Collective Bargaining, Unions, and the Wage Structure: An International Perspective

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Abstract

In this paper, we assess the recent economics literature on collective bargaining. Despite a declining trend in the OECD in coverage and especially union membership, a large share of formal workers around the world are still covered by collective bargaining agreements. We describe the substantial institutional variation across a variety of countries, highlighting research done with modern research designs and recently available administrative datasets. We then estimate a canonical empirical model of individual-level coverage effects and selection in harmonized cross-country data across 18 advanced economies (in Europe and North America). We estimate collective bargaining coverage premia, compression, selection, and spillover coefficients in each country, and use these to document considerable heterogeneity in collective bargaining coverage effects on the wage structure. While there is a strong negative relationship between collective bargaining coverage and wage inequality across countries, substantial uncertainties remain about the underlying mechanisms. Coverage effects may operate through direct premia, selection, or spillovers onto non-covered wages, but distinguishing and quantifying these channels and how they vary across institutional contexts remains a key challenge for future research. In our data, we find that the direct effect of coverage on wages of covered workers does not explain much of the cross-country correlation between coverage and inequality. While compelling research designs often result from specific institutional variation, we also emphasize that these contextual details must be accounted for when comparing estimates across industrial relations systems. A particularly pressing need is for more compelling causal evidence on spillover effects, which could help reconcile conflicting micro and macro evidence on how collective bargaining shapes the wage distribution.

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1 Introduction

At least since Adam Smith's discussion of "defensive combination[s] of the workmen" in The Wealth of Nations, economists have sought to understand the role of unions and collective bargaining in the labor market. Key questions have been whether there is a causal relationship between the power of collective bargaining and labor market outcomes, which channels mediate the relationship, and how it depends on specific institutional arrangements.

The modern micro-empirical study of unions in the economics literature has historically been dominated by evidence from the United States. The rich micro survey data on union wages provided by the Current Population Survey (CPS) began in 1973, well before most other countries. As U.S. union density has continued its precipitous decline, the study of U.S. unions has followed. But the decline in unionization is only partially mirrored outside the United States. Figure 1 shows that the gap between union contract coverage and union membership remains large and salient even within the OECD, and collective bargaining coverage exceeds union membership substantially in many contexts. In contrast to the U.S., collective bargaining coverage has remained relatively stable in many OECD countries.

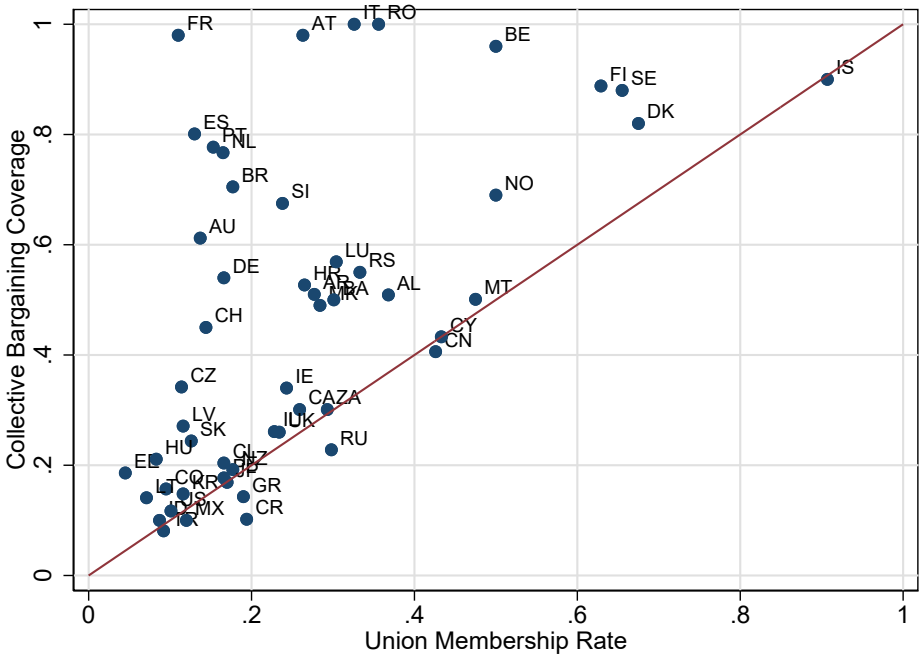
The U.S. system of industrial relations is also quite idiosyncratic in the global, comparative context. The units of bargaining are establishments, the process for union recognition is quite costly and conflict-ridden, and coverage of contracts is generally coincident with formal membership in unions. All of these features are exceptional relative to other advanced countries, where coverage is often sectoral and automatic, or goes along with firms' membership in employer associations. As we will document in this chapter,[1] the heterogeneity in collective bargaining is large and economically important across countries, and a grand synthesis will have to await many more local, country-specific empirical studies.

To address the limitations of the U.S.-centric approach and capture the global diversity of collective bargaining systems, our chapter provides a comprehensive, international survey of collective bargaining, emphasizing institutional variation across countries and drawing on recent research that utilizes administrative datasets. Our chapter builds upon and extends the rich tradition of Handbook of Labor Economics chapters on unions and labor market institutions. While previous chapters, such as Farber (1986), Kennan (1986), and Lewis (1986), primarily focused on U.S. unions, our approach is decidedly more global. We expand on the international, comparative perspectives introduced by Blau and Kahn (1999) and Nickell and Layard (1999), but go further in providing detailed analyses of diverse collective bargaining systems both qualitatively and quantitatively. Our chapter also complements Freeman (2010)'s coverage of unions in developing countries in the Handbook of Development Economics. Our chapter reflects four key aspects that have characterized recent work on collective bargaining and labor economics more generally: the pursuit of causal identification, the embrace of administrative data, especially in non-US settings, the recognition of employer market power, and the appreciation of diverse collective bargaining institutions worldwide.

While our chapter is global in scope, we primarily focus on Europe and the United States, and more briefly discuss collective bargaining institutions in significant emerging economies such as South

[1]

Figure 1: Collective Bargaining Coverage vs. Union Membership



Note: Own calculations, based on Visser (2019). The definition of the collective bargaining coverage rate in Visser (2019) that we draw on excludes employees without the right to collective bargaining from the employee population.

Africa, China, India, and Argentina. Given the vast diversity of labor institutions worldwide, we cover a necessarily selective but representative range of systems in which research has made advances in recent decades, rather than providing an exhaustive catalog. Our chapter also primarily focuses on private- rather than public-sector unions and collective bargaining. We primarily discuss the effects coverage on unions have on wages, although important outcomes include non-wage amenities and effects on and through the political system.[2]

Our chapter begins with an overview of three key dimensions in which collective bargaining systems differ: (i) coverage, or the share of the labor market covered by collective bargaining, (ii) the level of bargaining centralization, and (iii) the degree of horizontal coordination among bargaining parties. We discuss the complexities of collective wage setting in practice, including the role of wage floors, the favourability principle, wage cushions, and the role of derogations and opening clauses. We then describe institutional forces governing coverage, from mandatory extensions to tax-treatment of union dues, as well as insurance benefits of union membership, and the role of employer associations.

Next, we discuss the political economy of unions with a focus on the internal composition and representation of covered workers along demographic characteristics like race, gender, class, and citizenship, offering insights into the inclusivity and representativeness of different bargaining systems. We illustrate the diversity and trends in collective bargaining regimes and the various ways policies

[2]The recent political economy literature on labor unions, largely focused on the United States, is surveyed in a complementary paper by Kaplan and Naidu (2025).

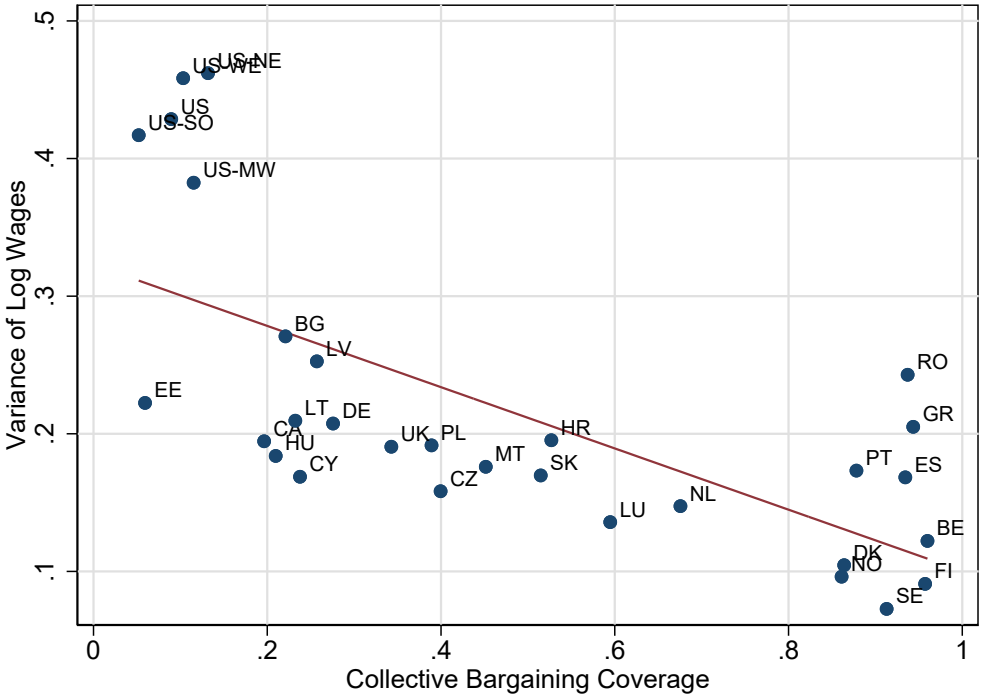
have preserved or weakened collective bargaining in several in-depth case studies.

The chapter then presents harmonized international econometric evidence on how collective bargaining, characterized system by system, shapes a country's wage structure. Our empirical analysis covers European countries, the U.S., and Canada. We explore patterns of wage premia, compression, spillovers, and selection into coverage. For the purpose of illustration, our econometric analysis starts off with a detailed inspection of unionization and coverage in two very different systems, the United States and Germany, and then moves to an econometric analysis for the full sample of countries. Country by country, our research design estimates a simple reduced form model of how coverage affects wages in a given system and who selects into and out of coverage. We then use those parameters to estimate how coverage—through wage effects, selection, and spillovers—shapes the wage distribution of each country, constructing wage distributions under different counterfactual coverage levels.

This analysis makes it possible to relate those patterns to the institutional heterogeneity in coverage rules and union centralization. To preview our harmonized analysis, Figure 2 plots the variance of log wages against the share of workers covered (with details on data, sample, estimation relegated to the later sections below). The scatter shows a clear downwards slope—reflecting the common belief that collective bargaining has equalizing effects on wages. A natural question is whether the aggregate correlation between collective bargaining coverage and wage inequality is actually causal or may instead be spurious, driven by other common determinants of inequality (like political parties, technology, or the welfare state). We will revisit the causal interpretation of this figure at the end of the chapter, through the lens of the heterogeneous and multifaceted effects that we show collective bargaining coverage can have on the wage distribution.

Our chapter concludes by highlighting open questions and directions for future research. We emphasize the pressing need for more compelling causal analyses of collective bargaining coverage effects. Much of the existing empirical literature has grappled with the endogeneity stemming from selection and the complex wage effects of collective bargaining agreements. Building on our international survey of bargaining systems, we argue that future work should prioritize innovative research designs that deeply engage with—and exploit for identification—the institutional specificities of collective bargaining and produce nuanced, context-specific causal analyses. We specifically stress the importance of developing more compelling estimates of spillover effects of collective bargaining coverage on wages and working conditions of uncovered workers and firms, and how these spillovers vary across different institutional contexts. Rigorous causal analysis and rich descriptive work are both crucial and complementary in advancing our understanding of these complex systems. We hope that our chapter will set the stage for future research that can leverage institutional diversity to generate deeper insights into the effects and workings of collective bargaining systems.

Figure 2: Collective Bargaining Coverage and Wage Inequality: Variance of Log Wages in Harmonized Sample Against Coverage



Note: The figure plots the variance of log wages against collective bargaining coverage drawing on data from the CPS, the Canadian LFS, and the European Structure of Earnings Survey (see Section 5.3 for more details on the data). For the U.S., we also separately plot four sub-regions (South, North-East, Mid-West, West) with substantial differences in bargaining institutions (e.g., due to the prevalence of right-to-work laws).

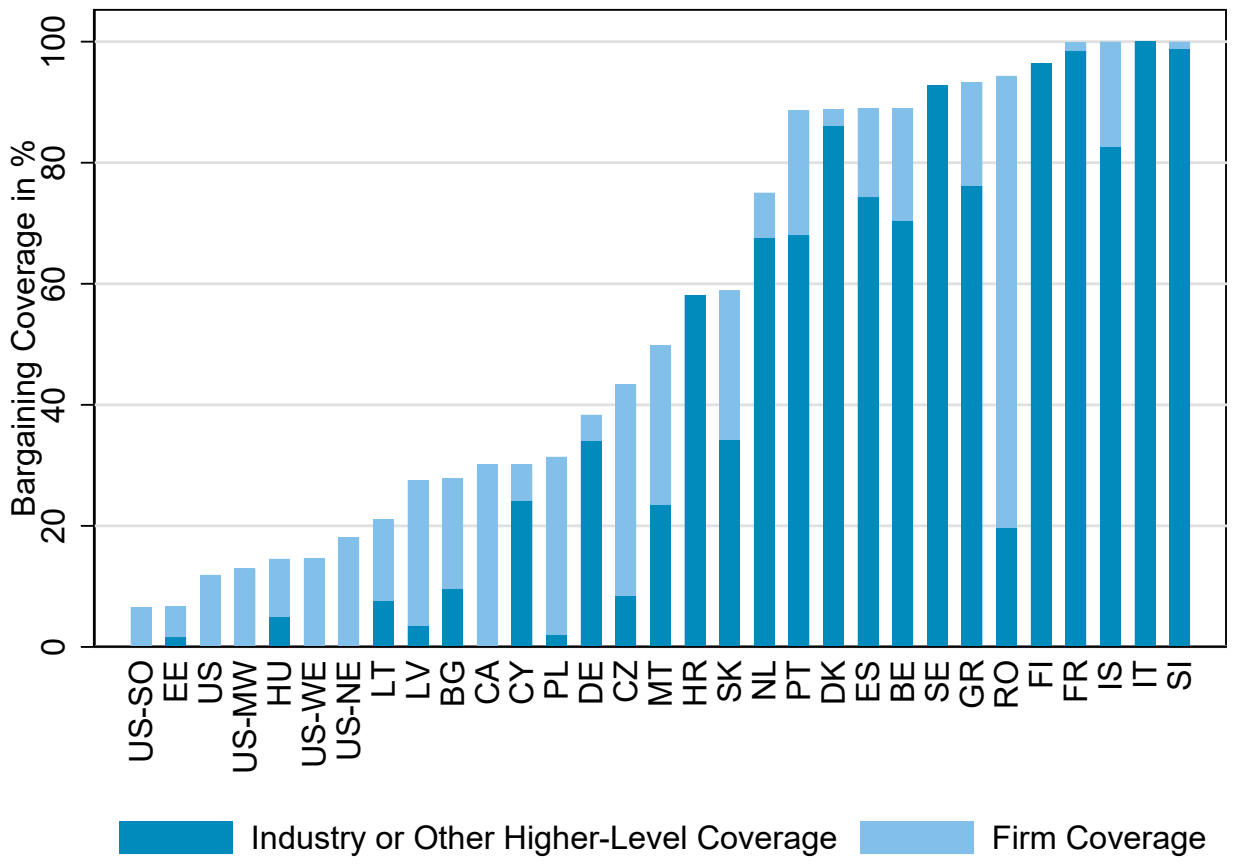
2 Varieties of Industrial Relations Systems

Our chapter starts with a bird's eye views of industrial relation systems and the crucial dimensions along which they differ, and include a discussion of how policies and institutional forces shape collective bargaining.

2.1 Bird's Eye View

Industrial relations systems vary widely across countries, with important implications for labor market outcomes and the broader economy. Three key dimensions along which these systems can be classified are (i) coverage, i.e., the share of the labor market covered by collective bargaining, (ii) the level of bargaining centralization, i.e., the scope of individual collective bargaining agreements and (iii) the degree of horizontal coordination in contract negotiations among bargaining parties (Calmfors and Driffill, 1988; Moene, Wallerstein, and Hoel, 1993; Visser, 2021; Bhuller, Moene, Mogstad, and Vestad, 2022). Based on this classification, we describe the institutional setting of different industrial relations systems and pay particular attention to the legal and practical scope for employers to avoid

Figure 3: Collective Bargaining Coverage and Bargaining Levels



Note: Collective bargaining coverage in selected countries. The darker shade highlights the share of workers covered by industry agreements or other agreements that cover multiple firms, potentially in addition to firm agreements. The lighter shade highlights the share of workers covered by firm-level agreements. U.S. data is from the 2018 Current Population Survey, whereas the rest draws on the 2018 or 2014 wave of the European Structure of Earnings Survey (2014: Norway, United Kingdom, Luxembourg). The bargaining type in the Structure of Earnings Survey reflects the agreement applied to the majority of workers in an establishment. For the U.S., we also separately plot four sub-regions (South, North-East, Mid-West, West) with substantial differences in bargaining institutions (e.g., due to the prevalence of right-to-work laws).

unionization or coverage by collective bargaining agreements.

Coverage Coverage refers to the share of workers or firms whose wages and employment conditions are at least partially determined by collective bargaining. Coverage varies greatly across countries (see Figure 3). The sample consists of countries in the Structure of Earnings Survey (SES) and the U.S. Current Population Survey (CPS). For example, the United States stand out with coverage at 12% (own calculations based on 2018 CPS) while the (unweighted) country average coverage is 62%.

In many industrial relations systems, collective bargaining coverage is *not* directly tied to individual workers' union membership. For example, in France, union membership is low at 10.8% (using data from 2016 Visser, 2021) while mandatory extensions increase coverage levels close to universal coverage at 99.9% (own calculations based on 2018 SES). We plot collective bargaining coverage against the

union membership rate in Figure 1. Most OECD countries have higher CBA coverage rather than union membership. We discuss below in Section 2.2 what institutional factors, such as mandatory extensions, increase CBA coverage above and beyond the union membership rate.

In so-called "Wagner Act" systems, like the U.S. and Canada (Card, Lemieux, and Riddell, 2020), membership and coverage are quite close. Coverage is at the establishment or bargaining unit level, and a majority of workers must agree (via election or petition) for a union to be legally recognized. This creates a considerable collective action and coordination problem for union organizers and workers to overcome (Naidu, 2022), often in the face of employer resistance. The race between new unionization and the natural exit of already unionized establishments accounts for at least some of the rapid decline in coverage in these systems relative to others. The decentralized Wagner system creates distinctive patterns of firm and worker selection into unionization, and one might predict should result in less wage compression than more centralized systems.

As this chapter details, Wagner-act like systems are anomalies in comparative context. In many countries, including developing ones, collective bargaining coverage is maintained by mandatory extensions of agreements negotiated at the industry level or higher. Collective bargaining coverage can be high even as union membership, and indeed, most indices of union power, are low, as we will discuss towards the end of the chapter.

Centralization The centralization of collective bargaining refers to the level at which wage negotiations take place—ranging from highly decentralized bargaining at the firm or establishment level to more centralized bargaining at the industry or national level ("sectoral bargaining").

Figure 3 also shows the level of bargaining with color codes indicating the share of employees covered only by local agreements (e.g., firm or establishment, in light blue), or whether they are subject to higher-level agreements (e.g., sector or sector-by-region level, in dark blue). For example, in the United States, collective bargaining occurs, if at all, at the establishment or sub-establishment (bargaining unit) level. At another extreme, Italy, France or Finland feature high bargaining coverage along with agreements concluded at higher levels of bargaining.

At its most extreme, centralization may involve national agreements. Historically, several Scandinavian countries such as Sweden or Denmark had highly centralized collective bargaining at the national level from the 1950s to the early 1980s. Today, direct national wage setting essentially no longer exists, although bargaining at the sector level remains important in many Continental European countries. For example, Dahl, Le Maire, and Munch (2013) study the transition of the Danish labor market from more centralization to decentralization and find that the former led to more wage compression.

Coordination Horizontal coordination captures the extent to which different unions and employer associations coordinate their bargaining strategies and outcomes across different contracts, industries or regions. For instance, German collective bargaining is typically at the sector-region level (with some coordination across regions) whereas Italy's has national agreements with wage floors typically not differentiated across regions (Boeri, Ichino, Moretti, and Posch, 2021). An additional dimension is the extent to which different worker types, e.g., across occupations within the same firm, are covered

by the same bargaining agreement. In the Scandinavian countries, for example, workers in different occupation groups will typically be covered by different collective bargaining agreements. In Germany, collective bargaining agreements historically differed for blue- and white-collar workers, but became more uniform in the mid-2000s (Meine, 2005).

2.2 Specific Institutional Arrangements and Aspects of Collective Bargaining

The collective bargaining systems vary along a wider range of specific institutional features and contracting approaches. Moreover, collective bargaining is embedded in the policy environment that regulates, encourages, or inhibits collective bargaining as well as (de-)centralization and coordination.

Administrative Extensions A key policy instrument to increase collective bargaining coverage are extensions, which refer to the practice of extending the terms of a collective agreement negotiated between unions and employers' associations in a particular sector to cover all workers and employers in that sector, including those who are not members of the negotiating unions or employers' associations. About two-thirds of OECD countries feature at least the possibility for such extensions but the scope and instruments vary considerably (Cazes, Garnero, Martin, and Touzet, 2019). Some countries, in particular France, Iceland, Italy, Spain, feature automatic or quasi-automatic extensions to all firms in a sector. In other countries, sectoral agreements are *not* extended by default but can be extended by the government (e.g., the state or federal labor ministries in the case of Germany). Hijzen and Martins (2016) study the abolition of extensions in Portugal during the sovereign debt crisis of 2011 and find that extensions compressed wages at the bottom of the wage structure (and also led to reductions in employment). Finally, in countries with firm-level bargaining (in particular, the U.S.), extensions are generally not applied or possible (though there are exceptions as in Australia's wage boards or forms of sectoral bargaining (Dube, 2019)).

Administrative extensions also exist in many developing countries. In Brazil, agreements negotiated between unions and employer associations at the sector-municipality level are automatically extended to all (formal) workers in that jurisdiction. A similar system exists in South Africa, but the ministry extends the agreements much more extensively, and with considerably more discretion. In Argentina and Tunisia, ministries of labor extend collective bargaining agreements to cover all workers nationally throughout a sector. In Uruguay, the tripartite wage council agreements are negotiated jointly across sectors and then extended nationally. In these and other similar developing countries, collective bargaining covers a large share of the formal sector via automatic extensions; the effect of these wage agreements on informality and wage-setting in the informal sector remains a nascent but active area of research (Kohli, 2024).

In sum, in many countries the collective bargaining agreement automatically covers workers and firms in a jurisdiction that are not party to the negotiations. In these systems, the traditional economic forces determining selection into coverage (e.g., low-productivity firms contesting or opting out of coverage) may be considerably attenuated. Administrative extensions may also lead to different bargaining behavior by employer associations (see our discussion of Haucap, Pauly, and Wey, 1999; Patault and Valtat, 2020, below).

Wage Floors, the Favourability Principle, and Wage Cushions A feature of many centralized bargaining systems is that they set *wage floors*, e.g., at the position or occupational level across a sector, but allow for deviations at the local bargaining (e.g., firm or establishment) level. These are akin to minimum wages, and are often modeled similarly, with effects such as spillovers and disemployment emphasized, as in the minimum wage literature recently surveyed in Dube and Lindner (2024).

In many *two-tier* bargaining systems, local bargaining needs to follow the *favourability principle*, implying that deviations from the higher-level agreements through firm-specific agreements or individual bargaining can only increase wages relative to the higher-level agreement (following Table 2.4 Cazes et al., 2019, this principle is applied in at least some contracts of 23 out of 25 OECD countries with sectoral bargaining). This feature therefore generates upward flexibility. (The same logic often applies to non-wage aspects regulated by collective agreements, too.)

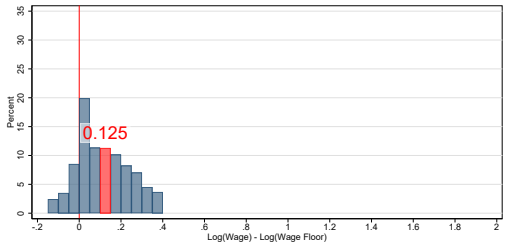
In the data, employers frequently pay *wage cushions* (Cardoso and Portugal, 2005): the premia that emerge when actually paid wages exceed the collectively bargained wage floors, i.e., the log difference between actual wages and the CBA floor of the respective wage group. Figure 4 plots the distribution of wage cushions based on data from Italy, Portugal, Spain, Germany, and Norway (Adamopoulou and Villanueva, 2022; Card and Cardoso, 2022; Busch and Weil, 2024; Bhuller, Moene, Mogstad, and Vestad, 2022).[3] It reveals substantial median wage cushions ranging from 12.5 to 57.5 log points. The variances of wage cushions in the German and Norwegian metal sectors are much smaller than in the three southern European countries and features more workers paid below their wage floor. In many countries, data limitations prevent a calculation of the level of cushions but still permit the calculation of the share of firms covered by a higher-level agreement that deviate upwards. For Germany, Jung and Schnabel (2011) calculate that 43% of employers with a CBA pay above-CBA wages, with an average cushion of 4.4%. Looking at just the metal sector in two states, North Rhine-Westfalia and Baden-Württemberg, Busch and Weil (2024) find larger wage cushions with a median of 12.5 and 17.5 log points.

In the U.S. bargaining system, wage cushions *per se* do not exist. Due to its decentralized nature with bargaining occurring within firms, U.S. union contracts directly set wage rates at the firm level, with little scope to deviate upwards (except in the case of managers who are not covered by a union contract to begin with, as we discuss below). Two-tier contracts can also exist at the firm-level, with new workers put on different pay scales than senior workers. Whether changes in the CBA wage floor for new workers pushes up wages for more senior workers is an open question, one that is difficult to empirically explore because entry and senior payscales are generally negotiated simultaneously.

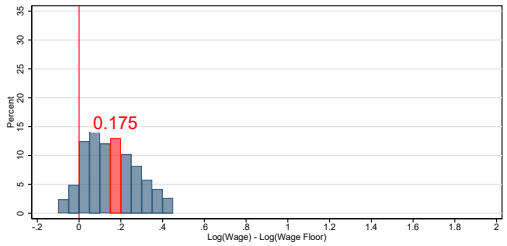
However, some U.S. jurisdictions have begun experimenting with tripartite sectoral wage boards (i.e., California for fast food workers in 2024, Minnesota for nursing home workers in 2023, and Seattle for domestic workers in 2018). Wage cushions, as in Europe, may emerge in these contexts.

[3]To facilitate a cross-country comparison and due to data constraints, we separately plot the wage cushion for the metal sector for all countries as previous research has focused on the metal sector. For Norway, Spain, and Portugal, we can also plot the cushion across all sectors.

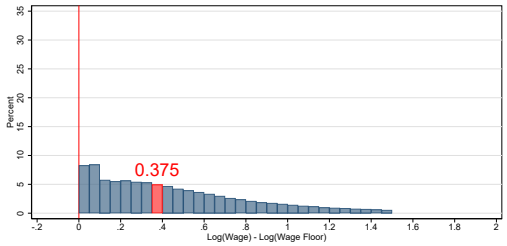
Figure 4: Wage Cushions in Italy, Portugal, Spain, Germany, and Norway (Metal Sector and All Sectors)



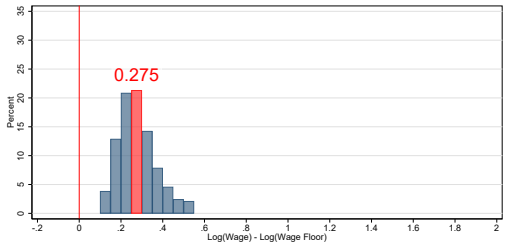
(a) Germany, Metal – North Rhine-Westphalia (2018)



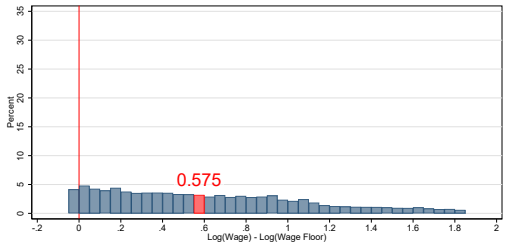
(b) Germany, Metal – Baden-Württemberg (2018)



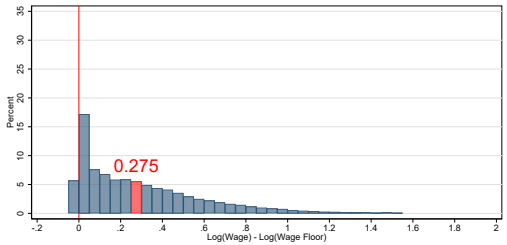
(c) Italy, Metal (2008-2013)



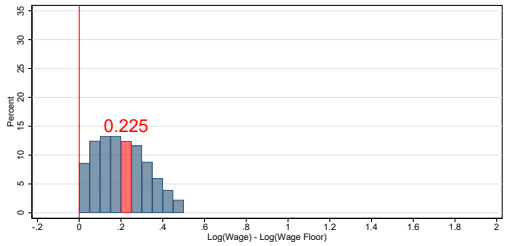
(d) Norway, Metal (2010-2014)



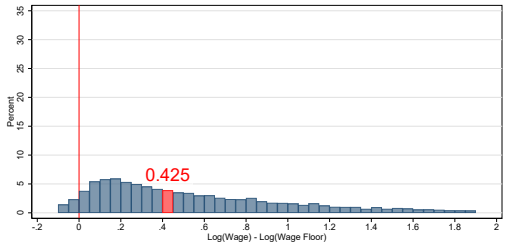
(e) Spain, Metal (2008-2013)



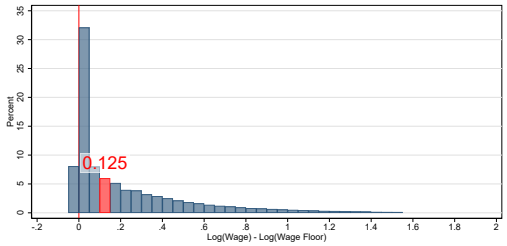
(f) Portugal, Metal (2008-2016)



(g) Norway, All Sectors (2010-2014)



(h) Spain, All Sectors (2007)



(i) Portugal, All Sectors (2008-2016)

Note: Wage cushions in Portugal, Italy, Spain, Norway and two German states. Due to data availability and to facilitate cross-country comparison, we separately plot wage cushions in the metal sector for all countries (or states) and plot the wage cushion in all sectors for those countries where the data exist (Norway, Spain, Portugal). The median wage cushion is highlighted. We thank Ana Cardoso, David Card, Effrosyni Adamopoulou, Ernesto Villanueva, Alexander Busch, Kilian Weil, Manudeep Bhuller, Karl Ove Moene, Magne Mogstad, and Ola Vestad for supplying us with these histograms based on (but not necessarily printed in) Adamopoulou and Villanueva (2022), Adamopoulou, Díez-Catalán, and Villanueva (2022), Card and Cardoso (2022), Busch and Weil (2024), and Bhuller, Moene, Mogstad, and Vestad (2022). We omit wage drift below the 5th and above the 95th percentile as likely measurement error. The definition of the metal sector follows Adamopoulou and Villanueva (2022) and includes the NACE rev. 2 categories 24, 25, 28, 29, and 33.

