members	-.0004 (.001)	.001 (.0003)***	-.001 (.004)
Const.	10.820 (.018)***	.281 (.006)***	8.506 (.080)***
Obs.	5669	6713	2100
R^2	.558	.524	.58

Panel B	(1) Log equity per worker	(2) Log number of workers	(3) Survival by 2013
Additional union rep(s)	.213 (.118)*	.177 (.067)***	.058 (.020)***
Union members	-.001 (.001)	.014 (.001)***	-9.00e-06 (.0003)
Const.	8.659 (.026)***	3.643 (.017)***	.862 (.005)***
Obs.	5748	6713	6713
R^2	.446	.516	.138

Notes: The columns present different specifications of a (sharp) regression discontinuity model. The dependent variables are . See the notes to Table 2 for additional explanation of the results. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table 7: Training effects: different margins

	(1) Training probability	(2) Log training	(3) Log training per worker
Additional union rep(s)	.046 (.028)	.275 (.137)**	.414 (.210)**
Union members	.002 (.0004)***	.012 (.002)***	.005 (.003)
Const.	.596 (.007)***	6.202 (.034)***	.049 (.044)
Obs.	6713	4241	6713
R^2	.226	.328	.226

Notes: The columns present different specifications of a (sharp) regression discontinuity model. The dependent variables are the probability that the firm provided training in 2010, the log total training hours for all workers, and the log training hours (plus one) per worker. See the notes to Table 2 for additional explanation of the results. Significance levels: * 0.10, ** 0.05, *** 0.01.

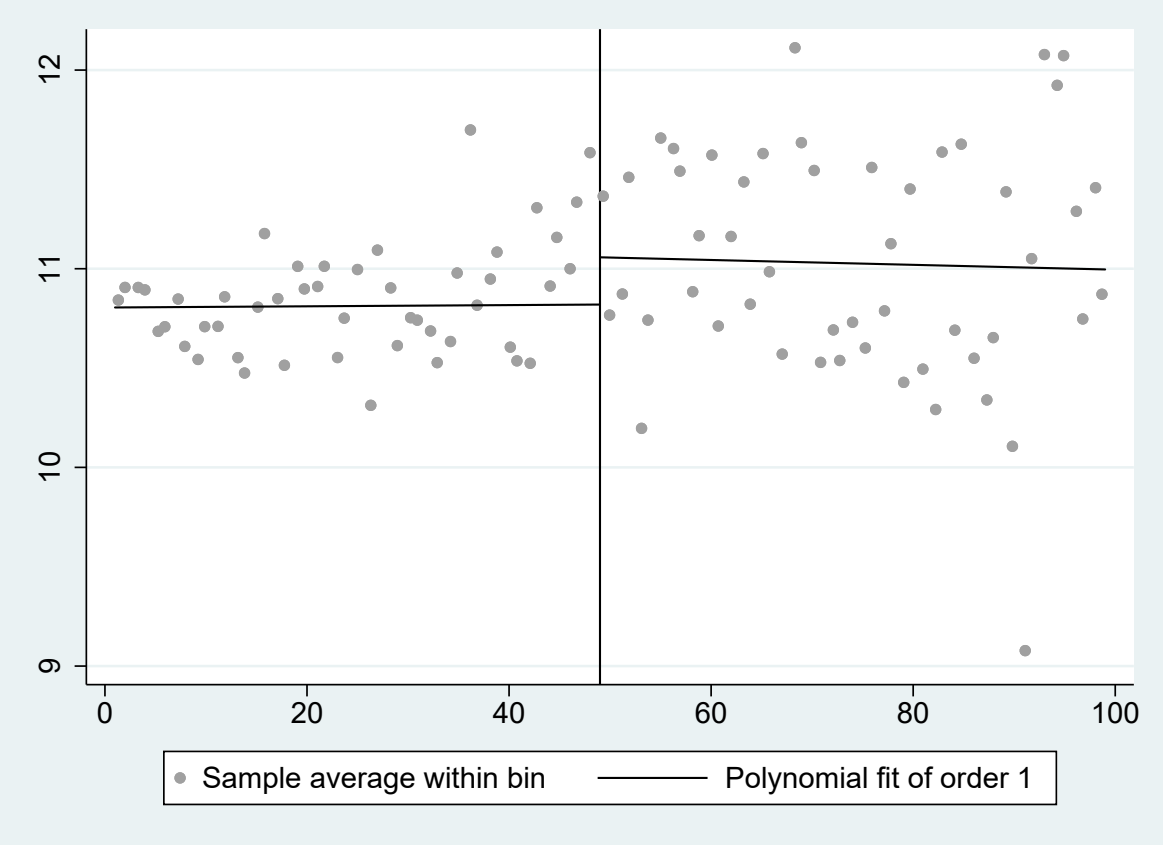
Table 8: Wage effects: firm- and worker-level analysis

