

Ratio Working Paper No. 241

## **The effect of decentralized wage bargaining on the structure of wages and firm performance**

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## Abstract

This paper analyses how decentralised wage bargaining affects wage levels and the structure of wages as well as the impact on firm performance. By using unique employer-employee matched data for Sweden 2007 and 2010, the paper presents new evidence on the collective bargaining premium in Sweden and the linkages between decentralised bargaining and firm performance. By differentiating between decentralised, two-tiered and centralised collective wage bargaining the methodologies of Card and De La Rica (2006); Dahl, le Maire, and Munch (2013); Guertzgen (2014); Gürtzgen (2007); Jakubson (1991) are adopted and adjusted using pooled OLS, first difference OLS, and quantile regressions. Variation in individual worker's bargaining regime is exploited for identification of the effect of decentralisation. Results indicate that a large share of the wage premium associated with decentralised and two-tiered bargaining is due to systematic selection/sorting into those regimes. Models that take into account individual and firm unobserved heterogeneity indicate that the wage premium associated with decentralised wage bargaining is around 5-7.5% and 0.7-4.1% for two-tiered bargaining. When examining the effect on the wage structure, results indicate that decentralised and two-tiered bargaining compresses the wage structure by awarding relatively higher wage premiums to low-wage earners, in particular in decentralised regimes. At the same time, no evidence is found of higher returns to education in either regime, but both regimes are associated with higher returns to experience than centralised bargaining.

Lastly, unique evidence is found of a positive linkage between the level of decentralisation at the firm-level and value added per employee and firm productivity. This is a novel contribution to the literature that has not yet considered the impact of decentralised wage bargaining on firm performance. Thus there is evidence that the level at which bargaining takes place influences both wage levels and wage structure as well as firm performance.

**JEL codes:** J31, J41, J51, D24

**Keywords:** Collective bargaining, Union wage premium, Wage structure, Firm productivity

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## 1. Introduction

Since the late 1970's a process of wage bargaining decentralisation has been ongoing in several OECD-countries (Dahl et al., 2013). This process has had a profound effect on the organisation of the Swedish wage setting system. In Sweden, labour relations have transitioned from central peak-level bargaining to industry- and firm-level bargaining, while union density and bargaining coverage have remained high by international comparison (Granqvist & Regnér, 2008; Hibbs Jr & Locking, 2000). Despite this enormous institutional change, little evidence exists on how decentralised bargaining has affected both employees and firms.

Decentralised bargaining<sup>1</sup> may generate favourable outcomes for both firms and workers. For firms, decentralised wage bargaining might be an attractive alternative since it gives them greater discretion in designing the wage formation such that good work performance is incentivised and rewarded, contributing to higher firm productivity. There are several reasons why this might be the case. Firstly, local negotiators possess knowledge about the abilities and characteristics of the workers at the firm that central negotiators do not (Freeman & Gibbons, 1995). Secondly, decentralised bargaining grants the firm greater flexibility in creating a wage formation that can take into account firm-specific incentives and norms, that are hard to capture in centralised negotiations. Thirdly, centralised negotiations become increasingly inefficient as job tasks become more heterogeneous or change from occupational specialisation towards multitasking (Lindbeck & Snower, 2001). Fourthly, centralised negotiations might entail “influence costs” as scarce resources are spent on trying to influence decision makers at the central level instead of being employed in productive use at the firm-level (see Milgrom 1988). It should be noted, however, that for small and labour-intensive firms outsourcing the bargaining process to a more centralised level might reduce transaction costs. Thus, it is expected that large and capital-intensive firms are more prone to employ decentralised bargaining. Empirical studies of the US, UK, and Germany support this conclusion (see Katz (1993) and Schnabel, Zagelmeyer, and Kohaut (2006)).

For workers, decentralised wage bargaining might be attractive since it is likely to entail a wage premium and higher returns to skill. There are several reasons to expect decentralised wage bargaining to carry a wage premium. Firstly, it is argued that the scope for rent-sharing is increased and wages are more responsive to firm profits (Guertzen, 2009; Rusinek & Rycx, 2013). Secondly, firms with decentralised bargaining might try raising productivity by offering higher wages as an

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<sup>1</sup> Decentralised wage bargaining is also called local bargaining, firm-level contracting, or single-employer bargaining in the literature.

incentive through efficiency-wages considerations (see Akerlof and Yellen (1988, 1990)). Thirdly, insider-outsider effects might generate larger rents to insiders at the expense of outsiders, increasing wages and decreasing employment (Fitzenberger & Franz, 1999). Fourthly, according to the *corporatist* hypothesis, decentralised bargaining is unable to minimize rent-seeking behaviour from competing unions, leading to excessive wage demands (Traxler, 2003). The *hump-shape* hypothesis, however, holds that there exists a non-linear relationship between bargaining centralisation and wage moderation, where extremes outperform intermediaries (Calmfors & Driffill, 1988). According to this view, decentralised and centralised bargaining generate lower average wages than industry or regional bargaining. Decentralised bargaining is also likely to have a substantial impact on the distribution of wages. According to Dahl et al. (2013) decentralised wage bargaining may increase the wage dispersion through two channels: firstly, by making it more likely that firm- and individual-specific characteristics enter wage contracts, and secondly, by undermining the implementation of egalitarian union's preferences.

To summarise, decentralised wage bargaining is expected to better take into account the heterogeneous nature of workers, firm-specific incentives and norms [i.e. issues related to the tournament model (see Lazear and Rosen (1981)) and the fair wage-effort hypothesis (see Akerlof and Yellen (1990))]. It is plausible that the effect is heterogeneous across industries, since issues of performance incentives, monitoring and views of fairness might differ depending on the nature of work tasks. Even so, a decentralised wage bargaining system might help firms set efficiency wages and raise productivity.

The aim of this paper is to empirically investigate how decentralised bargaining has affected wage levels and the structure of wages in Sweden, and how the level of decentralisation affects firm performance. To do this I use a unique employer-employee matched data set for the private sector in Sweden between 2007 and 2010.

Following Card and De La Rica (2006); Dahl et al. (2013); Gürtzgen (2007); Jakubson (1991) I estimate a number of different models that identifies the effect of being covered by decentralised and two-tiered bargaining regimes on mean wage levels, the distribution of wages and the returns to skills. Having access to repeated cross-sectional data (T=2) allows me to control for both observed and unobserved characteristics. Results show that a large share of the raw correlations can be explained by sorting of high ability individuals into decentralised and two-tiered bargaining. Wage premiums are estimated to be between 5 % and 7.5 % for the decentralised bargaining regime and between 0.7% and 2 % for two-tiered. There is evidence of a wage compressing effect of both

decentralised and two-tiered bargaining, by relatively higher wage premiums allocated to low-wage earners. Higher returns to experience is found under both regimes, but there are no systematic higher returns to education compared to centralised bargaining regimes. Using a simple model I empirically examine the linkage between decentralised wage bargaining and firm performance. This is a novel contribution to the literature, where the relationship between decentralised bargaining and firm performance has not yet been researched. Focusing on value added per employee and productivity as performance measures, indication of a positive relationship is found. Estimates indicate that a unit's change in the level of decentralisation at the firm-level is associated with a 5-6 % increase in firm performance. The performance effect is increasing over the distribution, being around 10 % for the 20 % highest performing firms.

The remainder of the paper is structured as follows. The next chapter discusses the previous literature. Chapter 3 outlines the history and current setup of the wage bargaining system in Sweden. In chapter 4 the data is described and the empirical strategy is outlined in chapter 5. Empirical results are presented and discussed in chapter 6, followed by conclusions in chapter 7.

## **2. Literature review**

An extensive literature has by now explored the effects of collective bargaining on wage levels and the wage distribution (see Card (1996, 2001); Freeman and Kleiner (1990); Jakubson (1991)). Most of the literature has focused on the US and UK, where the wage setting system is very decentralised and single-employer bargaining is widespread. In this institutional setting union coverage and membership are very similar, and the existence of a union wage premium is driven by union membership. In the European setting, in particular in the Nordic countries, collective bargaining coverage is often extended to non-union workers. Thus, union membership is a weak determinant of individual wages and the focus should rather be put on at what level collective bargaining takes place (Gürtzgen, 2007), in particular how decentralised bargaining affect wages.

In the late 1980's, within the macroeconomic literature, proponents of both the corporatist and the hump-shape hypothesis produced empirical in support of their respective views (see Bruno and Sachs (1985); Calmfors and Driffill (1988); Crouch (1985); Tarantelli (1986)). Those findings have come under scrutiny in later studies, partly for having weak theoretical foundations and partly for lacking robust empirical support (Traxler, 2003). Flanagan (1999) points out that adequate controls for other important macroeconomic and union-related variables are missing and the model framework is too simplistic to take into account differences in the bargaining structure, level of coordination and coverage. The OECD, exploring the relationship between aspects of the wage

bargaining system and macroeconomic outcomes, find no robust results in favour of either hypothesis regarding wages or employment (1997). Even though no effects on macroeconomic outcomes in general could be established, the OECD find evidence that the wage bargaining system critically influences earnings inequality. They show that centralised bargaining systems have significantly lower earnings inequality while decentralised (or uncoordinated) systems have higher earnings inequality, which has been confirmed in other studies (Kahn, 2000; Wallerstein, 1999).

Even though that the macroeconomic results are contested and unclear, there is an emerging field of micro-oriented studies focused on the linkages between decentralised, or firm-level, wage bargaining and wages levels and the distribution of wages. In an early study Dell'Aringa and Lucifora (1994a) explore the impact of unions on relative wages in the metal-mechanical industry in Italy using establishment-level data. Differentiating between firms that have and have not recognition for local bargaining, they find a positive wage premium in firms that have recognition for local bargaining and that this wage premium is larger for white-collar workers than for blue-collar workers. In another study by Dell'Aringa and Lucifora (1994b) they find that local bargaining decreases wage dispersion, in particular where union density is higher. In the corporatist Dutch bargaining system Hartog, Leuven, and Teulings (2002) find that wage differentials between firm-level and industry-level bargaining are modest and that there is no distinction between firms covered and not covered by collective agreements in terms of mean wages or the wage structure. The absence of any bargaining regime related premium is interpreted as due to the ability of the corporatist systems to limit rent-seeking. These results are contested in a study by Card and de la Rica (2006), who study the effects of firm-level contracting on the level and structure of wages, compared to regional and national contracts. They use matched employer-employee data from the 1995 Spanish Wage Structure Survey (ESS95) which contains information about firm and individual characteristics and what type of contract an individual belongs to. They find that firm-level contracting carries a substantial wage premium of circa 5-10 %, with larger premiums awarded to workers at the high end of the income distribution.

The European Structure of Earnings Survey (ESES), which is an employer-employee matched data set has been employed in three different studies for the year 1995. Plasman, Rusinek, and Rycx (2007) investigate the effect of collective bargaining on the structure of wages in the manufacturing sector in three countries (Belgium, Denmark, and Spain), where multi-employer bargaining is the prevalent form of bargaining. Their results shows that single-employer bargaining increase wage levels and within-firm wage dispersion, compared to multi-employer bargaining, in Belgium and Denmark. In Spain, however, single-employer bargaining is found to increase wage levels but



depress wage dispersion, in contrast to the findings of Card and de la Rica (2006). They interpret this as being a case where single-employer bargaining is used to adopt the wage formation to firm-specific conditions in Belgium and Denmark, while in Spain unions use single-employer bargaining to implement their egalitarian preferences.