Pass-Through and Wage Floors Importantly, how wage floor changes pass through into actually paid wages depends on how cushions respond. In some countries (e.g., Germany), *de jure*, wage cushions exempt firms from having to pass through the wage floor change into actually paid wages, although they may voluntarily do so or may regulate this question in contracts; if a cushion is arranged through certain bonuses, pass-through would be one to one. In other countries (e.g., Austria, Belgium), CBAs do not only update wage floors but may also prescribe wage increases of actually paid wages including cushions. Such prescriptions imply downward wage rigidity even for firms that pay above the wage floor and moreover lead to a mechanical and potentially perfect percent pass-through of wage floor increases into wages. Such CBA clauses may also limit the capacity of CBAs to compress wages. Finally, in the U.S. (as discussed above), pass-through should be one to one, too.

Favourability Rules and Exceptions: Derogation, Downward Deviation, and Opening Clauses Favourability rules determine the hierarchy between different levels of bargaining agreements, typically stipulating that lower-level agreements can only improve upon the standards set in higher-level agreements. By adjusting these rules, governments can significantly influence the degree of centralization or decentralization in collective bargaining. In most continental European countries, e.g., Austria, Belgium, Germany, and Italy (Cazes, Garnero, Martin, and Touzet, 2019), the favourability principle has traditionally applied and in practice continues to be the rule. In other countries, in particular in Scandinavia, the application of the favourability principle is up to the negotiating parties (Cazes, Garnero, Martin, and Touzet, 2019). Several countries have seen reforms, e.g., a 2012 reform in Spain largely abolished the favourability principle (OECD, 2013) and gave precedence to firm-level agreements; similarly, a series of reforms in France in 2016 and 2017 flipped the hierarchy of bargaining with company-level agreements taking precedence over sector-level agreements in some domains, e.g., work-time arrangements. Several countries allow *lower* wages to be bargained at the local level (following Table 2.5 of Cazes et al., 2019, 17 out of 30 eligible OECD countries allow some downward adjustments from higher-level CBA, with German-speaking countries and the Netherlands being more permissive).

As one mechanism of downward adjustment from higher-level agreements in systems with the favourability principle, opening or hardship clauses have become more common in many countries, e.g., Germany (Ellguth, Gerner, and Stegmaier, 2014; Brändle and Heinbach, 2013). Through opening clauses, firms can deviate from the terms set in sector-wide or national agreements under certain conditions, often to address firm-specific circumstances or economic challenges. These tools have become popular in many European countries, starting in Germany in the mid-1990s (Brändle and Heinbach, 2013). They are especially relevant in systems with strict hierarchies between bargaining levels and widespread use of administrative extensions and have become substantially more popular during and in the aftermath of the Great Recession (Visser, 2016), see, e.g., the reforms in Spain and France. As Figure 4 Panels (a) and (b) illustrates, a non-trivial share of German firms in the metal sector pay below CBA wage floors. It is an open empirical question how these clauses and their take-up causally affect worker and firm outcomes such as wages and employment stability.

Compliance and Enforcement Similar to minimum wages, a key open question for the efficacy of collective bargaining agreements is the intensity of their enforcement. Garnero (2018) and Garnero and Lucifora (2022) draw on Italian data and provide evidence of substantial non-compliance with collective bargaining wage floors. Of course, measurement error, e.g., in work hours, is a key barrier to accurately measuring non-compliance. Understanding the compliance with and enforcement of collective bargaining remains a crucial open question for research.

Beyond wages, enforcement of collective bargaining agreement clauses is often conducted by a combination of union stewards, workplace councils, and external arbitrators and regulators. In some contexts administrative data exists on these processes and could be used to assess the efficacy of enforcement mechanisms.

In developing countries, even those with extensive coverage on paper, these enforcement and compliance issues loom even larger. Collective bargaining is generally limited to the formal sector, and enforcement even there can be marred by low state capacity and corruption.

Coverage Exemptions for Certain Employees As an additional deviation from centralization, wages of specific employees are frequently not subject to collective bargaining. Almost universally, this exemption applies to wages at or near the top. In the U.S., the National Labor Relations Act (NLRA) defines a dividing line between labor and management so that managers and supervisors are exempt from protection through the NLRA, but there are also historical exemptions for low-wage work that was traditionally non-white (e.g., agriculture, domestic work, and, until 1974, health care). In many of the more centralized bargaining systems, managers and higher-paid occupations are also exempt from collective bargaining coverage. Outsourcing and temporary-help agencies can also limit effective coverage of low-wage workers (Weil, 2014). For these and other reasons, lower-paid employees at the bottom of the wage distribution may not be covered, even if agreements cover some of the workers at the firm. For example, in Germany, collective bargaining agreements *de jure* only apply to union members and coverage rates are often less than 100% (Fitzenberger, Kohn, and Lembcke, 2013; Biewen and Seckler, 2019; Hirsch, Lentge, and Schnabel, 2022)—on average, the coverage rate within-establishment appears to be about 91% in 2018 (Hirsch, Lentge, and Schnabel, 2022).

Strikes and Mediation There is significant variation in the regulation of strike activity across OECD countries, which in turn shapes collective bargaining processes and outcomes. Strikes change the cost of disagreement payoffs in bargaining between the union and an employer (association), which are a crucial determinant of wages in standard bargaining models (Binmore, Rubinstein, and Wolinsky, 1986; Hall and Milgrom, 2008). A classic body of work in labor economics considers strikes as arising from imperfect information in bargaining (e.g., about the profitability of the firm, see Ashenfelter and Johnson, 1969; Kennan, 1986; Card, 1990a).

Regulation of strikes ranges from constitutional protections to more limited rights defined by labor laws or court decisions. Common restrictions include limitations on strikes among civil servants (e.g., in Germany), in essential services (e.g., in Portugal or Greece), mandatory notice periods, and cooling-off periods. The types of strikes permitted also vary, with some countries allowing only

strikes directly related to collective bargaining disputes, while others permit broader political or solidarity actions. Policies on hiring replacement workers during strikes further differentiate countries, significantly affecting the potential impact of strike actions.

The centralization of bargaining and union density naturally influences the intensity and level of strikes. Centralized regimes with high density, like the Scandinavian countries, may have both low strike frequencies and extremely intense strikes conditional on them happening.

An older literature focused primarily on the U.S. and Canada examined determinants of strikes, as well as success and failure (Card, 1990a; Cramton and Tracy, 1998, 2003). A recent paper by Massenkoff and Wilmers (2024) uses strikes measured in the Panel Study of Income Dynamics to look at the effect of strikes on subsequent wages. They find that strikers experienced wage gains before the 1981 PATCO strike, but not afterwards.

Peace clauses (or no-strike clauses) are provisions in collective bargaining agreements that prohibit unions and their members from engaging in strikes or other industrial actions on issues regulated by the agreement during its term. In Nordic countries, peace clauses are widely used and effectively enforced. Conversely, in countries like Belgium, France, Mexico, and Chile, peace clauses are rarely used due to concerns about interfering with the right to strike. In Italy and Spain, while peace clauses are common, their effectiveness can be limited because the right to strike is considered an individual right, allowing even small groups of workers to potentially undermine the agreement's stability. In Germany, peace clauses apply throughout the duration of a collective bargaining agreement; worker board representatives and works council members are always bound by a peace clause (§74 II 2 BetrVG).

The analogue of peace clauses in the U.S. and Canada is mandatory arbitration. It is believed that the frequency of these clauses has increased over time, but there is little systematic data. These clauses mean that unions cannot exercise the right to strike over contract issues during the contract, but must instead take the ruling of an arbitrator. However, most unions maintain their own grievance management process, where worker complaints of violations to the contract are assessed and escalate to the level of arbitration depending on whether the union (or union steward) deems them legitimate.

Mediation and arbitration play a crucial role in resolving labor disputes and maintaining industrial peace across OECD countries. These mechanisms are present in approximately half of OECD nations, with compulsory mediation required in about two thirds of countries (Cazes, Garnero, Martin, and Touzet, 2019). For example, in Norway, mediation mechanisms exist outside of collective agreements, and parties are required to undergo mediation before a legal strike can be initiated. The Norwegian National Mediator intervenes when negotiations between employer and employee organizations reach an impasse, particularly during the renewal of existing agreements or the creation of new ones (Cazes, Garnero, Martin, and Touzet, 2019).

In many non-democracies, a right to strike does not exist even when unionization is legal (or even compulsory, as in historically Soviet blocs). Even when a right to strike formally exists, without robust rights to free association and speech it is difficult for strikers to exercise much economic power(Gourevitch, 2018). Work by Dean (2022) shows that strike (and union) repression in developing countries was associated with trade liberalization, using India and Argentina as salient case studies. Researchers in political economy often measure strikes as a proxy for pro-worker social unrest (Cantoni

et al., 2024). Strikes, both within and outside the law, remain an active area of research at the intersection of labor and political economy, where *de facto* and *de jure* sources of collective bargaining power interact to shape wages and employment. The dynamics and incidence of strikes in newer service-intensive sectors may be different than in traditional manufacturing sectors, with unions and employers both aiming to enlist customers as allies (e.g., parents in support of striking teachers in Hertel-Fernandez, Naidu, and Reich (2021)).

In sum, the breadth and depth of the right-to-strike varies a lot across countries, and even sectors within a country (e.g., public vs. private). The strike has traditionally been thought of as the outside option in collective bargaining, and evidence suggests that stronger rights to strike (e.g., restrictions on employers use of permanent replacements) may result in higher union-bargained wages (Cramton and Tracy, 1998). The absence of a strong economic outside option may also induce unions to seek other, non-economic, sources of leverage over employers, like pension-fund activism or political lobbying.

Cost-of-Living Adjustment and Automatic Wage Indexation Cost-of-living adjustment (COLA) clauses in collective bargaining agreements have been used to varying degrees across OECD countries. COLA clauses typically link wage increases to changes in the consumer price index, with the goal of maintaining real wage stability in inflationary environments. They lead to real wage rigidity and, if implemented in a progressive way, have been associated with wage compression (Manacorda, 2004).

COLA clauses gained prominence around the OECD in the 1960s and, in particular, the 1970s in response to high inflation rates. A key statistic to characterize COLA clauses is the elasticity of the contractual wage rate to changes in the price level. For instance,(Card, 1983) estimated an elasticity close to one for Canadian union contracts from 1968 to 1975, U.S. data from 1971 to 1983 reveal an elasticity of around 0.5 (Kaufman and Woglom, 1986). Card (1990b) shows that in response to inflation shocks, real wages fall and employment rises comparing non-indexed to indexed contracts. Another margin facilitating real wage stability during high-inflation times is shorter contract duration or pre-scheduling wage increases according to *anticipated* inflation. One of the most extensive systems of automatic wage indexation was Italy's *scala mobile*, introduced in 1975, gradually dismantled in the 1980s and formally abolished in 1992 (see Section 4.6 and Manacorda, 2004, for more details).

By 2006, 11 European countries still had some degree of automatic wage indexation, either by law or by agreement (Du Caju, Gautier, Momferatou, and Ward-Warmedinger, 2009). In the EU today, Belgium, Cyprus, and Luxembourg still feature automatic indexation systems at the national level. Belgium's system of automatic wage indexation at the national level links nominal wages to a moving average of lagged changes in consumer prices, allowing for flexibility across industries in frequency of adjustment, specific trigger rules, and incorporation of sectoral wage growth in peer countries (Bijnens, Karimov, and Konings, 2023). Luxembourg has a similar system of wage indexation based on a 6-month moving average of the CPI, triggering increases when the CPI has increased by 2.5% relative to the last automatic wage increase (Lünnemann and Wintr, 2010). The recent European evidence points to automatic wage indexation leading to substantial real wage rigidities (Lünnemann and Wintr, 2010; Du Caju, Fuss, Wintr et al., 2012; Bijnens, Karimov, and Konings, 2023). Other countries feature partial wage indexation, e.g., automatic indexation of minimum wages as in France, or indexation not

mandated nationally but still highly prevalent in many CBAs, e.g., in Spain (Banco de España, 2023).

The large increase in inflation in the last few years has also revived the debate around wage-price spirals (Blanchard, 1986; Lorenzoni and Werning, 2023), and has brought new scrutiny to automatic wage indexation schemes (Koester and Grapow, 2021; Boissay, De Fiore, Igan, Tejada, and Rees, 2022). Historically, high inflation rates preceded the introduction of indexation clauses. However, very high inflation rates have at times also led to the ban of indexation clauses. For example, Argentina *banned* and continues to ban any automatic indexation of CBAs in 1991, following extremely high inflation rates in the 1980s (Ley Nº 23.928, and amendment in Nº 25.561). With regard to the most recent, global bout of inflation, the countries with CBA indexation systems have taken different paths: Luxembourg postponed wage indexation in June 2022 for about a year; wages in Belgium, in contrast, continued to be increased in line with lagged inflation (Bijnens, Duprez, and Jonckheere, 2023). In light of the increase in inflation in the last years, Spain has seen a significant resurgence of indexation clauses with almost 50% of workers covered by agreements signed for 2023 falling under a COLA clause (Izquierdo and Herrera, 2022). While this represents about a threefold increase relative to the pre-COVID-19 period, it remains below the pre-2008 financial crisis levels, when approximately 70% of employees were covered by such clauses (Izquierdo and Herrera, 2022; Banco de España, 2023). Given the recent resurgence of inflation and the renewed interest in wage indexation mechanisms, we anticipate an increase (though not a spiral) in research examining the consequences of automatic indexation schemes in collective bargaining over the coming years.

"Ghent System" and Insurance Benefits A few countries (Denmark, Iceland, Finland, Sweden) have unemployment insurance benefits delivered via unions. In these countries, unions have developed high-quality service delivery in the domain of unemployment insurance. Landais and Spinnewijn (2021) use workers' choices over the comprehensive coverage offered by Swedish unions to assess the value of unemployment insurance.

These types of selective benefits seem important to maintain union membership independent of coverage. Western (1995) also observes that the provision of unemployment insurance through unions ensured that recessions did not mechanically result in lower union density; Jaumotte and Osorio Buitron (2020) leverage the interaction of lagged unemployment and the Ghent system as an instrument for union density in cross-country panel regressions with inequality as the outcome. Böckerman and Uusitalo (2006) find that the erosion of the Ghent system in Finland and a subsequent decline in union membership were driven by the entry of a fund providing unemployment insurance independent of union membership. There is not a complete consensus that Ghent systems are empirically important for density. A recent paper with longer historical cross-country data finds little effect of the introduction of Ghent systems on union density (Rasmussen and Pontusson, 2018).

The United States does not have a Ghent System, although unions often do assist their members in securing unemployment insurance. However, a significant though declining share of the union effect on overall compensation is the effect on workers' health insurance and other fringe benefits (Buchmueller, DiNardo, and Valletta, 2002; Knepper, 2020). In turn, expansions of social insurance in the U.S. may have led to a decline in unionization (Aizawa, Fang, and Komatsu, 2024).

Training and Re-training A related selective benefit unionism can provide to their members is training. This can come in the form of subsidies (e.g., paid time-off) to take part in external training programs or union-provided training programs. Unions (together with employer associations) are uniquely able to deliver training programs that supply workers with skills that are neither firm-specific (which theory suggests ought to be supplied by employers) nor fully general (which ought to be paid for by workers). Sector-specific training and credentialing, like union apprenticeship programs, can often be credibly designed and supplied by unions, as the union can promise a job, or at least a slot in the employment queue post-training. When designed by employers alone, the skills provided may be too specific, and when supplied by the government, they may be overly general. Acemoglu and Pischke (1999) present a model and German evidence that the wage compression induced by collective bargaining incentivizes employers to invest in general training, as trained workers will be less likely to leave as the compressed wage-structure will prevent them from reaping the gains of their training. Dustmann and Schönberg (2009) provide evidence that collective bargaining coverage leads to more apprenticeship training provision by firms. Lipowski, Salomons, and Zierahn (2024) study the process of curricular updates of training programs in response to technological advances in the German context, where unions and employer organizations initiate and negotiate over official curriculum changes.

In the United States, older evidence suggests unionized employers are more likely to provide training (Lynch, 1992), and unions retain control of disproportionately large share of formal apprenticeship programs. Lerman and Rauner (2011) notes that " union-connected sponsors provide nearly two-thirds of all registered apprenticeships." Unions are also involved in some sectoral training programs, like those studied by Katz, Roth, Hendra, and Schaberg (2022), but it is an open question to what extent union involvement alters the efficacy or content of the training.

Tax Treatment of Union Dues Many countries subsidize union membership through deductions of union dues from workers' taxable income. In many cases, there are caps on the total union dues an individual can deduct from their taxes or only a fixed percent of union dues can be deducted. In the Nordic countries, there have been a number of recent reforms in the deductability of union dues (e.g., in Norway and Sweden). Notably, a number of important papers study reforms of the tax deductability of union dues in Norway (Barth, Bryson, and Dale-Olsen, 2020a,b; Dodini, Stansbury, and Willén, 2023; Dodini, Salvanes, Willén, and Zhu, 2023), and use changes in the tax deductability of dues as an instrument for union membership. Barth, Bryson, and Dale-Olsen (2020a) estimate a price elasticity of union membership of around 7 percent.

In the U.S., dues were tax deductible (so long as they were over 2% of annual gross income) prior to the 2017 Tax Cuts and Jobs Act. The 1986 Tax Reform act may have altered the tax incentives for union membership by increasing the standard deduction and decreasing the incentives to itemize deductions. The 2017 TCJA froze itemized deductions that were subject to the 2% of AGI floor, including union dues, for tax years 2018 through 2025. The deduction item line includes professional association fees and other expenses and so it may not be straightforward to deduce union membership from tax data in the United States (although Beauregard, Lemieux, Messacar, and Saggio (2024) overcame this

limitation in Canada), and we know of no attempts to do this.

Firm- and Establishment-Level Codetermination As an additional dimension of collective bargaining, many Continental European countries allow for or prescribe firm- or establishment-level involvement of workers in the management or corporate governance (e.g., on the board) of their employer (Jäger, Noy, and Schoefer, 2022b).[4] Notably, Germany features worker involvement at the establishment level through works councils which are directly involved in management decision and have a variety of information, consultation, and codetermination rights (Jäger, Noy, and Schoefer, 2022a). Works councils can also affect wages, by (i) enforcing collective bargaining contracts, (ii) concluding establishment-specific agreements with firms, and (iii) by monitoring the assignment of workers to CBA positions. In addition, workers in larger firms in, e.g., Germany and the Scandinavian countries, have a right to representation on the board of their employer. Policies for co-determination/works councils in many countries follow strict firm size cutoffs, allowing causal identification using regression discontinuity designs (Fairris and Askenazy, 2010; Jäger, Schoefer, and Heining, 2021; Harju, Jäger, and Schoefer, forthcoming).

Employer Associations While the literature on union membership and coverage dates almost to the beginning of labor economics, there is much less research done on the other side of the bargaining table: employer associations. Employer associations are collectively organized groups of employers that, symmetrically to unions, negotiate collective bargaining agreements that cover not just the association's members, but often *all employers* via mandatory extensions.

Martins (2020) is an important paper beginning the study of employers associations, using data from Portugal. The paper argues that employer associations can secure better collective bargaining agreements, and higher industrial peace, in environments where they bargain with unions.[5]

But even away from the bargaining table, employer associations can conduct lobbying and representation of the industry to policymakers. They can also coordinate in the provision of sectoral public goods, most importantly the regulation (e.g., occupational licensing) and funding of training, like apprenticeships, that is neither firm-nor-worker specific. The flip side of this is that employers associations can also act as open cartels, either securing high wage agreements wages as a deterrent to entry in the product market or colluding to lower wages in the labor market (when not countervailed by unions). Employer associations may also serve as vehicles for employer collusion (Patault and Valtat, 2020; Sharma, 2024), including for wage setting. Bryson and Willman (2024) argue that employer associations are also information networks for transmitting technologies and human resource management practices.

[4] In fact, as of 2018, 92 of 116 countries in the Centre for Business Research Labour Regulation Index Dataset (Adams, Bastani, Bishop, and Deakin, 2017) apply some sort of shop floor representation such as works councils; 24 out of 116 have some sort of codetermination at the company board level, with 17 of the latter being European countries (Jäger, Noy, and Schoefer, 2022b).

[5] Martins (2020) matches hand-collected data on Portuguese employer affiliation with an associations with rich firm-level and matched worker-lever data. He then shows that affiliated firms have higher sales, productivity, and wages in cross-sectional regressions, but these effects disappear with firm fixed effects. However, he finds that the benefits of affiliation increase non-linearly with the share of the workforce in the association that is covered by the collective bargaining agreement, with the additional employment in affiliated firms reaching a peak at 87% of the workforce being covered.

Employer associations' strategic objectives may change when they negotiate agreements that then become binding through extensions. Haucap, Pauly, and Wey (1999) argue that employer associations then have an incentive to increase wages to increase rivals' costs. Patault and Valtat (2020) provide evidence on the collusion of large employers in the French labor market (where CBAs are universally extended), finding that employer associations dominated by large firms have stronger incentives to raise wages (the work is also included in theses by Valtat, 2019; Patault, 2021).

While these papers are important first steps, much more work remains to be done on assessing the selection into, and causal effects of, employer association membership and coordination.

3 Whom and What Do Unions Represent?

Unions are diverse in their ideologies and objective functions. An older literature debated the form of the union objective function, and the weights unions put on wages vs employment, or representing employed vs. unemployed workers, surveyed in the Handbook chapter by Farber (1986) and, more recently, in the graduate textbook by Cahuc, Carcillo, and Zylberberg (2014) and the paper by Kaufman (2002).

An Objective Function A commonly used formulation of the union's objectives is a Cobb-Douglas aggregate of average union wage premium ($\Delta w = w^c - w^n$) and membership employment L_u:

$$U(\Delta w, L_u) = (\Delta w)^{\alpha} L_u^{1-\alpha}. \tag{1}$$

While this specification is tractable and lends itself to standard optimization, concrete microfoundations such as maximizing union dues may seem contrived—and deserve more research, along with the role of other revenue streams.[6]

Being only a function of average premium and employment, this union objective function has a hard time rationalizing the patterns of pay premia seen in the data. An explanation of the wage-compression role of unions rests on the observation that unions are at least somewhat democratic organizations, and so compress wages towards the median covered worker. Standard political economy models of voting could microfound a union objective over wage compression, wage premia, and employment, so long as workers care both about their odds of being employed as well as their wage. In political economy models, individual interests are weighted according to their probability of being pivotal. Gans and Smart (1996) motivate a condition on preferences for the existence of multidimensional voting equilibria with an example of unions aggregating heterogeneous preferences of workers over wages and employment.

Unions can differ in the priority they put on wages of members vs. employment (either of members, or covered workers who are not members). For example, if unions also administer unemployment

[6]One justification points to the fact that primary revenue source for unions is membership dues, generally a fixed fractions of wages, which give organizations an incentive to maximize both wages of members as well as new members. However, many unions today have non-trivial asset income as well, from real-estate holdings and sometimes from equities, e.g., in strike and private pension funds. In some cases, unions are also funded directly from payroll taxes levied on employers (e.g., in China).

benefits, they may internalize the effects of wages on employment of members.

Beyond their internal political economy, unions have many of the issues highlighted in organizational economics, including agency problems and rent-seeking by leadership and staff (see, e.g., Venturini, 2023, for evidence on racketeering and corruption). On top of that, they are also to varying degrees both ideological organizations and internally democratic ones.

Boudreau et al. (2023) study union leaders in Myanmar in an experimental context. They find that union leaders are positively selected on leadership attributes and ability, and, when randomly embedded in groups of workers, are able to build consensus around union wage proposals. In an experiment testing for peer effects in attendance, they show that union leaders are able to amplify strategic complementarities, increasing coordination.

Constraints on Union Demands Several factors may lead unions to moderate wage demands in collective bargaining. For example, facing an elastic demand for labor, e.g., due to product market competition, a union interested in maximizing the wage bill would naturally moderate their wage demands in order to preserve employment (Friedman, 1951). Workers and unions may also anticipate that higher wage demands may trigger employer opposition (see, e.g., Wang and Young, 2022). Going back to Calmfors and Driffill (1988) and Wallerstein (1990), researchers have hypothesized that the structure of collective bargaining, specifically the degree of centralization, affects the militancy of unions' wage demands and the frequency and intensity of strikes, also depending on how broad-based organization is across workers that are substitutes vs. complements. Finally, codetermination—worker representation in management or corporate governance—was introduced in part as a way to integrate unions into management and thereby curbing more radical unions (Jäger, Noy, and Schoefer, 2022). Thelen (1991) hypothesizes that codetermination itself fostered more cooperative industrial relations and lead to more moderate union demands.

These constraints feed back into the effective objective function of unions and the debate about how unions aggregate preferences of their members, a process implicitly underlying the union objective function above. Unions do this in ways that are more or less democratic. Kremer and Olken (2009) pose a sharp "trilemma" building on an argument from evolutionary biology, by which unions can be either large, powerful, or democratic. This is because, notwithstanding Friedman's 1951 moderation hypothesis, democratic and powerful unions may drive up wages for their members, impeding employer growth and eventually leading to employer exit. Large and powerful, yet democratic, unions, then, must insulate leadership from membership to some degree to keep a focus on growth. The authors test this model with national union membership and election data from the U.S., showing that unions with indirect leadership elections grew more compared to unions with direct elections. Similarly, Kremer and Olken's 2009 model predicts the trend, observed over time in the U.S., of more centralization of union organization and away from independent local unions.

Politics and Ideology Beyond purely economic interests, unions often have distinct and consequential political ideologies, or explicit partisan attachments (Davis, 1999; Hyman, 2001). Unions in the United States were once the most important political contributors for the Democratic party, whose importance

has declined with the post-1970 entry of corporate and educated donors (Kuziemko, Marx, and Naidu, 2023). U.S. unions also vary in their political ideologies (Stepan-Norris and Zeitlin, 2003; Ahlquist, 2017). The most extreme left-wing ideologies in the U.S. (and Canadian) labor movement were purged in the post World War II years. But many of the largest unions, particularly manufacturing, service, and public sector teachers' unions, have been traditionally strong supporters of the Democratic party. In the United States, there are also unions that are either quite conservative in their political ideologies (e.g., police officer unions), or act more purely as a special-interest group (many building trade unions) in favor of their members, without any particular partisan allegiances. Ahlquist and Levi (2013) compare port unions in Australia and the United States, and show how even within the same sector and country, union leadership can transform successful collective bargaining into member mobilization for politics in very different ways. Kaplan and Naidu (2025) survey the literature on unions and political economy.

As we describe in the country descriptions in Section 4, many European countries feature a range of unions with diverse ideological backgrounds, ranging from unions with Communist roots and more militant approaches to industrial relations, e.g., the CGT in France or the CGIL in Italy, to unions originating from the Catholic labor movement or the Christian Democratic political spectrum, such as the CFTC in France or the CISL in Italy. In other contexts, such as the DGB in Germany or the CUT in Brazil, the main trade union federations are traditionally aligned with the Social Democratic parties, which themselves often originated from the labor movement (Streeck and Hassel, 2003). It remains an open question to investigate how union ideology affects union behavior with respect to, e.g., bargaining strategies, influence on firms' technology adoption decisions, and, overall, firm and worker outcomes (see Pecheu, Jäger, and Breda, 2024, for an analysis of the effect of union ideology on worker outcomes in France).

Beyond aggregating member preferences, unions also *shape* the political stance and ideology of workers and operate in the political arena (Streeck and Hassel, 2003; Acemoglu and Robinson, 2013). Matzat and Schmeißer (2022) provide evidence that successful union elections in the U.S. lead to a shift in campaign donations to Democratic politicians from workers and managers at the unionized workplace. Feigenbaum, Hertel-Fernandez, and Williamson (2018) document that Right-to-Work laws in the U.S., which weakened unions, reduce the Democratic vote share, donations to Democratic campaigns, and the share of working-class candidates serving in state legislatures or Congress.

Who is Represented? Below, we also review the reinvigorated literature that analyzes the descriptive and substantive representation of different groups of workers in unions and heterogeneity in the effects of unions and different bargaining regime on worker outcomes. In sum, besides the heterogeneity in collective bargaining environments, there is considerable heterogeneity in elements and weights entering union objective functions. Farber et al. (2021) and Batut, Lojkine, and Santini (2024) provide evidence on the evolving, long-run selection of union membership along several dimensions in the U.S. as well as, respectively, in Denmark, France, West Germany, Italy, Sweden, and the United Kingdom. Uniquely in this literature, Clark and Oswald (1993) survey union leaders directly about their preferences. Squaring all these dimensions of union objectives, and understanding how they shape the resulting collective bargaining agreements as well as worker and firm outcomes, remains an

important subject for future research.

Gender Corradini, Lagos, and Sharma (2023) draw on Brazilian administrative data to examine the effects of union leadership prioritizing gender on collective bargaining outcomes. The Brazilian union federation CUT, affiliated with the center-left party PT, passed a resolution mandating equal female representation in union leadership. The authors show that the subsequent collective bargaining agreements had more female-friendly clauses, and improved retention of female workers, with no adverse effects on male workers. Garcia-Louzao and Perez-Sanz (2024) find, similarly that female worker representatives improve family-friendly amenities in firm-level agreements, with the additional finding that this effect is attenuated in firms without flexible schedules. Studying a 2011 Wisconsin reform, Biasi and Sarsons (2022) show that moving away from collectively bargained salaries for public school teachers, largely based on seniority, and allowing for more flexible and individualized wage setting exacerbated the gender gap. Skorge and Rasmussen (2022) use cross-country OECD data to show that in countries where union density of women tracks female labor force participation, governments provide more family-friendly policies.

Race While the literature on ethnicity and race has been largely focused on the U.S., the question of how unions incorporate ethnic or non-citizen minorities remains an important area of research. Ashenfelter (1972) pioneered the effect of unions on the black-white wage gap in the U.S., while Farber, Herbst, Kuziemko, and Naidu (2021) show that the union premium for non-white workers was positive over the entire 20th century, even when non-white households were disproportionately more likely to be union (in the 1950s and 1960s). In political science, there is an active empirical debate on the causal effect, if any, of union membership on racial attitudes of white workers (Frymer and Grumbach, 2021; Yan, 2024).