Panel A	(1) Log average pay	(2) Log 25th perc pay	(3) Log median pay	(4) 75th/25th perc ratio
Additional union rep(s)	.016	.003	.007	-.061
	(.021)	(.024)	(.021)	(.088)
Union members	.0007	.0003	.0005	.0007
	(.0003)***	(.0003)	(.0003)*	(.001)
Const.	6.782	6.480	6.689	1.675
	(.005)***	(.005)***	(.005)***	(.018)***
Obs.	6709	6624	6698	6624
R^2	.574	.474	.596	.11

Panel B	(1)	(2)	(3)
Additional union rep(s)	.0001	-.030	-.037
	(.021)	(.023)	(.025)
Union members	-.0001	.001	.001
	(.0003)	(.0004)**	(.0005)**
(Union members)^2		-.0001	-.0002
		(.00004)***	(.0001)*
(Union members)^3			.0005
			(.0008)
Const.	1.685	1.666	1.662
	(.008)***	(.010)***	(.010)***
Obs.	818204	818204	818204
R^2	.39	.391	.391

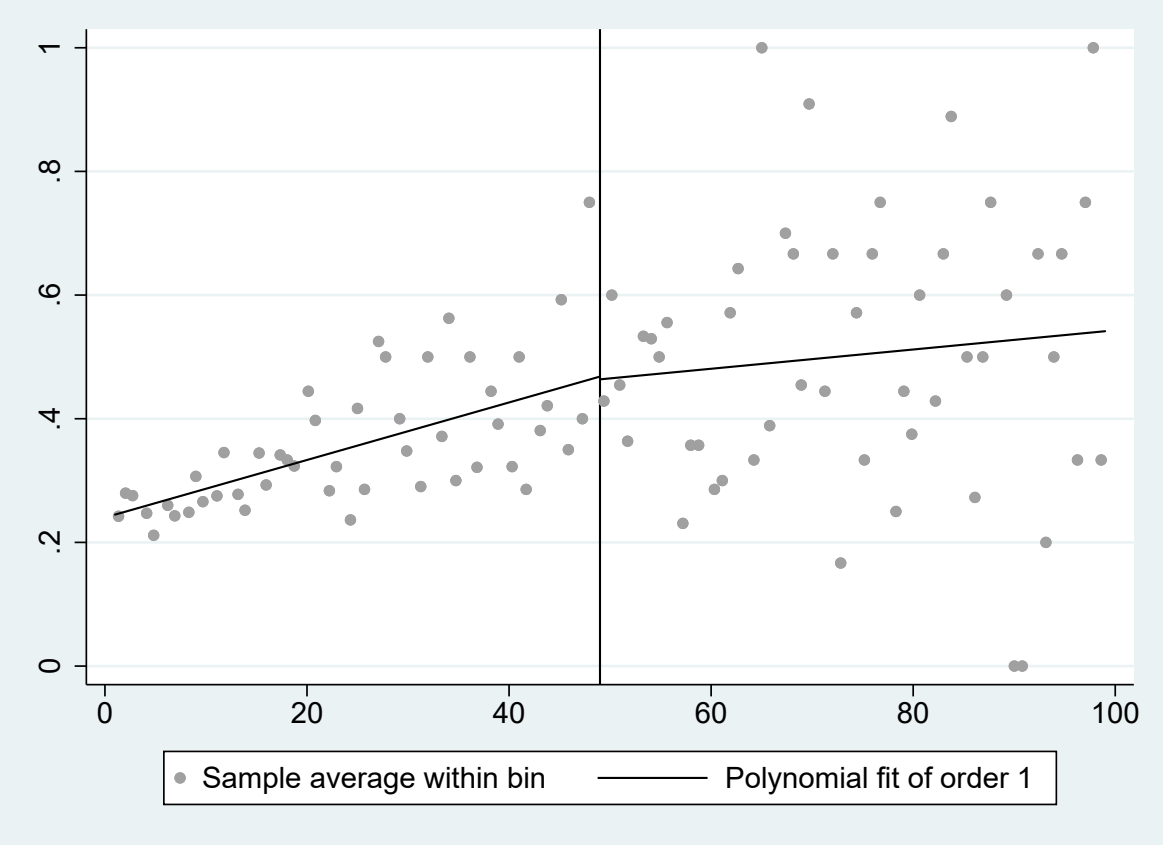
Notes: The columns of Panel A (firm-level analysis) present different specifications of a (sharp) regression discontinuity model. The dependent variables in Panel A are the log firm-level average total pay in October 2010, the log 25th percentile total pay, the log median total pay, and the ratio of the 75th and 25th percentiles of total pay. Panel B presents the worker-level analysis, under different polynomials of the number of union members and using the log of the hourly total monthly pay of each worker as the dependent variable in all specifications. Significance levels: * 0.10, ** 0.05, *** 0.01.

