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## ORIGINAL ARTICLE

# The effects of the decentralization of collective bargaining on wages and wage dispersion: Evidence from the Finnish forest and IT industries

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## Abstract

Recently, Finnish forest industries shifted from sectoral collective bargaining to firm-level bargaining, and the IT services industry shifted to a hybrid of sector- and firm-level bargaining. Using administrative data on monthly wages and the synthetic difference-in-differences method, I study the causal effects of collective bargaining decentralization on the level and dispersion of wages. Despite the substantial change in the level of collective bargaining, I generally find muted effects on the level and dispersion of wages. I find positive and economically and statistically significant effects on wage levels and within-firm wage dispersion only for blue-collar workers in the paper industry.

In October 2020, the Finnish forestry sector announced that it would abandon the sectoral collective bargaining system and move to firm-level bargaining. This represented a drastic change, breaking with the long tradition of sectoral bargaining in Finland and ending generally binding collective agreements in this sector. Moreover, the old contracts were not extended to cover the period before the new contracts were signed (no ultra-activity). These changes meant that all issues previously covered by sectoral agreements would now be negotiated at the firm level, which could lead to notable contract changes. In March 2021, technology industries followed suit, announcing that they would move to a hybrid model of sector- and firm-level bargaining.

These developments are an example of collective bargaining decentralization, which has been taking place in most European countries over the past few decades (Visser, 2016). Decentralization

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can take several forms, depending on the institutional setting. Traxler (1995) considers decentralization to be organized when it occurs within a sectoral bargaining system. Examples of organized decentralization are the opening clauses that are prevalent in German collective agreements (e.g. Ellguth et al., 2014) and the Scandinavian two-tiered bargaining models (Barth et al., 2014). In Traxler's terminology, disorganized decentralization refers to cases in which bargaining shifts to the firm level, with sectoral agreements playing no role. This is the case examined in this study.

The impact of decentralization on the level and dispersion of wages is ultimately an empirical question since, theoretically, the effects are unclear. Studies have shown that decentralization is associated with higher wages, but the findings on wage dispersion are mixed (see the next section for a more detailed literature review). Despite the substantial body of relevant literature, many questions remain. One central issue is the difficulty of establishing causality in this line of research. Many studies (e.g. Canal Domínguez & Gutiérrez, 2004; Card & de la Rica, 2006; Plasman et al., 2007) have used cross-sectional data, which do not allow a clear identification of the impact of decentralization.

More recent studies have used panel fixed-effects methods (Addison et al., 2017; Dahl et al., 2013; Gürtzgen, 2016). However, these studies have also had difficulty establishing causality. First, different pre-trends of treated and control units pose a threat to identification. For example, in Germany, firms can choose industry-level bargaining, firm-level bargaining or no bargaining at all, and their choices may depend on their financial success (Gürtzgen, 2016). Indeed, Gürtzgen (2016) shows that firms that abandoned sectoral bargaining had worse wage development before the shift than firms that did not. Second, these studies have examined settings in which decentralization does not occur at a single point in time; instead, units are treated at different points in time (staggered adoption) and may revert to the control state. These features and the likely heterogeneity in treatment effects mean that two-way fixed-effects methods cannot identify average treatment effects (Baker et al., 2022; Callaway & Sant'Anna, 2021; de Chaisemartin & d'Haultfoeuille, 2020; Goodman-Bacon, 2021; Sun & Abraham, 2021).

Another key issue is that the likely impact of decentralization depends heavily on the institutional framework. For example, its impact on wage levels depends crucially on its form. In Germany, the increasing prevalence of opening clauses may lead to lower wages, whereas in Belgium, the increased prevalence of firm-level bargaining can only increase wages relative to sectoral agreements. In Spain, firm-level bargaining is associated with a stronger union presence than sectoral bargaining, which may lead to lower wage dispersion under firm-level bargaining (Plasman et al., 2007). This heterogeneity in the forms of decentralization partly explains the conflicting empirical results reported in the literature.

This study contributes to the literature on the impacts of decentralization by studying Finnish industries that have decentralized their collective bargaining systems. I use monthly administrative data covering the entire Finnish workforce and employ a synthetic difference-in-differences method (Arkhangelsky et al., 2021) to study the causal effects of decentralization on the level of wages and on wage dispersion within and between firms.

This study differs from prior studies in that it examines a recent and clear event of collective agreement system decentralization in some sectors. A considerable part of the literature has used data from the 1990s or early 2000s and has examined settings in which firms are able to move between different bargaining levels. A setting in which large sectors move from sector- to firm-level bargaining is unique in the literature and arguably represents a more substantial change in the collective bargaining system than those typically studied previously. The institutional change is such that extensive changes in the content of contracts are possible. The setting in question and

the data and methods that I use allow more credible estimates of the impacts of decentralization than those reported previously.