Blue-Collar Representation An active literature in political science documents preference heterogeneity between blue- and white-collar workers with regard to union policy (Becher and Pontusson, 2011; Cronert and Forsén, 2023). Focusing on worker representation on German works councils, Budde, Dohmen, Jäger, and Trenkle (2024) show that blue-collar workers who become worker representatives provide more job security, in line with preferences of blue-collar workers.

Age In light of demographic change and insider-outsider dynamics, a key dimension is to what extent the demographic structure of unions affects union objectives and bargaining strategies. As one illustration, unions differ in whether retirees can stay dues-paying members and vote in internal union elections. Dodini, Salvanes, Willén, and Zhu (2023) show that the effects of union membership (holding coverage constant) vary by age, with older workers benefitting more in terms of non-wage outcomes (e.g., promotion) and less in terms of wage premia, than younger workers. Pyka and Schnabel (2023) show that retirees are slowly increasing as a share of union members, with a share as large as 20% in the Netherlands. The within-union conflicts over prioritizing pensions vs. wages induced by this variation together with the overall trend of aging workforces is intriguing and worthy of further study.

Citizenship and Immigration Unions have a complex relationship to immigration, but collective bargaining agreements generally do not distinguish between native-born and non-native born workers. Dodini, Willén, and Zhu (2024) use the Norwegian variation and document that union membership has little effect on immigrant outcomes, differentially benefiting native-born workers and exacerbating native-immigration differences. This is consistent with the historical record of native-born workers using their collective organization to secure exclusion of immigrants from their sectors (Antón, Böheim, and Winter-Ebmer, 2022). Mukherji (2021) uses CPS data and finds that low-wage immigration reduces native-born worker unionization, arguing that unions cannot secure a premium in the face of increases in low-wage non-union labor supply. Medici (2023) looks at the early 20th century U.S. and finds that unionization increases in response to immigration shocks. However, Bächli and Tsankova (2021) find that in Switzerland, collective bargaining coverage attenuates the effect of immigration on anti-immigrant voting, by blunting immigrant effects on native-born labor market outcomes.

4 A Brief Tour of Industrial Relations Around the World

We now describe industrial relations systems in selected countries and regions around the world. The overview demonstrates the diversity of collective bargaining regimes, and highlights policies that have preserved or weakened collective bargaining over time (e.g., decentralization in many European countries).

In our description, we synthesize recent economics research on these collective bargaining systems. With our description of institutional arrangements and changes therein, we also aim to stimulate future research, as many of these institutional differences and changes may suggest research designs for future empirical studies.

Several lessons emerge from our tour. First, there is substantial variation in the determinants of collective bargaining coverage and union membership across countries. While Nordic countries maintain high levels of both, many countries in Europe show a stark disconnect between low union membership and high coverage, achieved through extensions by law (France, Portugal) or *de facto* extension through courts (Italy). The United States stands out among most developed economies with both low density and coverage.

Second, most industrial relations systems in Europe have undergone significant decentralization since the 1980s, though through different mechanisms. Nordic countries and Germany have seen "organized decentralization" within existing frameworks and without much government intervention, while France and Portugal implemented reforms through legislative action, often in response to economic crises. Decentralization has generally corresponded with rising wage inequality (see, e.g., Hibbs and Locking, 1996; Skans, Edin, and Holmlund, 2009; Dahl, Le Maire, and Munch, 2013).

Third, the role of government varies markedly across systems. Some countries maintain autonomous social partner negotiations (Nordic countries, Germany) while others feature extensive state intervention through extensions, reforms, and direct participation (France, Portugal).

Finally, in many developing countries coverage is extended to a significant share of the formal sector, but large informal sectors put a ceiling on the coverage and wage compression that can be exercised

by formal unions. In middle income countries with growing formal sectors, collective bargaining continues to be important.

4.1 United States

The U.S. has very low union coverage (about 10% overall, with only 6% in the private sector as of 2022-2023 U.S. Bureau of Labor Statistics, 2024). Membership and coverage are very closely correlated, and membership overall is only about a percentage point less (U.S. Bureau of Labor Statistics, 2024). U.S. industrial relations in the private sector are largely codified by the 1935 National Labor Relations Act, subsequently amended by the 1946 Taft-Hartley law, and the 1959 Labor-Management Reporting Disclosure Act, along with various judicial precedents. These national laws largely preempt states from passing their own collective bargaining laws for private workers (public sector workers are generally governed by state laws). An important exception are state-level Right-to-Work (RTW) laws, which substantially curtail union power and which we describe below.

Trends Private sector union decline in the United States has been virtually monotonic since the 1950s. Farber and Western (2001) explore the reasons for the decline in union density. They find that a considerable amount of the decline is within-sector, so non-tradable occupations like transportation and construction have experienced union decline just as manufacturing and natural extraction.

Most of the growth in private sector unionization in the United States over the 20th century occurred during the late 1930s and early 1940s. (Farber, Herbst, Kuziemko, and Naidu, 2021) overcome the lack of pre-1973 microdata by exploiting historical polling data, largely from Gallup, and constructing a measure of "household" union status. They then measure household union household income premia and selection into union status by education and race. They find that at the peak of postwar union density, union members were much more negatively selected (e.g., in terms of education) relative to both pre-World War II or more recent years. Despite this changing composition, union premia were stable throughout the 1936-2016 period for which they have data, and were higher for non-white and less educated workers. Farber, Herbst, Kuziemko, and Naidu (2021) also find that union density is negatively correlated with various measures of inequality at the aggregate time-series level, in state-year panel regressions with state and year fixed effects, and in semi-parametric re-weighting exercises both with and without spillovers (DiNardo, Fortin, and Lemieux, 1996; Fortin, Lemieux, and Lloyd, 2023). To establish causality, they construct two instruments at the state-year level, one using differential state take-up of recognition elections and strikes after the 1935 Wagner Act, and another using World War II economic spending, which came with substantial union protections. They find that both instruments increased union density in the relevant periods, and reduced inequality and raised labor share of income.

Key Players The U.S. collective bargaining system primarily involves trade unions and *individual* employers. That is, unlike in the European systems, employer *associations* play no role in U.S. industrial relations as individual firms bargain with the relevant union.

The main union federation is the AFL-CIO (American Federation of Labor and Congress of Industrial Organizations), which represents about 12.5 million workers across various unions. A set of large unions, formally broke from the AFL-CIO in 2005 to form "Change to Win" (eventually named the Strategic Organizing Center) as an alternative to the AFL-CIO, with about 2.5 million additional members. Union federations have little formal power, and the member unions themselves have local organizations as well as national or international organizations, with relative balances of power varying from union to union. Membership is split roughly equally between the public and private sectors.

The National Labor Relations Board (NLRB) is an independent federal agency established by the NLRA to enforce labor law in relation to collective bargaining (primarily by conducting elections for union representation) and unfair labor practices. The conflictual industrial relations of the U.S. mean that seemingly small differences in the interpretation of labor law (e.g., the definition of "community of interest" in defining a bargaining unit, see below) wind up significantly influencing organizing and anti-union activities (Logan, 2006), and the five-member board is often quite politicized.

Unionization Process Unionization under the NLRA involves several steps. Initially, workers must gather signatures from at least 30% of their colleagues in a potential bargaining unit to petition the NLRB for an election. The NLRB then determines if the proposed bargaining unit is appropriate, based on the principle of "community of interest" among workers. The employer has the right to challenge this definition. If the petition is accepted, an election is typically scheduled within two months. During this period, both union organizers and the employer communicate with workers about unionization. The employer can hold mandatory meetings during work hours, often involving presentations from management or anti-union (formally: labor relations) consultants (Logan, 2006), and draw on data analytics.[7] In contrast, union organizers are generally restricted to off-work interactions (Bronfenbrenner, 2009). If the union wins the election by a simple majority, the employer is obligated to bargain "in good faith." The process of reaching a first contract can be lengthy and in many cases does not lead to a success; e.g., Frandsen (2021) estimates that a successful union election increases the probability of a contract by about 27 percentage points (though this may be an underestimate due to data limitations as only contract expiration reported to the Federal Mediation and Conciliation Service count as a concluded contract).

Overall, the multiple barriers put up by the law and employers mean that U.S. workers need to mobilize a great deal of workplace collective action to get union representation. Naidu (2022) presents evidence for unmet demand for unions (see also Kochan, Yang, Kimball, and Kelly, 2019), and discusses the collective action problems that workers need to overcome to obtain union recognition in Wagner Act-type systems, and the resulting effects on the evolution of unionization through inflow and outflow of establishments into coverage.

[7] Jacoby (1986) discusses the early practice of what would be called "human resource analytics" in late 1930s Sears-Roebuck anti-unionization efforts post-Wagner Act.

Evidence on the Effect of Unionization A large literature, surveyed in Farber et al. (2021), has estimated the union premium using a variety of identification strategies, from simple Mincerian controls to within-person changes in union status and even twin-based estimates. The features of the U.S. unionization process has also provided opportunities to estimate the causal effect of unionization on wages in design-based studies. Most prominently, DiNardo and Lee (2004) and Lee and Mas (2012) study close union elections, comparing unions that narrowly won to those that narrowly lost. DiNardo and Lee (2004) document small effects on wages in a regression discontinuity design drawing on data from 1984 to 1999, whereas Lee and Mas (2012) find larger implied wage effects of about $40,000 per unionized worker in an event study design with stock market data and union election data from 1961 to 1999. By studying a wider range of union win and loss margins, the event study design points to larger implied wage effects for larger union victories, suggesting that union strength and perhaps threat effects matter for the size of wage effects. Frandsen (2017) provides evidence of "manipulation" of the running variable of regression discontinuity designs using narrow union elections. The manipulation and corresponding missing mass of observations follows a political cycle as there is evidence for manipulation in favor of employers (as evidenced by missing narrow union victories) when Republicans control the NLRB and in favor of unions otherwise. Frandsen (2021) accounts for this manipulation and implements difference-in-discontinuities specifications that compare pre- and post-election outcomes in establishments with narrow union wins or losses. Frandsen's 2021 results point to an important role for selection in interpreting wage effects: payroll and employment fall in response to a successful union election, driven by increased exit rates of older and higher-paid employees following union wins. Wang and Young (2022) combine difference-in-differences techniques with regression discontinuity extrapolation methods to study the effects of unionization and find that unionization decreases employment and establishment survival, with reallocation to other plants, particularly under stronger employer opposition.

Alongside the wage premium, numerous less recent papers have used the CPS to study the effect of unions on U.S. wage inequality, beginning with Freeman (1980), DiNardo, Fortin, and Lemieux (1996), and continuing through Card (2001). The micro-effect of unions modestly compresses the wage distribution, but Fortin, Lemieux, and Lloyd (2021), find that spillovers of unions onto non-union workers roughly doubles the effect of union density on inequality.

CBAs Collective bargaining in the U.S. primarily occurs at the enterprise or bargaining unit level. There is no national-level bargaining as seen in some European countries, and industry-level bargaining is almost non-existent.

Some sectors, e.g., automobile production, have "pattern bargaining," where the first contract settlement in a bargaining round sets the parameters for the subsequent contracts. In 2023, the United Auto Workers (UAW) deviated from this approach by initiating simultaneous strikes against Ford, General Motors, and Stellantis, marking the first time in its history to strike all three automakers concurrently.

In some states, quasi-public sectors like healthcare have collective bargaining coverage for the entire sector, but the *Harris v Quinn* Supreme Court ruling essentially imposes a right-to-work arrangement

on these contracts, leading to low membership despite complete coverage (similar to many European countries).

Unlike in many European countries, there are no automatic extensions of collective bargaining agreements to non-unionized workers or firms. The principle of exclusive representation means that a union certified as the bargaining representative negotiates on behalf of all workers in a bargaining unit, regardless of their union membership status.

Collective bargaining coverage in the US exceeds union membership by 1.2 percentage points. Prior to the Taft-Hartley law, so-called "closed shop" agreements in contracts required workers to be union members as a condition of employment. But this arrangement has since become replaced by "union shop" requirements in collective bargaining agreements, where new employees have to either join the union after 30 days or pay an "agency fee", or "fair share fee" to the union to cover the costs of representation. In Right-To-Work jurisdictions, agency fees cannot be compelled in contracts, and covered workers are under no obligation to pay fees or membership dues to a union. Interestingly, the gap between coverage and membership in the private sector is not significantly different in RTW states than non-RTW states (about 1 percent in both), but it is much larger in the public sector (4.5 vs 3.5 percentage points difference between covered and membered in RTW vs non-RTW states, respectively) .

The scope of collective bargaining is defined by the NLRA and subsequent judicial interpretations. U.S. unions can bargain over two main categories of subjects: mandatory and permissive. *Mandatory* subjects, over which employers are required to bargain in good faith, include wages, hours, vacation days, and working conditions, benefits, workplace safety, work assignments and schedules, and layoff and recall procedures. *Permissive* subjects, which can be negotiated if both parties agree, include topics remote from workplace conditions and wages, such as customer and technology choices, expansions of the bargaining unit, arbitration procedures, and internal union governance.

In contrast to the European and in particular German codetermination model, which grants workers a say in a broad range of corporate decisions, U.S. labor law significantly restricts unions' ability to bargain over certain management rights (Jäger, Noy, and Schoefer, 2022). Core business decisions are typically considered outside the scope of mandatory bargaining, and in fact explicitly excluded in the scope of bargaining following the Supreme Court's 1981 decision in First National Maintenance Corp. v. NLRB. This exclusion applies to basic business decisions regarding plant closure or relocation decisions, production methods, product design and marketing, among others. This limitation on bargaining scope reflects a fundamental difference in the overall approach to labor-management relations between the U.S. and countries with stronger codetermination rights, emphasizing management's and, ultimately, owners' prerogative in strategic business decisions.

Right-to-Work Laws RTW laws have been a significant shifter of labor relations in the United States, permitted under the Taft-Hartley Act of 1947. These laws make it illegal to require employees to join a union or pay union dues as a condition of employment at a company. RTW laws were initially passed primarily in the Southern states. In the last 15 years, several "rust belt" states, notably Indiana, Michigan, and Wisconsin, have passed (and in the case of Michigan already repealed) RTW laws under

Republican leadership. As of 2023, 27 states have enacted RTW laws.

It is natural to think that RTW laws are a significant impediment to union organization and union power. Ellwood and Fine (1987) document the decline in union organization following passage of RTW laws. Fortin, Lemieux, and Lloyd (2023) show that RTW laws lower unionization rates and wages. Interpreted through an instrumental variables framework in which RTW laws instrument for union strength, Fortin, Lemieux, and Lloyd (2023) estimate an effect of unionization on log wages of 0.35. RTW laws also affect broader outcomes. Holmes (1998) shows an increase in manufacturing activity. Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten, and Van Reenen (2019) document that RTW laws lead to more structured management practices in the dimensions of pay, promotion, and dismissals—areas in which U.S. unions tend to wield influence (see, e.g., Grossman, 1983; Abraham and Farber, 1988). Matsa (2010) documents a decrease in firms' leverage, interpreted as firms responding to a decrease in union power. Finally, RTW laws are associated with political outcomes, too, with lower Democratic vote shares and campaign contributions (Feigenbaum, Hertel-Fernandez, and Williamson, 2018). Much of the within-state evidence comes from recent RTW laws that were passed in states with already substantial union density. In an Appendix, Farber, Herbst, Kuziemko, and Naidu (2021) find no effect of RTW laws on union density measured using Gallup surveys when including the full 20th century panel of states, as many early RTW laws had no effect on union density, a result also found in Lumsden and Petersen (1975).

Public Sector Unions In contrast to the private sector, U.S. unions maintain a significantly stronger presence in the public sector. Key areas of public sector union strength include teachers, firefighters, and police officers. The impact of these unions, particularly teachers' unions, has been the subject of extensive research (surveyed and discussed as a component of "state capacity" in Kaplan and Naidu (2025)).

In the 2018 case *Janus v. American Federation of State, County, and Municipal Employees*, the U.S. supreme court ruled that public sector unions cannot collect dues from non-union members, effectively putting the public sector under a right-to-work regime.

4.2 Canada

Collective bargaining coverage in Canada is roughly three times higher than in the U.S. at 30.4% in 2023 (Statistics Canada, 2024). Canadian labor law was initially modeled on the U.S. National Labor Relations Act, and many Canadian unions began as affiliates of U.S. unions. As in the United States, the basic unit of collective bargaining is the establishment or "bargaining unit." Canadian labor law has much more provincial variation, and both the unions and the law have diverged from the U.S. over time.

Trends and Broad Differences with the U.S. Despite the similarity of institutions and economic structure, Canadian private sector union density remains over twice as high as the United States (for a comparative historical account of labor relations in the U.S. and Canada see Eidlin, 2015). Unlike the U.S., Canada has no Right-to-Work jurisdictions, so unions can deduct payments from even non-union

members covered by a collective bargaining agreement. Legree, Schirle, and Skuterud (2014) use province-by-year data to look at the effect of provincial labor law on union density, and find positive, albeit small, effects of pro-union labor laws on union density. Further, labor law is adjudicated by a set of professional labor arbitrators, rather than agency judges and political appointees as in the United States. This means that Canadian variation across provinces and over time has proven to be useful in assessing which features of Canadian labor law are the most pro-employer or pro-union. For example, Riddell (2004) uses variation in British Columbia switching between card check and election union recognition policies to estimate their effects on union density. (Card check is a path for unionization involving a sufficient number of workers in a workplace sign authorization cards instead of, e.g., holding a formal election.) He finds that card-check recognition raises recognition success rates by almost 20 percentage points compared to elections.

Key Actors The main Canadian labor federation is the Canadian Labour Congress (CLC). It is historically quite close to the New Democratic Party, a labor party. However, the largest union in Canada, Unifor, split from the CLC in 2018, and is itself a merger of two large unions, the Canadian Auto Workers and the Communications, Energy, and Paperworkers unions. There are other much smaller union federations, for example the generally more conservative Christian Labor Association of Canada. Quebec, with a civil law system and very high union density, has a distinctive labor regime, with sectoral bargaining in construction, card-check union recognition, and prohibition of permanent replacements for strikers. Quebec unions also have significant social prestige, political power, and economic influence. For example, the major union federation operates a substantial investment fund and pension savings plan that it uses to invest in Quebec businesses.

Data The Canadian labor force survey only began asking about union membership in 1997, and microdata only exists beginning in the 1980s. Kuziemko, Naidu, Thomas, and Vogt (2024) harmonize historical Gallup polling data for Canada to produce comparable union density estimates over time and to the United States. The divergence between Canadian and U.S. density is even more striking given very similar historical patterns, going back to the 1950s, in union wage premia, patterns of selection, and effects on household income inequality.

Researchers have used features of the Canadian data to estimate the effect of unions on wages. Abowd and Lemieux (1993) use Canadian collective bargaining data to show rent sharing reductions from increases in product-market competition. Lemieux (1998) uses involuntary switches between the union and non-union sectors to estimate the within-worker union premium in Canada. Card, Lemieux, and Riddell (2020) decompose wage premia by gender in both the U.S. and Canada for both public and private sector, and find that the effect of unions on wage inequality is currently larger in the public sector, and this explains differences by gender. Arold, Ash, MacLeod, and Naidu (2024) use natural language techniques applied to Canadian collective bargaining agreements to measure the degree of worker control in collective bargaining, and show that this measure, along with wages, respond to taxes and labor demand shocks as would be expected for an amenity.

Recent Canadian administrative data provides almost the ideal setting to study Wagner-act type

unions. Firm variables can be merged to matched worker-firm data. Further, the Canadian tax code allows workers to deduct union dues, and Beauregard, Lemieux, Messacar, and Saggio (2024) use this to impute individual level union membership in the administrative data. Further, these authors use firm-level value-added data from balance sheets to study the role of rent sharing in the union premium. Controlling for worker fixed effects, the authors find a private sector union premium of about 15%, of which 40% is explained by higher value-added per worker at unionized firms, and the rest is attributed to stronger rent extraction by unions. They also find positive spillovers of unionized workers onto the wages of non-union workers in the same firm.

4.3 Germany

We now move to our first country that features sectoral bargaining, rather than only establishment-level bargaining as in the two North American settings above. Germany's system, however, features substantial flexibility in coverage and evasion opportunities (see Jäger, Noy, and Schoefer, 2022a, for a recent overview), implying that it sits in between the Wagner-style and the more rigid higher-coverage European settings we then move to next, both in terms of actual coverage levels and in its operations.

Trends CBA coverage in Germany has declined from about 70% since the 1990s and remains around 40% today (Jäger, Noy, and Schoefer, 2022a). While formal coverage has declined, a larger share of firms now report informally "orienting" their pay to the relevant CBA (Oberfichtner and Schnabel, 2018), suggesting that CBAs maintain an important role as a reference point.

Key Players The German collective bargaining system involves four main actors: trade unions and employer associations at the sectoral bargaining level, as well as individual firms and worker representatives on the corporate board and on works councils.

German unions are primarily organized at the sectoral level and coordinate in trade union federations. The by-far largest and most influential, the German Trade Union Confederation (*Deutscher Gewerkschaftsbund* (DGB)), has 5.7 million members, corresponding to about 13% of the German workforce (Jäger, Noy, and Schoefer, 2022a). Unlike in France, Portugal, or Spain, there is no union federation with a Communist tradition.

Mirroring the union structure, German employers organize in industry-level associations, which in turn belong to umbrella federations. The primary confederation is the Confederation of German Employers' Associations (BDA). Employer associations engage in collective bargaining and provide services to member firms.

Besides collective bargaining, both the trade unions and the employer associations are major political forces and also engage in policy lobbying as well as directly in the policy process (e.g., by co-chairing the government's Gas and Heat Commission during the 2022 energy crisis).

Most collective bargaining occurs at the sector-by-region level, e.g., there is a collective bargaining agreement for the metalworking and electrical industries in the state of Bavaria. However, firms play a crucial role in collective bargaining: first, firms are the *de jure* decision-maker about whether to accede to a sectoral bargaining agreement by joining an employer association. As a secondary bargaining

level, in some cases, more common among larger and productive employers, firms conclude direct firm-level agreements with unions.

In addition to unions, worker representatives shape collective bargaining through the German system of codetermination. Representatives include worker representatives on company supervisory boards as well as works council members at the establishment level, who have rights to information, consultation, and in some cases, co-decision-making on various workplace issues. Works councils have become an important actor in collective bargaining as they can conclude agreements with the employer and need to consent to the use of opening clauses at the firm level. Worker representation on corporate boards does not have substantial effects on wages (Jäger, Schoefer, and Heining, 2021), and the wage effects of works councils remain an open question (see, e.g., Hirsch and Mueller, 2020, for evidence on wage effects, as well as Mueller and Neuschaeffer, 2021, on evidence of high-paid workers sorting into establishments with works councils).

CBAs Generally, the German system features two main types of CBAs: first, sector-by-region agreements (*Flächentarifverträge*), which are negotiated between regional unions and employer associations, set standards for wages, working hours, and conditions across entire industries within specific regions. Second, firm-level agreements (*Firmentarifverträge* or *Haustarifverträge*), which often reference the relevant sector-by-region CBA but may include additional provisions specific to the firm and typically include more generous provisions.

Within a bargaining jurisdiction, there are important, typically longer-term agreements regulating working conditions, termination rules, or vacation entitlements as well as agreements defining criteria to assign workers to salary groups, effectively setting the structure for wage determination. Actually guiding wages, wage and salary CBAs (*Lohn- und Gehaltstarifverträge*) are usually renegotiated every year or every other year and set wage floors for different worker categories within the sector-by-region cell. Germany applies the favourability principle, so that employers can deviate to the benefit (but not to the detriment) of workers from the terms stipulated in the CBA.

Decentralization The German collective bargaining system, while based on broad sectoral agreements, allows for significant flexibility even within covered firms. First, the German sectoral bargaining system features *regional* negotiations and thus a closer mapping of local productivity into wage levels than, e.g., the Italian system (Boeri, Ichino, Moretti, and Posch, 2021). Second, the favourability principle allows firm-specific deviations in terms of higher wages (or better amenities, e.g., lower hours) than those stipulated in the sector-by-region CBA. Third, employers can exempt workers, in particular managers and other high-paid employees from CBA regulations. By law, a sector-by-region CBA only binds for employees who are members of the union signing the agreement, though employers commonly extend the CBA conditions to non-members. Still, a small share of employees in establishments with a CBA appear to be not covered (Fitzenberger, Kohn, and Lembcke, 2013; Biewen and Seckler, 2019; Hirsch, Lentge, and Schnabel, 2022). Fourth, opening and hardship clauses in CBAs are believed to have become a key flexibility tool in the last 25 years, allowing establishments to negotiate deviations from industry-level agreements on wage and non-wage aspects of the contract (Brändle and Heinbach, 2013;

Amlinger and Bispinck, 2015). They may allow for broader deviations from CBA terms to match local conditions and often do not necessitate crises to be activated, although it remains an open question how much wage flexibility arises from them rather than flexibility on other margins of the contract or through government-subsidized hours reductions (Brinkmann et al., 2024). Negotiations under opening clauses typically involve works councils at the establishment level, sometimes requiring approval from the relevant sectoral union and employer association.

Opportunities to Avoid CBA Coverage The main room of flexibility in German collective bargaining applies not within coverage but in firms' decision whether to seek or evade coverage. Broadly, in the German system, coverage is determined by a company choosing to join an employer association. Hence, German employers have several avenues to avoid CBA coverage. First, firms may decide to not join employer associations to begin with, hence never being subject to coverage. Second, firms can leave their employer association entirely. However, even after leaving an association, existing CBAs remain active until expiry for incumbent workers. Third, faced with declining membership, employer associations have begun to offer membership without collective bargaining obligations (*OT-Mitgliedschaft*), allowing firms to retain the benefits of membership without being bound by the association's CBAs. Fourth, a rising share of employers have avoided CBA coverage for many service jobs through domestic outsourcing (Goldschmidt and Schmieder, 2017), e.g., of food services, cleaning, logistics, and security, and the rise of temporary help agencies. In the case of temp agencies (Deibler, 2022), employers can explicitly pay below wage levels stipulated in their own CBA and only need to apply the typically substantially lower CBAs for temp agencies.

Government Instruments to Shape CBA Coverage The German government plays a much smaller role in collective bargaining compared to, e.g., France, and employer associations and unions are constitutionally autonomous and independent from the government (Article 9 (3) of the German Basic Law). Nonetheless, government policy also directly shapes CBA coverage. First, the government provides the legal environment with the Collective Agreements Act (*Tarifvertragsgesetz*) and other laws regulating collective bargaining and worker representation (e.g., the Collective Bargaining Unity Act of 2015). The origins of German collective bargaining go back to the 1918 Stinnes–Legien Agreement between industry and union leaders, which was shortly after formalized in the *Tarifvertragsordnung*. Second, the government has the power to extend CBAs by decree to cover all firms in a relevant industry-region cell, regardless of their membership in the signatory employer association. This tool, more common in low-wage industries, was historically used to deter mass CBA exits and prevent wage races to the bottom, though its use has become less common over time. Third, in response to declining coverage and rising inequality (Dustmann, Ludsteck, and Schönberg, 2009), Germany introduced its first federal minimum wage in 2015. This measure has increased wages at the bottom of the distribution and encouraged worker reallocation to higher-paying firms (Dustmann, Lindner, Schönberg, Umkehrer, and Vom Berge, 2022; Bossler and Schank, 2023), while potentially reducing economic incentives for firms to outsource low-wage work or escape CBA coverage. At the same time, higher minimum wages may also attenuate the incentive for unions to push for higher wages. The

minimum wage commission, which proposes minimum wage increases, is composed of delegates from the union and employer confederations. Fourth, the government has just started to experiment with using public procurement as a lever to encourage CBA compliance. A notable example is the Health Care Advancement Act of 2022, which mandates nursing facilities that bill expenses to public insurances to pay CBA-compliant wages.

Most changes in the German sectoral bargaining institutions, e.g., the increasing decentralization and the rising use of opening clauses, occurred without government intervention—broadly reflecting the German system's limited direct role of government in collective bargaining overall. The major German labor market reforms in the early 2000s (Hartz reforms) left the bargaining institutions largely untouched, though the rise of opening clauses may have occurred in the shadow of a potential government intervention. Specifically, the German Chancellor threatened to introduce general opening clauses through law if the unions did not agree to a widespread adoption of opening clauses (Deutscher Bundestag, 2003). But overall, observers attribute the decentralization as having been driven by competitive pressure and stemming from the autonomous interactions of employers and employees, with less role for government intervention (Dustmann et al., 2014).

Effects of Collective Bargaining on Wages Sectoral bargaining appears to have a modest positive impact on wages, with recent studies estimating a premium of 2 to 4% after controlling for worker and firm characteristics (Hirsch and Mueller, 2020). Similarly, board-level codetermination shows limited effects on pay, with estimates comparable to the smaller observed impacts of sectoral bargaining (Jäger, Schoefer, and Heining, 2021). Rent sharing in terms of pass-through of profits or productivity is lower in firms covered by a CBA (Gürtzgen, 2009), and appears to be unaffected by codetermination (Jäger, Schoefer, and Heining, 2021). Leveraging a DiNardo, Fortin, and Lemieux (1996) decomposition, Dustmann, Ludsteck, and Schönberg (2009) provide evidence in line with wage compression effects as they calculate that the decline in collective bargaining between 1995 and 2004 can account for a bit over a quarter of the rise in wage inequality at the lower end of the wage distribution, and only around 10% at the upper end. Card, Heining, and Kline (2013) document that the increase in pay dispersion is associated with a growing share of establishments that opted out of collective bargaining and pay low wages. (Goldschmidt and Schmieder, 2017) provide evidence that domestic outsourcing to service firms (with lower-wage or no CBAs) led to substantial wage declines in event studies and can account for about 10% of the increase in German wage inequality from the 1980s to the 2000s.

4.4 Nordic Countries

The Nordic countries—Sweden, Denmark, Finland, Norway, and Iceland—share a distinctive approach to collective bargaining, characterized by high union density, extensive coverage, and minimal government intervention. Unlike Germany, Nordic bargaining is primarily conducted at the national sectoral level rather than at the sector-by-region level. For national bargaining, unions and employer associations are the key players.

Union Density and the Ghent System Union density is exceptionally high, ranging from 50 to 70% across these countries. One reason is believed to be the Ghent system that is present in those countries (with the exception of Norway), where unions administer unemployment insurance (Landais and Spinnewijn, 2021). In addition, tax exemption of union dues has been a driver of union membership (Barth, Bryson, and Dale-Olsen, 2020b; Dodini, Stansbury, and Willén, 2023; Dodini, Salvanes, Willén, and Zhu, 2023).