Figure A1: Scatterplot of average firm profits by number of union members



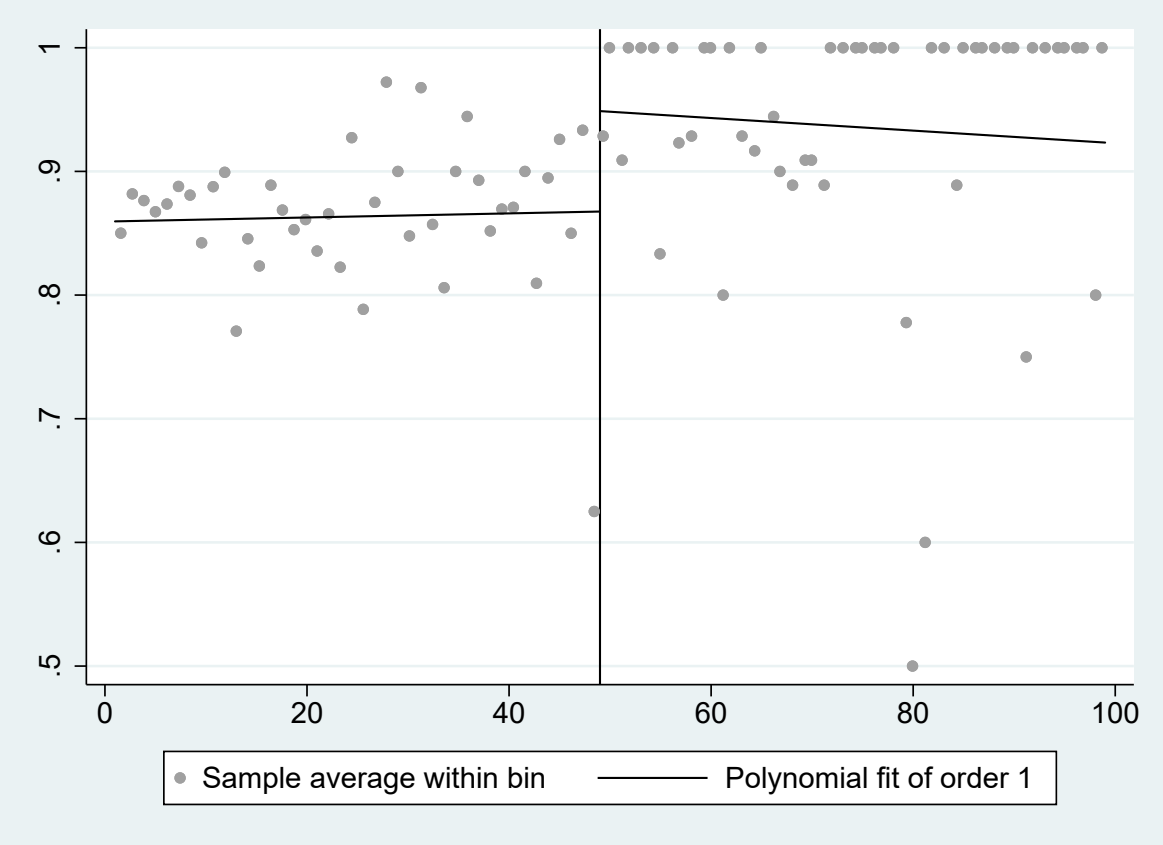
Notes: The sample is all firms in Portugal employing at least ten workers and between one and 100 union members, as measured in October 2010. Firm profits is measured as the log of total profits divided by the number of workers. Own calculations based on the 'Quadros de Pessoal' data set.

Figure A2: Scatterplot of average firm export probability by number of union members