## 1 | RELATED LITERATURE

The extant literature has mostly used cross-sectional individual-level data to study the association between collective bargaining decentralization and wages. Several studies have examined single- versus multiemployer bargaining in Spain. Using the 1995 wage structure survey, Card and de la Rica (2006) and Canal Domínguez and Gutiérrez (2004) find that single-employer bargaining is associated with higher wages than multiemployer bargaining. The difference is in the range of 5–10 per cent. Canal Domínguez and Gutiérrez (2004) also find that wage dispersion is lower under single-employer bargaining. Similarly, using the 1995 European Structure of Earnings Survey, Plasman et al. (2007) find that single-employer bargaining is associated with higher earnings in Denmark, Spain and Belgium. The differences are 3–4 per cent. Using the same data, Dell’Aringa and Pagani (2007) study the association between collective bargaining decentralization and wage dispersion and find that the results are mixed in Spain, predominantly negative in Belgium and slightly negative in Italy. Fitzenberger et al. (2013) use the 2001 German Structure of Earnings Survey and find that collective bargaining at both the firm and industry levels is associated with higher wages. A simple comparison between firm- and industry-level bargaining shows that wages are higher when bargained at the firm level.<sup>1</sup> Thus, previous studies using cross-sectional data have concluded that decentralized bargaining is associated with higher earnings. However, the results concerning wage dispersion are mixed.

The problem with cross-sectional data is that it is very difficult to establish causality. For this reason, more recent studies have used panel data. Using linked employer–employee panel data, Dahl et al. (2013) examine the decentralization of collective bargaining in Denmark over the period 1992–2001, during which industries’ wage-setting systems were decentralized. They classify collective agreements into three categories: (1) industry-level contracts; (2) two-tiered contracts (industry- and firm-level bargaining); and (3) purely firm-level bargaining. They identify the effects of decentralization using a panel regression that includes job spell dummies. Thus, the identification is based on changes in the type of collective agreement within a job spell. They find that decentralization increases wages by about 5 per cent, as well as increasing wage dispersion.

Also using linked employer–employee panel data, Gürtzgen (2016) studies decentralization in settings in which firms change their collective bargaining status in Germany. She classifies collective agreements into three categories: (1) industry-level contracts; (2) firm-level contracts; and (3) no contract. Her regression model includes both firm and individual fixed effects, which means that the effects are identified based on the variation in collective bargaining status within a job spell. The results show that collective bargaining status does not affect wages.<sup>2</sup> The estimated magnitudes are close to zero and statistically non-significant. However, while these two studies represent a clear improvement over studies using cross-sectional data, they do not necessarily identify causal effects either. This is because in both studies, industries or firms decentralize at different time points. Moreover, recent research has shown that fixed-effects regression models do not necessarily identify treatment effects in this case (Baker et al., 2022; Callaway & Sant’Anna, 2021; de Chaisemartin & d’Haultfoeulle, 2020; Goodman-Bacon, 2021; Sun & Abraham, 2021).

Overall, based on the extant literature, it can be said that decentralization is associated with higher — but not necessarily considerably higher — wages, whereas the findings concerning wage dispersion are mixed.

## 2 | INSTITUTIONAL SETTING

In Finland, collective bargaining takes place at the sectoral level, and the parties involved are employer federations and trade unions. Collective agreements cover, for example, wage formation, working times, vacations, social provisions and parental leave (e.g. Jonker-Hoffrén, 2019).

The contracts are often extended to non-signatory parties. The decision to extend a contract is made by an independent committee that operates under the Ministry of Social Affairs and Health. Although there are no strict extension criteria, the decisive factor is the coverage of a contract. Typically, a contract is extended if it covers at least 50 per cent of the employees in a sector (see Jonker-Hoffrén, 2019 for more details). The coverage of collective agreements is about 90 per cent.

The Finnish collective bargaining system has traditionally been quite centralized (e.g. Andersen et al., 2015). From 1968 to 2006, the dominant agreement type was a centralized tripartite collective agreement (the so-called incomes policy or TUPO). Central organizations first negotiated an agreement, and sectoral organizations then decided whether to follow it. The government often made its tax and social policies conditional on the coverage of collective agreements. The centralized bargaining rounds meant that wage increases were very similar across sectors. Occasionally, there were also purely sectoral bargaining rounds. This happened when some sectors did not accept a centralized collective agreement and decided to negotiate themselves. The typical contract duration was about 2 years.

In 2007, the Confederation of Finnish Industries (EK) announced that it would no longer participate in centralized bargaining (Andersen et al., 2015, p. 144). Its aim was a pattern bargaining model led by the export sector. In the 2007–2008 and 2009–2010 bargaining rounds, the negotiations took place at the sectoral level. In 2007–2008, the pattern bargaining model failed, and wage increases became higher later in the round. In hindsight, these increases were too high, given that the 2008 financial crisis ensued soon after the negotiations. In 2009–2010, the economic environment in the wake of the financial crisis was different, and wage increases were low — about 1 per cent per year. However, the competitiveness problem caused by the prior bargaining round persisted.

In 2011, a national centralized agreement provided guidelines for industry-level bargaining (the so-called Framework Agreement). This was similar in flavour to prior incomes policy agreements. Jonker-Hoffrén (2019) calls this and the following two agreements ‘new centralized agreements’. Another national centralized agreement, called the Pact for Employment and Growth, followed in 2013. This agreement attempted to solve the competitiveness problem created by the high wage increases of the 2007–2008 bargaining round and stipulated very low wage increases.<sup>3</sup> In 2016, the so-called Competitiveness Pact extended this agreement with no wage increases. It also extended working times (by about 24 h per year), shifted part of the social contributions from the employers to the employees and cut public sector holiday pay by 30 per cent for 3 years.