CBA Coverage CBA coverage in the Nordic countries is even higher than union membership, reaching levels above 80 to 90% of workers. Notably, this high coverage level is largely achieved *without* legal extension mechanisms. Denmark and Sweden do not have extensions; in Finland and Norway, extensions cover around 15% and fewer than 5% of workers, respectively (Garnero, 2017). Another important feature of collective bargaining is the absence of statutory minimum wages, with wage floors set through collective agreements. These systems are also characterized by a high degree of coordination across sectors, often with pattern bargaining, where the export-oriented sectors set the pace for wage increases.

Organized Decentralization Nonetheless, the Nordic models today feature "organized decentralization" with higher-level agreements providing frameworks for lower-level bargaining (Visser, 2016; Larsen and Ilsøe, 2022). Generally, sector-level agreements leave substantial room for local-level negotiations and the Nordic models generally do not feature the favourability principle by law (Cazes, Garnero, Martin, and Touzet, 2019, Table 2.4).

Multiple Unions and Recognition Another distinctive feature is that, today, there are typically multiple collective bargaining agreements in place for each employer, regulating pay and working conditions for different occupational groups. In each of the Nordic countries, there are typically at least three distinct union federations: one primarily representing blue-collar workers, one primarily representing white-collar workers, and one representing university-educated professionals. Unions gain recognition through a voluntary system rooted in historical agreements between labor and employer organizations (see more below), rather than through a formal legal processes. Most employers participate in this system by joining employer associations, which automatically binds them to the relevant sector-level agreements, though they may also sign direct agreements with unions. While participation is voluntary, strong social pressures encourage widespread adherence to collective agreements in what has become known as the consensus-based Nordic model (Hilson, 2008).

Codetermination With the exception of Iceland, the Nordic countries feature codetermination institutions with worker rights to representation on corporate boards as well as union shop stewards. In contrast to German works councils, elected by the whole workforce, union shop stewards are only elected by union members. Union shop stewards are also involved in any firm-level negotiations within the collective bargaining system. Representation on corporate boards does not seem to have large effects on wages (see, e.g., Blandhol et al., 2020; Harju, Jäger, and Schoefer, forthcoming, for

evidence on Norway and Finland, respectively), similarly for establishment-level representation in Finland (Harju, Jäger, and Schoefer, forthcoming).

History of the Nordic Model: Rise and Fall of Centralization The origins of the Nordic model, in particular centralized wage bargaining, can be traced back to a series of pivotal agreements concluded around the 1930s.[8] As Moene and Wallerstein (1995) argue, the Nordic model's centralization arose from a compromise between strong unions and internationally competitive firms, the latter of which were key forces for centralization. The centralized wage bargaining system allowed unions to pursue egalitarian wage policies, while permitting exporting firms to remain competitive in global markets. This arrangement was supported by Social Democratic governments, which implemented active labor market programs favoring worker reallocation to productive firms, with centralized bargaining potentially driving out unproductive ones.[9]

Even during the peak of heavily centralized wage negotiations, the Nordic model still left scope for local wage bargaining (see, e.g., Vartiainen, 2011). In particular in Finland, which has maintained some amount of centralization and more gradual decentralization, there had always been substantial scope for local deviations and individual wage setting (Uusitalo and Vartiainen, 2009).

More dramatic shifts occurred in Sweden and Denmark, where centralized and egalitarian bargaining began to break down during the 1980s, in the context of centrifugal forces such as skill-biased technological change (as modeled in Acemoglu, Aghion, and Violante, 2001). In Sweden, high-wage workers resisted wage compression, moving to militant unions dedicated to restoring traditional occupational wage differentials, culminating in a separate agreement in the metal industry in 1983 (Lash, 1985; Skans, Edin, and Holmlund, 2009). Around the same time, in 1982, Sweden abandoned its peace clause, which prohibited strikes when a central agreement was in place (Moene and Wallerstein, 1995). In 1982, Denmark abolished automatic wage indexation (Eriksson and Westergaard-Nielsen, 2009), and moved from centralized to industry-level bargaining in 1987 and to a larger role of firm-level negotiations in 1993 (Eriksson and Westergaard-Nielsen, 2009).

In both Denmark and Sweden, the move to decentralization has been associated with substantial increases in wage dispersion, with decentralization leading to higher differences in between-firm pay premia, larger earnings losses after displacement, and increases in the return to skills (Hibbs and Locking, 1996; Skans, Edin, and Holmlund, 2009; Dahl, Le Maire, and Munch, 2013; Janssen, 2018).

4.5 France

We now move to studying France, a case study of sectoral bargaining with high coverage, but, compared to the Nordic countries, stronger government involvement. Unlike Germany and the Nordic countries,

[8]The cornerstone of this model was the 1938 Saltsjöbaden Agreement in Sweden between the Swedish Trade Union Confederation (LO) and the Swedish Employers' Confederation (SAF). It established a framework for peaceful industrial relations, cooperation and and autonomous collective bargaining between labor and management. Similar agreements occurred around the same time in other Nordic countries: Norway's Basic Agreement (*Hovedavtalen*) in 1935 and Finland's January Engagement (*Tammikuun kihlaus*) in 1940. In Denmark, the earlier 1899 September Agreement laid the foundation for cooperative industrial relations (Popp-Madsen, 2024).

[9]In fact, this economic idea was part of the Swedish Rehn-Meidner model, developed by the union federations' chief economists, and is modeled in Moene, Wallerstein, and Hoel (1993); Moene and Wallerstein (1997).

France has relatively low union density (around 11%) but high collective bargaining coverage due to automatic extensions, which move CBA coverage from about two-thirds to close to 100% (Carcillo, Goujard, Hijzen, and Thewissen, 2019). Still, in present-day France, company-level negotiations have become increasingly important, balancing high coverage with potentially large company-level flexibility.

Key Players The French collective bargaining system involves trade unions, employer associations, the government, and individual firms.

The key trade union confederations are ideologically highly diverse and range from the CGT (*Confédération générale du travail*), which has Communist roots, to the CFTC (*Confédération française des travailleurs chrétiens*), which originates from the Christian democratic movement. Unions compete both to represent workers at the sector and at the company level. Compared to its European peers, France has a more adversarial industrial relations climate and a vital tradition of labor militancy, e.g., exemplified by a wave of "bossnappings," illegal lock-ins of management by employees, during the Great Recession (Parsons, 2013).

Importantly, the state plays a more active and direct role in industrial relations compared to Germany or the Nordic countries, and we discuss several examples below.

CBAs Collective bargaining in France occurs at three main levels: national inter-professional, sector, and company.

National inter-professional bargaining agreements (*Accords Nationaux Interprofessionnels* or ANIs) are a unique feature of the French system. These national negotiations occur between national trade union confederations and employer organizations on cross-cutting issues that affect workers across all sectors, including unemployment insurance, health insurance, vocational training, or gender equity. Once signed, ANIs can be extended by the government to become applicable to all employees and employers, regardless of whether they are members of the signatory organizations. While France does not have a Ghent system and benefits accrue to all workers, the unemployment insurance system was created in 1958 through an ANI that gets extended to all workers in the economy (regardless of union membership)—part of France's tradition of parity management (*paritarisme*), in which union federations and employers associations are involved in managing various aspects of (officially government-run) social protection.

For wage bargaining, sector-level agreements are particularly important as they set industry-wide minimum standards. The Ministry of Labor typically extends these CBAs to all firms in the sector, regardless of their membership in an employer association. In order to join negotiations at the sector level, a union needs to achieve at least 8% of votes in the union elections among the sector's workforce. For a sectoral agreement to be valid, it must be signed by one or more unions representing at least 30% of the voters in the sector (if there is no opposition from unions representing a majority of voters).

There is also substantial scope for company-level bargaining to deviate from sector-level bargaining, including downward, in departures from the favourability principle (*principe de faveur*)—see below for the details on this decentralization. Increased flexibility covers crucial aspects of employment

such as wages (while respecting base wages set at the sector level), working time arrangements, profit sharing, and overtime pay rates. Firm-level bargaining is associated with a small wage premium of 2 percent (Breda, 2015). Such firm-level negotiations typically occur between management and union representatives, often from multiple unions. Unions compete for worker representation at the company level and need to achieve 10% of the vote to have a right to represent workers (Askenazy and Breda, 2020). Agreements between management and the union delegates are valid if they have the support of delegates representing at least 50% of voters or if they have the support of unions representing 30% of voters and are further validated by a referendum. Pecheu, Jäger, and Breda (2024) study the consequences of radical vs. reformist unions representing workers at the firm level and document wage penalties associated with more radical unions and wage premia with more moderate, reformist unions.

Decentralization and Reforms France has undergone a series of significant labor market reforms since the 1980s, gradually shifting towards more decentralized collective bargaining and each named after the respective Labor Ministers. The Auroux laws of 1982 marked the beginning of this trend and introduced the concept of workplace-level bargaining, mandating annual negotiations on wages and working time at the company level, still subject to the favourability principle. The Fillon law of 2004 began to erode its strict application, and allowed company-level agreements to deviate downward from sector-level agreements in certain areas, except for the CBA wage floors, job classifications, and social protections.

The El Khomri law (*loi Travail*) of 2016 and the Macron ordinances of 2017 constitute a major shift in collective bargaining in France. Flipping the hierarchy of bargaining, company-level agreements now take precedence over sector-level agreements in the area of work-time arrangements. Negotiations over bonuses are exclusively the domain of company-level bargaining. Further breaking with the favourability principle, the reforms introduced the concept of opening clauses (previously reserved for hardships) in order to increase employment. Sector-level agreements now need to include flexible provisions for firms with fewer than 50 employees (or a justification of their absence), and the government can more easily refuse to extend the agreement (though in practice it has not exercised this option Carcillo et al., 2019). Finally, small firms with fewer than 20 employees can directly bargain with their employees even without union representatives.

Worker Representation Unions play a key role in worker representation at the various levels of negotiation. Elected union delegates at the company level, often from ideologically diverse unions, generally negotiate company-level agreements. Union delegates experience pay penalties when they take up their role (Bourdieu, Breda, and Pecheu, 2022), consistent with a more adversarial industrial relations climate in France and in contrast to, e.g., the pay premia of German works councilors (Budde, Dohmen, Jäger, and Trenkle, 2024). The Macron ordinances additionally consolidated several company-level representation bodies into one social and economic committee (*Comité Social et économique* or CSE). In companies without elected union delegates, the CSE can negotiate some agreements with the firm.

Role of Government The French government plays a crucial and active role in shaping industrial relations, contrasting sharply with the Nordic model, which has similarly high levels of coverage, and the German model, with its lower coverage through employer avoidance. First, France maintains a sizable statutory minimum wage (SMIC), regularly adjusted by the government, whereas Nordic wage floors are set through collective agreements. The SMIC has bite even in the face of sectoral bargaining; Breda (2015) reports that, in 2007, the SMIC was higher than the sectorally bargained minimum wage (i.e., the lowest wage floor in a sectoral CBA) in about 50% of sectors due to a lack of renegotiations of sectoral agreements. Second, France employs the most widespread extension mechanisms across all EU countries (Garnero, 2017). Third, the French industrial relations landscape has been significantly shaped by frequent government reforms, as discussed above. Such strong state involvement in reforming bargaining structures differs markedly from the Nordic or the German experience, where changes tend to evolve more organically and autonomously through social partner negotiations. This active role of the government reflects France's statist tradition in labor market regulation.

4.6 Italy

Italy's collective bargaining system plays a large role in wage setting and employment patterns, thanks to national sectoral bargaining agreements that cover heterogeneous firms, workers, and regions. Italy has a moderate union density (around 35%) but high collective bargaining coverage (about 80%) due to *de facto* application of sectoral agreements (Visser, 2019).

Key Players The Italian collective bargaining system involves trade unions, employer associations, and, to a lesser extent than, e.g., in France, the government.

The main trade union confederations in Italy are CGIL (*Confederazione Generale Italiana del Lavoro*), CISL (*Confederazione Italiana Sindacati Lavoratori*), and UIL (*Unione Italiana del Lavoro*). The CGIL has its roots in the Socialist and Communist movements while the CISL originates from the Catholic labor movement. CGIL, the largest federation representing around 21% of workers, is traditionally stronger among blue-collar workers and has a more confrontational approach; CISL, the second largest federation at 4.1 million members, is stronger among white-collar workers and pursues a more dialogue-oriented approach.

Employer associations play a crucial though somewhat declining role in Italy's industrial relations system. Membership is relatively fragmented with 25 main employer associations and declined from 64% of firms (84% of employment) in 2005 to 44% of firms (67% of employment) in 2015 (Fanfani, Lucifora, and Vigani, 2024).

A key change in the last 15 years has been the rise of previously unknown unions and employer association that conclude, in the terminology of Lucifora and Vigani (2021); Dustmann, Giannetto, Incoronato, Lacava, Pezone, Saggio, and Schoefer (2024), non-representative "pirate" agreements with lower wages.

CBAs Italy has a centralized collective bargaining system with a crucial role for sector-wide national agreements. National bargaining occurs between unions and employer associations. The national agreements (*Contratti Collettivi Nazionali di Lavoro* or *CCNL*) set contractual wages and hours at the job-title level (*livelli di inquadramento*), generally with no geographic differentiation despite large regional productivity differences (Boeri, Ichino, Moretti, and Posch, 2021).

Collective bargaining coverage is close to 100%. However, unlike in France, the government does not extend CBAs through laws or decrees. Instead, *de facto* extensions occur through the labor courts to non-member firms (Lucifora and Vigani, 2021; Dustmann, Giannetto, Incoronato, Lacava, Pezone, Saggio, and Schoefer, 2024), with reference to a key provision regarding worker rights and fair compensation in the Italian constitution (Constitution of the Italian Republic, art. 36, 1947). Hence, essentially all firms pay wages according to the relevant representative CBA (though there has been an increasing debate around some employers shifting to non-representative agreements since the mid-2000s, cf. Lucifora and Vigani, 2021; Dustmann et al., 2024). In an additional contrast to France, but more similar to the Nordic countries, Italy does not have a national minimum wage set by the government.

Generally, the favourability principle applies and opt-out clauses for wages do not exist (Devicienti, Fanfani, and Maida, 2019). With regard to wages, firm-level bargaining generally only concerns increases or bonuses on top of the national agreements. Sectoral agreements cover many facets of employment beyond wages, e.g., employment protection (Daruich, Di Addario, and Saggio, 2023), and there is more scope for deviations from the favourability principle for non-wage aspects (Fanfani, 2023).

The CBA positions or job titles are a crucial element of national sectoral wage setting and, within an employment spell at a firm, employees cannot be downgraded to lower-paid job titles (Fanfani, 2023).

Sliding Wage Scale and Attempts at Decentralization A unique mechanism of wage compression in Italy was the sliding wage scale (*scala mobile*). Introduced after World War II and substantially extended and centralized in 1975, the *scala mobile* was an automatic wage indexation system aimed at protecting workers' purchasing power against inflation. Crucially, rather than a *percent*-based cost of living adjustment, it granted the same *absolute* wage increase in a wage component (*punto di contingenza*) for workers regardless of section, region, or position, completely tied to inflation and adjusted every three months. This mechanism compressed the overall wage dispersion , and its erosion due to disinflation and reforms entailed an increase in inequality from the mid-1980s onward (Manacorda, 2004; Devicienti, Fanfani, and Maida, 2019; Leonardi, Pellizzari, and Tabasso, 2019).

Attempts at further decentralizing the wage bargaining system in Italy have had limited success, so the system remains centralized compared to other European countries. A 1993 reform attempted to decentralize wage bargaining by allowing for more regional differentiation and by promoting performance pay and other firm-specific pay policies, though it has been deemed to be relatively ineffective (Devicienti, Maida, and Pacelli, 2008; D'Amuri and Giorgiantonio, 2014). In line with a limited role for decentralization, firm-level rent-sharing coefficients for Italy, estimated with data from the Veneto region, are generally relatively low at 0.04 to 0.05, though a bit higher in firms with higher

probabilities of firm-specific bargaining (Card, Devicienti, and Maida, 2014).

As a result, national sectoral wage setting remains a dominant force in Italian wage determination. The elasticity of actual wage changes with respect to sectorally bargained wage changes is around 0.5 (see Fanfani, 2023, using a combination of social security and CCNL data for the time period from 2006 to 2016). Moreover, Devicienti, Fanfani, and Maida (2019) show that the increase in wage dispersion from the 1980s to the early 2000s occurred entirely between job titles (for which national sectoral CBAs set minimum pay).

Observers and researchers have often juxtaposted the more rigid Italian system with the more flexibile German system (Dustmann, Fitzenberger, Schönberg, and Spitz-Oener, 2014; Boeri, Ichino, Moretti, and Posch, 2021), given their their divergent labor market performances and decentralization experiences since the 2000s. Unlike in Germany, where a fall in coverage and decentralization were core forces accounting for the increase in pay dispersion (Dustmann, Ludsteck, and Schönberg, 2009; Card, Heining, and Kline, 2013), the Italian increase in wage dispersion thus operated through changes in nationally bargained wages (Devicienti, Fanfani, and Maida, 2019). Boeri, Ichino, Moretti, and Posch (2021) show substantial wage compression (and offsetting employment distortions) also across regions in Italy compared to Germany's system with sector-regional CBAs and room for firms to select in and out of coverage (Jäger, Noy, and Schoefer, 2022a).

4.7 Portugal

Portugal is another Southern European country with sectoral bargaining and high coverage. Portugal has a relatively low union density (around 15%) but high collective bargaining coverage (about 74%). One important feature of the Portuguese system is the explicit extension mechanism (OECD, 2021), which achieves this high coverage share.

Key Players The Portuguese collective bargaining system involves trade unions, employer associations, and the government.

The main trade union confederations in Portugal are the CGTP-IN (*Confederação Geral dos Trabalhadores Portugueses - Intersindical Nacional*) with ideological ties to the Communist movement and the more moderate and social democratic UGT (*União Geral de Trabalhadores*)). The origins of the trade union federations are deeply intertwined with the country's political history.[10]

Employer associations play a key role, as discussed above, though Martins (2020) documents about a 15% decline in the number of employer associations and the number of affiliated firms from 2007 to 2017.

[10]During the Estado Novo period (1933-1974), a corporatist authoritarian regime led by António Salazar, independent trade unions were banned, and workers were forced into state-controlled unions. The Carnation Revolution of 1974, which peacefully overthrew the dictatorship and in which underground labor movements and the CGTP-IN played a crucial role, marked a turning point for labor relations. The CGTP-IN brought together various underground labor movements with strong ties to the Communist Party. The UGT was established later, in 1978, as a more moderate alternative, aligning with Socialist and social democratic ideologies and seeking to counterbalance the CGTP-IN's influence.

CBAs Collective bargaining in Portugal occurs at three levels: national, sectoral, and company, with sectoral agreements being the most prevalent.

National agreements are less common and typically focus on broad issues like minimum wage setting or general labor market policies. Sectoral agreements (*Contratos Coletivos de Trabalho*) are the most important, setting standards for entire industries. These agreements can be extended by the Ministry of Labor to all companies in the sector, following a request by the relevant union or employer association. Until 2011, sectoral agreements were essentially always extended. Martins (2021) studies the effects of extensions and finds positive wage effects and declining employment following extensions. Company-level agreements (*Acordos de Empresa*) are less common but have gained importance in recent years.

The favourability principle traditionally applies, meaning that lower-level agreements can only improve upon the terms set in higher-level agreements. However, recent reforms have introduced more flexibility in this area.

Decentralization and Reforms Portugal has undergone significant reforms in its collective bargaining system, particularly in response to the 2008 financial crisis and a subsequent bailout and labor market reform program advanced by the Troika (composed of the European Commission, the European Central Bank, and the International Monetary Fund). The 2012 labor market reform, implemented as part of the bailout program, introduced stricter criteria for extensions of collective agreements and temporarily froze extensions. This led to a significant drop in collective bargaining coverage. Hijzen and Martins (2020) zoom into this episode and implement a temporal regression discontinuity design, comparing sectoral agreements that were extended shortly before versus after the freeze. They find positive wage effects of extensions, concentrated at the bottom of the earnings distribution and thereby leading to wage compression, but negative employment effects (also at the bottom of the wage distribution). These results must be read within the recessionary context, highlighting the importance of sharp identification and complicating the interpretation of time series evidence tying the evolution of the wage distribution to shifts in the collective bargaining system.

Wage Cushions Cardoso and Portugal (2005) and Card and Cardoso (2022) study wage cushions in the Portuguese system (see also Figure 4). Card and Cardoso (2022) find an average cushion of 20% and a pass-through rate of 50%, with no employment effects. Card, Cardoso, Heining, and Kline (2018) and Garin and Silvério (2024) study rent-sharing, i.e., the responsiveness of wages to firm-specific value-added shocks, and estimate rent-sharing elasticities between 0.05 to 0.15.

Worker Representation At the workplace level, worker representation is primarily through works councils (*Comissões de Trabalhadores*) and union delegates. Works councils have information and consultation rights, while union delegates are responsible for collective bargaining at the company level—which, as mentioned above, plays a relatively small role so far. In firms with at least 150 employees, works councils can negotiate firm-specific collective agreements if authorized by the relevant trade union (Addison, Portugal, and Vilares, 2017).

Role of Government The Portuguese government plays a significant role in shaping industrial relations. It sets a statutory minimum wage, which is regularly adjusted after consultation with social partners. The government has the power to extend collective agreements, though the use of this mechanism has varied over time due to policy changes (Martins, 2021; Hijzen and Martins, 2020). In particular during the economic crisis, the government implemented reforms that significantly affected the collective bargaining system.

4.8 Latin America: Argentina and Brazil

Collective bargaining coverage in Latin America, while formally sharing some features with Iberian Europe, is inherently constrained by its restriction to the formal sector, as the large informal sector—which comprises around 40% of the labor market in countries like Brazil and Argentina—creates a natural upper limit on potential coverage.

The effects of unions on the overall wage distribution of Latin American (indeed most developing and middle income) countries remain an open question, as it is difficult to find datasets that cover both the covered formal sector and the informal sector in comparable ways (although see Rios-Avila and Hirsch, 2014, for evidence from Bolivia and Chilean household surveys). The exclusion of the informal sector (and agriculture) means that union coverage is skewed towards the relatively high wage labor markets of educated workers (Ronconi, 2021).

Rich administrative data has recently become available for several Latin American countries and there are now several innovative studies of collective bargaining in Latin American contexts, in particular drawing on Argentinian and Brazilian data (Lagos, 2024; Corradini, Lagos, and Sharma, 2023; Hermo, 2023). We briefly describe the industrial relations setup in these two countries and hope that more such research covering other countries will follow in the coming years. For those two countries, we start by pointing out that Argentina has a moderate union density around 27%, while Brazil's is lower at about 13% (Visser, 2019).

Key Players The collective bargaining systems in Argentina and Brazil involve trade unions, employer associations, and the government, with a high degree of centralization and state intervention, e.g., through extensions or mandatory conciliation procedures before strikes. In Argentina, the General Confederation of Labor (CGT) is the largest union confederation, with historical ties to Peronism. Brazil's largest union confederation is the CUT (Central Única dos Trabalhadores), with ties to the center-left party PT (see Ogeda, Ornelas, and Soares, 2024, for evidence on how trade liberalization weakened unions and, in turn, allied parties in Brazil). Both countries have a tradition of strong, politically influential unions.

CBAs Both countries have fairly centralized collective bargaining systems and high coverage due to government-mandated extensions.

Argentina has sector-wide bargaining as the dominant force, with CBAs typically extended to all workers in the sector, resulting in high coverage (around 70%) despite lower union density (see Hermo, 2023, for additional institutional information).

Brazil similarly features sector-wide bargaining with mandatory extensions, leading to high coverage of the formal sector despite low union density (see Lagos, 2024, for additional institutional information). Until recently, Brazil had a unique system of compulsory union contributions, which was abolished in 2017, potentially affecting union finances and bargaining power (see Kohli, 2024, for an analysis of this reform).

Recent Research Lagos (2024) studies the effect of collective bargaining contracts being automatically extended (temporally, after expiration) during renegotiation in Brazil, following a 2012 court decision. Before the court decision, CBA provisions had expired along with the underlying agreement. For identification, he compares CBAs that expired and were thus renegotiated before vs. after the court decision. He finds that both wages and a measure of amenities increased in response to the court decision, with no reduction in employment. Corradini, Lagos, and Sharma (2023) also draw on Brazilian administrative data to examine the role of gender representation in union leadership on collective bargaining outcomes (summarized in Section 3).

Hermo (2023) studies rent-sharing and propagation of export shocks in Argentina, instrumented with shocks for imports in other parts of the world. A 10% increase in average revenue of firms covered by a CBA leads to a 4.2% increase in wages and an increase in CBA wage floors, affecting all the other covered firms, even non-exporting ones.

4.9 China

While data availability restricts our econometric analysis of the role of collective bargaining in the wage structure to European and North American countries, we also include a set of case studies of additional countries on which Western labor economists have focused much less.

On paper, the largest number of covered workers in any country exists in the People's Republic of China. The ILO records data from China's "Records of Worker Organizations," and the 2017 data reports 45% coverage (and 44% membership), implying that of the roughly 750 million workers, more than 300 million workers are covered. Importantly, coverage has also been increasing with liberalization, from just over 10% in 1993 to close to 40% in 2010 (Liu, 2014).

Key players China's collective bargaining system involves trade unions, employers, and the government, but operates within a unique political context dominated by the Communist Party of China (CPC). The All-China Federation of Trade Unions (ACFTU) is the sole legal trade union federation, and is constitutionally subordinate to the CPC.

The collective bargaining system is thus decidedly "state corporatist," with the state, employers associations, and unions jointly setting standards, in the shadow of government veto power.

There has been a debate over the extent of union diversity within the ACFTU, and the emergence of different strategies of collective bargaining (Liu, 2010).

CBAs and Unionization Unionization is China is generally done by ACFTU getting agreement from employers (or a group of employers), sometimes with the aid of CCP or government officials. A

unionized firm is technically covered by a collective bargaining agreement negotiated by the union, but firms can choose to not comply with the contract terms. However, it is not clear if the resulting collective bargaining agreements do more than implement the already binding legal minimums (Ge, 2014). Nonetheless, firms vary in whether they have unions, and whether those unions are effective or merely "company/paper" unions. Since unions are funded by a 2% payroll tax paid by employers, worker consent and participation is not necessary for a union to operate. Further, workers vary in union membership status, and both of these seem to show positive wage effects (Ge, 2014; Gunderson, Lee, and Wang, 2016), although there is no work using credible research designs that we know of.

Strikes The legal right to strike was eliminated early in the Chinese reform process, in 1982, and formal unions have little capacity for collective action.[11] However, there was a wave of independent strikes in the late 2000s that generated a number of reforms, at least on paper, to the collective bargaining system.

Evolution and Reforms Overall, China's industrial relation system has been subject to change, much more so than in most other countries.

Collective bargaining practices have been changed gradually and experimentally by the Chinese government, with as much as an emphasis on "social stability" and productivity growth as wages and working conditions. Some provinces have experimented with sectoral and regional associations. That said, there has been little change in the formal policies governing collective bargaining or coverage.

Prior to Xi Jinping's rule, there was a sense of openness and experimentation towards unions (Kuruvilla, 2018). But the early 2000s saw increased intensity of independent worker action, without any formal union backing. Friedman (2014) argues that absence of effective union representation exacerbated the costliness of strikes, as employers had no credible negotiating partner to end the labor disruptions. The resulting labor reforms were movements towards more effective representation of workers' interests in (particularly multinational) firms. But these reform efforts ended with the leadership of Xi Jinping, with the ACFTU no longer discussing expanding "collective consultation", and to our knowledge there is still little signal of independent, democratic labor unions in China, and nor could there be without the unlikely event of the Chinese Communist Party passing on some control of the ACFTU to independent unions. Within the very large migrant worker sector laboring under the *Hukou* system, more independent organizations have emerged, but have been repressed (Rho, 2023).

Existing Research A literature has estimated the cross-sectional union premium in China, but has focused on union membership or presence in the enterprise rather than coverage *per se*. Results are in the 5.5 to 17.9% range (Ma, 2024; Gunderson, Lee, and Wang, 2016). A few papers have used panel data: Ma (2024) finds positive but insignificant union membership premia in fixed-effect specifications.

Booth, Freeman, Meng, and Zhang (2022) study the effects of both union coverage and union membership, in both "paper" and "real" unions (with leadership determined by the workers) on

[11] Strikes are thus neither legal nor illegal. The Strike Labour Bulletin's strike tracker at `https://maps.clb.org.hk` has tracked strikes for the past two decades. Rho (2023) presents data suggesting that labor unrest in China since Jinping's rule has been channeled into individual and small group legal fora.

migrant workers using a panel dataset, controlling for worker fixed effects. "Coverage" is proxied by workers having a written contract (technically covered by the collective bargaining agreement), but there can be migrant workers without a written contract. They find that non-union members in firms with "real" unions are both more likely to have a written contract as well as higher wages than non-union members in "paper" unions, but that union members are more likely to have written contracts and higher wages relative to non-union members in both "paper" and "real" unions. While this paper makes considerable progress on identification and unpacking the complexities of collective bargaining coverage in China, it remains the case that unionized firms and workers are positively selected, and causal research designs (as well as reliable data) remain elusive.

Finally, on a broader notion of potential effects of worker representation, Cai and Wang (2022) study the effects of increased worker feedback in Chinese plants, and find it increased retention and job satisfaction, while Gunderson, Lee, and Wang (2024) find positive effects of "worker congresses" (which can be analogized to works councils) on worker outcomes in a sample of firms, finding that both congresses and enterprise unions raise *only* non-wage benefits, with even larger effects when both are present.

4.10 India

Formal collective bargaining in India is extremely limited in practice, potentially owing to the small share of the formal sector in total employment (Pratap, 2011). While there exists a formal structure for collective bargaining given by the Industrial Disputes Act (amended in 2001 so that 10% of a workplace is required for union recognition), there appears to be no formal data on collective bargaining coverage (e.g., the ILO reports no coverage data for India).

Union density in India's formal sector is at a moderate level. ILO estimates based on National Sample Survey data record between 10.3% (2010) and 22.8% (2013) of formal (organized sector) workers as union members. Ahsan, Ghosh, and Mitra (2017) report NSSO figures of 28.3% for 1993, 21.4% for 1999, and 21.9% for 2001, indicating a downward trend since the 1990s, though stabilizing since 2010. The Indian Human Development Survey, of which three rounds exist since 2011-12, also asks trade union membership, but bundles it with "business or professional group." As the formal sector is only 12-6% of employment, the vast bulk of Indian labor is outside the reach of any formal collective bargaining structure.

Key Players India's collective bargaining system involves trade unions, employers, and the government, operating within a nominally complex industrial relations landscape shadowed by a large informal sector.

Trade unions are highly fragmented, with over 100,000 unions organized into 12 union federations. Many of these federations are ideologically aligned with political parties; for example, one of the largest federations, the Bharatiya Mazdoor Sangh (BMS), with six million members, is affiliated with the currently ruling, right-wing BJP party, as are the other largest ones, such as the All-India Trades Union Council (Communist/Left oriented) and the Indian National Trades Union Council (Congress/Centrist) (Pratap, 2011).