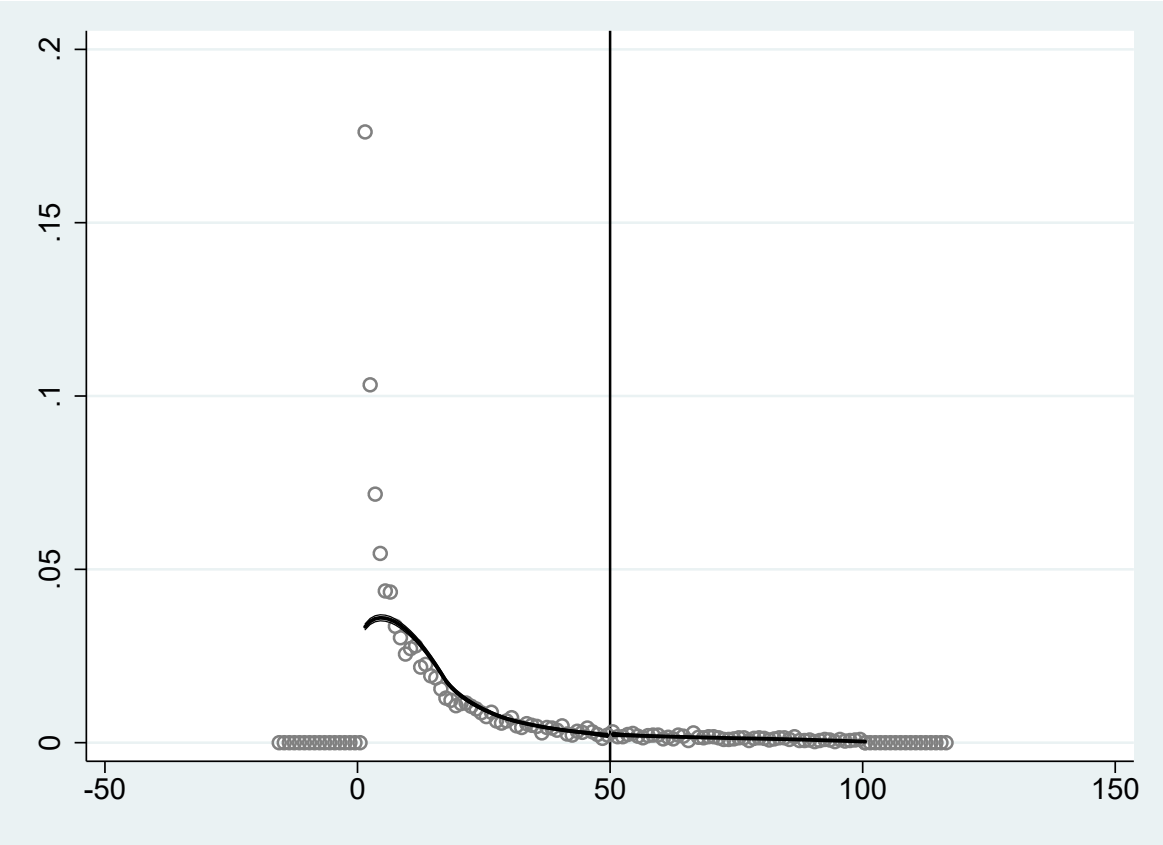
Notes: The sample is all firms in Portugal employing at least ten workers and between one and 100 union members, as measured in October 2010. Firm export probability is measured as a dummy variable equal to one if the firm exports in 2010. Own calculations based on the 'Quadros de Pessoal' data set.

Figure A3: Scatterplot of average firm survival by number of union members



Notes: The sample is all firms in Portugal employing at least ten workers and between one and 100 union members, as measured in October 2010. Firm survival is measured as a dummy variable equal to one if the firm is operating in 2013. Own calculations based on the 'Quadros de Pessoal' data set.

Figure A4: McCrary analysis



Notes: The sample is all firms in Portugal employing at least ten workers and between one and 100 union members, as measured in October 2010. Own calculations based on the 'Quadros de Pessoal' data set.

Table A1: Descriptive statistics - specific ranges of unionised workers

	Number of unionised workers in the firm							
	1-49		50-99		30-49		50-70	
	mean	sd	mean	sd	mean	sd	mean	sd
Union members	10.15	10.90	69.45	13.82	38.68	5.29	58.81	5.95
Additional union rep(s)	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
Workers	74.20	123.47	319.34	694.47	134.66	149.54	297.36	635.41
Log sales per worker	10.93	1.34	11.28	1.27	11.10	1.28	11.22	1.24
Firm age: 10-19 years	0.24	0.43	0.21	0.41	0.25	0.43	0.21	0.41
Firm age: 20-49 years	0.43	0.50	0.43	0.50	0.42	0.49	0.45	0.50
Firm age: 50+ years	0.16	0.37	0.20	0.40	0.20	0.40	0.21	0.41
Foreign-owned firm	0.15	0.36	0.21	0.40	0.16	0.37	0.19	0.40
Aveiro district	0.09	0.29	0.09	0.28	0.13	0.34	0.09	0.29
Braga district	0.08	0.27	0.07	0.26	0.09	0.29	0.06	0.24
Porto district	0.28	0.45	0.33	0.47	0.23	0.42	0.33	0.47
Lisbon district	0.16	0.37	0.18	0.38	0.15	0.35	0.19	0.39
Setubal district	0.06	0.24	0.05	0.22	0.08	0.27	0.04	0.19
Incorporated firm	0.76	0.43	0.83	0.38	0.84	0.36	0.81	0.39
Foreign-owned firm	0.15	0.36	0.21	0.40	0.16	0.37	0.19	0.40
Training provided	0.61	0.49	0.84	0.37	0.73	0.44	0.81	0.40
Log training hours	6.30	1.75	7.64	1.70	7.05	1.62	7.60	1.74
Log training (+1) pw	0.11	2.99	1.22	2.95	0.62	3.10	1.08	3.08
Exporter	0.30	0.46	0.50	0.50	0.43	0.50	0.48	0.50
Log exports	12.61	3.06	14.24	3.27	13.78	2.96	13.82	3.40
Log exports per worker	8.53	2.89	8.95	3.43	9.07	2.81	8.66	3.56
Log equity per worker	8.62	2.00	9.02	2.17	8.91	2.01	8.89	2.17
Log workers	3.75	0.96	5.17	0.91	4.55	0.77	5.04	0.95
Log average total pay	6.79	0.45	6.89	0.46	6.85	0.45	6.86	0.45
Log 25th perc total pay	6.48	0.42	6.54	0.47	6.51	0.46	6.51	0.47
Log median total pay	6.69	0.41	6.75	0.46	6.73	0.44	6.73	0.45
Ratio 75th-25 pay perc	1.68	1.56	1.68	0.83	1.81	3.26	1.71	0.85
N	5732		419		419		231	