The ‘new centralized agreements’ came to an end in 2017, when EK changed its rules so that it could not negotiate contracts for its members. This decision led to two industry bargaining rounds in 2017–2018 and 2019–2020 characterized by pattern bargaining in which the export sector contracts set the wage norm. This pattern bargaining took place with no formal agreements or guidelines (Jonker-Hoffrén, 2019, p. 202).

The Finnish system of collective bargaining has left very little room for firm-level contracts or other forms of decentralization. The main form of decentralization has been the so-called local pots. These are wage increases negotiated and implemented locally according to the rules set in sectoral collective agreements. Their prevalence has varied over time and across industries (see

Kauhanen et al., 2020 for more details and analysis). Employers have wished for more decentralized bargaining since at least the beginning of the millennium (Heikkilä & Piekkola, 2005; Pekkarinen & Alho, 2005). However, as seen above, the collective bargaining system has not evolved as employers would have liked. This led some sectors to abandon the sectoral bargaining system in late 2020.

## 2.1 | Developments in 2020–2021

In October 2020, the Finnish Forest Industries Federation (FFIF) announced that it would not continue sectoral bargaining when the running contracts expired (31 December 2021, in the paper industry and 28 February 2022, in the mechanical forest industry). This meant that the sector would shift to firm-level bargaining with no generally binding collective agreement. This was a notable announcement since the forest sector is a major industry in the Finnish economy. In 2020, it accounted for 1.9 per cent of the Finnish GDP and 17.9 per cent of exported goods and employed about 40,000 people.

In practice, this meant that the sectoral labour union would negotiate the contracts with individual firms instead of the FFIF. The issues negotiated in the contracts remained basically the same. The main change was that at the firm level, the negotiations could be impacted by a firm's circumstances. Labour unions might, for example, be ready to accept lower wage increases if a firm pledged to maintain the level of employment. Such concession bargaining effectively brings employment to the negotiation table. However, since the labour unions' resources are spread quite thin when negotiating simultaneously with several firms, the unions might try to minimize contract differences between firms.

The FFIF's shift to firm-level bargaining was unexpected, and even other employer associations were unaware of its plans. The Finnish Paper Workers' Union (the blue-collar workers' union in the paper industry), the Finnish Industrial Union (the blue-collar workers' union in the mechanical forest industry) and the Trade Union Pro (the white-collar workers' union in both sectors) condemned the decision. These unions are seen as quite powerful, which is reflected in the union density in the forest industries. In the paper industry, both white- and blue-collar workers are highly unionized, with densities close to 100 per cent. The mechanical forest industry has somewhat lower densities, about 70 per cent for blue-collar workers and 50 per cent for white-collar workers.

Despite the unions' stance towards the change, firm-level negotiations started, and the first firm-level contracts were signed in October 2021 and came into force at the beginning of 2022. Subsequently, many firms in the paper and mechanical forest industries signed firm-level collective agreements. This is not to say that all negotiations went smoothly. UPM, one of the largest firms operating in both the paper and mechanical forest industries, signed contracts for its subsidiaries in the mechanical forest industry well before the running contracts expired, but in its paper industry subsidiaries, strikes lasting almost 4 months started on 1 January 2022. Eventually, contracts were also signed for these subsidiaries.

In March 2021, the Technology Industries of Finland also announced that it would move to a hybrid model of sector- and firm-level bargaining.<sup>4</sup> However, its decision differed markedly from that of the forest sector in that it created a new organization that would negotiate sectoral collective agreements. In principle, this meant that firms could choose between firm- and sector-level contracts. However, if sectoral contracts were deemed generally binding, the scope of firm-level contracts was narrowed, as they could not go below the levels stipulated in the sectoral agreement.

Thus, if many firms chose the generally binding sectoral contracts, the changes would be minimal compared to the previous system.

Technology industries have different contracts for manufacturing (the largest in terms of employment), metal ore mining, IT services and consulting services. The contracts in these industries expired at the end of November 2021. In manufacturing, consulting and mining, new sectoral collective agreements were signed in January 2022. The contracts covered such a large proportion of the employees in these sectors that they became generally binding. Thus, the collective agreement system in these sectors was not decentralized. Conversely, in IT services, the sectoral agreement did not become generally binding, and many firms negotiated firm-level agreements. The trade union density in the IT industry is quite low by Finnish standards (around 30 per cent).

To summarize, the collective bargaining system was substantially decentralized in three industries: the paper industry, the mechanical forest industry and IT services.

### 3 | CONCEPTUAL FRAMEWORK

In this section, I discuss the theoretical literature on the impact of firm-level bargaining on the level and dispersion of wages within and between firms. I also draw on the empirical literature on issues about which the theoretical literature is silent.