Most of these unions are restricted to formal-sector workers, although large organizations of informal workers exist. For example, the Self-Employed Women's Association (SEWA, which has been studied extensively in development, see, e.g., Chen, Jhabvala, Kanbur, and Richards, 2007)) has been recently included as a central union federation.[12]

Employer associations play a crucial role, in particular in textile and garment manufacturing (Sharma, 2024). Nearly half of all workers in these industries are employed at factories with membership in local industry associations and members are typically larger, more productive firms with higher export propensities and better worker compensation (Sharma, 2024)—implying that those associations represent a distinct slice of the economy. Sharma (2024) provides evidence consistent with industry associations facilitating employer collusion to depress wages, specifically by paying only sector-specific minimum wages.

State governments have considerable authority in labor matters, leading to variations in industrial relations practices across states. A large set of papers has exploited state variation in amendments to the Industrial Disputes Act for variation in the strength of labor regulations, some of which affects collective bargaining (Besley and Burgess, 2004; Bhattacharjea, 2006).

CBAs Within the formal sector, a variety of national, sectoral, and firm-level collective bargaining agreements co-exist: During the post-independence, pre-liberalization period, many of the largest firms were public, and collective bargaining contracts often covered entire sectors nationwide (e.g., airlines or railroads). Enterprise-level bargaining is now the most common form, particularly in the private sector. If an employer or employer association bargains with a union, the resulting agreement can either cover just the union members, or all workers employed by the firm/association. In any case, whether the resulting contract is complied with in practice varies considerably, with members more likely to have their agreements enforced. As mentioned above, there does not appear to be reliable data on collective bargaining coverage, with the ILO reporting no coverage data for India.

Union Premia While the overlap between coverage and membership varies from contract to contract, the existing estimates focus on membership. Despite data limitations, economists have estimated union membership effects in India: Bhandari (2008) estimates a large union membership premium of 56.7% for permanent workers and 10.8% for contract workers using a unique survey of manufacturing workers in four states. Ahsan, Ghosh, and Mitra (2017) examined the effects of import liberalization on union membership and wage premia in India, finding that union membership declined, but union premia increased in sectors more exposed to import liberalization.

4.11 South Africa

Among Sub-Saharan African countries, the one with the most extensive and well-studied collective bargaining system is South Africa (Magruder, 2012; Bassier, 2022). Union density in South Africa is relatively high for a developing country, estimated at around 25-30% of the formal workforce

[12] Breza, Kaur, and Krishnaswamy (2019) provide some evidence that workers in the informal sector appear to collectively uphold wage standards and coordinate informally to prevent wage cuts.

(Wittenberg and Kerr, 2019). The informal sector in South Africa is also (perhaps surprisingly) only 30% of employment, as unemployment is extremely high.

Context The system is shaped by the country's history of apartheid and the subsequent democratic transition, with important consequences for how collective bargaining shapes inequality in this setting. The system of Industrial Councils, predecessors to today's Bargaining Councils which organize collective bargaining, did not originally include representation of black workers (Butcher and Rouse, 2001). Despite these constraints, black trade unions grew in strength, particularly from the 1970s onward, organizing strikes and protests that played a crucial role in the broader anti-apartheid struggle. The Wiehahn Commission's recommendations in 1979 led to the formal recognition of black trade unions, marking a significant shift in the industrial relations landscape (Butcher and Rouse, 2001; Godfrey, 2018). However, full labor rights for all workers were only realized with the fall of apartheid and the subsequent labor law reforms of the 1990s.

Key Players The main trade union federation is COSATU (Congress of South African Trade Unions), which plays a significant political role through its alliance with the ruling African National Congress (ANC). In 2017, SAFTU (South African Federation of Trade Unions) broke away with a majority of the private sector unions to form the second largest federation, which is not affiliated with the ANC, leaving COSATU with mostly public sector workers. The counterparts are employer associations, for example the National Employers Association of South Africa, who bargain with the unions in Bargaining Councils described below.

The Minister of Employment and Labour can extend Bargaining Council agreements to non-parties (employers and employees who were not part of the original negotiation) within the sector covered by the Bargaining Council. Typically, this occurs at the request of the bargaining parties, and contracts last for multiple years.

CBAs and Extensions Centralized bargaining occurs in Bargaining Councils, which are sector-specific bodies where unions and employer organizations negotiate agreements at the sector-region level that the Ministry of Labour can extend to the entire jurisdiction if the parties are sufficiently representative. The bargaining councils set minimum wages throughout the formal firms under their jurisdiction, but there can be firm/establishment premia negotiated on top of this (like in other two-tier systems), and cover both unionized and non-union workers. A union can gain recognition by achieving majority representation (50%+1) at a workplace.

Recent Research Around 30% of the formally employed are union members, and Wittenberg and Kerr (2019), surveying the literature, find a large union membership (not coverage) premium of 25-30%. While union membership compresses wages within the formal sector, the lack of coverage for the 50% of South Africans not employed in the formal sector mitigates any large compression effects.

Magruder (2012) studies the effects of the Bargaining Council minimum wages on employment, and finds that increases in the bargaining council wages induce disemployment of workers at smaller

firms (as well as wage increases, partly due to composition effects).

Bassier (2022) assembles new matched worker-firm data from the South African tax authority and merges it to a comprehensive database of Bargaining Council contracts. He studies the direct and indirect effects of the CBA on wages and employment. While there are positive wage and negative employment effects at small firms, this is offset by employment increases in larger firms. Constructing job flow networks, Bassier (2022) also finds that bargained wage increases have positive spillovers on the wages in non-covered firms.

5 Harmonized International Evidence from Europe and North America

While the institutional heterogeneity described above may seem intractable, the tools of labor economists can still be used to put structure on how industrial relations systems alter the wage structure. In this section we use a standard two-equation model to summarize internationally comparable data from Europe and North America and seek to pin down the role of collective bargaining in the wage distributions, country by country. Data availability limits us to the North America and Europe countries, which are most familiar to both us and the labor economics literature. We remain optimistic that these geographical gaps in the literature will continue to be filled, as evidenced by emerging research from around the world that is beginning to provide rich institutional analysis and empirical findings.

5.1 Overview of Main Mechanisms

We organize our empirical analysis around a simple framework of how collective bargaining coverage can affect the wage structure. It features three mechanisms: (i) direct wage effects on covered workers (in turn encompassing wage premia and compression), (ii) selection of firms, workers, and jobs into coverage, and (iii) spillovers of coverage on uncovered workers. For the first two margins, our model echoes the approaches in Abowd and Farber (1982); Card (1996); the treatment of spillovers draws on Fortin, Lemieux, and Lloyd (2021). We estimate this model in the data in a harmonized implementation across the sample countries. We then interpret how the country-specific estimates relate to features of the industrial relations systems. Using those country-specific estimates, we conclude by constructing counterfactual wage distributions with higher or lower coverage rates, country by country.

Wage Premia Unions traditionally raise wages for covered workers above their outside options, i.e., non-covered wages. This wage premium emerges through a collective bargaining agreement that specifies wages and pay scales for workers. In models with inefficiently low wages, e.g., monopsony, the union wage markup can improve efficiency. In models where unions distort wages above the efficient level, the union wage premium will induce both distortions as well as redistribution from firms, consumers, and uncovered workers to covered workers.

While labor economists have traditionally focused on the wage effects of unions and collective bargaining, there is also a literature studying the effects non-wage amenities, generally finding positive

effects.[13]

Compression Unions may also affect wages differently within the covered sector. Specifically, they may compress wages. For instance, using matched worker-firm data, Beauregard, Lemieux, Messacar, and Saggio (2024) find that unions "shrink" the worker fixed-effect in the AKM earnings regression, so that worker heterogeneity is compressed in the union sector. A basic reason that unions compress the wage distribution, as discussed above, is that they are (generally) internally democratic, and so collective bargaining agreements need to be generally supported by the median worker covered (Frandsen, 2010). A second reason is that collective bargaining agreements typically standardize pay scales, job qualifications and promotion requirements, which lowers managerial discretion in promotion and pay, including some forms of performance-based pay. A third reason is that high-wage workers and firms may select out of collective bargaining coverage (Acemoglu, Aghion, and Violante, 2001), or contest potential coverage with more resources (Wang and Young, 2022), so that the dispersion among the workers that remain covered is lower. Such compression comes about differently depending on the industrial relations system, or even across unions within the same system. Derenoncourt, Gerard, Lagos, and Montialoux (2024) examine heterogeneity in union premia and compression across unions in Brazil, estimating union fixed-effects in administrative data, finding that differential sorting across unions attenuates some of the compression effects of unions.

Selection Coverage can change the shape of the wage distribution by changing the wage distribution for differentially selected groups of workers (Abowd and Farber, 1982; Card, 1996). For example, Farber, Herbst, Kuziemko, and Naidu (2021) show that union households were much more negatively selected (on, e.g., education) during the period of peak union density, while today union members are not very differentially selected from non-union members. Large firms are more likely to be unionized, but even non-union large firms pay a wage premium. The premia and compression effects interact with the selectivity of union coverage to affect inequality. Beauregard, Lemieux, Messacar, and Saggio (2024), for example, find that 40% of a 15% unionized firm premium is explained by selection of high-productivity firms into unionization status, and are able to use their matched Canadian worker-firm data to adjust for selection by workers into unionized firms. Selection into coverage is determined by many factors, including employer, occupation, geography, race, gender, and formal education, even parental union membership (Bryson and Davies, 2019). Policies can directly alter who is covered (e.g., automatic extension, discussed above), and even who is legally allowed to be covered. Our institutional review above made clear that the margins, actors, and direction of selection will depend on the specific industrial relations system, precluding a one-size-fits all assessment.

[13] In the U.S. microdata, union workers generally have better health care benefits and more vacation time (Buchmueller, DiNardo, and Valletta, 2002; Alesina, Glaeser, and Sacerdote, 2005; Knepper, 2020). Unions also play an important for regulating workplace safety (Johnson, 2020). Arold, Ash, MacLeod, and Naidu (2024) use syntactic parsing methods and legal concepts of "rights" and "duties" to measure the extent of worker-friendly text in collective bargaining agreements (for other applications of text analysis to collective bargaining agreements see also Corradini, Lagos, and Sharma, 2022; Lagos, 2024).

Spillovers Finally, coverage also affect wages of uncovered workers. Coverage can also raise non-covered worker wages via labor market competition or threat effects (Rosen, 1969; Neumark and Wachter, 1995; Farber, 2005; Taschereau-Dumouchel, 2020; Green, Sand, and Snoddy, 2022), with threat effect capturing the idea that non-covered firms may preemptively raise wages to discourage unionization or coverage among their workforce. Wage (compression) effects may also affect decisions to invest in capital, human capital, and technology by non-covered firms and workers, in turn affecting wages (see, e.g., Acemoglu and Pischke, 1999). Coverage can also raise the wages of non-covered workers via statutory mechanisms like prevailing wage laws. Unions are also social and political organizations that set norms of prevailing pay (Western and Rosenfeld, 2011; Mosimann and Pontusson, 2017). In the other direction, coverage can also lower wages for non-covered workers by lowering non-covered labor demand, e.g., by raising barriers to entry for non-union producers or workers or through direct product-market or productivity effects on non-covered producers. Finally, unions lobby governments and political parties for both jobs and wage regulation, all of which can affect the larger policy environment and the pay of non-union workers (see also Section 3). Again, all those mechanisms will differ across industrial relations environments and the broader economic contexts.

5.2 A Simple Framework and Research Design

Our main strategy is based on two basic equations: wage setting and selection. They are reduced-form, capturing results of specific economic forces that we do not explicitly model but that reflect, and hence differ across, specific industrial relations systems—the diversity of which would be hard to represent in a single microfounded model.

While we sidestep a specific economic model due to the diversity of mechanisms across industrial relations systems, recent theoretical advances in the literature have shed new light on the effects of collective bargaining in equilibrium search and matching models (Barth, Moene, and Willumsen, 2014; Krusell and Rudanko, 2016; Cardullo, Conti, and Sulis, 2020; Taschereau-Dumouchel, 2020; Hermo, 2023; Berge, 2024). Foundational work by Pissarides (1986), Holden (1988, 1989), and Moene, Wallerstein, and Hoel (1993) laid the groundwork by exploring interactions between central and local wage-setting under simplified conditions. More recent contributions incorporate richer dynamics such as search frictions or endogenous labor supply in two-tier bargaining (Cardullo, Conti, and Sulis, 2020; Hermo, 2023; Berge, 2024), or provide a model of threat effects in an equilibrium search model (Taschereau-Dumouchel, 2020).

5.2.1 Model: Wages, Selection, and Wage Distribution

Wages and Coverage: Individual Level In a potential-outcomes spirit, a worker i's wage w_i depends on coverage status (indicator c_i), either the covered wage w_i^c or the non-covered wage w_i^n:

$$w_i = c_i \cdot w_i^c + (1 - c_i) \cdot w_i^n. \tag{2}$$

A coverage function gives the covered wage as a function of the non-covered wage:

$$w_i^c = f(w_i^n). \tag{3}$$

Equivalently, we can formulate a *coverage effect* as a percent (log) wage premium $p(w_i^n) = \ln w_i^c - \ln w_i^n$.

Figure 5 Panel (a) presents potential links between the covered and non-covered wage, tracing out various potential coverage effect functions. Covered wages situated above the 45 degree line reflect positive coverage effects. It is also possible that coverage may lower some wages, e.g., due to wage compression for high-wage workers.

Predicting Wages: Estimating the Coverage Function and Non-Covered Wages We assign each worker a covered and a non-covered wage using two regression-based predictions previewed next. We obtain the predicted covered wage as $\widetilde{w}_i^c = f(\widetilde{w}_i^n)$, where we estimate the coverage function among covered workers in a regression of the actual covered wage w_i^c on the predicted non-covered wage $\widetilde{w}_i^n$. We construct a predicted non-covered wage $\widetilde{w}_i^n = m(x_i)$ by fitting a Mincer regression among non-covered workers based on human capital proxies x_i (see below). Analogously to the potential actual wage defined in Equation (2), we can also define a predicted potential wage, $\widetilde{w}$, as:

$$\widetilde{w} = c_i \cdot \widetilde{w}_i^c + (1 - c_i) \cdot \widetilde{w}_i^n. \tag{4}$$

This predicted wage is therefore equal to either the predicted non-covered wage or the predicted covered wage, depending on the values of x_i and c_i.

Spillovers We will also permit spillover effects from covered on non-covered workers. We model spillover effects as an additive term in the non-covered wage regression, and regress the wages of non-covered workers on the level of coverage (share of workers covered) in their labor market "cell" (our proxy for the scope of the potential spillovers), conditional on their Mincer predictors (i.e., we include cell-level coverage shares as an additional independent variable in the Mincer regression), as in Fortin, Lemieux, and Lloyd (2021).[14]

Selection Workers and firms may select into coverage for a variety of reasons—a decision shaped by the specific rules and incentives of each system. Again, we appeal to a reduced-form equation. Specifically, we model selection to depend on a worker's predicted non-covered wage only (which, consistent with Equation (3), also determines the coverage effect):

$$P(c_i = 1) = g(\widetilde{w}^n). \tag{5}$$

Figure 5 Panel (b) illustrates potential selection patterns. For instance, as in Abowd and Farber (1982); Card (1996), actual coverage can be an outcome of two-sided selection. In a scenario with wage

[14] An alternative way to model spillovers is to include wages in the covered sector as a source of spillovers (see, e.g., Bassier, 2022; Demir, 2023), rather than the level of coverage. Our measure of labor market "cells" corresponds to region-by-industry cells for Germany and industry-by-firm-size cells for the U.S.

compression, workers' selection will be decreasing in the non-covered wage, whereas firms' incentives would imply the opposite shape. We will observe the actual gradient of coverage by worker type, which is an outcome of two-sided selection and the broader economic environment (including product market forces, trade-offs between wage levels and job postings on the firm side, unemployment, etc.). Most importantly, our counterfactual analysis will ignore equilibrium effects of our coverage scenarios (e.g., on employment levels and on compositional effects from firm and worker exit and entry margins).

Wages and Coverage: Distributions Besides characterizing the effect of coverage on individual-level wages, we also aim to understand the effect of coverage on overall wage distributions. These effects of coverage on the wage distribution will be shaped by an economy's non-covered wages (in return reflecting skills and skill prices), initial share of coverage and selection into coverage, and, most importantly, the coverage wage effect function.[15]

Figure 5 Panel (c) illustrates the four scenarios we consider, which are the actual wage distribution, that of the predicted wages our framework can account for, and two associated counterfactuals: full coverage and zero coverage. More formally, these are:

1. Our baseline is the existing wage structure using raw actual wages, i.e., $F_w(w)$, where CDFs $F_x(x)$ without superscript refer to the population pooling covered and non-covered workers.

2. Second, we isolate the distribution of predicted wages, the object we can explain within our framework, i.e., $C \cdot F^c_{\widetilde{w}^n}(f(\widetilde{w}^n)) + (1-C) \cdot F^n_{\widetilde{w}^n}(\widetilde{w}^n)$, where $F^i_{\widetilde{w}^n}$ is the distribution of predicted noncovered wages for the covered $i = c$ (noncovered $i = n$) population and C is the aggregate share of workers covered. This step will compress wages substantially, as the prediction only imperfectly predicts wages, and does not speak to the residual wages. (Below, we will present a DFL exercise as a complement that does so.)

3. Third, we study a full-coverage counterfactual, where we generate the wage distribution that would emerge if all workers were covered. Hence, this amounts to swapping the non-covered wage $\widetilde{w}^n$ for actually non-covered workers with the covered wage $\widetilde{w}^c = f(\widetilde{w}^n)$. Formally, this exercise constructs and analyzes $C \cdot F^c_{\widetilde{w}^n}(f(\widetilde{w}^n)) + (1-C) \cdot F^n_{\widetilde{w}^n}(f(\widetilde{w}^n)) = F_{\widetilde{w}^n}(f(\widetilde{w}^n))$.

4. Fourth, we compute the analogous no-coverage counterfactual, where we reset wages of covered individuals from w^c to $\widetilde{w}^n$. Formally, this counterfactual is $C \cdot F^c_{\widetilde{w}^n}(\widetilde{w}^n) + (1-C) \cdot F^n_{\widetilde{w}^n}(\widetilde{w}^n) = F_{\widetilde{w}^n}(\widetilde{w}^n)$.

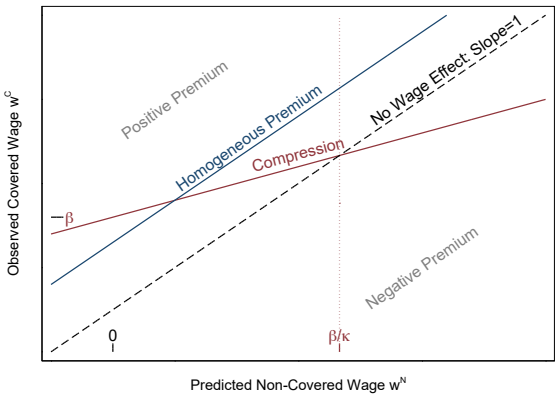
Besides plotting these distributions, we will also compute moments of this distribution: the p90/p50 ratio, the p50/p10 ratio, the variance, and the Gini coefficient.

5.2.2 Implementation: Estimating Equations

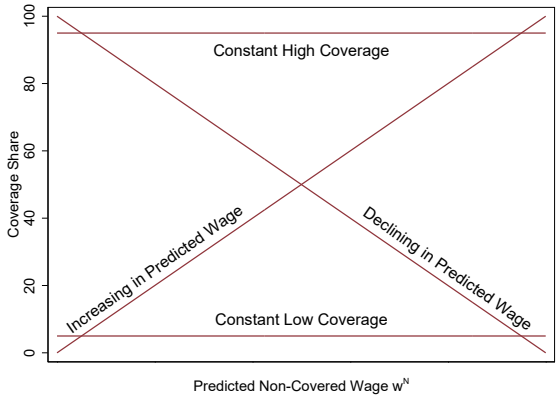
We now present the econometric implementation of our research design. *All implementations are on a country-by-country basis, so that all estimated coefficients are country-specific*, although we do not include

[15] To see this, consider a distribution of skills and resulting predicted non-covered wages, and note that the expected predicted potential wage $\widetilde{w}$ for each skill group is a combination of the coverage effect and selection, $E[\widetilde{w}|\widetilde{w}^n = x] = (1-\widetilde{g}(x)) \cdot x + \widetilde{g}(x) \cdot f(x) = x + \widetilde{g}(x) \cdot (f(x) - x)) = x + p(x)$. In a slight abuse of notation, we here refer to the absolute rather than relative premium as $p(x)$.

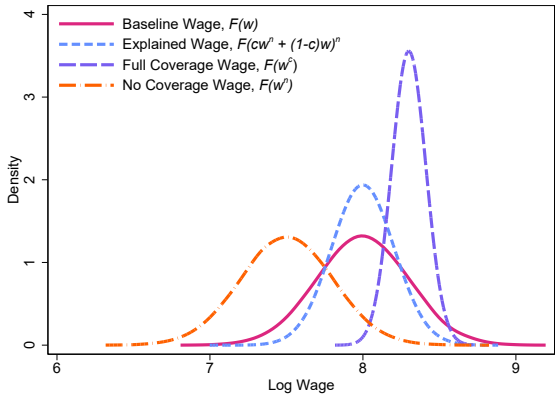
Figure 5: Illustration: Wages and Coverage



(a) Coverage Premia



(b) Selection into Coverage



(c) Effect of Coverage on Wage Distribution

Note: Panel (a) illustrates potential scenarios for the coverage premium. Panel (b) illustrates potential selection scenarios. Panel (c) previews our illustration of the effect of coverage on the wage distribution.

country indices below for notational convenience.

Linear Specification We specify the coverage effect p to be a linear function that consists of a baseline effect and a compression effect (Abowd and Farber, 1982; Card, 1996):

$$p(w_i^n) = \overbrace{\beta}^{\substack{\geq 0 \\ \text{Baseline effect}}} - \overbrace{\kappa}^{\substack{0 \leq \kappa < 1 \\ \text{“Compression” effect}}} \cdot \ln w_i^n. \tag{6}$$

We include the commonly assumed and plausible effect directions for each parameter. This specification for the coverage premium implies the following covered wage function $f()$:

$$\ln w_i^c = \beta + (1 - \kappa) \cdot \ln w_i^n + \varepsilon_i^c, \tag{7}$$

where ε_i^c is a mean-zero idiosyncratic component of individual i's covered wage.

In this linear specification, κ captures compression of wages, whereas β captures a baseline effect on wages that all covered workers receive. By plotting linear underlying wage effects, Figure 5 Panel (a) has actually illustrated potential coverage effects stemming from this specification. First, for $\beta = 0$ and $\kappa = 0$, coverage does not affect wages, and the data are organized around the 45 degree line, with an intercept of zero and a slope of one. Second, an industrial relations system featuring $\beta > 0$ and $\kappa = 0$ implies a homogeneous coverage premium that results in a parallel upward shift of the 45 degree line, with the intercept giving the homogeneous wage premium. Third, a system featuring $\beta = 0$ and $\kappa > 0$ would exert pure compression: a slope below one around an intersection point at $\widetilde{w}^N = \frac{\beta}{\kappa}$. In the data, we will estimate $0 < \kappa < 1$ and $\beta > 0$ for most industrial relations systems.

Normalization In Equation (7), the intercept β would denote the average wage premium for a worker with a hypothetical non-covered wage of zero, which our specification in logs makes unappealing as a benchmark that will not be populated. In the empirical implementation, we will normalize all wages (both covered and non-covered) by subtracting the 25th percentile, so that β can be interpreted as the wage effect on the worker at that baseline percentile.

Estimating the Coverage Effects To estimate β and κ, we relate observed covered wages to the worker's predicted non-covered wage, i.e., we estimate the following regression in the sample of *covered* workers:

$$\ln w_i^c = \beta + (1 - \kappa) \cdot \ln \widetilde{w}_i^n + \varepsilon_i^{c\prime}. \tag{8}$$

Below, we explain how we construct the covered workers' predicted non-covered wage, $\widetilde{w^n}_i$.

Estimating Selection We consider selection as a function of the Mincerian predicted wage $\widetilde{w}^n$ only. Empirically, we look at coverage as a non-parametric function of $\widetilde{w}^n$, as well as coverage by terciles of the same variable.

In order to summarize the overall sign of the selection, we also parameterize the selection function $g()$ as a function of the (demeaned) Mincerian wage, and write the conditional expectation $Pr(c_i = 1|\widetilde{w}_i^n)$ as:

$$g(\widetilde{w}_i^n) = Pr(c_i = 1|\widetilde{w}_i^n) = C + \alpha(\ln \widetilde{w}_i^n - \mu). \tag{9}$$

Coefficient α captures the sensitivity of coverage with (demeaned) predicted wages, and is a parameter reflecting the selectivity of union coverage as a function of the latent wage relative to the mean μ.

While we do not focus on the intercept, we note that when uncovered wages are demeaned, it will give an estimate of mean coverage, as $E[Pr(c_i) = 1] = E[E[Pr(c_i) = 1|\ln \widetilde{w}^n]] = C + \alpha \times 0 = C$.

When $\alpha < 0$, union coverage is negatively selected; union contracts cover those whose wages would be lower in the non-union market than those not covered. When $\alpha > 0$, union coverage is positively selected, and those covered by CBAs would have non-covered wages higher than non-covered workers.

This parameterization of $g(.)$ does not allow for non-monotonic selection patterns, e.g., as in Abowd and Farber (1982). As a complement, our analysis of coverage by predicted wage terciles does allow us to detect non-monotonic selection patterns.

The Non-covered Wage The non-covered wage reflects the productivity and markdowns absent coverage. We construct it following a Mincer regression specification with wage predictors x_i (chiefly experience/age, education). That is, we will fit the following regression *in the sample of non-covered workers*:

$$\ln w_i^n = \zeta + \gamma x_i + \varepsilon_i^n, \tag{10}$$

to construct the predicted non-covered wage $\widetilde{w}_i^n$ (for both covered and non-covered workers) as follows:

$$\ln \widetilde{w}_i^n = \widehat{\zeta} + \widehat{\gamma} x_i. \tag{11}$$

Spillovers In an important extension of the baseline model, we also permit spillovers from covered other workers in the labor market onto the non-covered workers. We zoom into one narrow but specific spillover: the possibility that strategic complementarities and prevailing wage levels affect the wage setting of a firms not directly subject to collective bargaining, or through workers' outside options in the bargaining problem (Beaudry, Green, and Sand, 2012; Bassier, 2022; Berger, Herkenhoff, and Mongey, 2022; Green, Sand, and Snoddy, 2022). We model these spillovers through a linear function of the share of workers covered in worker i's labor market l, $C_{l(i)}$ (broadly as in Fortin, Lemieux, and Lloyd, 2021), so that spillovers are the product of the coverage share $C_{l(i)}$ and spillover coefficient σ:

$$\ln w_i^n = \zeta + \gamma x_i + \underbrace{\sigma \cdot C_{l(i)}}_{\text{Spillovers}} + \varepsilon_i^n, \tag{12}$$

so that the predicted non-covered wage from the extended Mincer model is:

$$\ln \widetilde{w}_i^n = \widehat{\zeta} + \widehat{\gamma} x_i + \widehat{\sigma} C_{l(i)}. \tag{13}$$

The "micro wage" specification in Equation (13) takes the coverage share as given. In "macro" counterfactuals that remove coverage for the full economy, we additionally set all coverage shares to zero.

Extension: Zooming into Bargaining Jurisdictions Our primary focus is on the aggregate wage distribution. The above wage equations summarize collective bargaining in the form of a reduced-form coverage effect on the aggregate wage distribution. However, it is plausible that coverage effects, especially compression, may primarily be observed *within* bargaining cells. Further, selection into coverage may be determined by bargaining jurisdiction characteristics as well as latent worker Mincerian wages.

We therefore additionally consider coverage effects within proxies for bargaining cells tailored to the given industrial relations system. To implement this check and zoom into within- rather than between-bargaining cell variation, we also estimate a modified wage equation by including fixed effects in Equation (8) for, e.g., industry-sector (most European systems) or proxies for firm types (e.g., for the U.S.), depending on the respective industrial relation system's bargaining level.

5.2.3 Wage Inequality in the Parametric Model

We can use this simple two equation model to compute the effect of collective bargaining on the variance of the log wage following (Card, 2001). To simplify the exposition and algebra, consider the wage effect without spillovers, and standardize $\widetilde{w}_i^n$ to be mean 0 and variance $\sigma^2_{\widetilde{w}^n}$. If coverage C is independent of Mincerian predicted wages, then we will have simply:

$$\text{var}[\ln \widetilde{w}_i] - \sigma^2_{\widetilde{w}^n} = \underbrace{C(1-C)\beta^2}_{\text{Between-Group Premia}} - \underbrace{C(1-(1-\kappa)^2)\sigma^2}_{\text{Within-Group Compression}} . \tag{14}$$

This equation shows that, when purged of selection, collective bargaining exercises two effects on wage dispersion. The first is the between-group premia effect, whereby covered workers earn more than uncovered workers. This effect has inequality increasing with coverage at low levels of coverage, and decreasing with additional coverage at high levels of coverage, leading to an inverse-U shaped relationship between coverage and wage dispersion with a peak at $C = 0.5$ in this example.

The second effect is the equalizing (as $0 \leq \kappa < 1$) within-group compression effect, which reduces the returns to Mincerian predicted wages. This effect has inequality falling monotonically with coverage.

When coverage is differentially selected ($\alpha \neq 0$), we can write the effect of coverage on the empirical variance of wages as:

$$\text{var}[\ln \widetilde{w}_i] - \sigma^2_{\widetilde{w}^n} = \underbrace{C(1-C)\beta^2}_{\text{Between-Group Premia}} - \underbrace{C(1-(1-\kappa)^2)\sigma^2_{\widetilde{w}^n}}_{\text{Within-Group Compression}} + \underbrace{\alpha\sigma^2_{\widetilde{w}^n} S}_{\text{Selection}}, \tag{15}$$

where $S = 2\beta(1-\kappa(1-C)) - \alpha\kappa^2\sigma^2_{\widetilde{w}^n}$ captures the interaction of differential selection with compression and premia.

In a more general setup with within-market spillovers $\sigma > 0$, the effect of coverage will depend on the within-market premium, compression, and selection terms, along with the cross-market effects of spillovers. Coverage expansions can have complex effects on inequality depending on specifically where coverage expandes along with which economic forces dominate.

5.2.4 Semi-parametric Approach

Unions may not just affect the intercept and slope of coverage function, but also the distribution of the residual wages, i.e., the prediction errors in our econometric model. To account for this, we additionally implement the general semi-parametric approach proposed by DiNardo, Fortin, and Lemieux (1996).