These results are contrasted by Dell’Aringa and Pagani (2007), whose work show quite the opposite. Focusing on Belgium, Italy, and Spain, they perform a variance decomposition analysis and estimate quantile regressions for each bargaining system. They extend the analysis by not only looking at those covered by multi- or single-employer bargaining, but also on those that are covered by both systems (“multi-level”-bargaining). In Belgium and Italy single-employer bargaining is found to not increase within-firm wage dispersion. While the evidence for Spain is mixed, it is generally in favour of the results of Card and de la Rica (2006), i.e. a positive association with wage dispersion. Using the ESES while looking at the effect of bargaining regimes on inter-industry wage differentials in Belgium Rycx (2003) also took into account the multi-employer/multi-level setting of the Belgian bargaining system. Rycx shows that having wages renegotiated at the firm-level is associated with on average a wage premium of 5.1 % and higher inter-industry wage dispersion. This is not a surprising result, given that wage agreements renegotiated at the firm-level cannot be lower than national and/or sectoral set agreements in Belgium.

In addition there are several other studies who find positive wage effects of having decentralised wage bargaining. In two separate studies, using German cross-sectional data, Gerlach and Stephan find both evidence of a positive wage premium and higher wage dispersion coming from firm-level contracting (Gerlach & Stephan, 2005; Stephan & Gerlach, 2005). Cardoso and Portugal (2005) and Daouli et al. (2013) both find support for a positive wage premium, while in the latter study the premium is found to be hump-shaped over the earnings distribution. Granqvist and Regnér (2008) show that pay decentralisation in Sweden raised individual wages and Fitzenberger, Kohn, and Lembcke (2013) show that the firm-level share of employees that are covered by firm-level bargaining has a positive influence on wage levels. There is also evidence suggesting that decentralised bargaining increases the scope of rent-sharing (see Guertzgen (2009); Rusinek and Rycx (2013)).

One major drawback of the majority of the studies in the field is that they use cross-sectional data. Cross-sectional estimates are potentially biased because they are sensitive to selection/sorting effects and misclassification of union-status (see Card (1996) and DiNardo and Lee (2004)). Given the empirical support of positive wage effects of decentralised bargaining, and if workers are aware

of this effect, we might suspect in accordance with the Roy model (1951) that high-productivity individuals might self-select into decentralised wage settings (Dahl et al., 2013) to capture larger returns to skills and human capital investment, biasing wage premium estimates upwards. At the same time, risk averse individuals might prefer working in centralised regimes with more compressed wage structures, accepting lower wages for lower risk, possibly aggravating the bias (Dahl et al., 2013).

Two studies of particular interest have managed to identify the effects of decentralisation while controlling for unobserved heterogeneity, using longitudinal data<sup>2</sup>. Using a large employer-employee matched data set for western and eastern Germany between 1995-2002, Gürtzgen (2007) investigates the wage-setting effects on mean wages. By being able to observe individual contract status changes Gürtzgen can identify the wage premium arising from firm-level bargaining. The results show that a large share of the wage premium associated with firm- and industry-level bargaining can be explained by observables. There is however still a positive average wage premium of 2 %, compared to having no coverage of collective bargaining, which is lower than cross-sectional estimates have suggested. In a recent and modified version of the same paper, Guertzgen (2014), also finds that a large fraction of wage premiums associated with firm-level and industry-level bargaining can be explained by individual and firm observables and unobservables, i.e. by selection effects, in western Germany. There is still indication of a positive wage premium associated with firm-level bargaining, compared to no coverage. Transitioning from firm-level to industry-level bargaining, however, is associated with a wage penalty and leaving collective wage bargaining altogether is not found to have any “true” wage effects. Dahl et al. (2013) uses a rich employer-employee matched panel data set to assess the effect of firm-level bargaining on wage levels and the wage structure. Having data over a period of transition towards decentralisation in the Danish wage setting system, they can also isolate contract status changes and thus identify the true effect of decentralisation. Their results show that, when controlling for both observed and unobserved heterogeneity, that firm-level bargaining compared to sectoral-level bargaining entails an average wage premium of about 4.7 %. The wage dispersion and the return to skills are found to be higher under firm-level bargaining.

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<sup>2</sup> Two interesting papers by J. Addison et al. (2014) and Addison, Kölling, and Teixeira (2014) also use longitudinal data. They do not however differentiate between firm- and industry-level contracts in their analysis, making them less relevant for this study.

Even though there are heterogeneous empirical results (Plasman et al., 2007) there is empirical evidence in support of a positive wage premium arising from decentralised wage bargaining, and that such bargaining may alter the wage structure. Despite that decentralisation often is found to increase dispersion, the effect is not clear-cut and may depend on country-specific institutions and the preferences of unions.

In this study I am also interested in the effect on firm productivity. There is a large literature documenting the effects of increased wage dispersion on firm productivity (see for example Heyman (2005, 2012); Hibbs Jr and Locking (2000); Jirjahn and Kraft (2007); Lallemand, Plasman, and Rycx (2004); Winter-Ebmer and Zweimüller (1999)). Despite that there are studies on both the effect of decentralised wage bargaining on the distribution of wages and the effect of wage dispersion on firm productivity, the linkage between decentralised wage bargaining and firm productivity is surprisingly absent in the literature. In a theoretical study Lindbeck and Snower (2001) suggest that centralised bargaining is inefficient and detrimental to firm's profit opportunities, since it cannot offer employees appropriate incentives to perform a mix of tasks. To my knowledge, McGuinness, Kelly, and Connell (2010) is the only study to have empirically explored this area. Using an Irish employer-employee linked data set for private firms, they analyse the effect of wage bargaining regime on firm competitiveness and within-firm wage inequality. As a measure of competitiveness they use average labour costs and show that centralised bargaining both reduces labour costs and wage dispersion. Given the previous literature, this result is not surprising. However, average labour costs are a good measure of cost competitiveness only, and not on competitiveness per se. Thus the effect on firm productivity is still unknown. This study will try to improve upon this research gap.

### **3. Collective bargaining in Sweden**

Post Second World War wage formation in Sweden was under a long time characterised by coordinated centralised 'solidarity' wage bargaining, high union membership and a compressed wage structure. Wages and working conditions were bargained in central, peak-level, negotiations between the confederation of private employers, *Swedish Employer's Confederation* (SAF), and trade unions representing different segments of workers; the *Swedish Trade Union Confederation* (LO) representing blue-collar workers, the *Swedish Confederation of Professional Employees* (TCO) representing white-collar workers and the *Swedish Confederation of Professional Associates* (SACO) representing academics and graduates with university or college degrees (Fredriksson & Topel, 2010; Granqvist & Regnér, 2008). Centralised bargaining was perceived as a crucial

instrument in promoting both economic efficiency and solidarity, through wage restraint and wage solidarity. Wage restraint served to uphold the competitiveness of Swedish exports while wage solidarity disabled low-productive firms and industries from paying wages in par with their productivity, thus sorting out weak firms, raising average productivity and equalizing wages *between* sectors (Fredriksson & Topel, 2010; Hibbs Jr & Locking, 2000; Pontusson & Swenson, 1996).

In the late 1960's the goals of the solidarity wage policy radicalised, with the new aim of compressing the overall wage structure. Previously the goal had been to equalise wages between jobs of similar difficulty, risk, and skill (Hibbs Jr & Locking, 2000). Throughout the 1970's and 1980's the system was faced with mounting discontent and resistance, partly due to the solidarity wage policy (Pontusson & Swenson, 1996). SAF, one of the chief architects of the centralised system, and SAF member employer associations, became increasingly sceptical of central negotiations. After an unstable period of pedalling between peak-level and industry-level negotiations during the 1980's and early 1990s', SAF responded by firstly shutting down its bargaining and statistics unit in 1991, *de jure* ending centralised bargaining, and secondly by withdrawing its representatives from established corporatist bodies in 1991. Rejecting corporatism they instead focused on public policy advocacy (Hibbs Jr & Locking, 2000; Pontusson & Swenson, 1996).

The presence of institutional and macroeconomic shocks<sup>3</sup> in the 1990's spurred institutional change, culminating with the Industrial Agreement (IA) signed in 1997 between unions and employer's associations in the manufacturing sector. The agreement outlined procedural rules for the wage bargaining process, in the form of timetables for negotiations and rules for conflict resolution. It also bestowed a significant role for outside mediators in disputes, who are appointed by the National Mediation Office. The model has since then been adopted in other sectors following similar agreements (Fredriksson & Topel, 2010).

Trade unions have retained their strong position in the labour market, where union membership is around 70 % and collective agreements cover around 90 % of employees (National Mediation Office, 2008, 2013). LO, TCO, and SACO are still the dominating confederations of unions and they bargain with employer's associations in each sector. Since all the confederations can be present

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<sup>3</sup> Most notably Sweden was struck by the worst macroeconomic crises since the 1930's, joined the EU in 1995, enacted structural reforms, and experienced significant demographic changes (through increased immigrant flows and increased educational attainment) (Fredriksson & Topel, 2010).

within a single establishment, different employees can be covered by different agreements (Granqvist & Regnér, 2008). Collective agreements are typically set for a three year period. The parties that first strike a collective agreement sets the “mood” of the bargaining process. The outcome of that agreement is used as a “mark” that subsequent negotiations have to relate to. Traditionally it is the competitive sector who sets the mark (National Mediation Office, 2007), but this has been challenged lately. In general, the institutional setup gives wide discretion towards industry- and local bargaining. There is still bargaining conducted on the national level in many industries, but generally those agreements only come into operation if industry-local-level negotiators fail to reach an agreement. Typically, centralised agreements specify a fall-back wage increase, which acts like a guaranteed minimum wage increase for individuals (Fredriksson & Topel, 2010).

It is thus clear that the Swedish wage setting system has transitioned towards decentralisation, albeit not full decentralisation, to the extent that a majority of workers’ wages are at least partially set at a local level (Granqvist & Regnér, 2008; National Mediation Office, 2008). The National Mediation Office record statistics over the wage agreements struck in the Swedish labour market. They characterise 7 different types of agreements based on the extent to which they give room to local bargaining. As can be seen in Table 1, 34 % were covered by agreements where local negotiations have employee-specific wage increases (agreement 1-3) in 2010, 43 % by agreements where local negotiators determine the allocation of wage increases (the wage frame). 10 % have influences of local bargaining and 6 % have their wages completely determined by central agreements. It is notable that it is only in the private sector that completely centralised agreements exist, and that the central government has fully endorsed decentralised wage bargaining in practice. Aggregate changes in the types of agreements is mainly driven by changes in the type of agreements in the central and local government, as the setup in the private sector has not changed by a lot between 2007 and 2010.