Economic theories have produced mixed results on the impact of firm-level bargaining on the level of wages. Jimeno and Thomas (2013) use the Mortensen–Pissarides model with heterogeneous firms and find that wages are higher with sectoral bargaining than with firm-level bargaining. This is because firms with low productivity are driven out of the market by the wage floor established in the sectoral agreement. Haucap and Wey (2004) use an oligopoly model with three modes of wage bargaining: firm-level bargaining, in which firms and firm-level unions negotiate wages; ‘coordination’, in which an industrial union negotiates wages for all firms in the industry; and ‘centralization’, in which an industrial union negotiates a single wage for all firms in the industry. Their results show that wages are higher with sectoral or coordinated bargaining than with firm-level bargaining. Gürtzgen (2009) generalizes Haucap and Wey (2004) model by allowing the number of firms to be arbitrary instead of two. In her model, the average wages are lower with sectoral bargaining than when an industry-wide union negotiates firm-specific wages.

Thus, from a theoretical point of view, the impact of moving to firm-level bargaining on the level of wages is ambiguous. In terms of theory application, it is also important to note that theoretical studies do not consider contractual variables other than wages. In practice, collective agreements deal with many issues, and a local union may settle for lower wage increases if it achieves other important goals, such as higher employment.

Another important topic to consider is wage drift. In the Finnish context, wage drift is defined as the difference between the actual wage increase and the contractual wage increase. Wage drift has been an important part of actual wage increases in Finland. Employers are, under certain circumstances, willing to pay more than stipulated by the contract — for example, due to efficiency wage considerations (see e.g. Muysken & van Veen, 1996). The shift from sector- to firm-level bargaining may change the role of wage drift: if employers can better tailor the contracts to their needs at the firm level or implement a more flexible wage-setting system, the wage drift may decrease.

The theoretical results concerning the impact of firm-level bargaining on wage dispersion between firms are clearer than those concerning the level of wages. In the presence of heterogeneous firms, firm-level bargaining leads to greater wage dispersion between firms than does

sectoral bargaining (Gürtzgen, 2009; Haucap & Wey, 2004; Moene & Wallerstein, 1997). However, an industry-level union that negotiates with individual firms may try to secure similar contracts for its members across firms. This may lead to a reduced impact on between-firm wage dispersion. This is important for the Finnish case, in which the contracts are negotiated by industry-level unions.

There are also several reasons to assume that firm-level bargaining leads to greater wage dispersion within firms. First, Lindbeck and Snower (2001) show that firms using multitasking would prefer to have different wages for employees in the same occupation, whereas centralized bargaining leads to the same wages for employees in the same occupation. Thus, if wages are negotiated at the firm level, there may be greater wage dispersion within firms. Second, collective agreements stipulate wage-setting systems, which affect wage dispersion within firms. With firm-level bargaining, these systems are part of the negotiations; thus, firm-level bargaining may lead to greater wage dispersion within firms. Third, Dell’Aringa and Pagani (2007) note that the impact of firm-level bargaining on within-firm wage dispersion depends on the bargaining power of the negotiating parties. Employers typically prefer greater wage dispersion than trade unions, but the result depends on which party has more bargaining power. For example, in Spain, firm-level bargaining typically takes place at firms with strong unions and is thus associated with lower wage dispersion (Plasman et al., 2007).

This leads us to the issue of bargaining power. It is not clear whether the relative powers of employees and employers differ between firm-level and sectoral bargaining. Some studies have argued that firm-level bargaining with an industry-level union puts employers in a weaker position than does industry-level bargaining (Arrowsmith et al., 2003, p. 374, Zagelmeyer, 2005, p. 1627). Others have suggested that employers may have greater bargaining power locally (Schnabel et al., 2006, p. 172, Hirsch et al., 2014). Theoretical studies assume similar bargaining powers for industry- and firm-level bargaining since there is no clear theoretical rationale for differences in bargaining power between these two scenarios (see e.g. Moene & Wallerstein, 1997, p. 414).

So far, the discussion has considered a one-off change from sectoral bargaining to firm-level bargaining. In practice, the impact may be muted at first but may grow over time for several reasons. First, contracts are complicated,<sup>5</sup> and renegotiating an entire contract is costly. Thus, the content of a contract may change slowly rather than abruptly. Second, if firm-level bargaining leads to productivity gains — for instance, due to better-tailored working time arrangements — wages may grow more rapidly than they would under sectoral bargaining. Third, it may initially not be in employers’ interests to try to achieve drastic changes to collective agreements if the trade unions oppose them; it may be more advantageous to make incremental changes.

Overall, from a theoretical perspective, the impact of firm-level bargaining on the level and dispersion of wages both within and between firms is ambiguous and depends on the institutional context and factors that are difficult to quantify, such as the negotiating parties’ bargaining power. Moreover, it is likely that the short-term effects may differ from the long-term effects.

## 4 | DATA

The main dataset used in this study is the Incomes Register from Statistics Finland,<sup>6</sup> a national database maintained by the Finnish Tax Authority. It contains information on wages, pensions and benefits. Information on wages is available as of January 2019. Due to their nature, these data are accurate and reliable. The register also contains unique person and firm identifiers, which



makes it possible to follow individuals and firms over time. The data are released for research purposes at a monthly frequency.