Notes: The table presents means and standard deviations of each variable for a subset of the full data set defined by a particular range of the number of unionised workers: 1-49, 50-99, 30-49, and 50-70 unionised workers. Please see the description of the variables in the notes to Table 1.

Table A2: Analysis of differences in predetermined variables (1st model)

Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Industry 1	.531	Industry 41	.415	Age category 1	.362
Industry 2	.17	Industry 42	.499	Age category 2	.644
Industry 3	.293	Industry 43	.898	*Age category 3*	.09
Industry 4	.78	Industry 44	.804	Age category 4	.78
Industry 5	.897	Industry 45	.398	Age category 5	.207
Industry 6	.965	Industry 46	.962	Age category 6	.589
Industry 7	.662	Industry 47	.438	*Foreign firm*	.02
Industry 8	.332	Industry 48	.781	*Region 1*	.032
Industry 9	.11	Industry 49	.158	Region 2	.27
Industry 10	.865	Industry 50	.783	*Region 3*	.019
Industry 11	.032	Industry 51	.426	Region 4	.964
Industry 12	.405	Industry 52	.421	Region 5	.966
Industry 13	.864	Industry 53	.353	Region 6	.965
Industry 14	.17	Industry 54	.345	Region 7	.926
Industry 15	.252	Industry 55	.488	Region 8	.715
Industry 16	.296	Industry 56	.945	Region 9	.669
Industry 17	.522	Industry 57	.963	Region 10	.557
Industry 18	.306	Industry 58	.131	*Region 11*	.001
Industry 19	.89	Industry 59	.532	Region 12	.338
Industry 20	.103	Industry 60	.134	Region 13	.268
Industry 21	.047	Industry 61	.615	Region 14	.52
Industry 22	.449	Industry 62	.233	Region 15	.215
Industry 23	.15	Industry 63	.947	Region 16	.46
Industry 24	.322	*Industry 64*	.048	Region 17	.968
Industry 25	.025	Industry 65	.408	Region 18	.162
Industry 26	.636	Industry 66	.752	Region 19	.904
Industry 27	.424	Industry 67	.287	Region 20	.235
Industry 28	.343	Industry 68	.946	Region 21	.168
Industry 29	.954	Industry 69	.606	Firm legal type 1	.262
Industry 30	.618	Industry 70	.436	Firm legal type 2	.634
Industry 31	.605	Industry 71	.854	Firm legal type 3	.942
Industry 32	.118	*Industry 72*	.092	Firm legal type 4	.987
Industry 33	.137	Industry 73	.716	Firm legal type 5	.197
Industry 34	.05	Industry 74	.381	*Firm legal type* 6	.029
Industry 35	.935	Industry 75	.995	Firm legal type 7	.639
Industry 36	.254	Industry 76	.234	Firm legal type 8	.847
Industry 37	.746	Industry 77	.141	Firm legal type 9	.32
Industry 38	.292	Industry 78	.132	Firm legal type 10	.191
Industry 39	.002	Industry 79	.178	Empl assoc affil	.794
Industry 40	.563	Industry 80	.136		

Notes: The cofficients presented are obtained from individual regressions of the presumably predetermined variables listed in the table. They follow from our benchmark model (linear control for the number of unionised workers) and considering the full range of unionised workers.