*Table 1: Types of wage agreements*

Agreement	<i>Share of Employees</i>			
	All	Private sector	Central government	Local government
<i>1. Local bargaining without restrictions</i>	0.08 (0.09)	0.06 (0.07)	0.38 (0.38)	0.05 (0.05)
<i>2. Local bargaining with a fallback</i>	0.25 (0.04)	0.09 (0.08)	0.62 (0.00)	0.40 (0.00)
<i>3. Local bargaining with a fallback plus a guaranteed wage increase</i>	0.01 (0.11)	0.01 (0.10)	0.00 (0.62)	0.00 (0.00)

4. <i>Local wage frame without a guaranteed wage increase</i>	0.07 (0.23)	0.12 (0.11)	0.00 (0.00)	0.00 (0.46)
5. <i>Local wage frame with guarantee or a fallback regulating the guarantee</i>	0.43 (0.37)	0.43 (0.35)	0.00 (0.00)	0.54 (0.49)
6. <i>General pay increase plus local wage frame</i>	0.10 (0.10)	0.18 (0.18)	0.00 (0.00)	0.00 (0.00)
7. <i>General pay increase</i>	0.06 (0.06)	0.11 (0.11)	0.00 (0.00)	0.01 (0.00)

Source: National Mediation Office (2007, 2010)

Note: Numbers within brackets refer to 2007 and numbers without brackets refer to 2010.

In this paper, the focus is on the decentralisation of bargaining, and thus the terminology is slightly different. Due to this, I will use the “Ratio scale”, which instead tries to measure the level of decentralisation, by using and rearranging the scale of the National Mediation Office, see Table 2 below for how it is constructed.

Here, I will refer to bargaining regimes instead of agreements. The decentralised regime has firm-level/local bargaining, without any provision for centrally set fallbacks or guarantees. In the second regime, local bargaining with minor restrictions (LBMI), the total wage increases are restricted either directly or indirectly by a fallback if local negotiators cannot reach an agreement. This can significantly influence the negotiations.

**Table 2: The Ratio scale of decentralisation**

Level of decentralisation	Description	Old	New
Decentralised bargaining	<i>Local bargaining without fallback or guarantee</i>	1	4
Local bargaining with minor restrictions (LBMI)	<i>Wage formation without individual guarantee, but with fallback or wage frame</i>	2+4	3
Local bargaining with major restrictions (LBMA)	<i>Wage formation with individual guarantee, fallback or wage frame</i>	3+5	2
Centralised bargaining	<i>General pay increase and wage frame</i>	6+7	1

Source: Karlson (2011)

In the third regime, local bargaining with major restrictions (LBMA), both the allocation and the size of wage increases are restricted through individual guarantees awarded to all employees. In many cases this there is little left to negotiate about. In the last regime, centralised bargaining, the scope for local bargaining is absent or heavily restricted – the level and allocation of wages is set centrally (Karlson, 2011).

## 4. Data and descriptive statistics

The data is an employer-employee linked data set that has been created using data from the Confederation of Swedish Enterprise (Svenskt Näringsliv, henceforth SN<sup>4</sup>) which has been combined with administrative registers from Statistics Sweden. The core of the matched data set is formed of the Earnings Structure Survey (Lönestrukturstatistiken, henceforth ESS) and the Structural Business Statistics (Företagens Ekonomi, henceforth SBS) from Statistics Sweden, and the data set from SN which contains data on wages and collective agreements for employees in private sector establishments that are members of SN.

Using the SN-data, the collective agreements of 27 employer associations have been coded according to the 7 grade classification of the National Mediation Office. What collective agreement each individual belongs to is identified by using detailed information on union number, agreement number, job classification (white-collar or blue-collar) and where needed occupational classification (SSYK<sup>5</sup>), union number subgroups, and trade union affiliation. For blue-collar workers the collective agreement is correctly identified, due to the detailed data. For some white-collar workers, however, there is some uncertainty to what collective agreements they belong to. In those cases, different specifications are used to test the robustness of the coding – without generating any significant differences on neither the distribution of collective agreements nor empirical results. Using this identification of collective agreements according to the scale of the National Mediation Office, I created the Ratio scale of decentralisation. The sample distribution is available in Table 3.

Several sets of control variables are employed, grouped into individual, co-worker, firm, and region/industry/time controls. Details on the variables used are available in Table 13 in the appendix. In the individual-level regressions I use hourly wages as the dependent variable. The measure does not only account for base wages but also for performance pay and wage complements for overtime, shift work and inconvenient working hours, which gives a more accurate description of individual wages than base wages do. The measure is from the SN-data set. Wages, and other monetary variables, are expressed in Swedish Krona (SEK), in constant 2007 prices. In the firm-level regressions I use value-added per employee as a measure of firm performance. The measure of value added is from the EBS-data set and value added per employee is calculated by dividing value

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<sup>4</sup> SN was founded in 2001 by the merger between the Swedish Employers' Confederation (SAF) and the Federation of Swedish Industry (SI). As Sweden's largest business federation SN represents 49 member organisation, 60 000 member companies and over 1.6 million employees (Confederation of Swedish Enterprise, 2014).

<sup>5</sup> See Table 12 for details.

added by the number of employees in the firm. From this data a simple measure of productivity is estimated using a Cobb-Douglas regression<sup>6</sup>. To diminish shock- and business cycle effects, firm-level monetary variables are expressed as three-year averages. In the firm-level regressions I include workforce characteristics, firm characteristics and region/industry/time controls (see Table 13).

The sample is trimmed by discarding individuals who are not observed in the SN-data set and lacks data on collective bargaining regime. In cases where an individual is observed in more than one firm, the observation with the highest number of monthly working hours is retained. Individuals with missing or incomplete data on hourly wages were also discarded. To diminish potential problems of measurement errors the top and bottom per cent of hourly wages and value added were removed. This leaves the sample with circa 1.6 million person-year observations (almost equally split between 2007 and 2010) distributed into 17 000 unique firms.

Descriptive statistics for the sample is available in Table 3, divided by bargaining regime. Observed characteristics differ between bargaining regimes, as the workers in the two regimes with elements of local bargaining (decentralised and LBMI) are older and more experienced, have higher education and more qualified occupations, work less part time and are found in larger firms. Only white-collar workers are covered by completely decentralised bargaining, while almost only blue-collar are covered by centralised bargaining.

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<sup>6</sup> See Table 12.



*Table 3: Sample descriptive statistics by bargaining regime*

Variables	<i>All</i>	<i>Decentralised</i>	<i>LBMI</i>	<i>LBMA</i>	<i>Centralised</i>
Bargaining regime	.	0.05	0.31	0.24	0.4
Age Distribution:					
<i>Mean age</i>	39.8	41.8	42.1	40.7	37.2
<i>under 30</i>	0.25	0.05	0.14	0.23	0.39
<i>31-49</i>	0.52	0.64	0.61	0.51	0.42
<i>Over 50</i>	0.23	0.31	0.25	0.26	0.19
Human capital distribution:					
<i>Primary schooling</i>	0.12	0.05	0.06	0.14	0.20
<i>Secondary schooling</i>	0.54	0.34	0.37	0.67	0.66
<i>Tertiary schooling</i>	0.56	0.73	0.66	0.36	0.56
<i>Years of experience</i>	22.22	25.91	23.01	22.93	19.87
Work force distribution:					
<i>Female</i>	0.37	0.37	0.31	0.41	0.38
<i>Part time work</i>	0.16	0.08	0.07	0.14	0.26
<i>Performance pay</i>	0.12	0.08	0.12	0.10	0.13
<i>White-collar</i>	0.44	1.00	0.85	0.49	0.01
Occupation distribution:					
<i>Managers/Technicians/     Professionals/Associate     professionals</i>	0.35	0.99	0.84	0.10	0.02
<i>Clerical</i>	0.14	0.01	0.01	0.42	0.10
<i>Service</i>	0.14	0.00	0.04	0.02	0.31
<i>Qualified manual</i>	0.28	0.00	0.11	0.42	0.37
<i>Unqualified manual</i>	0.09	0.00	0.01	0.03	0.21
Firm size distribution:					
<i>10-20 Workers</i>	0.05	0.03	0.02	0.03	0.08
<i>21-50 Workers</i>	0.11	0.10	0.06	0.07	0.16
<i>51-100 Workers</i>	0.09	0.09	0.07	0.08	0.12
<i>101-200 Workers</i>	0.09	0.10	0.08	0.08	0.11
<i>200- Workers</i>	0.66	0.68	0.77	0.73	0.52
Firm type distribution:					
<i>Export oriented</i>	0.87	0.89	0.85	0.91	0.86
<i>Foreign owned</i>	0.33	0.40	0.38	0.36	0.27
<i>Part of business group</i>	0.83	0.89	0.94	0.84	0.75
Industry Distribution:					
<i>Manufacturing</i>	0.32	0.42	0.41	0.49	0.13
<i>Construction</i>	0.09	0.01	0.05	0.07	0.14
<i>Trade, hotels and     restaurants</i>	0.26	0.27	0.12	0.07	0.47
<i>Transports</i>	0.06	0.05	0.01	0.07	0.10
<i>Agriculture and forestry</i>	0.01	0.00	0.00	0.02	0.02
<i>Service</i>	0.26	0.25	0.41	0.27	0.13
Geographic distribution:					
<i>South Sweden</i>	0.42	0.40	0.36	0.43	0.45
<i>East Sweden</i>	0.43	0.47	0.48	0.43	0.39
<i>North Sweden</i>	0.15	0.13	0.16	0.13	0.16
Number of observations	1,693,175	95,723	528,680	398,764	670,008

Table 4 displays means and standard deviations for wages divided by bargaining regimes and gender. To account for structural differences in observed characteristics between the bargaining regimes, I also show standardised means and standard deviations of log wages. The standardisation is performed by using the methodology outlined by DiNardo, Fortin, and Lemieux (1996) where the sample is re-weighted to adjust the distribution of observed characteristics by bargaining regimes back to the overall distribution (Card & De La Rica, 2006). Table 4 shows that wages are on average both highest and most dispersed under decentralised bargaining, followed by LBMI, and lowest and most compressed in the centralised regime. This result holds even when observed characteristics are taken into account, although with slightly smaller overall standard deviations. Kernel density estimates are available in Figure 2 in the appendix.