The last month used in this study is June 2023. Thus, I analyse the first 15–19 months of the new contracts, depending on the industry. For the analyses, I aggregate the data to the industry level or the industry  $\times$  worker (blue- or white-collar) group level. I use Statistics Finland's Standard Industrial Classification TOL 2008 and perform the aggregation at the two-digit level (78 industries), at which the extensions of collective agreements are typically defined. Because blue- and white-collar workers have different collective agreements in the manufacturing industries, I perform the aggregation separately for these two groups. In the IT industry, there is no need to separate the blue- and white-collar workers because there is a single collective agreement. I define blue- and white-collar workers as employees falling under Statistics Finland's National Classification of Occupations categories 5–9 and 1–4, respectively.<sup>7</sup>

The wage concept that I use is the total amount of wages. This includes all taxable earnings from an employment relationship.<sup>8</sup> I use nominal monthly wages in the analysis. There is no need to deflate the wages because the method that I use accounts for inflation. I analyse monthly wages instead of the more usual hourly wages because the data do not include information on hours of work. The main dependent variable is the average wage in an industry. I also study the standard deviation of wages and decompose the industry-level standard deviation to within- and between-firm components to examine whether firm-level bargaining affects wage dispersion within firms (e.g. by affecting the wage structure) and between firms (by affecting how a firm's economic performance is reflected in wages). For this analysis, I obtain monthly measures of within- and between-firm standard deviations at the industry level using the Stata command `xtsum`.<sup>9</sup>

#### 4.1 | Treatment and control groups

The treatment groups are the paper industry (TOL 17), the mechanical forest industry (16) and IT services (62 and 63<sup>10</sup>). The control group consists of all untreated industries except industries 31 and 32. I exclude the manufacturing of furniture (31) and other manufacturing industries (32) from the analyses because they used to have two generally binding collective agreements — one with the Technology Industries of Finland and one with the FFIF — and the impact of the FFIF's decision to switch to firm-level bargaining on these industries is unclear. I also exclude programming and broadcasting activities (60) and gambling and betting activities (92) from the analyses of blue-collar workers due to the small number of such workers in these industries. The treatment periods start in January 2022 for the paper industry, March 2022 for the mechanical forest industry and December 2021 for IT services.

### 5 | DESCRIPTIVE STATISTICS

To provide an overview of the magnitudes of the level and dispersion of wages, Table 1 shows the averages of the dependent variables by industry for selected industries. The paper industry stands out in terms of average wage, especially for blue-collar workers, with considerably higher wages than in the other manufacturing industries. In the manufacturing industries, the within-firm standard deviations of the total wage are somewhat larger than the between-firm standard deviations, whereas in the service industries, the opposite tends to be more common.

Figure 1 shows the average monthly wages in the treatment industries from January 2019 to June 2023. Wages are higher in the paper industry than in the mechanical forest industry,

TABLE 1 Descriptive statistics of selected industries.

Industry (2-digit code)	Blue-collar workers				White-collar workers			
	Average wage	Between- firm SD	Within- firm SD	N	Average wage	Between- firm SD	Within- firm SD	N
10: Food products	2955	942	1165	21,919	4005	1611	1713	9243
16: Mechanical forest industries	2861	970	1013	12,459	4400	1487	1740	5067
17: Paper and paper products	4642	1252	1352	11,177	5420	1546	2386	7199
22: Rubber and plastic products	3168	921	1016	7496	4661	1571	1917	3830
25: Fabricated metal products	3042	1038	1055	25,291	4297	1554	1640	9792
28: Machinery and equipment	3362	1070	1107	19,105	5031	1684	2117	25,568
49: Land transport and transport via pipelines	3137	1260	1027	46,804	3513	1581	1198	7615
62: Computer programming, consultancy and related activities	2905	2121	1116	695	4980	2117	1942	55,971
63: Information service activities	3199	1859	1041	108	5178	2386	2487	3374
69: Legal and accounting activities	1628	1468	912	403	3942	1795	2013	20,242
71: Architectural and engineering activities; technical testing and analysis	3177	1577	1204	3324	4293	1874	1716	36,776

especially for blue-collar workers. In the paper industry, there are also substantial monthly variations in the average wage. This reflects both the cyclical nature of production (due to the seasonality of demand) and the collective agreement, which stipulates substantial compensation for work during periods such as Christmas holidays and midsummer. Vacation pay also affects the average wage in the summer, as these payments are typically made in June. In IT services, most employees are white-collar workers, which is reflected in the level of wages. Temporal variation is limited and is mostly due to vacation pay.