Table A3: Analysis of differences in predetermined variables (2nd model)

Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Industry 1	.560	Industry 41	.825	Age category1	.199
Industry 2	.655	Industry 42	.634	Age category2	.952
Industry 3	.346	Industry 43	.906	Age category3	.108
Industry 4	.312	Industry 44	.398	Age category4	.612
Industry 5	.526	Industry 45	.575	Age category5	.217
Industry 6	.566	Industry 46	.925	Age category6	.719
Industry 7	.338	Industry 47	.562	Foreign owned	.223
Industry 9	.005	Industry 48	.95	*Region 1*	.092
Industry 10	.392	Industry 49	.136	Region 2	.905
Industry 11	.3	Industry 50	.487	*Region 3*	.076
Industry 12	.388	Industry 51	.76	Region 4	.713
Industry 13	.697	Industry 52	.654	Region 5	.948
Industry 14	.161	Industry 53	.271	Region 6	.954
Industry 15	.193	Industry 54	.377	Region 7	.742
Industry 16	.585	Industry 55	.589	Region 8	.348
Industry 17	.694	Industry 56	.988	Region 9	.871
Industry 18	.153	Industry 57	.726	Region 10	.813
Industry 19	.367	Industry 58	.484	*Region 11*	.069
Industry 20	.729	Industry 59	.472	Region 12	.98
Industry 21	.12	Industry 60	.247	Region 13	.118
Industry 22	.852	Industry 61	.795	Region 14	.878
Industry 23	.573	Industry 62	.223	*Region 15*	.062
Industry 24	.759	Industry 63	.678	Region 16	.948
Industry 25	.02	*Industry 64*	.053	Region 17	.82
Industry 26	.749	Industry 65	.171	Region 18	.366
Industry 27	.725	Industry 66	.285	Region 19	.55
Industry 28	.314	Industry 67	.573	Region 20	.4
Industry 29	.05	Industry 68	.343	Region 21	.167
Industry 30	.418	Industry 69	.761	Firm legal type 1	.125
Industry 31	.644	Industry 70	.915	Firm legal type 2	.422
Industry 32	.21	Industry 71	.811	Firm legal type 3	.866
Industry 33	.009	Industry 72	.964	*Firm legal type 4*	.071
Industry 34	.268	Industry 73	.255	Firm legal type 5	.11
Industry 35	.749	Industry 74	.235	Firm legal type 6	.155
Industry 36	.863	Industry 75	.908	Firm legal type 7	.631
Industry 37	.3	Industry 76	.307	Firm legal type 8	.83
Industry 38	.344	Industry 77	.734	Firm legal type 9	.147
Industry 39	.054	Industry 78	.25	Firm legal type 10	.651
Industry 40	.741	Industry 79	.489	*Empl assoc affil*	.017
		Industry 80	.468		

Notes: The cofficients presented are obtained from individual regressions of the presumably predetermined variables listed in the table. They follow from our benchmark model (quadratic control for the number of unionised workers) and considering the 1-99 range of unionised workers.

Table A4: Robustness 1: including specific covariates in regression

	(1)	(2)	(3)	(4)
Additional union rep(s)	.119	.125	.099	.109
	(.048)**	(.062)**	(.065)	(.066)*
Union members		-.0001	.0009	.0003
		(.0008)	(.001)	(.001)
(Union members)^2			-.0002	.0002
			(.0001)	(.0003)
(Union members)^3				-.004
				(.003)
Const.	10.855	10.857	10.845	10.851
	(.012)***	(.019)***	(.020)***	(.021)***
Obs.	6489	6489	6489	6489
R^2	.628	.628	.629	.629

Notes: This specification is based on the benchmark model (full range of unionised workers) but includes 13 additional control variables that are significant at the 10% level in the analysis presented in Table A2. Please see notes to Table 2 for more details on the models considered. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A5: Robustness 1: including specific covariates in regression (1-99 subsample)

	(1)	(2)	(3)	(4)
Additional union rep(s)	.151	.136	.064	-.038
	(.042)***	(.079)*	(.092)	(.111)
Union members		.0003	-.002	-.008
		(.001)	(.002)	(.004)*
(Union members)^2			.004	.029
			(.003)	(.015)*
(Union members)^3				-1.948
				(1.129)*
Const.	10.838	10.835	10.846	10.868
	(.012)***	(.020)***	(.022)***	(.026)***
Obs.	6151	6151	6151	6151
R^2	.627	.627	.627	.627

Notes: This specification is based on the benchmark model (1-99 unionised workers subsample) but includes eleven additional control variables that are significant at the 10% level in the analysis presented in Table A3. Please see notes to Table 2 for more details on the models considered. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A6: Robustness 2: considering only firms with 1-99 unionised workers

	(1)	(2)	(3)	(4)
Additional union rep(s)	.191	.166	.099	-.004
	(.043)***	(.081)**	(.094)	(.114)
Union members		.0004	-.001	-.008
		(.001)	(.002)	(.004)*
(Union members)^2			.004	.029
			(.003)	(.015)*
(Union members)^3				-1.951
				(1.143)*
Const.	10.945	10.940	10.950	10.973
	(.010)***	(.016)***	(.018)***	(.023)***
Obs.	6151	6151	6151	6151
R^2	.617	.617	.618	.618