*Table 4: Mean log wages by bargaining regime*

	<i>Mean log wage</i>	<i>Standard deviation</i>	<i>Standardised mean log wage</i>	<i>Standardised standard deviation</i>
<b>Overall</b>				
Total	4.97	0.28	5.00	0.21
<i>Decentralised</i>	5.31	0.31	5.36	0.18
<i>LBMI</i>	5.15	0.27	5.17	0.15
<i>LBMA</i>	4.91	0.20	4.90	0.09
<i>Centralised</i>	4.82	0.18	4.83	0.10
<b>Men</b>				
Total	5.01	0.28	5.03	0.21
<i>Decentralised</i>	5.39	0.29	5.40	0.17
<i>LBMI</i>	5.19	0.26	5.18	0.14
<i>LBMA</i>	4.94	0.20	4.91	0.08
<i>Centralised</i>	4.85	0.18	4.85	0.10
<b>Women</b>				
Total	4.90	0.26	4.96	0.21
<i>Decentralised</i>	5.18	0.30	5.27	0.18
<i>LBMI</i>	5.08	0.27	5.14	0.17
<i>LBMA</i>	4.86	0.20	4.88	0.10
<i>Centralised</i>	4.78	0.18	4.81	0.09

*Note: Standardised means and standard deviations are obtained from a weighted sample using DiNardo et al. (1996) methodology.*

In the empirical model, identification is contingent on individuals changing bargaining regimes. Those changes can either be *within job* changes, as collective bargaining negotiations may result in a changed level of centralisation, or *between job* changes, as an individual changes to a job covered by another bargaining regime. Table 5 outlines the bargaining regime changes that have occurred in the sample between 2007 and 2010. Over 23 000 individuals have changed regimes. Of those over 70 % moved in the direction towards decentralisation (as shown by the lower diagonal entries). Almost 47 % are due to job changes and the rest due to within job regime changes. The LBMA and

centralised regime are both very similar in terms of observed worker characteristics and the little scope they leave for local bargaining in setting wages. At the same time both are quite distinct from decentralised and LBMI, in terms of sample characteristics. Due to this, in the empirical analysis LBMA and centralised will be treated as one coherent centralised regime. Since LBMI has provision for both local and non-local bargaining it will henceforth be referred as two-tiered bargaining.

*Table 5: Bargaining regime transition matrix*

Transition from	Transition to				Total
	Decentralised	LBMI	LBMA	Centralised	
<i>Decentralised</i>	.	1,432	260	165	1,857
<i>LBMI</i>	2,138	.	2,329	689	5,156
<i>LBMA</i>	521	3,119	.	1,635	5,275
<i>Centralised</i>	832	2,817	7,715	.	11,364
<i>Total</i>	3,491	7,368	10,304	2,489	23,652

## 5. Empirical framework

The empirical framework is developed to assess the effect of decentralised bargaining on individual wages and the wage structure as well the effect on firm performance. In the case of individual wages, the model is developed in the vein of Card and De La Rica (2006); Dahl et al. (2013); Guertzgen (2014); Gürtzgen (2007); Jakubson (1991), where standard Mincer regressions are employed while controlling for observed and unobserved heterogeneity, using pooled ordinary least squares and first difference ordinary least squares. In the case of firm performance ordinary least squares and quantile regressions are employed.

### 5.1 Individual wage regressions

I assume individual wages to be determined by the following model relationship:

$$y_{ijt} = \gamma_D D_{ijt} + \gamma_I I_{ijt} + \beta_V X'_{it} + \beta_C U_i + \phi_V Z'_{jt} + \phi_C F'_j + V_{ijt} \quad (1)$$

Where the dependent variable,  $y_{ijt}$ , is the log of hourly wage of worker  $i$  in firm  $j$  at time  $t$ .  $D_{ijt}$  and  $I_{ijt}$ , which are the variables of interest, are indicator variables that take the value of unity if individual  $i$  is covered by a decentralised or two-tiered collective agreement, respectively.  $X'_{it}$  is a vector of time-varying individual observed covariates,  $U_i$  is a vector of time-constant individual observed covariates,  $Z'_{jt}$  is a vector of time-varying firm covariates and  $F'_j$  is a vector of time-constant firm covariates.  $V_{ijt}$  is the error component and can be decomposed as:

$$V_{ijt} = a_i + \psi_j + \lambda_{jt} + \varepsilon_{it} \quad (2)$$

Where  $a_i$  is individual unobserved heterogeneity,  $\psi_j$  is firm unobserved heterogeneity,  $\lambda_{jt}$  is a firm-specific time-varying error term and  $\varepsilon_{it}$  is an individual-specific time-varying error term. Co-worker characteristics are included as a way of trying to handle potential endogeneity. Under the exogeneity assumption, individual and firm unobserved heterogeneity,  $a_i$  and  $\psi_j$ , are uncorrelated with the bargaining regime status, and the effect of decentralised/two-tiered collective bargaining coverage on wages ( $\gamma_D$  and  $\gamma_I$ ) can be consistently estimated using ordinary least squares. There are good reasons, however, to suspect that unobserved individual or firm heterogeneity, or both, is correlated with the bargaining regime (Card & De La Rica, 2006). Assume the variation in  $a_i$  and  $\psi_j$  is given by:

$$E[a_i | D_{ijt}, I_{ijt}, X'_{it}, U'_i, Z'_{jt}, F'_j] = D_{ijt}\mu_a + I_{ijt}\pi_a + X'_{it}\theta_a + U'_i\rho_a + Z'_{jt}\varphi_a + F'_j\omega_a \quad (3)$$

$$E[\psi_j | D_{ijt}, I_{ijt}, X'_{it}, U'_i, Z'_{jt}, F'_j] = D_{ijt}\mu_\psi + I_{ijt}\pi_\psi + Z'_{jt}\varphi_\psi + F'_j\omega_\psi \quad (4)$$

Combining equation (3) and (4) with (1) and (2) the model becomes:

$$y_{ijt} = (\gamma_D + \mu_a + \mu_\psi)D_{ijt} + (\gamma_I + \pi_a + \pi_\psi)I_{ijt} + (\beta_V + \theta_a)X'_{it} + (\beta_C + \rho_a)U_i + (\phi_V + \varphi_a + \varphi_\psi)Z'_{jt} + (\phi_C + \omega_a + \omega_\psi)F'_j + a_i + \psi_j + \lambda_{jt} + \varepsilon_{it} \quad (5)$$

If bargaining regime status is endogenous, either due to individual or firm unobserved heterogeneity, the estimates will contain the true effects  $\gamma_D$  and  $\gamma_I$  as well as the bias factors  $\mu_a + \mu_\psi$  and  $\pi_a + \pi_\psi$ . To account for this possible endogeneity, I follow three different strategies. Firstly, I run pooled OLS regressions and mimic the method of Card and De La Rica (2006). As mentioned, endogeneity might arise due to selection effects captured in either individual or firm-level unobserved heterogeneity. To account for individual heterogeneity, I include covariates of co-worker characteristics in the same firm and occupation group<sup>7</sup>. The rationale is that, under plausible conditions, workers with high unobservable skills should have co-workers with higher average skills, and vice versa (Card & De La Rica, 2006). Some of the bias coming from unobserved ability might then be alleviated. To account for firm heterogeneity, I include controls for the probability of having decentralised and two-tiered collective agreements at the firm-level. The idea is that if contract status is good as random, conditional on the observed control variables, then conditioning on the probability of having a certain contract will remove the bias coming from the correlation between contract status and firm characteristics. I implement this approach by fitting probit

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<sup>7</sup> See Table 13 for details on the variables used.

regressions for the probability of having decentralised and two-tiered contracts separately, form the propensity score and a quadratic propensity score and include the polynomials as control variables in the regressions. Ideally an instrumental variable approach would be preferred to deal with this endogeneity problem. It is however hard to find a suitable candidate for an instrument and the previous literature does not give good guidance. Given this, and that Card and De La Rica (2006) manage to reduce estimation bias using this method, the propensity score might be useful in dealing with endogeneity.

The second and third estimation strategies exploits changes in bargaining coverage over time to identify the causal effect of bargaining regimes on wage premiums. In the second method I will use dummy variables that identifies changes in bargaining status. In the third method I will use dummies that differentiate between entering, leaving or staying in each bargaining regime, adopting the approach of Jakubson (1991). In both methods I will use first difference OLS (FD) regressions. By exploiting the repeated time periods ( $T=2$ ), first differencing can account for individual and firm fixed effects by removing time-constant terms. In this case, the time-constant observed characteristics cancels out as well as the unobserved individual and firm heterogeneity. When using simple dummies, the FD model is then given by equation (6):

$$\Delta y_{ijt} = \gamma_D \Delta D_{ijt} + \gamma_I \Delta I_{ijt} + \beta_V \Delta X'_{ijt} + \delta_V \Delta W'_{jt} + \phi_V \Delta Z'_{jt} + \Delta \lambda_{jt} + \Delta \varepsilon_{ijt} \quad (6)$$

Given that  $\Delta D_{ijt}$  and  $\Delta I_{ijt}$  are uncorrelated with  $\Delta \lambda_{jt}$  and  $\Delta \varepsilon_{ijt}$ , the wage premiums arising from decentralised and two-tiered contracts can be consistently estimated. The wage effects will be identified through changes in bargaining regimes. In the third empirical model I extend the framework of the previous model in the vein of Jakubson (1991), by noting that four combinations of bargaining regime status are possible for two periods: never being covered, entering coverage, leaving coverage, and staying in coverage for both periods. In the model I include three dummies for each bargaining regime, which are defined as:

$$ENTER: E_{ijt}^b = 1 \text{ if } \begin{cases} D_{ijt} \\ I_{ijt} \end{cases} = 1 \text{ and } \begin{cases} D_{ijt-1} \\ I_{ijt-1} \end{cases} = 0 \quad (7)$$

$$LEAVE: L_{ijt}^b = 1 \text{ if } \begin{cases} D_{ijt} \\ I_{ijt} \end{cases} = 0 \text{ and } \begin{cases} D_{ijt-1} \\ I_{ijt-1} \end{cases} = 1 \quad (8)$$

$$STAY: S_{ijt}^b = 1 \text{ if } \begin{cases} D_{ijt} \\ I_{ijt} \end{cases} = 1 \text{ and } \begin{cases} D_{ijt-1} \\ I_{ijt-1} \end{cases} = 1 \quad (9)$$

Where, as before,  $D_{ijt}$  and  $I_{ijt}$  represents dummies for decentralised and two-tiered bargaining, respectively. The dummy  $E_{ijt}^b$  represents entering,  $L_{ijt}^b$  leaving,  $S_{ijt}^b$  staying, in regime  $b$ . If combined with the baseline model in equation (1) the model becomes:

$$y_{ijt} = \gamma_E^D E_{ijt}^D + \gamma_L^D L_{ijt}^D + \gamma_S^D S_{ijt}^D + \gamma_E^I E_{ijt}^I + \gamma_L^I L_{ijt}^I + \gamma_S^I S_{ijt}^I + \beta_V X'_{it} + \beta_C U_i + \phi_V Z'_{jt} + \phi_C F'_j + V_{ijt} \quad (10)$$

Thus, in the same manner as in equation (6) the FD model can be derived, which will not be displayed here. More importantly, by using this specification it is possible to determine whether entering or leaving a bargaining regime have symmetric wage effects<sup>8</sup>. If not, using this specification allows for more dynamics in the estimation of the wage premium than the baseline specification. This model will be called the Jakubson specification.

To estimate the effects of contract status over the wage structure, I follow Card and De La Rica (2006) in estimating separate wage regressions for workers in five different wage quantiles. This is done by firstly calculating the 20<sup>th</sup>, 40<sup>th</sup>, 60<sup>th</sup>, and 80<sup>th</sup> percentiles separately for men and women by year. Secondly, ordered probit regressions are run to predict the probability of earning a wage in each wage quantile, separately for men and women by year. The probit regressions include age, education level, part time work and occupation dummies as control variables. The predicted probabilities are then used to weight individual observations in wage regressions. To estimate the returns to skills in each bargaining regime I will follow the methodology of Dahl et al. (2013) by including interaction terms with education and experience dummies for the FD models.