## 6 | METHODS

To estimate the causal effects of decentralization, I use the synthetic difference-in-differences method (Arkhangelsky et al., 2021), which generalizes and unifies the difference-in-differences

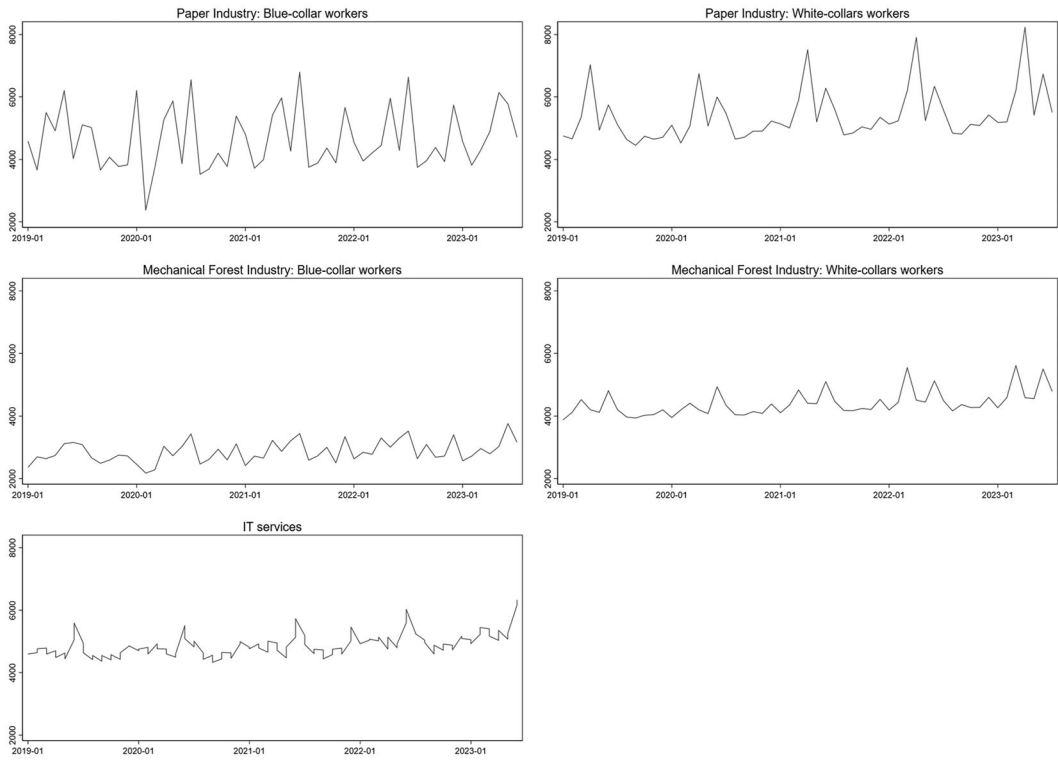


FIGURE 1 Average monthly wages in the treatment industries from January 2019 to February 2023.

and synthetic control methods. Like the synthetic control method, it matches the pre-treatment trends of the treatment and control units, and like the difference-in-differences method, it allows for additive unit-level shifts. Given the few treated industries, many control industries and relatively many periods included in this study, this method suits the purpose of the analysis.<sup>11</sup>

The synthetic difference-in-differences method estimates the following weighted two-way fixed-effects regression:

$$\left( \hat{\tau}^{sdid}, \hat{\mu}, \hat{\alpha}, \hat{\beta} \right) = \operatorname{argmin}_{\tau, \mu, \alpha, \beta} \left\{ \sum_{i=1}^N \sum_{t=1}^T (Y_{it} - \mu - \alpha_i - \beta_t - W_{it}\tau)^2 \hat{\omega}_i^{sdid} \lambda_t^{sdid} \right\},$$

where  $Y_{it}$  is the dependent variable (average wage and within- and between-firm standard deviations of wages),  $\alpha_i$  is the industry fixed effect,  $\beta_t$  is the time fixed effect,  $W_{it}$  is a binary treatment indicator and  $\tau$  measures the average causal effect of the treatment. The weight  $\hat{\omega}_i^{sdid}$  is intended to balance the pre-treatment trends between the treatment and control units, while the weight  $\lambda_t^{sdid}$  is intended to balance the pre-treatment and post-treatment periods. Together, these weights make the identifying assumptions needed in difference-in-differences analysis more plausible.

The treatment assignment needs to be a so-called block treatment assignment, in which some units are treated after a given date, while other units remain untreated throughout the observation period. Since the decentralization of collective bargaining occurs at different time points in different industries, I perform separate analyses for the treated industries. I use the placebo variance estimation to calculate standard errors, which is the only option given that there is only one

TABLE 2 Synthetic difference-in-differences: Paper industry.

	Wage level (€)	Between-firm standard deviation	Within-firm standard deviation
A. Blue-collar workers			
Treatment effect	296.679*** (89.871)	-106.839 (124.595)	232.782*** (53.629)
Observations	3942	3942	3942
B. White-collar workers			
Treatment effect	56.827 (285.738)	36.267 (117.946)	174.178 (230.430)
Observations	4050	4050	4050

Note: The table displays the treatment effects and standard errors estimated using the synthetic difference-in-differences method. \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ .

treated unit per estimation (Arkhangelsky et al., 2021, Algorithm 4). I use 1000 bootstrap replications. Arkhangelsky et al. (2021) simulation studies show good properties, with similar numbers of cross-sectional units and periods to those in my analysis. To estimate the model, I use the Stata command described by Clarke et al. (2023).