We can write the actual wage distribution (of wages w) as a mixture of the covered and non-covered distributions of wages at a particular vector of covariates x,

$$F(w) = \int [g(x)F^c(w|x) + (1 - g(x))F^n(w|x)]\, dF_x(x). \tag{16}$$

Restricting to $x = \widetilde{w}^n$—i.e., restricting selection and coverage effects to be only a function of the non-covered wage, analogously to our parametric framework above—we have $F(w) = \int f(w|\widetilde{w}^n)dF(\widetilde{w}^n)$ and can write:[16]

$$F(w|\widetilde{w}^n) = g(\widetilde{w}^n)F^c(w|\widetilde{w}^n) + (1 - g(\widetilde{w}^n))F^n(w|\widetilde{w}^n). \tag{17}$$

Note that the wage dispersion in $F^n(w|\widetilde{w}^n)$ reflects simply the prediction errors in the non-covered sector, among workers with wage $\widetilde{w}^n$. We can construct a counterfactual distribution f_{NC} for non-covered wages for the covered observations using Bayes rule:

$$f^c_{NC}(w^n|\widetilde{w}^n) = \int_{\widetilde{w}^n} f^n(w|\widetilde{w}^n)\frac{Pr(\widetilde{w}^n|c=1)}{Pr(\widetilde{w}^n|c=0)}d\widetilde{w}^n \tag{18}$$

$$= \int_{w} f^n(w|\widetilde{w}^n)\frac{g(\widetilde{w^N})Pr(c=0)}{(1 - g(\widetilde{w^N}))Pr(c=1)}d\widetilde{w}^n. \tag{19}$$

We can estimate this with kernel density methods, with weights constructed from predicted values from the logit selection equation $g()$, and then recover the counterfactual with no coverage:

$$F_{NC}(w) = Pr(c_i = 1)\int_{\widetilde{w}^n} f^c_{NC}(w^n|\widetilde{w}^n)dF(\widetilde{w}^n|c=1) + Pr(c_i = 0)\int_{\widetilde{w}^n} f^n(w^n|\widetilde{w}^n)dF(\widetilde{w}^n|c=0). \tag{20}$$

We can compute any desired inequality statistic $\nu(F_{NC})$ from this counterfactual with no coverage and compare it one calculated with the empirical distribution F. Similarly, we can compare the empirical distribution to the analogously constructed counterfactual with full coverage $\nu(F_C)$.

The advantage of the semi-parametric approach over the more parametric counterfactual distributions constructed above is that there is no assumption about the covered and non-covered wage structures being made. In particular, even with our use of the "predicted wage" as the sole observable covariate, the semi-parametric approach accounts for effects of bargaining coverage on the prediction error (or residual wage variance), whereas the parametric approach assumes that the residual variance is unaffected by bargaining coverage.

5.3 Datasets, Variables, And Analysis Samples

We combine several datasets to conduct our analysis.

Structure of Earnings Survey (SES) Our main dataset covering most of our countries is the SES, conducted every four years in EU countries, including the UK, when it was a member state of the EU, and countries in the European Free Trade Association (EFTA), specifically Norway and Iceland.

[16] We have found similar results using the Mincer predictors as such, rather than the predicted Mincer wage.

It is a large-scale cross-sectional survey of enterprises designed to gather accurate and comparable matched employer-employee data on earnings across various European countries. It includes detailed information on employees' pay levels, including overtime pay and bonuses, and hours, and their individual characteristics, such as gender, age, occupation, tenure, and education, as well as the employers' industry (2-digit NACE), size, and location. The SES is available as a harmonized use-file from Eurostat. For the Eurostat version we draw on, some variables are dropped or coarsened to ensure anonymity in a two-stage process. After uniform rules applied to all countries, such as 10-year age bins, national statistical agencies can enforce additional rules.

The SES is conducted with a two-stage sampling approach. In the first stage, a stratified random sample of local units (establishments) is selected. The stratification is usually based on industry (NACE 2-digit level), size, and region (NUTS 1 level). In the second stage, a random sample of employees is drawn within each of the selected local units. In some cases, all employees of an establishment are sampled in the second stage. Participation in the SES is mandatory for the selected establishments. We draw on the most recent wave of the SES for each country, which for most countries is 2018 (see Eurostat, 2018, for more information). For the UK, Norway, and Luxembourg, we use the 2014 wave instead (the UK left the survey after its exit from the EU, and the 2018 waves in Norway and Luxembourg did not contain coverage). Austria and Ireland do not participate in the Eurostat data sharing that we draw on.

Crucially for our purposes, the SES also asks the detailed collective bargaining coverage of the majority of the employees in an establishment.[17] Specifically, the SES distinguishes between national or interconfederate agreements, industry agreements, industry-region agreements, employer-specific agreements, and unit-specific agreements. Our analysis of coverage premia in the SES complements analyses in OECD (2018) and Zwysen and Drahokoupil (2024) with the SES data.

Current Population Survey (CPS) The CPS is the primary labor force survey in the U.S. Participation is mandatory. It includes detailed information on demographics and labor force variables such as employment, wages, or hours. Respondents are in the survey for four months, exit the sample for 8 months, and then enter the survey again for four months. Detailed questions on labor income and union status are included in the questionnaires of the outgoing rotation group (ORG) sample (the last month of each four-year panel), and has been since 1983.

We use the outgoing rotation samples of 2018. We obtain information on firm size from the Annual Social and Economics Supplement (ASEC), part of the March CPS. To increase sample size, we impute firm size for the observations in the outgoing rotation samples of April, May, and June for those who are still employed by their March employer.

Labor Force Survey (Canada) Like the CPS, the Canadian LFS is a monthly survey of a random sample of around 55.000 Canadian households resulting in about 100.000 individual observations. Participation is mandatory. Households (not individuals) are surveyed for 6 consecutive months before leaving the sample. The survey includes items on demographics, labor income, and since 1997 also

[17] As a result, an employee will be classified as covered if more than 50% of employees in the establishment are covered. This restriction entails some mismeasurement.

union membership and coverage by collective bargaining agreements.[18]

Analysis Samples For our harmonized cross-country data set, we keep establishments in the private sector. To ensure comparability, we drop the health care sector, social work sector, public administration, as well as education, since these industries are dominated by the public sector. We define these sector through the respective available classifications schemes of the data source (SES: NACE, CPS: U.S. Census, LFS: NAICS).

Additionally, we restrict our sample to non-managerial employees. We define such workers through the respective available classifications schemes of the data source (SES: ISCO, CPS: U.S. Census, LFS: NOC).

We only keep full-time workers between the ages of 20 and 59. We define full-time workers as workers who have a regular work week of at least 30 hours (excluding overtime). We drop self-employed workers in the LFS and CPS (the SES does not include self-employed workers).

We convert wages to 2018 EUR for all countries using OECD data on current price indices and conversion rates.[19]

Some incongruencies remain. First, the SES, LFS, and CPS use different occupation and industry classifications. Second, the SES is a survey of *establishments*, not workers, in contrast to CPS and LFS. We drop observations with multiple jobs in the CPS and LFS (in both samples, multiple job holders make up less than 5% of the overall sample). Third, most, but not all, countries in the SES omit establishments with fewer than 10 employees. However, establishment and firm size restrictions vary, and we do not make sample restrictions thereon.[20] Fourth, age is only recorded in 10 year bins in the SES and 5 year bins in the LFS, though our results in the CPS and LFS are robust to coarsening age to such 10 year bins. Finally, wages in the CPS are top-coded, whereas the LFS and SES do not censor wages (except for a very small number of observations in the SES). We do not expect this to drive major differences between countries as we omit most censored wages in the CPS by dropping managers and impute top coded wages for the remaining observations[21].

Variables Our main wage variable is the monthly gross wage (in 2018 EUR) in the SES, LFS, and CPS. We restrict workers to be working full-time ($\geq$ 30 hours).

We also draw on information on education, experience, gender. As education is reported in the CPS and LFS in more detail, we coarsen education to the same four categories across data sets ("less

[18]One practical challenge of the LFS is that the data generally does not include an individual identifier, as the sampling unit is the household. Under some assumptions, it is possible to generate individual identifiers with the help of a number of variables that plausible identify individuals within the household. This is not possible with the public use file we are using. As a result, our sample, which pools monthly data of a given year, has a sample size roughly six times larger than the actual number of individuals in the data. Our results are robust to restricting our data to a single month instead of the full year, where the observations are guaranteed to be equal to the number of individuals.

[19]This adjustment is inconsequential for our analysis, which is done country by country. For some countries (Bulgaria, Cyprus, Croatia, Malta, and Romania) price data for 2014 is lacking.

[20]In the SES, employer size is not recorded for all countries to guarantee anonymity of establishments and workers. In the CPS, we can identify employees in *firms* with less than 10 employees, but only for the respondents also surveyed in the ASEC. The LFS has a coarser measure of firm and establishment size, with the smallest category "less than 20 employees."

[21]We follow the procedure of the Current Population Survey Extracts of the Economic Policy Institute, Version 1.0.58, https://microdata.epi.org.

than high school," "high school," "first university degree," "graduate university degree"). We assign expected years of education to each category (9 years of schooling, 12 years, 15 years, 17 years) when imputing (potential) labor market experience as age minus years of schooling. Note again that the SES only offers age in 10-year bins – we use the midpoint of each bin to assign this variable. For Sweden, we do not observe people in the highest education category in some age x gender cells in the final sample that is not covered by collective bargaining. Hence, we cannot predict not covered wages for some high-education individuals for Sweden.

To construct coverage, we take two routes depending on the country/dataset. For SES countries, we use the coverage indicator. (In our scientific use file for the European SES, coverage is coarsened at the establishment level, such that all workers in an establishment are coded as covered whenever the majority of employees is covered.) For the U.S. CPS, we consider a worker to be covered who is either a union member or covered by a union contract.

Mincer Predictors To predict non-covered wages $\widetilde{w}^n$, we estimate a Mincer model (separately by country) using the following predictors: gender (categorical, 2 categories), education (categorical, 4 categories), experience (up to the 4th power; potential experience as age minus years of schooling, imputed by schooling level). We randomly split our sample on the country level into a training (30%) and estimation (70%) data. We estimate those coefficients in the sample of non-covered workers and regress log wages on those variables.

Normalization As mentioned above in Section 5.2.2, we subtract the country-specific 25th percentile of the predicted wage in the estimation sample from both the predicted wage and the empirical wage. Therefore, we can interpret β as the coverage premium for workers at the 25th percentile of the predicted wage distribution.

5.4 Results: USA

We start our analysis with two case studies: the United States, and then move to Germany. The two-sided selection model has been widely used to explain patterns of union premia in the United States (Abowd and Farber, 1982; Card, 1996). We discuss country-specific figures in this section, and summarize estimates and results of the cross-country analyses in Table 3 and the additional figures visualizing the results discussed in Section 5.6 below.

Wage Effects of Coverage We start by estimating the wage effect of coverage. Figure 6 Panel a) is a binned scatter plot of the wages of covered workers against their predicted non-covered wage. The bins are organized by Mincer cell, and size circles represent observation counts in the covered population. The figure visualizes our estimates of β and κ, i.e., the baseline coverage premium β) (the intercept and the compression effect κ (one minus the slope of the linear regression line). The estimate for β is 0.232, i.e., on average, covered workers at the 25th percentile obtain a 23% wage premium compared to their non-covered peers with similar Mincer attributes. The U.S. estimates also imply an economically significant compression effect, as we estimate a κ of 0.210. This means that on average, comparing

two workers whose Mincer attributes predict non-covered wage difference of 10 percentage points, the covered wage differs by about 8 percentage points. Compression also means that there exists a cutoff point after which covered wages would be beneath the non-covered wage, given by β/κ, the point at which the covered wage crosses the 45 degree line from above. The cutoff point is at the 98th percentile of the U.S. population (printed in the figure).

Selection Figure 6 Panel b) depicts the selection into coverage in the U.S. economy. Recall that our sample restriction is to private-sector workers, so that coverage is, on average, very low. The graph reveals a pattern that is mildly hump-shaped, in that higher coverage cells are concentrated in the middle of the wage distribution (in terms of Mincer-predicted wages).

Effects on the Wage Distribution We now move to our assessments about how selection and the coverage effect on wages interact to affect the wage distribution, following the counterfactuals described in Section 5.2.1. Figure 6 Panel c) depicts four histograms. First, we plot the raw wage distribution. Second, we plot the wage distribution that is explained by our Mincer model. Third and fourth, we plot the counterfactual wage distribution that would emerge if all non-covered workers were covered, too (hence 100% coverage), as well as the complementary counterfactual of the covered workers not being covered, and hence instead obtaining their predicted non-covered wage (0% coverage). The figure also prints the resulting key statistics of the wage distribution: the variance, the p90/p50 and p50/p10 ratios, the Gini coefficient, and the mean wage.

The analysis reveals significant impact of coverage on the U.S. wage distribution.

At baseline, coverage is 9%, and raw wages exhibit high inequality levels, with a variance of 0.43, a Gini coefficient of 0.38, and p50/p10 and p90/p50 ratios of 1.95 and 2.49.

Naturally, our Mincer predictors considerably shrink the dispersion, yielding associated dispersion measures of 0.13, 0.20, 1.58 and 1.59, respectively. This wage distribution is the reference one for the following two counterfactuals, which operated on predicted wages.

Owing to a combination of the small baseline coverage share, selection (relative to the wage premium), and moderate compression effects of coverage, the counterfactual with 0% coverage implies hardly a movement in those inequality measures.

However, this is not because collective bargaining does not have the potential to affect the wage distribution in the U.S. This becomes clear when considering the 100% coverage counterfactual. In this full-coverage counterfactual, the variance of wages falls from 0.13 to 0.08, the Gini coefficient falls from 0.20 to 0.16, and the p90/p50 and p50/p10 ratios shift from 1.58 and 1.59 to 1.42 and 1.45 respectively. These are sizable effects, although in particular the shift to 100% of coverage would be a massive counterfactual shift in the U.S., with a 9% baseline coverage share.

We close our analysis of the counterfactual wage distributions with an important additional perspective. In this setup, we follow the strategy described in Section 5.2.4, following the method in DiNardo, Fortin, and Lemieux (1996), thereby also incorporating effects on the residual wage dispersion as well as without parametric assumptions about the coverage effect. This means that we can more directly compare the counterfactual wage distributions with the raw analog, rather than to

the distribution of Mincer-predicted wages. We show the results in Figure 6 Panel (d), again plotting wage distributions for the actual data, and for the counterfactuals of 0% and 100% coverage.

Again, due to the low baseline coverage share, moving to 0% from 9% coverage implies minor effects on the U.S. wage distribution, and also on the mean wage. By contrast, we see more sizable declines in most inequality measures when moving to 100% coverage. These findings imply that coverage appears to not only compress the wage dispersion implied by Mincer predictors, but also those independent of our basic human capital proxies. We caveat that this semi-parametric method, too, is subject to concerns about selection on unobservables and the other issues inherent in our two-equation approach.

Extension: Spillovers Our baseline specifications above do not account for spillovers. Next, permit the non-covered wage to be affected by spillovers, in a model as specified in Section 5.2.2, reporting results in Figure 7. (In the counterfactuals in Panel (d), we additionally set cell-level coverage shares to zero or 100% in the counterfactual non-covered wages.)

Accounting for spillovers leads to a moderate increase in the baseline wage premium from coverage, with a β of 0.253 rather than 0.232.[22] By contrast, accounting for spillovers has hardly any effect on the compression parameter κ, which stays at 0.211 (from 0.210). As a result of the higher baseline premium and the stable κ, the crossing point of the regression line, at β/κ, is now outside of the support of the empirical distribution (i.e., is in the top bin).

We then replicate our analysis of counterfactual wages. Accounting for spillovers leads to a somewhat more sizable change in inequality measures, even when moving from 9% coverage to 0% coverage, for the p90/p50 ratio as well as the p50/p10 ratios. Turning to the full coverage counterfactual, we find a somewhat higher reduction in inequality, amounting to 20 and 18 percentage points for the p90/50 and p50/p10 ratios, respectively.

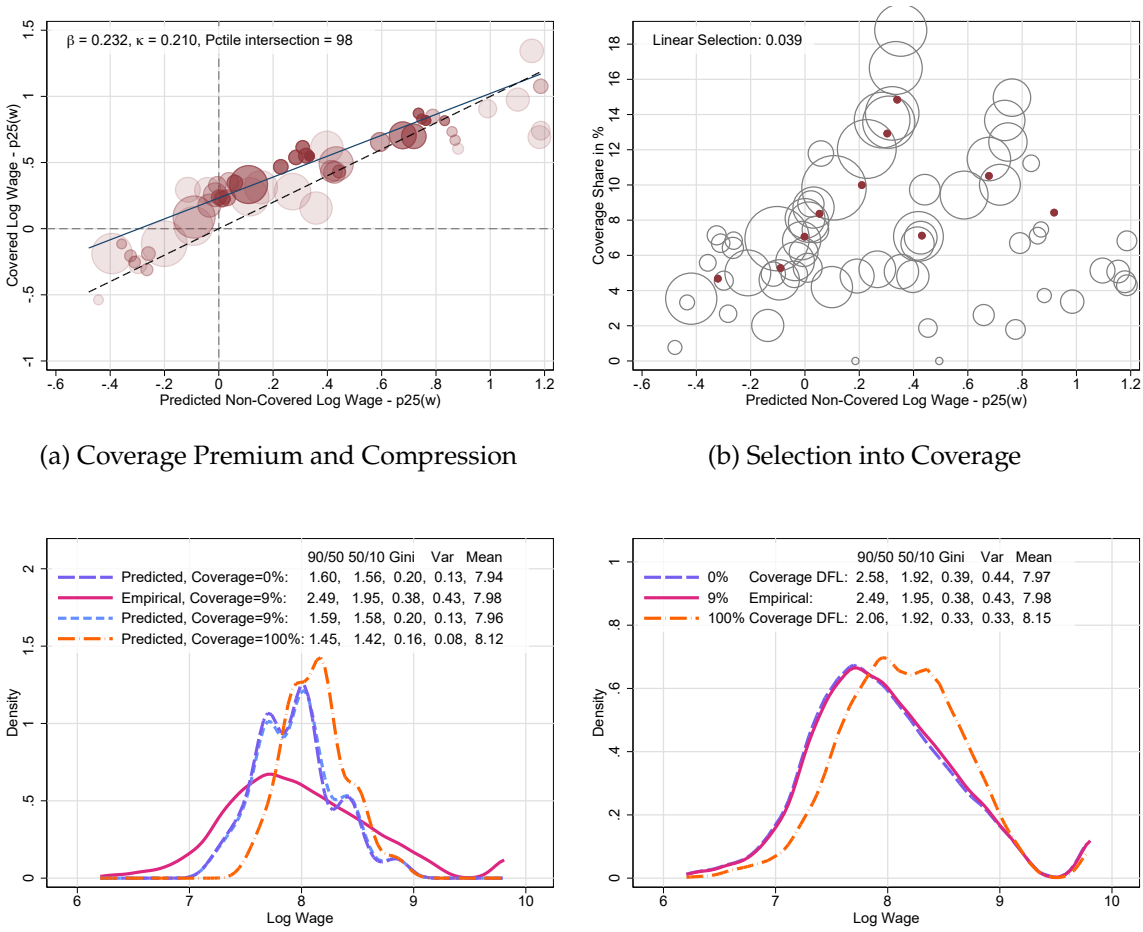
Extension: Zooming into Bargaining Cells Finally, we so far took a national approach to effects of coverage on the wage structure. But collective bargaining may shape wages most directly at the bargaining cell. For the U.S., the basic bargaining cell is the workplace, such as a firm. In Appendix B, we check for how accounting for bargaining cells may affect results. For the U.S., as a simple proxy, we check whether including controls for the interaction of firm size bins, industry and state in the wage equation (i.e., among covered workers) may affect the estimates, and find similar results, albeit with slightly higher inequality in the deunionized counterfactual.

5.5 Results: Germany

We now turn to our second case study, Germany, before moving to the full set of countries in Section 5.6. Germany is a country with considerable flexibility in coverage, specifically driven by employers' decision to join or leave an employer association. Compared to the U.S., Germany has higher coverage. Importantly, collective bargaining is typically at the sector-region level. All those features have the

[22] We explain why accounting for spillovers should lead one to estimate higher β baseline wage premia in the full discussion of the estimates in Section 5.6 below.

Figure 6: Results: USA



(a) Coverage Premium and Compression

(b) Selection into Coverage

(c) Wage Structure, Two-Equation Model

(d) Wage Structure, DFL

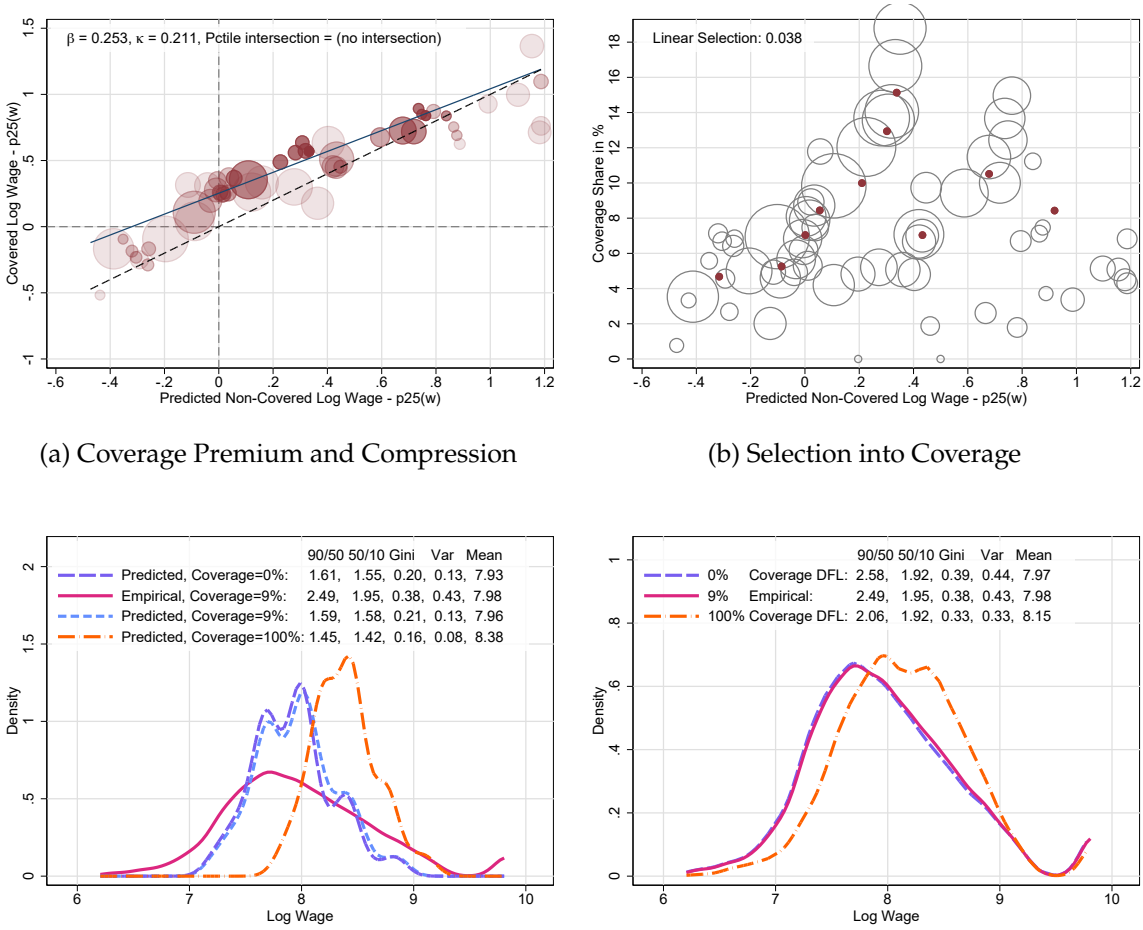
Note: Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Marker sizes are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the coverage rate in that cell relative to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray, which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

potential to imply different coverage effects on wages and selection patterns, and hence different effects of collective bargaining on the wage distribution.

Wage Effects of Coverage Figure 8 Panel a) reports on the effects of coverage on wages, again comparing the covered workers' actual wages with their predicted wages from the Mincer regression.

Our empirical framework taken to the German labor market context reveals two differences with the U.S. results. First, the baseline wage premium in Germany is lower, with β standing at 0.158 compared to 0.232 in the U.S.

Figure 7: Results with Spillovers: USA



(a) Coverage Premium and Compression

(b) Selection into Coverage

(c) Wage Structure, Two-Equation Model

(d) Wage Structure, DFL

Note: This figure replicates Figure 6 but adjusts for spillovers as described in Section 5.2.2.

Second, the compression effect is considerably below the U.S. level, with a κ estimate of 0.024 rather than 0.210. Hence, unlike in the U.S., the near absence of compression effects ($\kappa = 0.024$) indicates that wage premia are more evenly distributed across workers and do not decline for higher-wage individuals. Put differently: in Germany, coverage appears to boost wages by much less at the bottom of the distribution compared to the U.S., where compression effects appear much stronger.

Selection Figure 8 Panel b) shows the selection into coverage in Germany. Coverage rates in Germany are notably higher compared to the U.S., reflecting a broader scope of collective bargaining agreements following the sectoral nature of the German system. Unlike the hump-shaped pattern observed in the U.S., coverage in Germany is quite stable along the predicted Mincer wage distribution, indicating less variation in selection across predicted wage levels. As a caveat due to data limitations, we note that our coverage data is at the establishment level and that a non-trivial share of high-paid workers in

German establishments with collective bargaining coverage at the establishment levels are themselves not subject to collective bargaining (as they receive above-CBA compensation, see also our discussion of Coverage Exemptions for Certain Employees in Section 2.2).

Effects on the Wage Distribution Figure 8 Panel c) depicts the four wage distributions that reflect different coverage scenarios: actual raw wages, those explained by our Mincer model, and two counterfactuals for 0% and 100% coverage.

Baseline coverage is 28% in Germany, and raw wages exhibit lower inequality levels than in the U.S. The variance is 0.21, a Gini of 0.25 and p50/p10 and p90/p50 ratios of 1.84 and 1.73.

Again, the Mincer predictors somewhat compress the wage dispersion, yielding dispersion measures of 0.09, 0.17, 1.52 and 1.50 for the variance, the Gini, and the p50/p10 and p90/p50 ratios.

As in the U.S.—but not as obvious *a priori* given the much higher baseline coverage in Germany at 27% rather than 9%—moving to 0% coverage would imply only small movements in those inequality measures, towards 0.09, 0.16, 1.42 and 1.56. This implication reflects the relatively flat selection curve in Germany and the absence of compression.

More strikingly, in contrast to the U.S., where 100% coverage significantly reduces inequality, increasing coverage to 100% in Germany has only minimal effects on wage dispersion. The variance decreases slightly (from 0.09 to 0.08), and the Gini coefficient remains stable at approximately 0.16. Interestingly, the p50/p10 ratio decreases marginally (from 1.52 to 1.43), while the p90/p50 ratio *increases* slightly (from 1.50 to 1.54). These muted impacts underscore the weaker role of coverage in compressing the German wage distribution, reflecting the low degree of compression in the wage equation and the fact that coverage is relatively uniformly distributed across worker groups in Germany.

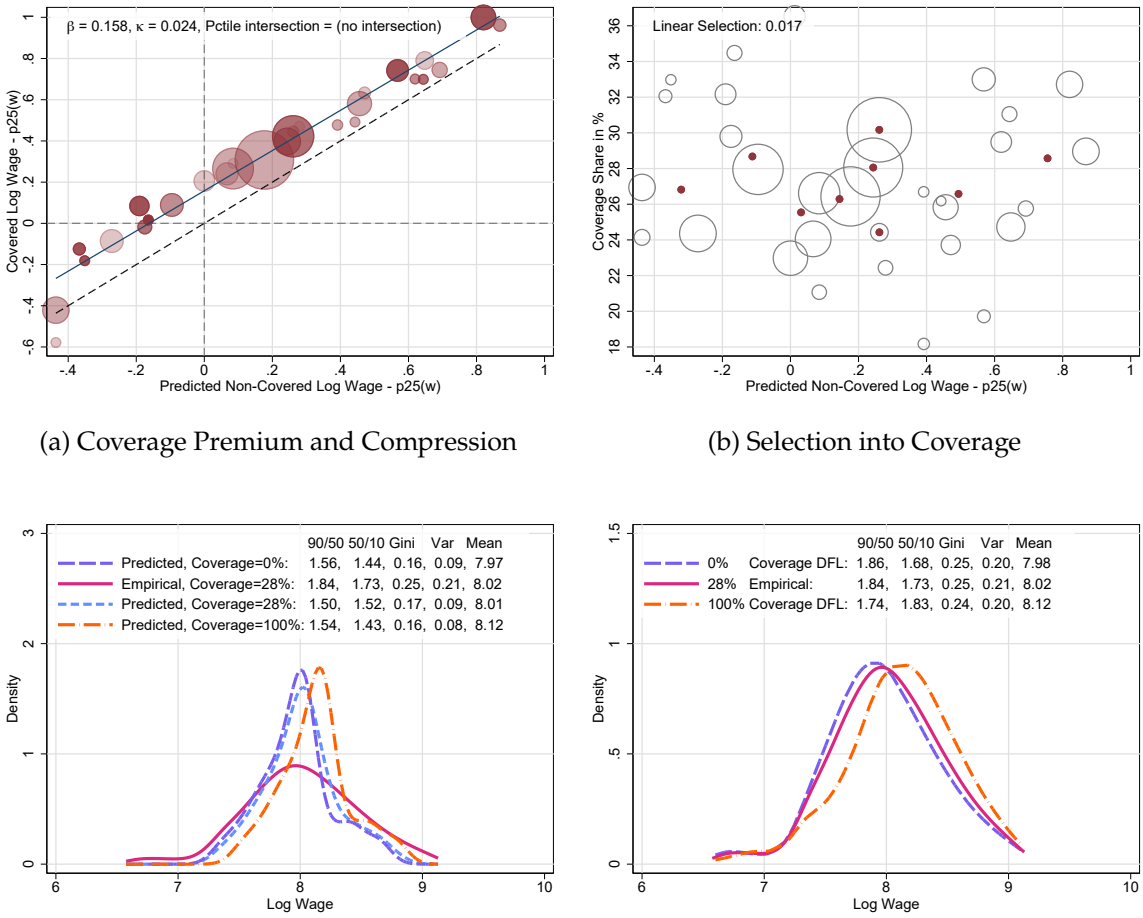
Semi-Parametric (DFL) Approach Figure 8 Panel d) extends the analysis using the semi-parametric DFL approach. Similar to the more parametric two-equation model results, the DFL analysis confirms minimal shifts in inequality measures under counterfactual coverage scenarios, in line with coverage not leading to stronger compression of residuals compared to observable wage determinants. Even at 100% coverage, the variance and Gini coefficient remain relatively unchanged, reinforcing the limited impact of coverage on the overall wage structure in Germany. We note that the 100% coverage scenario now does see more of an effect on the percentile ratios.