## 5.2 Firm performance regressions

To assess the effect of decentralised bargaining on firms I will run regressions on two simple measures of firm performance; value added per employee and productivity. The productivity measure was estimated using a Cobb-Douglas regression<sup>9</sup>. I use pooled ordinary least squares and quantile regressions. The model is given by two different specifications:

$$y_{jt} = \beta LEVEL_{jt} + \gamma W_{jt} + \phi F_{jt} + \psi C_{rjt} \quad (11)$$

$$y_{jt} = \alpha_D D_{jt} + \alpha_I I_{jt} + \gamma W_{jt} + \phi F_{jt} + \psi C_{rjt} \quad (12)$$

$y_{jt}$  is either the log of value added per employee or the log of productivity. I use two different specifications to try to measure decentralisation at the firm-level as flexibly as possible.  $LEVEL_{jt}$

<sup>8</sup> By symmetric effects I mean that the coefficients are equal in size but opposite in sign, i.e.:  $\gamma_E^D = -\gamma_L^D$  and  $\gamma_E^I = -\gamma_L^I$ .

<sup>9</sup> See Table 12.

measures the average level of decentralisation in a firm, defined as the mean of the employees bargaining regimes.  $D_{jt}$  and  $I_{jt}$  measure the fraction of employees who have decentralised and two-tiered bargaining regimes in the firm. The control variables are average workforce characteristics ( $W_{jt}$ ), firm characteristics ( $F_{jt}$ ) and controls for regional, industry and time effects ( $C_{rjt}$ ). Ideally, productivity would be estimated using an Olley and Pakes (1996) estimation that can take into account selection effects and unobserved heterogeneity between firms. Since that method is dependent on rich longitudinal firm data that I do not have, I have to restrict the analysis to a simpler model. Hence endogeneity might still be a problem and the estimates must not be interpreted as causal, but rather as correlations.

## 6. Results

In this chapter I present results on how decentralised wage bargaining affect both individual wages and firm performance. I begin by assessing how mean individual wages are affected by coverage of decentralised and two-tiered wage bargaining, how this effect varies over the distribution of wages and how it affects the returns to skills. Thereafter I present empirical results on how firm performance is affected by the degree of decentralisation of bargaining at the firm.

### 6.1 Individual wages

Table 6 reports a range of regressions based on the baseline wage determination model. Dummies for the occurrence of decentralised and two-tiered bargaining regimes are the variables of my interest, where a dummy for centralised bargaining regime is used as the reference category in the regressions. Regressions are run on the whole sample and separately for men and women. Model specifications (1)-(3) are estimated using pooled ordinary least squares (POLS). Specification (1) reports the raw wage differential, without including any control variables. In specification (2) the model is extended to control for propensity scores, individual characteristics, firm characteristics, and region/industry/time effects. In (3) individual unobserved ability is also controlled for, through average characteristics of co-workers within the same firm and occupation group. Specification (4) is estimated using first difference (FD). In (4) co-worker characteristics is not included, since the methods already account for individual unobserved ability. Further, (4) identify the unbiased wage effect of contract status, by exploiting the variation in individual wage bargaining regime over time.

The raw differential, reported in (1), suggest that there is a very large premium both for having decentralised bargaining regime and two-tiered, of about 46 % and 30 % on log mean wages, respectively. Controlling for individual and firm observables and firm unobserved heterogeneity

(through the propensity scores) reduces the premiums significantly, by circa 20 %, and increases the explanatory power of the model. Even though added controls for unobserved heterogeneity slightly increases the premiums, this suggest that a sizeable portion of the wage premiums are due to systematic selection/sorting effects into firms. Those estimates, however, are still quite large. If we account for individual unobserved heterogeneity, by using FD, it is obvious that a large fraction of the premiums are driven by systematic individual selection/sorting effects. When doing so the premiums decreases, especially the premium associated with decentralised bargaining. Thus, the premium is 6.1 % for being covered by decentralised bargaining and 1.7 % for two-tiered bargaining, compared to centralised wage bargaining. This result is in line with the previous literature (e.g. Card and De La Rica (2006); Dahl et al. (2013) as well as Guertzgen (2014); Gürtzgen (2007) even though their estimates are considerably smaller). The pooled OLS estimates indicate that the premiums are larger for men than for women. According to Card, Cardoso, and Kline (2013) a large share of the gender wage gap has its origin in firm-specific wage formation. If true, we would expect that the premiums associated with local influence over the bargaining process would be larger for men than for women. This result, however, disappears when unobserved ability is controlled for. Instead the premiums are very similar, only 0.6 percentage points larger for women. Granqvist and Regnér (2011) find a similar result for Swedish data; women do not perform worse in negotiations than men, rather, individualised wage setting seem to be more important for women's wages than for men's. Table 7 reports the results from the baseline models based on the Jakubson specification. F-tests on the null hypothesis of symmetric wage effects are rejected in the FD-regressions. This implies that entering and leaving a bargaining regime does not have identical but opposite effects and that the Jakubson specification capture dynamic effects that are lost to the standard specification. The results shows that there are wage premiums attached to both entering and staying within both bargaining regime, with wage penalties of leaving the decentralised regime. Further on, the higher wage premiums of entering each regime than staying in them suggest that such regimes primarily offer higher wage levels, than wage growth, than do centralised regimes. Also, the wage premium associated with entering decentralised bargaining is lower for women (6.5 %) than for men (7.5 %) at the same time as the wage penalty for leaving decentralised wage bargaining is larger for women than for men (-3.6 % versus -1.8 %).



**Table 6: Baseline regressions - Standard specification**

Dependent variable:	ALL				MEN				WOMEN			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Log Hourly Wage	POLS	POLS	POLS	FD	POLS	POLS	POLS	FD	POLS	POLS	POLS	FD
Decentralised bargaining	0.457*** (0.001)	0.244*** (0.002)	0.262*** (0.002)	0.061*** (0.003)	0.509*** (0.002)	0.294*** (0.002)	0.311*** (0.002)	0.055*** (0.004)	0.378*** (0.002)	0.166*** (0.002)	0.180*** (0.002)	0.061*** (0.006)
Two-tiered bargaining	0.299*** (0.000)	0.083*** (0.001)	0.081*** (0.001)	0.017*** (0.003)	0.305*** (0.001)	0.086*** (0.001)	0.084*** (0.001)	0.014*** (0.004)	0.267*** (0.001)	0.069*** (0.001)	0.064*** (0.001)	0.009* (0.005)
<b>Propensity scores</b>	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
<b>Individual characteristics</b>	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
<b>Firm characteristics</b>	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
<b>Co-worker characteristics</b>	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	YES
<b>Region/Industry/Time</b>	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Constant	4.853*** (0.000)	3.781*** (0.005)	3.906*** (0.006)	0.176*** (0.001)	4.882*** (0.000)	3.623*** (0.007)	3.817*** (0.008)	0.172*** (0.001)	4.807*** (0.000)	3.695*** (0.009)	3.791*** (0.011)	0.182*** (0.002)
Observations	1,586,788	989,554	989,554	277,732	1,012,745	656,396	656,396	195,611	574,043	333,158	333,158	82,121
R-squared	0.333	0.552	0.567	0.110	0.366	0.558	0.574	0.133	0.280	0.519	0.532	0.093

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 7: Baseline regressions - Jakubson specification**

Dependent variable:	ALL				MEN				WOMEN			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Log Hourly Wage	POLS	POLS	POLS	FD	POLS	POLS	POLS	FD	POLS	POLS	POLS	FD
<b>Decentralised bargaining</b>												
Enter	0.296*** (0.004)	0.080*** (0.004)	0.092*** (0.004)	0.075*** (0.004)	0.315*** (0.005)	0.099*** (0.005)	0.108*** (0.005)	0.075*** (0.005)	0.262*** (0.006)	0.049*** (0.006)	0.064*** (0.006)	0.065*** (0.006)
Leave	0.349*** (0.005)	0.248*** (0.005)	0.247*** (0.005)	-0.027*** (0.004)	0.364*** (0.006)	0.255*** (0.006)	0.251*** (0.006)	-0.018*** (0.005)	0.295*** (0.009)	0.227*** (0.011)	0.229*** (0.011)	-0.036*** (0.008)
Stay	0.447*** (0.002)	0.190*** (0.002)	0.200*** (0.002)	0.029*** (0.001)	0.486*** (0.002)	0.221*** (0.002)	0.229*** (0.002)	0.035*** (0.001)	0.376*** (0.003)	0.128*** (0.004)	0.141*** (0.004)	0.016*** (0.002)
<b>Two-tiered bargaining</b>												
Enter	0.082*** (0.002)	-0.106*** (0.002)	-0.104*** (0.002)	0.041*** (0.003)	0.066*** (0.002)	-0.113*** (0.003)	-0.110*** (0.003)	0.038*** (0.004)	0.107*** (0.003)	-0.091*** (0.003)	-0.091*** (0.003)	0.033*** (0.006)
Leave	0.145*** (0.003)	0.080*** (0.003)	0.073*** (0.003)	0.014*** (0.004)	0.129*** (0.004)	0.061*** (0.004)	0.058*** (0.004)	0.015*** (0.005)	0.166*** (0.005)	0.106*** (0.005)	0.097*** (0.005)	0.020*** (0.006)
Stay	0.297*** (0.001)	0.036*** (0.001)	0.033*** (0.001)	0.026*** (0.000)	0.284*** (0.001)	0.032*** (0.001)	0.028*** (0.001)	0.030*** (0.001)	0.297*** (0.001)	0.043*** (0.001)	0.040*** (0.001)	0.020*** (0.001)
<b>Propensity scores</b>												
<b>Individual characteristics</b>	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
<b>Firm characteristics</b>	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
<b>Co-worker characteristics</b>	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
<b>Region/Industry/Time</b>	NO	YES	YES	YES	NO	YES	YES	YES	NO	NO	YES	YES
Constant	4.934*** (0.000)	3.790*** (0.005)	3.907*** (0.006)	0.165*** (0.001)	4.971*** (0.000)	3.626*** (0.007)	3.809*** (0.008)	0.160*** (0.001)	4.872*** (0.000)	3.724*** (0.009)	3.809*** (0.011)	0.173*** (0.002)
Observations	1,586,788	989,554	989,554	277,732	1,012,745	656,396	656,396	195,611	574,043	333,158	333,158	82,121
R-squared	0.143	0.540	0.552	0.122	0.150	0.539	0.553	0.150	0.124	0.514	0.525	0.101

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: F-tests for the joint null hypothesis of symmetric wage effects are rejected in the FD-regressions. I.e.  $\gamma_E^p = -\gamma_L^p$ ,  $\gamma_E^s = -\gamma_L^s$  and  $\gamma_E^s = 0, \gamma_L^s = 0$  is rejected

As previously mentioned, identification of the unbiased wage effect of contract status is dependent on variation in individual bargaining regime setting. Even though this is achieved in the FD regressions in Table 6 and Table 7 those results do not differentiate between premiums coming from within or between job regime changes. It is likely that between jobs changes in bargaining regimes will capture firm-specific heterogeneity, as job changes are more likely to occur when individuals are offered better wages, reasonably in firms with higher average wages, biasing estimates upwards. To account for this, FD regressions are run on the sample of individuals who are observed in both time periods, firstly for the whole sample and then separately for those have changed jobs (“switchers”) and those who have stayed in the same job (“stayers”). Baseline model results are presented in Table 8 and results from the Jakubson specification is available in Table 14 in the appendix.