Notes: This specification is based on the benchmark model but the sample is based exclusively on firms employing 1-99 unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A7: Robustness 3: considering only firms with more than 30 unionised workers

	(1)	(2)	(3)	(4)
Additional union rep(s)	.130	.149	.109	.133
	(.069)*	(.080)*	(.091)	(.114)
Union members		-.0005	.002	.0002
		(.001)	(.003)	(.005)
(Union members)^2			-.0002	.00006
			(.0003)	(.0008)
(Union members)^3				-.002
				(.005)
Const.	11.162	11.179	11.105	11.151
	(.048)***	(.063)***	(.107)***	(.164)***
Obs.	1221	1221	1221	1221
R^2	.692	.692	.692	.692

Notes: This specification is based on the benchmark model but the sample is based exclusively on firms employing at least 30 unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A8: Robustness 4: considering the role of employer association affiliation

	(1)	(2)	(3)	(4)
Additional union rep(s)	.171	.180	.155	.163
	(.078)**	(.092)**	(.094)*	(.095)*
Additional union rep(s) * Empl. assoc. member	-.034	-.035	-.032	-.030
	(.094)	(.095)	(.094)	(.094)
Employer assoc. member	.089	.089	.088	.088
	(.026)***	(.027)***	(.027)***	(.027)***
Union members		-.0002	.0007	.0002
		(.0008)	(.001)	(.001)
(Union members)^2			-.0002	.0002
			(.0001)	(.0003)
(Union members)^3				-.004
				(.003)
Const.	10.917	10.919	10.910	10.914
	(.020)***	(.020)***	(.021)***	(.022)***
Obs.	6489	6489	6489	6489
R^2	.62	.62	.62	.62

Notes: This specification is based on the benchmark model but including a dummy variable for firms that are affiliated with employer associations (and an interaction with the 'additional union member' dummy variable). Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A9: Robustness 5a: Specific industry - manufacturing

	(1)	(2)	(3)	(4)	(5)	(6)
Additional union rep(s)	.239	.226	.167	.173	.149	.189
	(.067)***	(.078)***	(.084)**	(.063)***	(.104)	(.120)
Union members		.0003	.003		.0004	.002
		(.001)	(.002)*		(.001)	(.003)
(Union members)^2			-.0007			-.002
			(.0003)**			(.004)
Const.	11.096	11.093	11.063	11.074	11.069	11.061
	(.017)***	(.023)***	(.027)***	(.017)***	(.026)***	(.030)***
Obs.	2089	2089	2089	1958	1958	1958
R^2	.523	.523	.524	.5	.5	.5

Notes: This specification is based on the benchmark model but considering only firms in the manufacturing sector (industry code 'C'). The first three columns consider all firms; the last three columns consider only firms with up to 99 unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A10: Robustness 5b: Specific industry - retail and wholesale

	(1)	(2)	(3)	(4)	(5)	(6)
Additional union rep(s)	.485	.347	.284	.636	.408	.293
	(.137)***	(.203)*	(.213)	(.125)***	(.238)*	(.276)
Union members		.003	.005		.004	.001
		(.003)	(.004)		(.003)	(.006)
(Union members)^2			-.001			.006
			(.0005)**			(.010)
Const.	12.034	12.014	11.998	12.036	12.008	12.018
	(.027)***	(.038)***	(.043)***	(.027)***	(.041)***	(.047)***
Obs.	951	951	951	931	931	931
R^2	.423	.423	.424	.423	.424	.425

Notes: This specification is based on the benchmark model but considering only firms in the retail and wholesale sectors (industry code 'G'). The first three columns consider all firms; the last three columns consider only firms with up to 99 unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A11: Robustness 6: Propensity score matching

	(1)	(2)	(3)	(4)
Additional union rep	.185	.163	.093	-.036
	(.043)***	(.083)**	(.096)	(.117)
Union members		.0004	-.002	-.010
		(.001)	(.002)	(.004)**
(Union members)^2			.004	.035
			(.003)	(.016)**
(Union members)^3				-2.401
				(1.177)**
Const.	10.963	10.959	10.970	10.999
	(.010)***	(.017)***	(.020)***	(.024)***
Obs.	5593	5593	5593	5593
R^2	.611	.611	.611	.611

Notes: Analysis based on 1-99 subsample after eliminating 558 observations that could not be matched using a specific nearest-neighbour caliper. The propensity score is established using region, industry and firm age dummy variables. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A12: Robustness 7a: Additional outcomes - Specification 1

	Log profits per worker	Export status	Log exports per worker	Log equity per worker	Log number of workers	Survival by 2013
Add'l union rep	.218	.142	.391	.162	.886	.058
	(.062)***	(.020)***	(.194)**	(.088)*	(.080)***	(.015)***
Const.	10.816	.293	8.483	8.650	3.790	.862
	(.014)***	(.006)***	(.056)***	(.018)***	(.061)***	(.005)***
Obs.	5673	6717	2101	5752	6717	6717
R^2	.557	.523	.582	.447	.487	.138