Extensions: Spillovers We now also account for spillovers in the German context. Again, we define the labor market cell by region-industry[23], and estimate effects of the average coverage share in the labor market cell on the wages of non-covered workers.

Accounting for spillovers in Germany in Figure 9 reveals about a 25% increase in the baseline wage premium ($\beta = 0.255$) but negligible effects in the compression effect ($\kappa = 0.030$). Spillovers also slightly amplify the effects on inequality measures when moving to full coverage, although the overall changes remain smaller compared to the U.S. (see Figure 9). This limited role of spillovers on the wage distribution may reflect the fact that not just across worker types coverage is relatively

[23]Our cells are the interaction of 5 major German regions based on NUTS 2 categories and single digit NAICS 2 industries.

Figure 8: Results: Germany



(a) Coverage Premium and Compression

(b) Selection into Coverage

(c) Wage Structure, Model

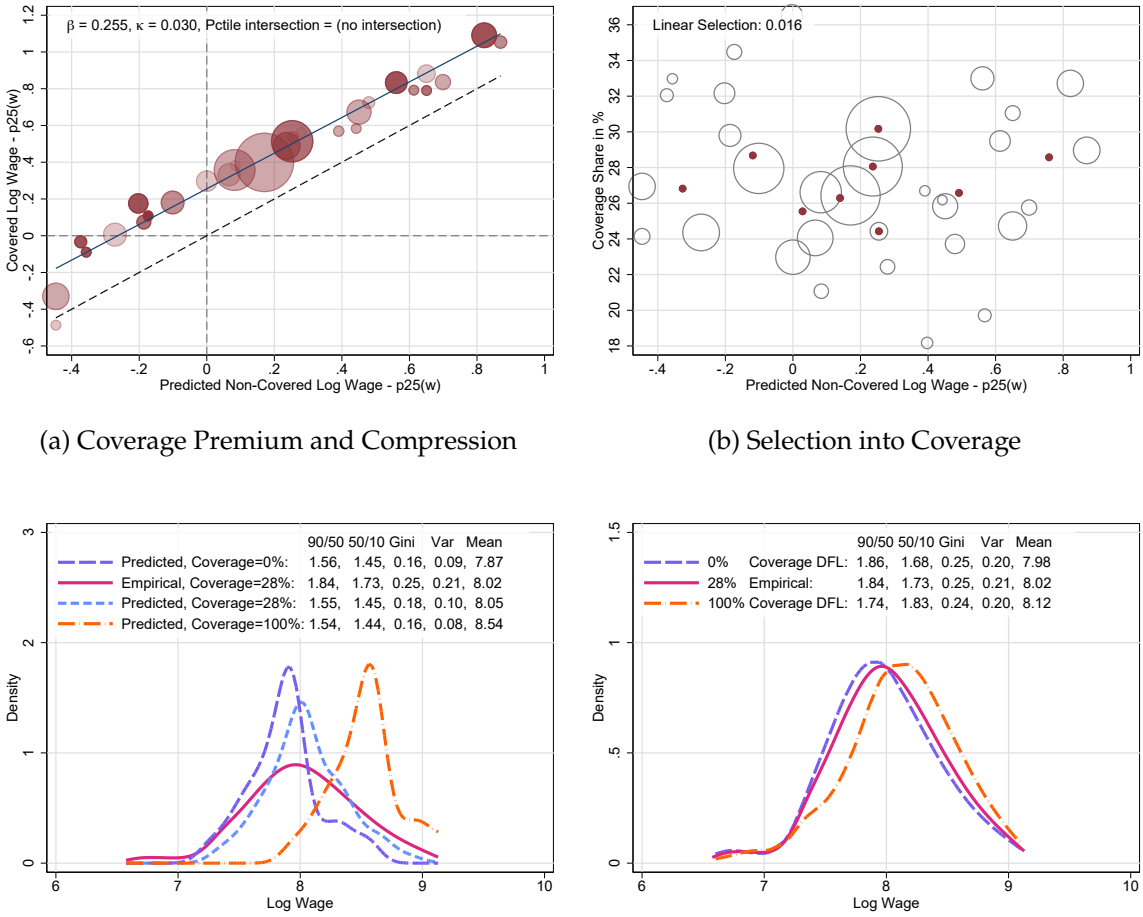
(d) Wage Structure, DFL

Note: Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray, which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

uniformly distributed (see above), but also that coverage shares may be similar across labor market cells in Germany.

Extension: Zooming into Bargaining Cells Finally, in Appendix B, we again check for how accounting for bargaining cells may affect results. In Germany, the most appropriate definition of the bargaining cell is the industry and region (state), given the sectoral bargaining system we described above. As with the U.S., results are largely similar when these predictors of the non-covered wage are included.

Figure 9: Results with Spillovers: Germany



(a) Coverage Premium and Compression

(b) Selection into Coverage

(c) Wage Structure, Model

(d) Wage Structure, DFL

Note: This figure replicates Figure 8 but adjusts for spillovers.

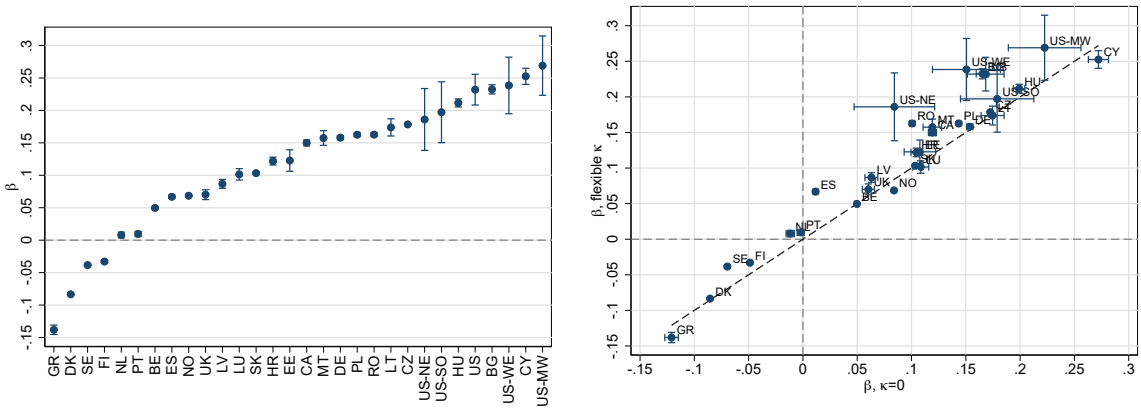
5.6 Results: Cross-Country Analysis

We now extend our method to our full set of countries: the U.S., Canada, and the European countries we can study in the European Structure of Earnings Survey, described in Table 1. This perspective permits us, and our reader, to consider a broad set of countries that differ in coverage and, as discussed in Section 4 above, in their institutional arrangements regarding industrial relations.

For each country, we again implement the steps described in Section 5.2, and conduct the same empirical analyses detailed for our case studies of Germany and the U.S. above.

We provide summary statistics in Table 2 and an overview of results in Tables 3 to 5 and Figures 10 to 14. Appendix 7 contains the full set of exhibits analogous to the country case studies of Germany and the U.S. above

Figure 10: Cross-Country Analysis: Coverage Premium β



(a) Coverage Premium β (Flexible κ)

(b) Coverage Premium β with Flexible κ vs. β with $\kappa = 0$

Note: Panel (a) reports the coverage premium β for countries in our data in a specification allowing for a flexible, country-specific κ. In Panel (b), we plot the estimates for β obtained from the specification with a flexible κ to those with a fixed $\kappa = 0$.

Wage Effects of Coverage: Baseline Wage Premia β Figure 10 and Columns 1 and 2 of Table 3 report on the country-specific estimates for baseline wage effects β.

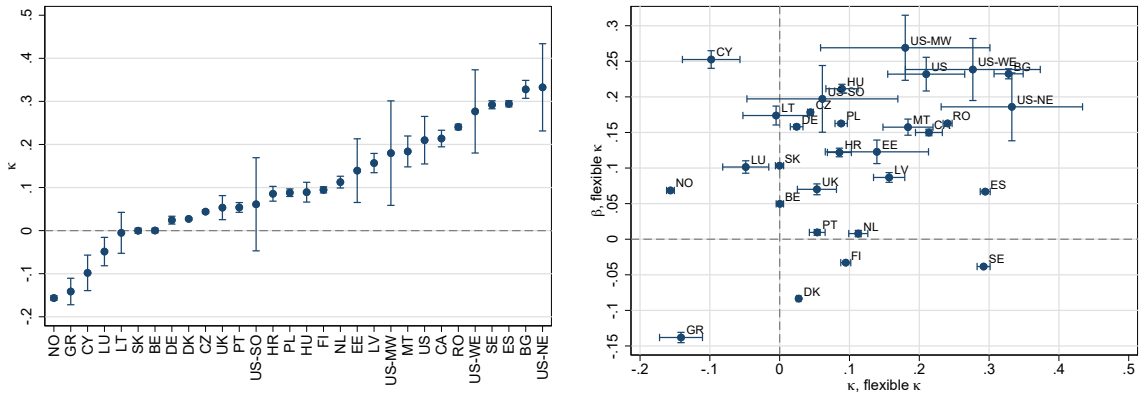
Panel (a) shows the country-specific estimates of the coverage premium β. They are generally precisely estimated and positive in the majority of countries (for around 80% of countries in our sample). Most estimates range from around 0 to around 25%.

Our cross-country perspective also permits us to gauge the role of permitting compression effects in the wage premium. Comparing estimates for β in a model that that imposes a homogeneous wage premium of coverage (i.e., imposes $\kappa = 0$) and one that estimates κ and hence permits compression effects from coverage, we find that those specifications tend to yield similar results for the estimate for β. Figure 10 Panel (b) illustrates the strong correlation between those estimates, suggesting that little of the average premium is attenuated by heterogeneity due to compression. We will discuss the estimates for κ separately below.

We caveat that those estimates are obtained in the strategy that suffers from selection by wage-relevant unobservables as causal effects of coverage on wages remains scarce. Hence, a high β may indicate positive selection of workers into the covered sector that would have had high earnings no matter the coverage (in terms of unobservables beyond the Mincer predictors we do include). The opposite bias for β is also possible if high earners seek to evade coverage due to, e.g., compression effects or mechanically (e.g., as in some countries, if high-level managers may not be covered). Different industrial relations systems would permit and imply different selection directions and channels.

Wage Effects of Coverage: Wage Compression κ Turning to wage compression κ, we find estimates of κ greater than zero for most countries—with a handful of exceptions we discuss below. Figure 11 Panel (a) and Column 3 of Table 3 report on the country-specific estimates for κ.

Figure 11: Cross-Country Analysis: Wage Compression κ



(a) Wage Compression κ (b) Wage Compression and Coverage Premium

Note: Panel (a) plots estimates of wage compression κ. Panel (b) plots the coverage premium β against wage compression κ.

κ is positive for the vast majority of countries (with an average of 0.13), indicating wage compression effects. At the median, the Netherlands and Finland have κ values just below 0.11. At the high end, both Bulgaria and the U.S. West feature substantial compression with κ around 0.34.

Again, we caveat that the estimates are subject to selection concerns. For instance, a κ above one is possible if, e.g., in high-coverage countries, uncovered workers are particularly high skilled (as in, e.g., Acemoglu, Aghion, and Violante, 2001). The two-sided selection model in Abowd and Farber (1982) and Card (1996) provides a mechanism underlying such a selection (see, e.g., Lemieux, 1998, for evidence for such a selection pattern). Such patterns could generate wage "amplification" through coverage instead of compression. Conversely, selection may also drive some of the compression results; for instance, with workers or firms selecting into coverage that would pay low wages anyway.

Panel (b) of Figure 11 relates the estimates for compression, κ, and the associated estimates of the baseline wage premium, β. Generally, we find that higher compression is associated with higher baseline premia across countries. That is, countries in which coverage appears to boost wages by more also see higher compression of wages through coverage. (The estimate of β is very similar whether compression is accounted for or not, see Figure 10 Panel (b).)

Counterfactuals: Effects on the Wage Distribution Table 3 additionally reports the counterfactual variances under scenarios of moving coverage to 0% or 100%, country by country. As a benchmark, we use the variance of predicted wages. The underlying harmonized design permits us to estimate how collective bargaining and unions affect the wage distribution across a variety of industrial relations systems, and describe patterns of those effects in relation to the industrial relations features.

Moving to 0% coverage tends to slightly increase wage variance in most countries, suggesting that the absence of collective bargaining would lead to more wage dispersion. Moving to 100% coverage tends to decrease wage variance in the vast majority of countries, often by a larger magnitude than

the changes seen at 0% coverage. Some countries stand out with particularly large effects, e.g., the counterfactual of moving the U.S. labor market to full coverage is associated with a variance decrease of 0.05 from a baseline (predicted) variance of 0.13, i.e., a 38% decrease in variance—which is the case study we had detailed above. By analyzing comparable data from many countries with a uniform method, the table illustrates the diversity of coverage effects across countries.

Selection We report coverage by (predicted) wage terciles in columns 7 through 9 of Table 3. The distribution of coverage across wage terciles reveals four distinct patterns: flat, increasing, decreasing, and hump-shaped. Countries with *flat coverage*, such as Germany (27%, 28%, 27%), Slovakia (52%, 51%, 51%), and Romania (94%, 94%, 93%), exhibit very similar coverage rates across all terciles, accounting for about a fifth of the sample. *Increasing coverage*, where rates rise from lower to higher wage terciles, is observed in countries including Cyprus (20%, 25%, 27%), Croatia (50%, 52%, 57%), Malta (42%, 42%, 53%), and the United Kingdom (31%, 35%, 37%). This pattern is more common in lower-coverage countries. By contrast, *decreasing coverage*, seen in Finland (97%, 97%, 94%), Greece (95%, 94%, 93%), and Norway (88%, 89%, 81%) is more common in Nordic and other high-coverage countries. Lastly, *hump-shaped coverage*, where mid-wage earners experience the highest rates, is evident in the Czech Republic (37.9%, 43.2%, 37.9%), Poland (36%, 42%, 39%), and Hungary (18%, 27%, 18%) as well as the U.S. (6%, 11%, 10%).

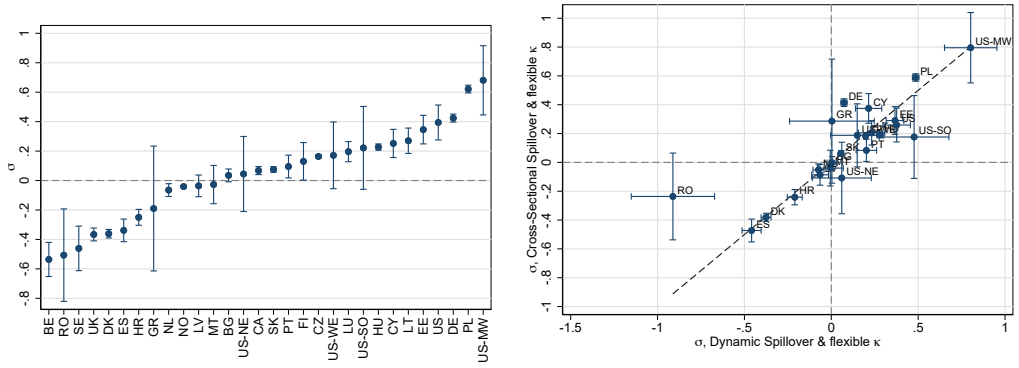
While the parsimonious two-sided selection model predicts the hump-shaped coverage pattern because firms opt out at the bottom and workers opt out at the top, our data suggest that this pattern is only present in a subset of countries. But when coverage is high and unions are strong, our data suggest the marginal covered worker is relatively high-wage compared to the average covered worker, suggesting worker choice is the binding constraint. When coverage is low and unions are weak, our data suggest the marginal covered worker is lower wage than the average worker, suggesting firms are the binding constraint. The forces driving coverage in the two-sided selection model may still account for some of the comparative patterns observed in our sample.

Spillovers Figure 12 Panel (a) reports the spillover coefficient estimates country by country. We find relatively wide dispersion in the spillover effects, with most countries' estimates for σ being above zero, i.e., coverage tends to increase wages among non-covered workers. In this specification, we can also show that our spillover effects yield similar results whether we estimate them in the cross section or in a panel (dynamic) specification that countries for cell-level fixed effects, and find similar patterns (Panel (b)). Below, we will revisit the interpretation of spillover estimates from the perspective of selection bias, and show results from a calibration strategy, and hence delay a substantive interpretation for now.

5.7 Industrial Relations: From Micro to Macro Effects of Coverage

We continue our cross-country analysis with an assessment of how the collective bargaining system appears to shape the observed wage effects. We focus our analysis on the incipient and perhaps most basic coverage effect, namely the baseline wage premium, β. Our harmonized empirical strategy permits us to simply relate this coverage premium β to institutional and other relevant features across

Figure 12: Cross-Country Analysis: Spillover Coefficient σ



(a) Cross-Sectional Spillover Coefficient σ

(b) Panel versus Cross-Sectional Spillover Coefficient σ

Note: Panel (a) reports spillover effects estimated for each country in an augmented Mincer regression, capturing the effect of a shift in the labor-market cell level coverage share on non-covered worker's wages (in logs). Panel (b) reports those estimates in the subset of countries in which we can do so in a panel approach ("dynamic effect"), which includes cell-level fixed effects and country-level year effects, and so the effect is estimated off changes in coverage (but does not contain worker fixed effects).

countries. We zoom into coverage as perhaps the most salient and important difference in industrial relations across countries, potentially reflecting union strength, selection, underlying pressures from worker and firm heterogeneity, wage effects from coverage.

Doing so, we highlight pitfalls of simple comparisons, and emphasize that the variables we consider should be viewed as equilibrium outcomes that need to be interpreted with attention to both economic mechanisms and econometric forces underlying the estimates.

While we focus on coverage, the full tables as well the datasets we share online in our replication package permits the reader and researchers to conduct additional analyses, including assessing how other features of the industrial relations system may correlate and shape our estimates and counterfactuals.

Baseline Comparison In Figure 13 Panel (a), we plot our estimates of the coverage premium (not allowing for compression effects, i.e., setting $\kappa = 0$) against bargaining coverage. We document a negative relationship: countries with low coverage feature relatively high union premia, e.g., around 20 log points for the United States, whereas high-coverage countries such as Portugal have substantially smaller premia, centered around zero for the countries in the highest coverage group. With both coverage and premia as a plausible proxies for union power in a country, such a negative relationship may appear surprising. Interpreted naïvely, this negative correlation may suggest that unions may face a steep trade-off between the extent of coverage and the benefits of coverage.

In Panel (b) we plot corresponding estimates of κ against coverage. In contrast to the union premium, there is little evidence of a strong relationship between the share covered and the degree of wage compression. While the relationship is slightly negative, it is insignificant. Perhaps surprisingly,

a high degree of coverage is not associated with significantly higher levels of compression. The absence of a relationship between compression κ and coverage also implies that the clear negative relationship between the baseline coverage effect β is not complicated by offsetting compression effects.

The Potential Role of Selection Several potential mechanisms could explain the negative relationship between the coverage effect β and the coverage level. At a broad level, and interpreting β as a proxy for the true premium plus selection, positive (worker or firm) selection into coverage could underlie part of this negative relationship. As coverage expands across the distribution, premia measures would be expected to decline. Into the other causal direction, shifters that change the true premium could trigger selection out of coverage.

As one tentative empirical assessment of selection, Figure 13 Panel (b) plots our estimates of the degree of selectivity, α, against coverage. There is again a negative relationship, albeit less stark, between the extent of coverage and the degree of (positive) selection, with low coverage countries more likely to have positively selected workers, as discussed above. This modest downward relationship thus makes selection by itself an unlikely candidate for explaining all of the negative slope in Panel (a). Indeed, if the selection coefficient α is included in a regression of β on coverage and α, the coefficient on α turns positive and the coefficient on coverage remains strongly negative. We caveat that we can only measure selection based on Mincer observables, but not based on unobservables.

The Role of Spillovers Another candidate explanation for the negative relationship between premia and coverage are spillovers. This is because essentially mechanically, the estimated premia might fall in high-coverage countries due to spillovers from covered jobs to non-covered jobs. This is because our baseline measure for β does not correct for spillovers. Since spillovers are typically modeled as a function of the share of covered workers in a cell, the estimate of β that does not account for spillovers would be biased downwards.[24]

To gauge this effect and attempt to correct for it, we therefore estimate β again country by country but now account for spillovers, controlling for labor-market level coverage in the specification of the non-union wage as described above. Panel (a) of Figure 14 plots the resulting estimates of β again against coverage. Strikingly, correcting for spillovers does *not* attenuate the surprising negative relationship: in fact, correcting for spillovers *amplifies* rather than attenuates the counterintuitive negative relationship between the strength of unions as measured by the coverage effect β and the coverage share in the country. Controlling, in addition, for selection does not change this pattern.

Spillovers Revisited The underlying impasse in correcting for spillovers in high-coverage countries is that spillover effect themselves are estimated to be lower—close to zero or even negative values—in high-coverage countries. This can be gauged in Table 14 and Figure 12.

[24]To see this, consider a simple model of wages in which $w^c = w^n + \beta$ and $w^n = \omega + \sigma \cdot C$, where w^n is the observed non-covered wage and ω is the hypothetical non-covered wage for a coverage share of zero. The true estimate for β corrected for spillovers is $\beta = w^c - \omega = w^c - (w^n + \sigma \cdot C)$. The naive estimate omitting spillovers is $\beta = w^c - w^n$. The higher the coverage share C in a setting, the higher this downward bias.

This surprising result likely reflects selection into coverage, too: in cells with higher coverage, the non-covered individuals may be negatively selected on unobservables—generating small or even negative spillover effects. In short, our empirical estimates of spillover effects are likely biased, too—generating an econometric catch 22 if relying on country-specific estimates.

A Calibration Strategy for Spillovers While there are no existing estimates that would estimate a causal effect of the coverage share on the non-covered wage stripping out selection (and we note that even panel variation usually does not include worker or firm fixed effects but only cell level fixed effects, as in our dynamic panel specification), we do attempt to correct for spillovers by *calibrating* the spillover effect to a constant level across countries. We choose $\sigma = 0.25$, which lies within the range of the positive estimates we find, and is somewhat below the U.S. number, where the strategy we employ has been used most prominently (Fortin, Lemieux, and Lloyd, 2023).

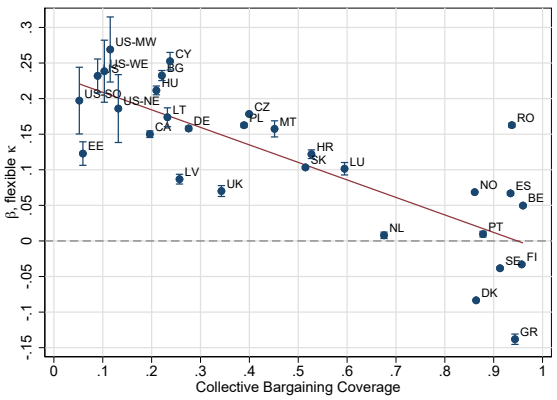
We then re-estimate the β values that are implied by setting $\sigma = 0.25$ in the estimation of the non-covered wages. Intuitively, this calibrated spillover effect would, compared to both the model without spillovers, attribute a larger wage effect to coverage, the higher the baseline coverage share (see also Footnote 24). As a result, this strategy also undoes the unappealing negative correlation between spillover effect estimates and coverage.

Figure 14 Panel (b) reports the results drawing on a spillover correction where we force a common $\sigma = 0.25$ across countries. As expected, we find that this strategy implies substantially larger β in high-coverage countries. In fact, for $\sigma = 0.25$, this correction *completely flattens* the slope between the estimate baseline wage effect β and the country-level aggregate coverage share.

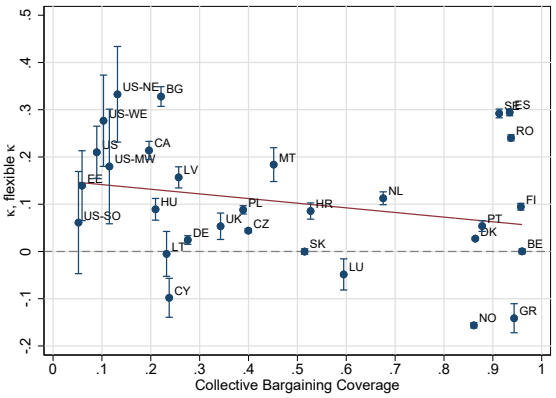
There is inherent uncertainty in the literature about the magnitude and sources of spillovers, which we highlight as an evidently important mechanism to study, dissect, and quantify in future work, specifically in the form of causal effects. Figure 14 Panels (c) and (d) illustrates this crucial role of spillover effects in understanding the wage effects of collective bargaining. Panel (c) zooms into our two case study countries, the U.S. and Germany, which have different baseline coverage shares. We plot the implied β wage premia effects as a function of the σ fed into the estimation of the non-covered wage. $\sigma = 0$ on the x-axis returns our baseline effect size for each country without adjusting for spillovers. By selecting the country's respective actual spillover estimate, one recovers the corresponding β estimate from the specification permitting country-specific spillovers. In turn, for any value of σ between 0 and 100 percent, Panel (c) shows the associated estimated β wage effect. Particularly in Germany, with its higher baseline coverage share, the implied wage effects of coverage range from 0.15 to nearly 0.40. Hence, precise and credible estimates of spillovers dramatically change the resulting true direct wage effects of coverage. We add that the concern of spillovers in accounting for the full effect of coverage would apply even in the presence of causal micro-level variation in coverage in identifying β.

Panel (d) of Figure 14 again zooms out to the cross-country relationship, and plots the slope between country-specific β and aggregate coverage, against the spillover effect fed into the non-covered wage equation. The spillover effect of zero recovers the baseline slope depicted in Figure 13. The value at 0.25 would recover the case we choose to illustrate the importance of accounting for true spillover effects. Values above 0 on the x-axis would imply that countries with high coverage also have

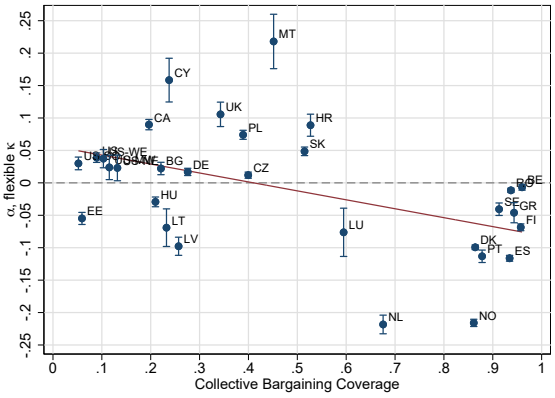
Figure 13: Cross-Country Analysis Without Spillovers: Estimates Plotted Against Coverage



(a) Coverage Premium β and Bargaining Coverage



(b) Compression coefficient κ and Bargaining Coverage



(c) Selection Coefficient α and Bargaining Coverage

Note: Panel (a) plots the coverage premium β against the share of workers covered by collective bargaining agreements in each country. Panel (b) plots the compression coefficient κ against the share of workers covered. Panel (c) plots the selection coefficient α against the share of workers covered. The coefficients β, κ, and α were estimated in specifications that do not account for spillovers.

stronger—rather than weaker—direct wage effects as captured by β.[25]

[25]This modification of $\widetilde{w}^n$ does not appreciably alter estimates of selection α, and the relationship between spillover-adjusted β and coverage is unaffected by controlling for α.

Hence, our analysis highlights the importance of interpreting collective bargaining institutions jointly and in equilibrium, with econometric attention to selection concerns as well as economic intuitions. Realized coverage shares and wage effects of coverage are equilibrium outcomes. While our reduced form analysis has informally attempted such a perspective, we view the most promising future of comparative industrial relations research to draw on structural and causal modeling (Green, Sand, and Snoddy, 2022; Fortin, Lemieux, and Lloyd, 2023, as in) aimed at understanding spillover effects of coverage on uncovered workers and firms. This includes all facets of industrial relations research: functional-form driven quantitative modeling, less parametric credible identification-based empirical research aimed at causally identifying direct wage and indirect spillover effects, and qualitative work that appreciates the rich institutional varieties of industrial relations around the world.[26] We hope that our chapter will serve as one useful piece of this research agenda.

5.8 The Impact of Collective Bargaining on Wage Inequality: Summary

We started our chapter with the idea that collective bargaining has the potential to shape wage inequality in direct ways. Indeed, Figure 2 traced out a clear pattern across countries in our sample: wage inequality is lower whenever coverage is higher.

We then provided more direct estimates of how a given system's coverage actually shapes wages. The downward-sloping relationship between collective bargaining coverage and effects of coverage on the wage structure (whether premia, compression, selection, or spillovers) naturally makes one wonder whether the aggregate correlation between collective bargaining coverage and wage inequality is spurious, driven instead by other common determinants of inequality (like political parties, technology, education, or the welfare state). In this section we conduct a simple, if crude, exercise and see if the correlation of inequality with coverage is driven by the effect of coverage on the wage structure.

Of course, there is no single economic force that guarantees that coverage will compress the wage distribution. As discussed in section 5.2.3, effects of expansion of coverage on inequality can be complex even when selection bias is eliminated. A combination of between-sector inequality and within-sector compression will together shape the equalizing vs. disequalizing forces of collective bargaining coverage. When there is endogenous selection into coverage or spillover effects within labor markets, the effects can be even more complicated.