The dependent variables show some seasonality, especially in the paper industry. The method deals with this in three ways. First, it includes time period dummies. Second, it weights the control group so that the pre-trends are similar (using the weight  $\hat{\omega}_i^{sdid}$ ). This makes the seasonality in the treatment and control groups similar. Third, it weights the compared periods using the weight  $\lambda_t^{sdid}$ . The pre-treatment period was also impacted by COVID-19. In Finland, its impact on the labour market was small and short-lived in the treatment industries but considerably stronger in other industries, such as hospitality and dining. The method accounts for this in forming the comparison group.

## 7 | RESULTS

Table 2 shows the results for the paper industry.<sup>12</sup> As shown in panel A, for blue-collar workers, the treatment effect on wages is positive and significant. The effect is €296, which is about 6 per cent of the average wage in the industry. This magnitude is similar to previous estimates (e.g. Dahl et al., 2013). In terms of wage dispersion, the effect on the between-firm standard deviation is negative but non-significant. Conversely, the effect on the within-firm standard deviation is positive, substantial and statistically significant. The average within-firm standard deviation is about €1352, and the estimate of €233 can be considered comparatively large. This magnitude is greater than that reported by Addison et al. (2017) for Germany.

Panel B shows the results for white-collar workers. All estimates are smaller than those for blue-collar workers, and none are significant. The estimate of the impact on the wage level is small, but the confidence interval is very wide. The effects on between- and within-firm wage dispersion are positive but small in magnitude and imprecisely estimated.

Table 3 shows the results for the mechanical forest industry. As shown in panel A, the estimated treatment effect on wages is -€61 but not statistically significant. The estimated effects on between- and within-firm wage dispersion are positive, small and statistically non-significant.

**TABLE 3** Synthetic difference-in-differences: Mechanical forest industry.

	<b>Wage level (€)</b>	<b>Between-firm standard deviation</b>	<b>Within-firm standard deviation</b>
<b>A. Blue-collar workers</b>			
Treatment effect	−61.468 (93.776)	32.457 (111.435)	2.222 (62.966)
Observations	3942	3942	3942
<b>B. White-collar workers</b>			
Treatment effect	106.246 (237.661)	12.038 (111.524)	113.819 (267.915)
Observations	4050	4050	4050

Note: The table displays the treatment effects and standard errors estimated using the synthetic difference-in-differences method.

**TABLE 4** Synthetic difference-in-differences: IT services.

	<b>Wage level (€)</b>	<b>Between-firm standard deviation</b>	<b>Within-firm standard deviation</b>
Treatment effect	196.785 (174.482)	67.132 (85.598)	175.943 (122.197)
Observations	4104	4104	4104

Note: The table displays the treatment effects and standard errors estimated using the synthetic difference-in-differences method.

As shown in panel B, the estimated impact on wages for white-collar workers is larger (€106) but with a substantial confidence interval. Similarly, the effects on wage dispersion between and within firms are positive but statistically non-significant.

Table 4 shows the results for IT services. Here, I do not distinguish between blue- and white-collar workers, since collective agreements do not make such a distinction. The results again show positive but non-significant effects on wage levels and dispersion. The coefficients are quite large in magnitude, but the standard errors are also substantial.

Overall, the main drawback of the analysis is that the effects are quite imprecisely estimated. This is due to the large monthly variations in the dependent variables in a given industry (this variability can be seen in the figures in the [Online Appendix](#)). This inherent variability makes precise effect estimations difficult, at least with the given number of observations. Another possible source of seasonality could be summer workers. As shown in the [Online Appendix Tables A1–A3](#), excluding summer workers has no impact on the results.

## 8 | DISCUSSION

As discussed in the Conceptual Framework section, the impact of shifting from sectoral bargaining to firm-level bargaining on the level of wages is theoretically ambiguous. However, all prior empirical results have shown a positive effect (as noted in the Related Literature section). I also find positive impact estimates, although they are significant in only one case. The difference between the setting that I study, and the prior literature is that in this case, the institutional

framework makes it possible for wages to decrease following the shift to firm-level bargaining. This was indeed the view that received considerable attention in Finland when the FFIF announced its shift to firm-level bargaining. The results show that this worry was unwarranted.

The conceptual framework shows that theoretically, the expectation is greater between-firm wage dispersion following the shift to firm-level bargaining. The results are largely consistent with this view, with positive — albeit statistically non-significant — effects in all cases, except for blue-collar workers in the paper industry, for whom the estimated treatment effect is negative, albeit also non-significant. A reason for the small estimated effects of firm-level bargaining on between-firm wage dispersion may be that a single bargaining round is a short time for large effects to take place. For example, in the paper industry, the first publicized large-firm contracts stipulated wage increases of about 2 per cent. Even if some firms increased their wages by 4 per cent and others froze them, the impact on between-firm wage dispersion would be in the order of some tens of euros.<sup>13</sup>

The conceptual framework also shows that firm-level bargaining is likely to lead to greater within-firm wage dispersion. The results are in line with the theory. Again, all estimated treatment effects are positive, although the only statistically significant effect is that for blue-collar workers in the paper industry.

The estimated treatment effects on the different industries and employee groups are qualitatively similar. However, it is likely that there are differences in bargaining power between workers in different industries. Although it is difficult to empirically measure union strength, one important factor is union density (Metten, 2021). As mentioned earlier, union density is highest in the paper industry, followed by the mechanical forest industry, and lowest in IT services. Despite these differences, I find small differences in the estimated treatment effects. Again, this may be because a single bargaining round is not a sufficiently long time to see considerable changes.