Notes: Analysis based on the full sample and no control for the number of unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A13: Robustness 7b: Additional outcomes - Specification 2

	Log profits per worker	Export status	Log exports per worker	Log equity per worker	Log number of workers	Survival by 2013
Add'l union rep	.190	.037	.389	.147	-.132	.046
	(.079)**	(.026)	(.260)	(.127)	(.061)**	(.022)**
Union members	.0009	.003	.0001	.0003	.024	.0003
	(.001)	(.0004)***	(.005)	(.002)	(.001)***	(.0004)
(Union members)^2	-.0002	-.0002	-.00004	1.00e-05	-.002	-.00005
	(.0001)	(.00003)***	(.0004)	(.0002)	(.0001)***	(.00004)
Const.	10.808	.267	8.482	8.646	3.538	.859
	(.020)***	(.006)***	(.086)***	(.031)***	(.016)***	(.006)***
Obs.	5673	6717	2101	5752	6717	6717
R^2	.558	.526	.582	.447	.537	.139

Notes: Analysis based on the full sample and a quadratic control for the number of unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A14: Robustness 7c: Additional outcomes - Specification 3

	Log profits per worker	Export status	Log exports per worker	Log equity per worker	Log number of workers	Survival by 2013
Add'l union rep	.226	.162	.375	.245	1.212	.077
	(.057)***	(.019)***	(.176)**	(.095)**	(.081)***	(.016)***
Const.	10.808	.291	8.518	8.627	3.762	.861
	(.015)***	(.005)***	(.051)***	(.018)***	(.058)***	(.005)***
Obs.	5346	6374	1922	5423	6374	6374
R^2	.55	.514	.557	.438	.365	.144

Notes: Analysis based on the sample of firms with one to 99 unionised workers and no control for the number of unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A15: Robustness 7d: Additional outcomes - Specification 4

	Log profits per worker	Export status	Log exports per worker	Log equity per worker	Log number of workers	Survival by 2013
Add'l union rep	.215	.033	.213	.181	-.210	.072
	(.099)**	(.030)	(.313)	(.155)	(.071)***	(.026)***
Union members	.0002	.002	.003	.001	.025	.00009
	(.001)	(.0004)***	(.005)	(.002)	(.001)***	(.0004)
Const.	10.806	.267	8.482	8.615	3.501	.860
	(.021)***	(.006)***	(.081)***	(.030)***	(.016)***	(.006)***
Obs.	5346	6374	1922	5423	6374	6374
R^2	.55	.516	.558	.438	.428	.144

Notes: Analysis based on the sample of firms with one to 99 unionised workers and a linear control for the number of unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A16: Robustness 7e: Additional outcomes - Specification 5

	Log profits per worker	Export status	Log exports per worker	Log equity per worker	Log number of workers	Survival by 2013
Add'l union rep	.175	.081	-.060	.087	.048	.074
	(.118)	(.038)**	(.348)	(.190)	(.089)	(.028)***
Union members	-.0008	.004	-.006	-.001	.032	.0001
	(.002)	(.0007)***	(.008)	(.004)	(.002)***	(.0007)
(Union members)^2	.002	-.003	.017	.005	-.014	-.0001
	(.004)	(.001)**	(.010)	(.006)	(.003)***	(.0009)
Const.	10.812	.260	8.544	8.630	3.463	.860
	(.023)***	(.007)***	(.094)***	(.035)***	(.018)***	(.007)***
Obs.	5346	6374	1922	5423	6374	6374
R^2	.55	.517	.558	.438	.43	.144

Notes: Analysis based on the sample of firms with one to 99 unionised workers and a quadratic control for the number of unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.

Table A17: Robustness 8: Training (log average number of hours per worker)

	(1)	(2)	(3)	(4)	(5)	(6)
Additional union rep(s)	.654	.414	.271	.807	.400	.403
	(.168)***	(.210)**	(.215)	(.166)***	(.264)	(.343)
Union members		.005	.010		.007	.007
		(.003)	(.003)***		(.004)**	(.006)
(Union members)^2			-.001			-.0002
			(.0005)**			(.011)
Const.	.098	.049	-.011	.072	-.003	-.003
	(.028)***	(.044)	(.047)	(.028)***	(.048)	(.054)
Obs.	6713	6713	6713	6374	6374	6374
R^2	.226	.226	.227	.219	.219	.219

Notes: The first three columns consider all firms; the last three only firms employing one to 99 unionised workers. Please see notes to Table 2. Robust standard errors, with union membership clustering. Significance levels: * 0.10, ** 0.05, *** 0.01.