**Table 8: Job Switchers/Stayers regressions – Standard specification**

Dependent variable: Log Hourly Wage	ALL	SWITCHERS	STAYERS
	(1)	(2)	(3)
	FD	FD	FD
Decentralised bargaining	0.061*** (0.003)	0.082*** (0.008)	0.050*** (0.003)
Two-tiered bargaining	0.017*** (0.003)	0.025*** (0.006)	0.007** (0.003)
<b>Propensity scores</b>	YES	YES	YES
<b>Individual characteristics</b>	YES	YES	YES
<b>Firm characteristics</b>	YES	YES	YES
<b>Co-worker characteristics</b>	NO	NO	NO
<b>Industry/Region/time</b>	YES	YES	YES
Constant	0.176*** (0.001)	0.191*** (0.004)	0.176*** (0.001)
Observations	277,732	32,047	245,685
R-squared	0.110	0.139	0.113

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Thus, specification (1) is for the whole sample, (2) is for job switchers, and (3) for job stayers. When we differentiate between the reasons for bargaining regime changes, it is obvious that regime changes due to job changes carries a larger premium. In the case of decentralised bargaining the difference is circa 3 %, dropping from 8.2 % to 5 %, while the wage effect of two-tiered bargaining drops from 2.5 % to 0.7 %, which is a very small premium. Estimates from the Jakubson specification, Table 14, also show that the wage premiums drop, they are however larger and do not drop as much for the two-tiered regime (6.8 % and 2.6 % wage premium associated with entering decentralised and two-tiered regimes, respectively). This suggest that the between jobs regressions capture firm-specific heterogeneity. Thus the within jobs changes estimates are likely to be more precise by eliminating firm-specific effects that are biasing the wage premiums upwards.

The results so far indicate that the level of decentralisation at which bargaining takes place has positive effects on mean wages. This does not however address the question how those premium are distributed across skill groups. To answer this question separate wage regressions for workers in five different wage quantiles are estimated (see chapter 5.2 for details). The wage regressions are run separately for the sub-samples in each of the five quantiles for men and women. Both POLS and FD regressions are run, available in Table 9, and Table 15 and Table 16 in the appendix.

Estimates from the POLS regressions, in Table 15, suggest that the wage premium profile from decentralised bargaining is U-shaped, with larger premiums for top income earners than bottom income earners, thus increasing wage dispersion. When taking into account unobservables, as in Table 9, another image emerges. The FD estimates suggest that the wage premiums are decreasing in wage levels; premiums are largest for low-wage earners and decrease in higher wage quantiles, even turning negative for the highest wage quantile for men and women. The negative impact in the top quantile is also found in Granqvist and Regnér (2011) when looking at how individualised bargaining through pay reviews affects wages in the Swedish labour market. The premium arising from decentralised bargaining is 13.9 % for men and 19 % for women in the lowest quantile, and decreases to around 4-5 % in the middle of the distribution for both. The two-tiered premium is 6 % for men in the lowest quantile for men and decreases to 1-2 % in the middle of the distribution. For women there is no significant premium in the lowest quantile, but there is in the middle quantiles of around 2.5-4.4 %, higher than for men. Notably, the wage penalty in the highest wage quantile is larger for women than for men (-9.2 % vs -3.7 %). It should be noted, however, that the number of observations with decentralised bargaining in quantile 1 for men and women is very low in the two regressions (36 versus 13), making those estimates less credible. This is not a problem for the other quantiles whose estimates are credible. In essence, the results show that local bargaining (as is present in both regimes) mainly benefits low-wage earners. This can be interpreted as local union's enforcing egalitarian preferences, rewarding relatively higher premiums to low-wage earners to compress the within-firm structure, which would be consistent with evidence for Italy and Spain by Dell'Aringa and Lucifora (1994b) and Plasman et al. (2007).

*Table 9: Quantile regressions – Standard specification*

Dependent variable:	MEN					WOMEN				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Log Hourly Wage	0.002	0.004	0.018	0.044	0.189	0.002	0.014	0.028	0.076	0.150
FD Model	0.139*** (0.050)	0.093*** (0.021)	0.040*** (0.009)	0.048*** (0.008)	-0.008 (0.014)	0.190** (0.075)	0.071*** (0.020)	0.047*** (0.011)	0.049*** (0.010)	-0.050*** (0.013)
Fraction with Decentralised bargaining	0.096	0.154	0.311	0.585	0.716	0.099	0.125	0.195	0.425	0.680
Fraction with Two-tiered bargaining	0.060*** (0.018)	0.008 (0.007)	0.012** (0.006)	0.020*** (0.007)	-0.037*** (0.014)	0.015 (0.023)	0.044*** (0.011)	0.025*** (0.008)	0.028*** (0.007)	-0.092*** (0.013)
<b>Propensity scores</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Individual characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Firm characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Co-worker characteristics</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>Region/Industry/Time</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	0.097*** (0.004)	0.109*** (0.003)	0.147*** (0.003)	0.215*** (0.002)	0.269*** (0.003)	0.080*** (0.005)	0.079*** (0.004)	0.145*** (0.003)	0.198*** (0.003)	0.293*** (0.004)
Observations	18,091	38,893	39,461	48,222	50,944	6,436	13,363	18,490	20,719	23,113
R-squared	0.148	0.137	0.187	0.192	0.207	0.184	0.086	0.087	0.129	0.184

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Note: Quantile 1 is the lowest wage quantile, Quantile 5 is the highest.

To analyse how bargaining regimes affects the returns to skills, I estimate regressions with interaction effects between bargaining regimes and education and experience levels. The results are available in Table 10. Columns (1)-(2) reports the interaction effects with education and columns (3)-(4) the interaction effects with experience. Pooled OLS and FD regressions are run. Schooling shorter than 9 years and experience less than 5 years are used as reference categories in respective regressions. POLS estimates suggest that there are positive interaction effects with decentralised

bargaining for post-secondary schooling, compared to less than 9 years of schooling and centralised bargaining. For two-tiered bargaining the positive interaction effect is also significant for secondary schooling. The positive returns to education, however, largely disappear when unobserved heterogeneity is taken into account (column (2) and (3)). For decentralised bargaining there is none and for two-tiered is only for post-secondary schooling of more than 2 years. Thus, there is no evidence of higher returns to education in decentralised and two-tiered bargaining, compared to centralised wage bargaining. This is a surprising result. There are both theoretical and empirical reasons<sup>10</sup> why the return to education might be higher under decentralised bargaining. It is worth to note, however, that the return to education in Sweden is small in an international perspective (OECD, 2013).

**Table 10: Returns to skills regressions**

Dependent variable: Log Hourly Wage	EDUCATION		EXPERIENCE	
	(1)	(2)	(3)	(4)
	POLS	FD	POLS	FD
<b>Decentralised bargaining - Interaction</b>				
Primary schooling\5-10 years' experience	0.011 (0.014)	-0.011 (0.034)	0.125*** (0.009)	0.014 (0.018)
Secondary schooling\11-20 years' experience	0.023* (0.013)	-0.007 (0.033)	0.288*** (0.009)	0.036** (0.018)
Post-secondary schooling (Less than 2 years)\21-30 years' experience	0.143*** (0.013)	-0.031 (0.033)	0.353*** (0.009)	0.042** (0.018)
Post-secondary schooling (More than 2 years)\31- years' experience	0.137*** (0.013)	0.009 (0.033)	0.352*** (0.009)	0.043** (0.018)
<b>Two-tiered bargaining - Interaction</b>				
Primary schooling\5-10 years' experience	0.004 (0.004)	0.009 (0.013)	0.043*** (0.002)	0.026*** (0.003)
Secondary schooling\11-20 years' experience	0.012*** (0.003)	0.006 (0.012)	0.160*** (0.002)	0.056*** (0.004)
Post-secondary schooling (Less than 2 years)\21-30 years' experience	0.061*** (0.004)	-0.006 (0.013)	0.195*** (0.002)	0.067*** (0.004)
Post-secondary schooling (More than 2 years)\31- years' experience	0.107*** (0.003)	0.027** (0.012)	0.188*** (0.002)	0.070*** (0.004)
<b>Propensity scores</b>	YES	YES	YES	YES
<b>Individual characteristics</b>	YES	YES	YES	YES
<b>Firm characteristics</b>	YES	YES	YES	YES
<b>Co-worker characteristics</b>	YES	NO	YES	NO
<b>Industry/Region/time</b>	YES	YES	YES	YES
Constant	3.894*** (0.006)	0.177*** (0.001)	3.884*** (0.007)	0.172*** (0.001)
Observations	989,554	277,732	1,000,030	412,264
R-squared	0.572	0.110	0.573	0.099

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

<sup>10</sup> For example Dahl et al. (2013) find higher returns to education in decentralised regimes in Denmark, compared to centralised.

Estimates show significant and sizable returns to experience under both decentralised and two-tiered bargaining. Decentralised bargaining is associated with a premium around 3-4 % and two-tiered 2.6-7 %, increasing in experience, compared to centralised wage bargaining. In general, a positive experience-wage relationship could exist because more experienced workers have more firm-specific human capital or because they have longer tenure within the firm, capturing higher rents to insiders. Due to data limitations I cannot test which hypothesis is true. It could be suspected that in regimes with local bargaining, insider market power is used to favour insiders, i.e. workers with seniority and longer tenure, thus raising the returns to experience.

To summarise, there is evidence of a positive wage premium coming from decentralised and two-tiered wage bargaining. There is also evidence that low-wage earners are awarded relatively larger premiums, compressing the wage structure. There are no systematic differences in returns to education between bargaining regimes, but returns to experience are higher when local bargaining elements are present, compared to centralised bargaining.

## ***6.2 Firm performance***

Now I turn to the question of how the level of decentralisation of wage bargaining affects firm performance. As measures of firm performance I will consider two simple measures; value added per employee and productivity. As a measure of the level of decentralisation I use two different measures. In specification (1) and (2) I use the mean level of decentralisation at the firm, defined as the mean of all employees' bargaining regimes' level of decentralisation. In specification (3) and (4) I use two variables; the proportion employees with decentralised bargaining and the proportion with two-tiered bargaining in the firm. I also include control variables for the average workforce characteristics, firm characteristics and regional, industry and time effect controls<sup>11</sup>. I use both pooled OLS and quantile regressions (QR). Quantile regressions are employed because the effect on the median firm might differ from the average firm, and using that technique can help illuminate how the effect varies over the distribution of firms. Results are available in Table 11.