The moderate effects found here may also reflect the cost of negotiating substantial changes to complex contracts. The collective agreements in the studied sectors cover a wide range of issues and are lengthy documents. Negotiating multiple changes to these contracts might take a long time and complicate the negotiation process. Considering trade unions' lack of enthusiasm about the shift to firm-level bargaining, it may also be in employers' interests not to introduce too wide-ranging changes at once. In the paper industry, UPM was the only one of the big three companies to renegotiate the contract completely.

## 9 | CONCLUSION

The decision of the Finnish forestry sector to move from sectoral collective bargaining to firm-level bargaining was drastic, ending the decades-long tradition of sectoral bargaining in Finland. It also prompted the IT service industry to shift to a hybrid model of sector- and firm-level bargaining. In this study, I examine how the substantial decentralization of collective bargaining in these sectors affects the level and dispersion of wages. I use monthly administrative data on wages and the synthetic difference-in-differences method. Despite the substantial change in the level of collective bargaining, I generally find muted effects on the level and dispersion of wages. Only for blue-collar workers in the paper industry do I find positive and economically and statistically significant effects on the level of wages and within-firm wage dispersion.

The results are, in many respects, similar to those reported previously, especially in studies using credible designs. For example, Gürtzgen (2016) finds an economically small and

statistically non-significant impact of firm-level bargaining on wages, and Addison et al. (2017) find little evidence that abandoning collective bargaining increases within-firm wage dispersion.

This analysis concerns short-term effects. The long-term effects may differ for several reasons. First, firm-level bargaining makes it easier for firms to develop their own wage policies, which may affect wage formation and thus wage differentials. However, the results of the new wage policies will likely take several years to emerge. Second, firm-level bargaining may also lead to productivity gains if firms are better able, for example, to tailor working time arrangements to their needs. In turn, productivity gains may affect wage levels, but such gains are also unlikely to be realized in the short term.

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## CONFLICT OF INTEREST STATEMENT

The author declares that he has no relevant or material financial interests that relate to the research described in this article.

## DATA AVAILABILITY STATEMENT

The data used in this article are proprietary. However, other researchers can independently obtain access to the Incomes Registry data by entering a contract with Statistics Finland. The specific instructions to obtain access to the data are available at [http://tilastokeskus.fi/tup/mikroaineistot/hakumenettely\\_en.html](http://tilastokeskus.fi/tup/mikroaineistot/hakumenettely_en.html). I will make available the computer codes that generate the final dataset and the results presented in the article.

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## ENDNOTES

<sup>1</sup>Table 2, column 1 in Fitzenberger et al. (2013).

<sup>2</sup>Table 2, column 3 in Gürtzgen (2016).

<sup>3</sup>€20 + 0.4% after 12 months (24-month period), or €16 or at least 0.43% (12-month period).

<sup>4</sup><https://teknologiateollisuus.fi/en/ajankohtaista/press-release/technology-industries-finlands-activities-be-divided-between-two>

<sup>5</sup>For example, the collective agreements for blue-collar workers in the paper and mechanical forest industries are about 200 pages long.

<sup>6</sup><https://www.vero.fi/en/incomes-register/about-us/>, [https://taika.stat.fi/fi/aineistokuvaus.html#!dataid=TAX\\_INCOMES\\_jua\\_delivery\\_002.xml](https://taika.stat.fi/fi/aineistokuvaus.html#!dataid=TAX_INCOMES_jua_delivery_002.xml).

<sup>7</sup>This classification is based on the International Standard Classification of Occupations ISCO-08.

<sup>8</sup>Wages can be reported to the Incomes Register either as total amounts or in an itemized manner. In the case of itemized reporting, I add up the different items to obtain the total amounts. More details can be found at <https://www.vero.fi/en/incomes-register/companies-and-organisations/detailed-guidance/62696/reporting-data-to-the-incomes-register-monetary-wages-and-items-deducted-from-wages5/#1.1-wage-concept>.

<sup>9</sup>Other approaches, such as variance decomposition based on the methods developed by Abowd et al. (1999), used, for example, by Devicienti et al. (2019), do not allow calculations at a monthly frequency or the decomposition of the standard deviation to within- and between-firm components.

<sup>10</sup>The collective agreement for IT services does not cover the three-digit industry 639, which is thus excluded from the analysis.

- <sup>11</sup> For example, the standard difference-in-differences model requires many treated and control industries for valid inferences, whereas here, there is only one treated industry in each estimated model.
- <sup>12</sup> Graphical representations of the results can be found in the Online Appendix.
- <sup>13</sup> For example, if there were three types of firms, each group consisting of one-third of the sample, and the average wages in these groups were €3090, €4590 and €6090, the grand mean (€4590) and between-firm standard deviation (€1225) would closely match the observed values for blue-collar workers in the paper industry. If the lowest-paying firms increased the average wage by 0 per cent, the middle group of firms by 2 per cent and the highest-paying firms by 4 per cent, the between-firm standard deviation would increase by €100.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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