As previously mentioned, there might be issues of endogeneity coming from unobserved firm heterogeneity. In the absence of an identification strategy I cannot determine if estimates reflect a causal effect on firm performance, or if the estimates are the result of firms adjusting to higher average wages by hiring higher-ability workers and increasing the capital-labour ratio. This implies that the estimates should be interpreted with caution and simply as correlations, rather than

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<sup>11</sup> See Table 13 for details on variables used.

causations. With this in mind, the results from Table 11 shows that decentralisation, when measured on a firm average level, has positive and statistically significant relationship with both value added per employee and productivity. The effects are very similar in size. For the mean firm the effect is 5.9 % on value added per employee and 6.3 % for the median firm. The effect on productivity is 5.3 % for the mean firm and 5.6 % for the median firm. In Figure 1 the coefficient of the level of decentralisation is plotted over the distribution of firms, for both value added per employee and productivity. In both regressions, the effect is larger for highly performing firms, being around 10 % for the top 20 % firms.

**Table 11: Firm performance regressions**

Dependent variable:	VALUE ADDED				PRODUCTIVITY			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Pooled OLS & Quantile Regressions	POLS	QR	POLS	QR	POLS	QR	POLS	QR
Level of decentralisation	0.059*** (0.011)	0.063*** (0.006)			0.053*** (0.011)	0.056*** (0.008)		
Proportion Decentralised bargaining			0.043 (0.036)	0.027 (0.032)			0.024 (0.036)	0.061** (0.028)
Proportion Two-tiered bargaining			0.197*** (0.023)	0.191*** (0.014)			0.209*** (0.023)	0.207*** (0.019)
<b>Workforce characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES
<b>Firm characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES
<b>Industry/Region/Time</b>	YES	YES	YES	YES	YES	YES	YES	YES
Constant	10.01*** (0.194)	10.16*** (0.188)	10.09*** (0.190)	10.18*** (0.192)	-2.080*** (0.195)	-2.020*** (0.207)	-2.013*** (0.191)	-1.924*** (0.201)
Observations	7,866	7,866	7,866	7,866	7,832	7,832	7,832	7,832
R-squared	0.369		0.375		0.283		0.293	
Pseudo-R-squared		0.229		0.234		0.167		0.173

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

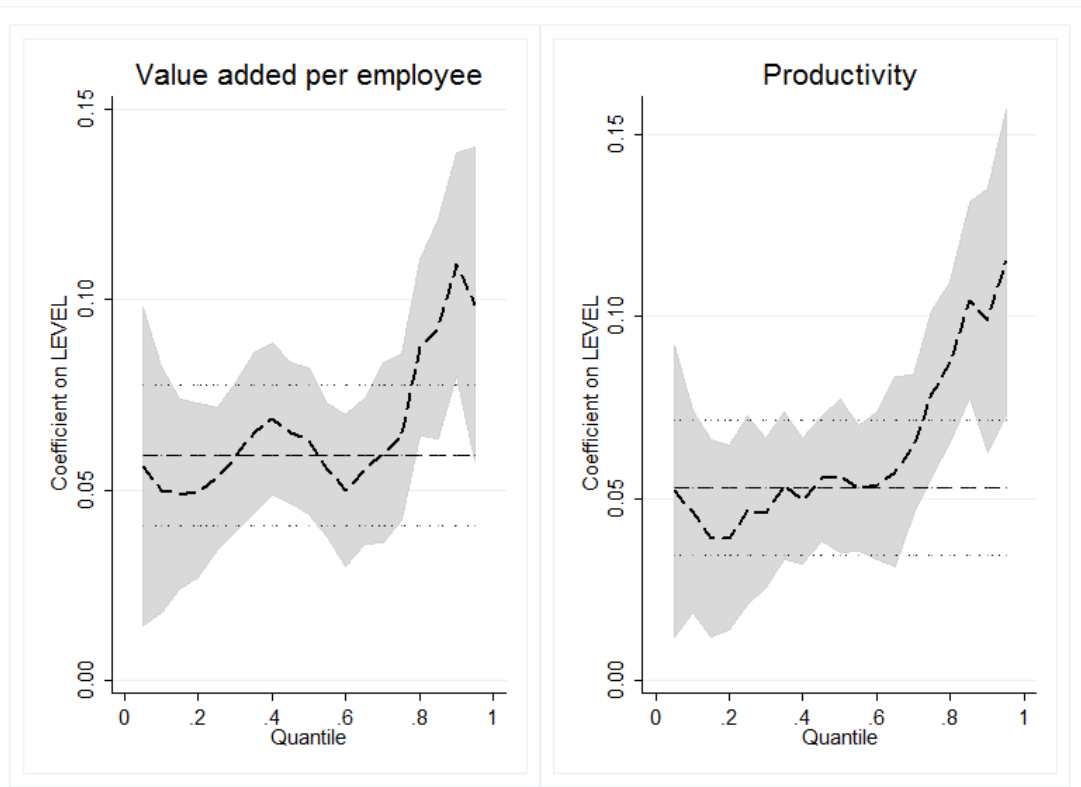
When the proportion of employees with decentralised/two-tiered regimes are employed instead, there is only a statistically significant effect of decentralised bargaining on median firm productivity. The proportion two-tiered covered employees, however, has a large coefficient, around 19 % for value added and 20 % for productivity. This result could be due to the fact that only a small share of the workforce are covered by completely decentralised bargaining regimes, which is not enough to affect the overall firm performance. Two-tiered bargaining, which covers a larger share of the workforce, has a sizeable effect as compared to centralised bargaining.

Under the strong assumption that wages are equal to worker's marginal productivity, wage premiums reflect higher productivity. With this in mind, the earlier wage regressions indicate that decentralised bargaining raises productivity. Interestingly, the individual returns to decentralised



wage bargaining (premiums of 5-7.5 %) are very similar to the increase in firm performance of an additional units increase in the level of decentralisation (5-6 %). A similar result is found by Jones (2001), looking at education and firm productivity. By simultaneously estimating earnings and production functions, results indicate that the individual return to schooling is almost identical the rise in productivity from a one year increase in average years of schooling. Wald statistics confirms that there is no statistical difference between relative wages paid to workers and their relative productivity, suggesting that education reflects productivity. Since the data used in the wage and firm regressions consists of two different samples, empirical testing of the equality of coefficients is not possible. Even though it would be interesting to see if a similar relationship exists between wage bargaining premiums and firm performance in the vein of the Jones (2001) study, data characteristics does not allow for such testing.

To summarise, there are indications that there exist a positive relationship between firm performance and wage bargaining regimes that gives leeway for local bargaining. The size of the



results, however, are likely to be overestimated in the absence of controls for unobserved firm

*Figure 1: Coefficients of LEVEL over the distribution of firms*  
 Note: Horizontal lines represents OLS estimates with 95 % confidence intervals.

heterogeneity.

## 7. Conclusions

The previous literature has produced clear predictions on the effect of decentralised wage bargaining on wage levels, entailing a positive wage premium. At the same time the effect on wage dispersion is less clear-cut and empirical support exists for both a positive and negative relationship with dispersion. The bulk of the studies, however, have relied on cross-sectional estimates that are likely to be upward biased, since they cannot control for individual and firm unobserved heterogeneity. The majority of studies have focused on continental Europe, with little empirical evidence for Scandinavia in general and in Sweden in particular. Hitherto, the topic has been scarcely studied for Sweden, even though labour relations has clearly moved towards increased decentralisation. Further on, no study so far have studied the impact of decentralised wage bargaining on firm performance, despite the importance of an effective wage formation for the functioning of firms.

This paper has tried to improve on those research gaps. By using a unique employer-employee matched data new evidence is provided on how decentralised collective bargaining has affected both the levels and structure of wages as well as firm performance in Sweden. The availability of repeated time periods ( $T=2$ ) makes it possible to control for unobserved individual ability and firm heterogeneity, producing less biased estimates than simple cross-sectional estimates.

To assess and evaluate the effect of decentralised wage bargaining on both individual's wages and firm's performance several empirical methods have been used. Initial estimates, using pooled OLS, suggest that being covered by decentralised and two-tiered bargaining entails large premiums of 26.2 % and 8.1 %, respectively, compared to centralised wage bargaining. Those estimates are likely to be biased due to systematic selection and sorting effects since pooled OLS cannot adequately control for unobserved ability. The identification of the true effects of the bargaining regimes on wages is dependent on variation in bargaining status. Two methods are employed to deal with this. Firstly, first difference OLS (FD) regressions are run with indicator dummies for decentralised/two-tiered bargaining, controlling for observable and unobservable characteristics. Using this method the size of the premiums reduce drastically, to 6.1 % for decentralised bargaining and 1.7 % for two-tiered bargaining. Secondly, I differentiate between entering, leaving, and staying in each bargaining regime, using dummies, and its effect on wages. This nuances the interpretation of the wage premium. FD regressions show that entering decentralised regimes entails a positive premium of 7.5 %, staying 2.9 %, and leaving a negative premium of 2.7 %, compared to never

being covered by decentralised bargaining. For two-tiered bargaining, the premium from entering is 4.1 %, staying 2.6 % and 1.4 % from leaving. The premium differential between entering and staying in each regime suggest that a large share of the wage premiums is due to a wage level effect, rather than a wage growth effect. Thirdly I assess how the structure of wages and returns to skills are affected. There is evidence of a wage compressing effect of both decentralised and two-tiered bargaining, by relatively higher wage premiums for low-wage earners. Higher returns to experience is found under both regimes, but no higher returns to education.

Lastly, using a simple model I empirically examine the linkage between decentralised wage bargaining and firm performance, focusing on value added per employee and productivity. This is a novel contribution to the literature, where the relationship between decentralised bargaining and firm performance has not yet been researched. Estimates indicates that the effect of a unit's change in the level of decentralisation is associated with a 5-6 % increase in firm performance, with larger effects for the median firm than for the average firm. The effects are monotonically increasing over the distribution with around 10 % coefficient size for the top 20 % highest performing firms. In the absence of an identification strategy, however, the estimates are to be seen as upper bounds and it is not possible to distinguish if the effect is causal or the results of firms adjusting to higher wage levels by hiring higher ability individuals and/or increasing the capital to labour ratio.

Future research can improve upon the methodology in several ways. More time periods and control variables can generate more precise estimates, for example by allowing more variation over time and controlling for wage effects arising from tenure. An identification strategy could identify the causal effect of bargaining on firm performance. With this in mind, however, the paper adopts and modifies the methodology of influential studies to investigate the topic as flexibly as possible.

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## Appendices

### Appendix 1 – Variable descriptives

*Table 12: Details on variables*

Variable	Details
SSYK	Swedish standard for occupational classification, which is based on ISCO-08 (International Standard Classification of Occupation 2008).
Years of experience	Calculated as:

	<i>Age – 6 – Years of education.</i>
Bargaining dispersion	This variable tries to measure the complexities of the bargaining setup in the firm. It is a Herfindahl-index of qualitative variation constructed from the 7 different types of agreements characterised by the National Mediation Office. A higher value indicates that there are more different agreements in the firm, and a lower value indicates that are fewer.
Capital intensity	Calculated as the real capital stock divided by net sales.
Productivity	Estimated as the residual coming from the firm-regression on log value added per employee of the form: $VA_{jt} = \beta_1 CAPITAL_{jt} + \beta_2 LABOUR_{jt}$ where capital is the log of the capital stock per employee and labour is the log of the number of employees, for each firm $j$ at time $t$ .
Level of decentralisation ( $LEVEL_{jt}$ )	Mean of the employees' bargaining regimes. The value range is 1 (centralisation) to 4 (decentralisation).

*Table 13: Control variable groups' details*

<b>Control variable group:</b>	<b>Include variables:</b>
Propensity scores	Two polynomials with the predicted probability in levels and quadratic form of having decentralised and two-tiered contracts at the firm, separately.
Individual characteristics	Age, age-squared, and dummies for female, performance pay, part time work, white-collar, occupation group (“Managers/Technicians/Professionals/Associate professionals”, “Clerical”, “Service”, “Qualified Manual”; “Unqualified manual” is the reference category), and secondary and tertiary schooling (primary

	schooling is the reference category).
Firm characteristics	Firm age, log of capital intensity, log of net sales, dummies for export-orientation, number of employees (“10-20”, “21-50”, “51-100”, “101-200”; “200-“ is the reference category. Firms with less than 10 employees are excluded). In firm performance regressions, regional unemployment is also included, derived from the OECD regional statistics database.
Co-worker characteristics (within firm and occupation group)	Proportion under 30, proportion over 50, proportion female, proportion white-collar, proportion secondary schooling, and proportion tertiary schooling.
Region/Industry/Time	Regions (“East middle”, “Småland with islands”, “South”, “West”, “North Middle”, “Central Norrland”, “Upper Norrland”; ”Stockholm” is the reference category), industries (“Construction”, “Trade, hotels, and restaurants”, “Transports”, “Agriculture and forestry”, “Service”; “Manufacturing” is the reference category) and a year dummy for 2010.
Average workforce characteristics	Bargaining dispersion, and proportions of: under age 30, over age 50, white-collar, post-secondary education, female, 5 occupation groups.



## Appendix 2 – Regression tables

**Table 14: Job switchers/stayers regressions – Jakubson Specification**

Dependent variable:	ALL	SWITCHERS	STAYERS
Log Hourly Wage	(1)	(2)	(3)
	FD	FD	FD
<b>Decentralised</b>			
Enter	0.075*** (0.004)	0.091*** (0.009)	0.068*** (0.004)
Leave	-0.027*** (0.004)	-0.053*** (0.010)	-0.012*** (0.004)
Stay	0.029*** (0.001)	0.052*** (0.005)	0.026*** (0.001)
<b>Two-tiered</b>			
Enter	0.041*** (0.003)	0.060*** (0.007)	0.028*** (0.003)
Leave	0.014*** (0.004)	0.025*** (0.008)	0.016*** (0.003)
Stay	0.026*** (0.000)	0.040*** (0.002)	0.024*** (0.000)
<b>Propensity scores</b>	YES	YES	YES
<b>Individual characteristics</b>	YES	YES	YES
<b>Firm characteristics</b>	YES	YES	YES
<b>Co-worker characteristics</b>	NO	NO	NO
<b>Industry/Region/time</b>	YES	YES	YES
Constant	0.165*** (0.001)	0.172*** (0.004)	0.167*** (0.001)
Observations	277,732	32,047	245,685
R-squared	0.122	0.154	0.125

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 15: Quantile regressions - POLS Standard specification**

Dependent variable:	MEN					WOMEN				
	(1) Quantile 1	(2) Quantile 2	(3) Quantile 3	(4) Quantile 4	(5) Quantile 5	(1) Quantile 1	(2) Quantile 2	(3) Quantile 3	(4) Quantile 4	(5) Quantile 5
Log Hourly Wage	0.003	0.007	0.020	0.050	0.164	0.003	0.137	0.034	0.087	0.125
POLS Model	0.041*** (0.009)	0.017*** (0.002)	0.008*** (0.001)	0.030*** (0.001)	0.123*** (0.004)	0.028*** (0.009)	0.011*** (0.001)	0.006*** (0.001)	0.012*** (0.001)	0.154*** (0.004)
<b>Bargaining regime</b>										
Fraction with Decentralised	0.075	0.149	0.271	0.525	0.590	0.075	0.128	0.194	0.368	0.483
Decentralised	0.018*** (0.001)	0.006*** (0.000)	0.002*** (0.001)	0.020*** (0.001)	-0.021*** (0.004)	0.003*** (0.001)	0.002*** (0.001)	0.001*** (0.001)	0.010*** (0.001)	0.028*** (0.003)
Fraction with Two-tiered	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Two-tiered	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Propensity scores</b>										
<b>Individual characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Firm characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Co-worker characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Region/Industry/Time</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	4.27*** (0.007)	4.656*** (0.00292)	4.774*** (0.003)	4.859*** (0.006)	4.301*** (0.023)	4.262*** (0.008)	4.536*** (0.004)	4.683*** (0.004)	4.785*** (0.006)	4.192*** (0.030)
Observations	100,549	127,530	127,872	145,551	154,364	55,441	59,697	67,820	72,977	77,123
R-squared	0.379	0.633	0.645	0.467	0.274	0.366	0.599	0.646	0.482	0.2667

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Note: Quantile 1 is the lowest wage quantile, Quantile 5 is the highest.

**Table 16: Quantile regressions – Jakubson specification**

Dependent variable:	MEN					WOMEN				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Quantile 1	Quantile 2	Quantile 3	Quantile 4	Quantile 5	Quantile 1	Quantile 2	Quantile 3	Quantile 4	Quantile 5
<b>Decentralised bargaining</b>										
Enter	-0.003 (0.034)	0.032* (0.016)	0.041*** (0.011)	0.034*** (0.009)	-0.053*** (0.014)	0.131*** (0.045)	0.009 (0.021)	0.040*** (0.012)	0.045*** (0.011)	-0.080*** (0.013)
Leave	-0.213*** (0.058)	-0.137*** (0.031)	-0.047*** (0.013)	-0.061*** (0.009)	-0.035*** (0.015)	-0.314*** (0.095)	-0.153*** (0.025)	-0.072*** (0.020)	-0.064*** (0.016)	-0.002 (0.016)
Stay	-0.043 (0.051)	-0.038*** (0.013)	-0.013*** (0.005)	-0.014*** (0.003)	-0.073*** (0.003)	-0.006 (0.035)	-0.007 (0.010)	-0.017*** (0.005)	-0.014*** (0.003)	-0.045*** (0.003)
<b>Two-tiered bargaining</b>										
Enter	-0.008 (0.019)	-0.002 (0.007)	0.038*** (0.007)	0.052*** (0.008)	-0.052*** (0.015)	-0.046* (0.027)	0.037*** (0.012)	0.028*** (0.009)	0.038*** (0.008)	-0.064*** (0.015)
Leave	-0.142*** (0.023)	-0.026*** (0.010)	0.031*** (0.007)	0.034*** (0.008)	0.019 (0.014)	-0.088*** (0.028)	-0.055*** (0.015)	-0.021** (0.010)	-0.007 (0.008)	0.092*** (0.013)
Stay	0.016*** (0.004)	-0.008*** (0.002)	0.015*** (0.001)	0.005*** (0.001)	-0.077*** (0.003)	-0.010 (0.008)	0.007** (0.003)	-0.004* (0.002)	-0.006*** (0.002)	-0.047*** (0.003)
<b>Propensity scores</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Individual characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Firm characteristics</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<b>Co-worker characteristics</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>Region/Industry/Time</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	0.100*** (0.004)	0.111*** (0.003)	0.140*** (0.003)	0.210*** (0.002)	0.340*** (0.004)	0.082*** (0.005)	0.080*** (0.004)	0.146*** (0.004)	0.201*** (0.004)	0.337*** (0.005)
Observations	18,091	38,893	39,461	48,222	50,944	6,436	13,363	18,490	20,719	23,113
R-squared	0.153	0.138	0.192	0.197	0.226	0.189	0.089	0.088	0.132	0.200

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### Appendix 3 – Figures

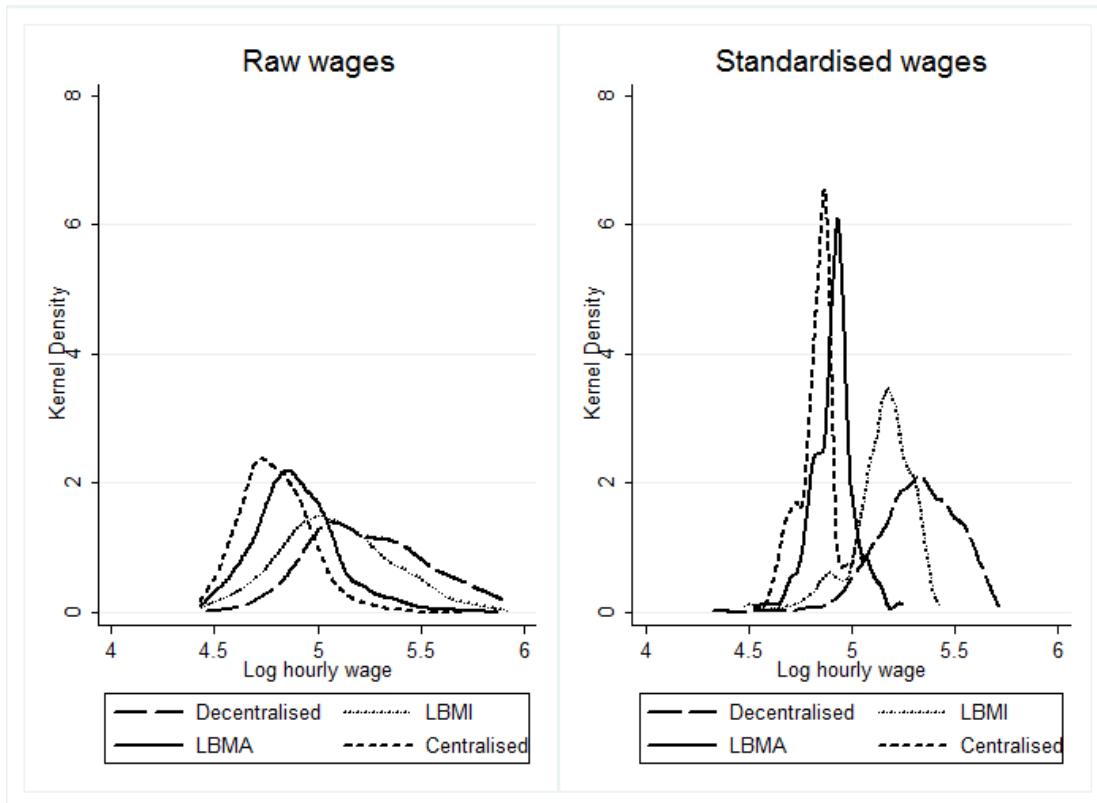


Figure 2: Wage distribution by bargaining regime