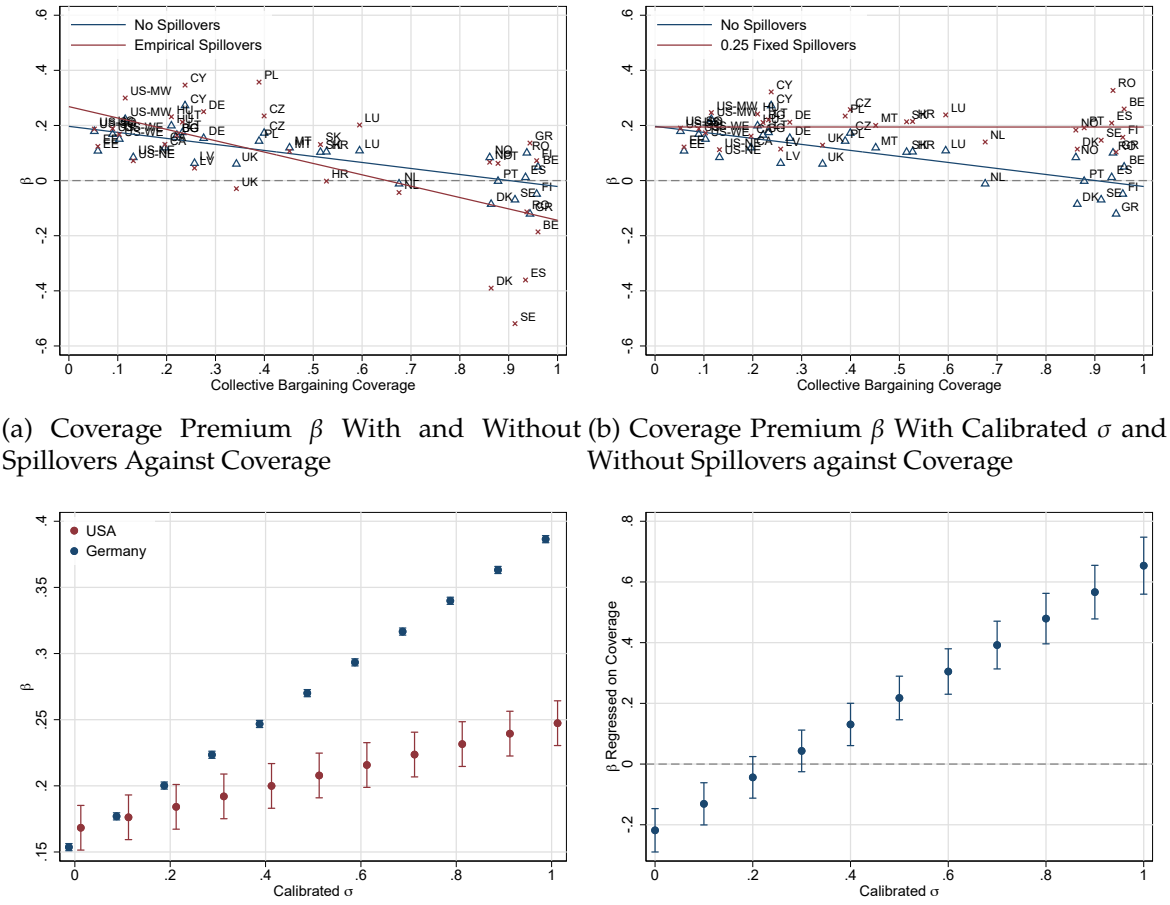
To assess the scope for the micro-effect of coverage on the wage structure to explain the aggregate correlation between coverage and wage inequality we use our DFL-reweighted no-coverage counterfactual distribution. In Panel (a) of Figure 15, we plot the inequality in this non-unionized distribution (measured, as in the introduction, by the variance of log wages), against the share covered in red. We then superimpose the empirical variance, in blue, on the same axis.

The surprising result is that the no-coverage counterfactual tracks the empirical variance quite closely, giving little room for coverage to explain much of the gap. Put differently, collective bargaining coverage is inversely correlated with *latent* non-covered wage inequality.

Farber et al. (2021) conduct a similar analysis with the United States time-series correlation of

[26] Recent advances in identifying spillovers with known or unknown network structure, surveyed in Bramoullé, Djebbari, and Fortin (2020) may be helpful in this.

Figure 14: Cross-Country Analysis With Spillovers



(a) Coverage Premium β With and Without Spillovers Against Coverage

(b) Coverage Premium β With Calibrated σ and Without Spillovers against Coverage

(c) Coverage Premia β in Germany and the USA as Function of (Calibrated) σ

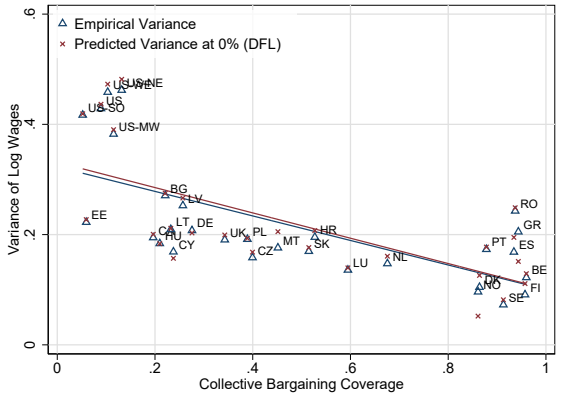
(d) Relationship Between β as Function of (Calibrated) σ

Note: Panel (a) plots the coverage premium β against collective bargaining coverage share, comparing estimates that do and do not account for spillovers. Panel (b) plots the coverage premium β against coverage share, comparing estimates without spillovers to estimates using a calibrated spillover coefficient of $\sigma = 0.25$ across all countries. Panel (c) shows how the estimated coverage premium β varies with different calibrated values of the spillover coefficient σ for Germany and the USA. Panel (d) plots the slope coefficient from regressing country-specific β estimates on coverage shares, for different calibrated values of σ.

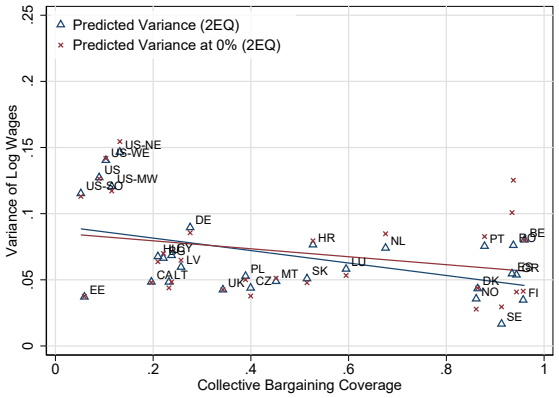
inequality and union density, regressing the empirical inequality minus the reweighted non-union counterfactual inequality on union density. A 10% increase in density reduces the Gini by 0.005 points via the pure "micro" effect, while the overall "macro" effect would be 0.03. Therefore they also find that, subject to identification concerns, spillover effects must play a large role.

We find similar results based on two-equation model rather than the DFL setup. Panel (b) shows the results from the model-based prediction of wages, as well as the predicted variance when coverage is set to 0. Both lines are quite close to each other, and neither move with overall coverage. Again, this suggests that our two-equation micro-economic model does not capture the forces driving the correlation of wage equality with coverage. Including the model parameters estimated with local

Figure 15: Collective Bargaining Coverage and Wage Inequality: Model Performance



(a) Empirical Variance of (log) Wages, and No-Coverage DFL Counterfactual vs. Coverage.



(b) Variance of (log) Wages from Parametric Model, and No-Coverage Model-Based Counterfactual vs. Coverage.

Note: Panel (a) reports binned scatterplots super-imposing the empirical variance of log wages (identical to Figure 2), with the variance of log wages from the reweighted zero-unionization DFL counterfactual distribution. Panel (b) reports the variance of the predictions from the 2-equation model, along with the variance of the predictions from the 2-equation model with flexible κ and no spillovers at zero union coverage.

spillovers, as above, does not change this picture. Again, the predicted variance from the model with the true level of coverage is remarkably close to the model where the level of coverage is set to 0.

All of our measures of inequality, along with predictions from the two-equation model and the DFL counterfactuals, are shown in Table 4. Across measures, the basic pattern remains that the relationship between coverage and inequality seems not to be primarily driven by the component of individual wage inequality that is affected by individual union coverage. 5 reproduces this table accounting for spillovers with the calibrated σ and local labor market coverage, as above. 16 shows that our calibrated local spillovers, interestingly, do not seem to increase the scope for coverage to explain the gap between counterfactual deunionized inequality and empirical inequality.

Of course, all previously professed caveats apply: this result could arise from misspecification of selection into coverage (and we have no valid instruments), or it could be because coverage and wage inequality are both driven by common omitted variables (like shared histories or political parties or strong welfare states). Or, spillovers from coverage onto the non-union sector may be extremely broad and strong, making the individual-level counterfactual a poor guide to the macro-level effects of coverage.

These regressions are small-N correlations with no attempt to be causal. But they reiterate the point of the previous section: individual treatment effects of coverage on worker wages will have a hard time explaining the aggregate correlation between inequality and coverage. Selection and quantifying spillovers are an important next step for unpacking whether aggregate correlations are plausibly causal, or merely spurious. Lastly, it is important to understand whether there is a natural trade-off

between coverage and impact on the wage distribution that limits how much collective bargaining can shape inequality in light of competitive forces.

6 Conclusion

Collective bargaining continues to be an important labor market institution. For workers across many developed and emerging economies that labor economists study, collective bargaining remains a cornerstone of wage determination. The institution continues to evolve, with divergent coverage trends and reforms that have changed, albeit generally weakened, its importance depending on the country. While union *membership* has sharply fallen around the world, union *coverage* remains an important determinant of wages in many countries. Both collective bargaining coverage and union membership have fallen in establishment-based systems, like the U.S., Canada, or the U.K., but both have stayed high in more centralized systems like in Scandinavia. In other countries in continental Europe, coverage remains high even as membership has fallen or stagnated. Developing country labor market institutions sometimes prominently feature collective bargaining coverage in the formal sector, even as questions of enforcement and compliance remain open.

In this chapter, we have mapped the complex landscape of collective bargaining systems, highlighting key institutional differences across countries. We then applied the basic empirical concepts used to study unions in labor economics to organize the heterogeneity in collective bargaining across countries. Using harmonized microdata, we show that basic parameters governing union wage-setting, namely the union premium, degree of wage-compression, and selectivity of union coverage all systematically vary across countries, and with the degree of coverage.

Our empirical exercises in this chapter have illustrated how harmonized administrative microdata can be used to compare institutionally diverse systems of collective bargaining. Estimates of union premia, compression, and selection vary across collective bargaining regimes, for example by coverage. In the presence of institutional and empirical heterogeneity, it may make little sense to talk of "the" collective bargaining effect on the wage structure.

The empirical analysis in this chapter did not leverage any research design able to identify causal effects or netting out selection fully. Yet, our basic framework suggests that coverage is endogeneous, and further any effect of coverage is likely to be heterogeneous. But much of the work we have surveyed throughout this chapter leverages ingenious identification strategies, often generated by the institutional idiosyncracies we have described. From close NLRB elections in the United States to tax-deductions for union dues in Norway to automatic extensions in Portugal, researchers have learned valuable lessons about labor market structure from context-specific policy variation. But the portability of these estimates depends on understanding when and where "coverage" is a similar bundle of treatments affecting a similar set of workers.

Our penultimate section suggests that one fruitful avenue forward would be to find policy variation that exogenously shifts coverage at higher levels of aggregation. In many context researchers have used subnational variation (e.g., Right-to-Work laws) to generate aggregate variation in coverage that can be used to examine spillovers. These "meso-level" experiments would allow the literature to

interpolate between the individual level variation generated by mini-policies and the full institutional packages that vary across countries.

While we have emphasized research using government labor market data, another underexplored resource is data from unions and employer associations themselves. In the process of servicing contracts, mobilizing members, and negotiating new contracts modern, large-scale unions as well as employer associations generate administrative data that may not obtainable anywhere else. Researchers partnering with these organizations may find new questions and new tools to answer existing questions.

The extent and structure of collective bargaining is as much a product of political cleavages, history and culture as policy choices, and more work integrating the microeconomics of collective bargaining with "deep" political economy determinants of institutions (e.g., the social trust identified in Aghion, Algan, and Cahuc, 2011) would be welcome.

The institutional packages we have studied are unlikely to disappear quickly. Collective bargaining may continue to slowly decline, become further decentralized, or may find new expressions in unions of the future. Several states in the United States have begun to experiment with sectoral bargaining legislation modeled on European environments, extending union contracts to uncovered workers, or creating sector-specific minimum wages with input from worker organizations.

The future of collective bargaining is unlikely to look much like the 20th century past, but we are optimistic that labor economists will find plenty of institutional variation, rich new datasets, and novel forms of collective wage setting to study. Collective wage-bargaining is an economic reality that makes the market for labor different from other markets, and can also make labor markets different from each other.

Bibliography

Abowd, John and Henry Farber. 1982. "Job Queues and the Union Status of Workers." *Industrial and Labor Relations Review* 35 (3):354–367.

Abowd, John and Thomas Lemieux. 1993. "The Effects of Product Market Competition on Collective Bargaining Agreements: the Case of Foreign Competition in Canada." *The Quarterly Journal of Economics* 108 (4):983–1014.

Abraham, Katharine and Henry Farber. 1988. "Returns to Seniority in Union and Nonunion Jobs: a New Look at the Evidence." *Industrial and Labor Relations Review* 42 (1):3–19.

Acemoglu, Daron, Philippe Aghion, and Giovanni Violante. 2001. "Deunionization, Technical Change and Inequality." In *Carnegie-Rochester Conference Series on Public Policy*, vol. 55. Elsevier, 229–264.

Acemoglu, Daron and Jörn-Steffen Pischke. 1999. "The Structure of Wages and Investment in General Training." *Journal of Political Economy* 107 (3):539–572.

Acemoglu, Daron and James A Robinson. 2013. "Economics Versus Politics: Pitfalls of Policy Advice." *Journal of Economic Perspectives* 27 (2):173–192.

Adamopoulou, Effrosyni, Luis Díez-Catalán, and Ernesto Villanueva. 2022. "Staggered Contracts and Unemployment During Recessions." *Working Paper* .

Adamopoulou, Effrosyni and Ernesto Villanueva. 2022. "Wage Determination and the Bite of Collective Contracts in Italy and Spain." *Labour Economics* 76:102147.

Adams, Zoe, Parisa Bastani, Louise Bishop, and Simon Deakin. 2017. "The Cbr-lri Dataset: Methods, Properties and Potential of Leximetric Coding of Labour Laws." *International Journal of Comparative Labour Law and Industrial Relations* 33:59–91.

Addison, John, Pedro Portugal, and Hugo Vilares. 2017. "Unions and Collective Bargaining in the Wake of the Great Recession: Evidence From Portugal." *British Journal of Industrial Relations* 55 (3):551–576.

Aghion, Philippe, Yann Algan, and Pierre Cahuc. 2011. "Civil Society and the State: the Interplay Between Cooperation and Minimum Wage Regulation." *Journal of the European Economic Association* 9 (1):3–42.

Ahlquist, John. 2017. "Labor Unions, Political Representation, and Economic Inequality." *Annual Review of Political Science* 20 (1).

Ahlquist, John S and Margaret Levi. 2013. *In the Interest of Others*. Princeton University Press.

Ahsan, Reshad, Arghya Ghosh, and Devashish Mitra. 2017. "International Trade and Unionization: Evidence From India." *Canadian Journal of Economics/revue Canadienne D'économique* 50 (2):398–425.

Aizawa, Naoki, Hanming Fang, and Katsuhiro Komatsu. 2024. "Labor Unions and Social Insurance." *Working Paper* .

Alesina, Alberto, Edward Glaeser, and Bruce Sacerdote. 2005. "Work and Leisure in the United States and Europe: Why So Different?" *Nber Macroeconomics Annual* 20:1–64.

Amlinger, Marc and Reinhard Bispinck. 2015. "dezentralisierung Der Tarifpolitik." *Wsi-mitteilungen* .

Antón, José-Ignacio, René Böheim, and Rudolf Winter-Ebmer. 2022. "The Effect of Migration on Unionization in Austria." *Empirical Economics* 63 (5):2693–2720.

Arold, Benjamin W, Elliott Ash, Bentley MacLeod, and Suresh Naidu. 2024. "Do Words Matter? the Value of Collective Bargaining Agreements." *Center for Law & Economics Working Paper Series* 6.

Ashenfelter, Orley. 1972. "Racial Discrimination and Trade Unionism." *Journal of Political Economy* 80 (3, Part 1):435–464.

Ashenfelter, Orley and George Johnson. 1969. "Bargaining Theory, Trade Unions, and Industrial Strike Activity." *The American Economic Review* 59 (1):35–49.

Askenazy, Philippe and Thomas Breda. 2020. "Electoral Democracy at Work." *IZA Discussion Paper* .

Bächli, Mirjam and Teodora Tsankova. 2021. "Does Labor Protection Increase Support for Immigration? Evidence From Switzerland." *Cesifo Working Paper* .

Banco de España. 2023. "Quarterly Report and Macroeconomic Projections for the Spanish Economy." Economic bulletin, Banco de España.

Barth, Erling, Alex Bryson, and Harald Dale-Olsen. 2020a. "Do Public Subsidies of Union Membership Increase Union Membership Rates?" *IZA Discussion Paper* .

———. 2020b. "Union Density Effects on Productivity and Wages." *The Economic Journal* 130 (631):1898–1936.

Barth, Erling, Karl O Moene, and Fredrik Willumsen. 2014. "The Scandinavian Model—an Interpretation." *Journal of Public Economics* 117:60–72.

Bassier, Ihsaan. 2022. "Collective Bargaining and Spillovers in Local Labor Markets." *Working Paper* .

Batut, Cyprien, Ulysse Lojkine, and Paolo Santini. 2024. ""which Side Are You On?" a Historical Study of Union Membership Composition in Seven Western Countries." *Industrial Relations: a Journal of Economy and Society* 63 (2):205–287.

Beaudry, Paul, David A Green, and Benjamin Sand. 2012. "Does Industrial Composition Matter for Wages? a Test of Search and Bargaining Theory." *Econometrica* 80 (3):1063–1104.

Beauregard, Pierre-Loup, Thomas Lemieux, Derek Messacar, and Raffaele Saggio. 2024. "Why Do Union Jobs Pay More? New Evidence From Matched Employer-employee Data." *Working Paper* .

Becher, Michael and Jonas Pontusson. 2011. "Whose Interests Do Unions Represent? Unionization by Income in Western Europe." In *Comparing European Workers Part B: Policies and Institutions*. Emerald Group Publishing Limited, 181–211.

Berge, Agneta. 2024. "Two-tier Collective Wage Bargaining in a Frictional Labor Market." *Working Paper* .

Berger, David, Kyle Herkenhoff, and Simon Mongey. 2022. "Labor Market Power." *American Economic Review* 112 (4):1147–1193.

Besley, Timothy and Robin Burgess. 2004. "Can Labor Regulation Hinder Economic Performance? Evidence From India." *The Quarterly Journal of Economics* 119 (1):91–134.

Bhandari, Amit K. 2008. "Union Membership Effect on Wage Premiums: Evidence From Organized Manufacturing Industries in India." .

Bhattacharjea, Aditya. 2006. "Labour Market Regulation and Industrial Performance in India: a Critical Review of the Empirical Evidence." *Indian Journal of Labour Economics* 49 (2):211–232.

Bhuller, Manudeep, Karl Ove Moene, Magne Mogstad, and Ola L Vestad. 2022. "Facts and Fantasies About Wage Setting and Collective Bargaining." *Journal of Economic Perspectives* 36 (4):29–52.

Biasi, Barbara and Heather Sarsons. 2022. "Flexible Wages, Bargaining, and the Gender Gap." *The Quarterly Journal of Economics* 137 (1):215–266.

Biewen, Martin and Matthias Seckler. 2019. "Unions, Internationalization, Tasks, Firms, and Worker Characteristics: a Detailed Decomposition Analysis of Rising Wage Inequality in Germany." *The Journal of Economic Inequality* 17 (4):461–498.

Bijnens, Gert, Cédric Duprez, and Jana Jonckheere. 2023. "Have Greed and Rapidly Rising Wages Triggered a Profit-wage-price Spiral? Firm-level Evidence for Belgium." *Economics Letters* 232:111342.

Bijnens, Gert, Shyngys Karimov, and Jozef Konings. 2023. "Does Automatic Wage Indexation Destroy Jobs? a Machine Learning Approach." *De Economist* 171 (1):85–117.

Binmore, Ken, Ariel Rubinstein, and Asher Wolinsky. 1986. "The Nash Bargaining Solution in Economic Modelling." *The Rand Journal of Economics* :176–188.

Blanchard, Olivier. 1986. "The Wage Price Spiral." *The Quarterly Journal of Economics* 101 (3):543–565.

Blandhol, Christine, Magne Mogstad, Peter Nilsson, and Ola Vestad. 2020. "Do Employees Benefit From Worker Representation on Corporate Boards?" *National Bureau of Economic Research* .

Blau, Francine and Lawrence Kahn. 1999. "Institutions and Laws in the Labor Market." In *Handbook of Labor Economics*, vol. 3. Elsevier, 1399–1461.

Bloom, Nicholas, Erik Brynjolfsson, Lucia Foster, Ron Jarmin, Megha Patnaik, Itay Saporta-Eksten, and John Van Reenen. 2019. "What Drives Differences in Management Practices?" *American Economic Review* 109 (5):1648–1683.

Böckerman, Petri and Roope Uusitalo. 2006. "Erosion of the Ghent System and Union Membership Decline: Lessons From Finland." *British Journal of Industrial Relations* 44 (2):283–303.

Boeri, Tito, Andrea Ichino, Enrico Moretti, and Johanna Posch. 2021. "Wage Equalization and Regional Misallocation: Evidence From Italian and German Provinces." *Journal of the European Economic Association* 19 (6):3249–3292.

Boissay, Frederic, Fiorella De Fiore, Deniz Igan, Albert Pierres Tejada, and Daniel Rees. 2022. "Are Major Advanced Economies on the Verge of a Wage-price Spiral?" *Bank for International Settlements Working Paper* .

Booth, Alison, Richard Freeman, Xin Meng, and Jilu Zhang. 2022. "Trade Unions and the Welfare of Rural-urban Migrant Workers in China." *Industrial and Labor Relations Review* 75 (4):974–1000.

Bossler, Mario and Thorsten Schank. 2023. "Wage Inequality in Germany After the Minimum Wage Introduction." *Journal of Labor Economics* 41 (3):813–857.

Boudreau, Laura, Rocco Macchiavello, Virginia Minni, and Mari Tanaka. 2023. *Union Leaders: Experimental Evidence From Myanmar*.

Bourdieu, Jérôme, Thomas Breda, and Vladimir Pecheu. 2022. "Labor Facing Capital in the Workplace: the Role of Worker Representatives." *Working Paper* .

Bramoullé, Yann, Habiba Djebbari, and Bernard Fortin. 2020. "Peer Effects in Networks: a Survey." *Annual Review of Economics* 12 (1):603–629.

Brändle, Tobias and Wolf Dieter Heinbach. 2013. "Opening Clauses in Collective Bargaining Agreements: More Flexibility to Save Jobs?" *Review of Economics* 64 (2):159–192.

Breda, Thomas. 2015. "Firms' Rents, Workers' Bargaining Power and the Union Wage Premium." *The Economic Journal* 125 (589):1616–1652.

Breza, Emily, Supreet Kaur, and Nandita Krishnaswamy. 2019. "Social Norms as a Determinant of Aggregate Labor Supply." *Nber Working Paper* .

Brinkmann, Christina, Simon Jäger, Moritz Kuhn, Farzad Saidi, and Stefanie Wolter. 2024. "Short-time Work Extensions." *Nber Working Paper* .

Bronfenbrenner, Kate. 2009. "No Holds Barred: the Intensification of Employer Opposition to Organizing." .

Bryson, Alex and Rhys Davies. 2019. "Family, Place and the Intergenerational Transmission of Union Membership." *British Journal of Industrial Relations* 57 (3):624–650.

Bryson, Alex and Paul Willman. 2024. "How Should We Think About Employers' Associations?" *British Journal of Industrial Relations* 62 (2):193–205.

Buchmueller, Thomas, John DiNardo, and Robert Valletta. 2002. "Union Effects on Health Insurance Provision and Coverage in the United States." *Industrial and Labor Relations Review* 55 (4):610–627.

Budde, Julian, Thomas Dohmen, Simon Jäger, and Simon Trenkle. 2024. "Worker Representatives." *Working Paper* .

Busch, Alexander and Kilian Weil. 2024. "Sectoral Bargaining and the Wage Structure." *Unpublished Manuscript* .

Butcher, Kristin and Cecilia Elena Rouse. 2001. "Wage Effects of Unions and Industrial Councils in South Africa." *Industrial and Labor Relations Review* 54 (2):349–374.

Cahuc, Pierre, Stéphane Carcillo, and André Zylberberg. 2014. *Labor Economics*. MIT press.

Cai, Jing and Shing-Yi Wang. 2022. "Improving Management Through Worker Evaluations: Evidence From Auto Manufacturing." *The Quarterly Journal of Economics* 137 (4):2459–2497.

Calmfors, Lars and John Driffill. 1988. "Bargaining Structure, Corporatism and Macroeconomic Performance." *Economic Policy* 3 (6):13–61.

Cantoni, Davide, Andrew Kao, David Y Yang, and Noam Yuchtman. 2024. "Protests." *Annual Review of Economics* 16.

Carcillo, Stéphane, Antoine Goujard, Alexander Hijzen, and Stefan Thewissen. 2019. "Assessing Recent Reforms and Policy Directions in France: Implementing the Oecd Jobs Strategy." *Oecd Working Paper* .

Card, David. 1983. "Cost-of-living Escalators in Major Union Contracts." *Industrial and Labor Relations Review* 37 (1):34–48.

———. 1990a. "Strikes and Bargaining: a Survey of the Recent Empirical Literature." *The American Economic Review* 80 (2):410–415.

———. 1990b. "Unexpected Inflation, Real Wages, and Employment Determination in Union Contracts." *The American Economic Review* 80 (4):669.

———. 1996. "The Effect of Unions on the Structure of Wages: a Longitudinal Analysis." *Econometrica* 64 (4):957–979.

———. 2001. "The Effect of Unions on Wage Inequality in the U.s. Labor Market." *Industrial and Labor Relations Review* 54 (2):296–315.

Card, David and Ana Rute Cardoso. 2022. "Wage Flexibility Under Sectoral Bargaining." *Journal of the European Economic Association* .

Card, David, Ana Rute Cardoso, Joerg Heining, and Patrick Kline. 2018. "Firms and Labor Market Inequality: Evidence and Some Theory." *Journal of Labor Economics* 36 (S1):S13–S70.

Card, David, Francesco Devicienti, and Agata Maida. 2014. "Rent-sharing, Holdup, and Wages: Evidence From Matched Panel Data." *Review of Economic Studies* 81 (1):84–111.

Card, David, Jörg Heining, and Patrick Kline. 2013. "Workplace Heterogeneity and the Rise of West German Wage Inequality." *The Quarterly Journal of Economics* 128 (3):967–1015.

Card, David, Thomas Lemieux, and W Craig Riddell. 2020. "Unions and Wage Inequality: the Roles of Gender, Skill and Public Sector Employment." *Canadian Journal of Economics/revue Canadienne D'économique* 53 (1):140–173.

Cardoso, Ana Rute and Pedro Portugal. 2005. "Contractual Wages and the Wage Cushion Under Different Bargaining Settings." *Journal of Labor Economics* 23 (4):875–902.

Cardullo, Gabriele, Maurizio Conti, and Giovanni Sulis. 2020. "A Model of Unions, Two-tier Bargaining and Capital Investment." *Labour Economics* 67:101936.

Cazes, Sandrine, Andrea Garnero, Sébastien Martin, and Chloé Touzet. 2019. "Collective Bargaining Systems and Worker Voice Arrangements in Oecd Countries." *Negotiating Our Way Up* :22.

Chen, Martha, Renana Jhabvala, Ravi Kanbur, and Carol Richards. 2007. *Membership Based Organizations of the Poor*. Routledge.

Clark, Andrew and Andrew Oswald. 1993. "Trade Union Utility Functions: a Survey of Union Leaders' Views." *Industrial Relations: a Journal of Economy and Society* 32 (3):391–411.

Corradini, Viola, Lorenzo Lagos, and Garima Sharma. 2022. "Collective Bargaining for Women: How Unions Can Create Female-friendly Jobs." *Working Paper* .

———. 2023. "Collective Bargaining for Women: How Unions Can Create Female-friendly Jobs." *Working Paper* .

Cramton, Peter and Joseph Tracy. 1998. "The Use of Replacement Workers in Union Contract Negotiations: the U.S. Experience, 1980–1989." *Journal of Labor Economics* 16 (4):667–701.

———. 2003. *Chapter 4: Unions, Bargaining and Strikes*. Cheltenham, UK: Edward Elgar Publishing.

Cronert, Axel and Richard Forsén. 2023. "Like Worker, Like Union? Labor Market Risk Exposure, White-collar Predominance and Trade Unions' Policy Advocacy." *Socio-economic Review* 21 (1):367–395.

Dahl, Christian M, Daniel Le Maire, and Jakob R Munch. 2013. "Wage Dispersion and Decentralization of Wage Bargaining." *Journal of Labor Economics* 31 (3):501–533.

D'Amuri, Francesco and Cristina Giorgiantonio. 2014. "Diffusion and Outlook of Firm-level Bargaining in Italy." *Bank of Italy Working Paper* .

Daruich, Diego, Sabrina Di Addario, and Raffaele Saggio. 2023. "The Effects of Partial Employment Protection Reforms: Evidence From Italy." *Review of Economic Studies* 90 (6):2880–2942.

Davis, Mike. 1999. *Prisoners of the American Dream: Politics and Economy in the History of the U.S. Working Class*. Verso.

Dean, Adam. 2022. *Opening Up by Cracking Down: Labor Repression and Trade Liberalization in Democratic Developing Countries*. Cambridge University Press.

Deibler, Daniel. 2022. "The Effect of Outsourcing on Remaining Workers, Rent Distribution, and Inequality." *Rent Distribution, and Inequality (november 21, 2022)* .

Demir, Gökay. 2023. "Labor Market Frictions and Spillover Effects From Publicly Announced Sectoral Minimum Wages." *Working Paper* .

Derenoncourt, Ellora, François Gerard, Lorenzo Lagos, and Claire Montialoux. 2024. "Union-specific Rents and Inequality." Working Paper.

Deutscher Bundestag. 2003. "Plenarprotokoll 15/32." Stenografischer Bericht 32, Deutscher Bundestag, Berlin.

Devicienti, Francesco, Bernardo Fanfani, and Agata Maida. 2019. "Collective Bargaining and the Evolution of Wage Inequality in Italy." *British Journal of Industrial Relations* 57 (2):377–407.

Devicienti, Francesco, Agata Maida, and Lia Pacelli. 2008. "The Resurrection of the Italian Wage Curve." *Economics Letters* 98 (3):335–341.

DiNardo, John, Nicole M Fortin, and Thomas Lemieux. 1996. "Labor Market Institutions and the Distribution of Wages, 1973-1992: a Semiparametric Approach." *Econometrica* 64 (5):1001–1044.

DiNardo, John and David Lee. 2004. "Economic Impacts of New Unionization on Private Sector Employers: 1984-2001." *Quarterly Journal of Economics* 119 (4):1383–1441.

Dodini, Samuel, Kjell G Salvanes, Alexander Willén, and Li Zhu. 2023. "The Career Effects of Union Membership." *Nhh Dept. of Economics Discussion Paper* (12).

Dodini, Samuel, Anna Stansbury, and Alexander Willén. 2023. "How Do Firms Respond to Unions?" *Norwegian School of Economics, Department of Economics* .

Dodini, Samuel, Alexander Willén, and Li Zhu. 2024. "The Role of Labor Unions in Immigrant Integration." *Nhh Dept. of Economics Discussion Paper* (24).

Du Caju, Philip, Catherine Fuss, Ladislav Wintr et al. 2012. "Downward Wage Rigidity for Different Workers and Firms." *Brussels Economic Review* 55 (1):5–32.

Du Caju, Philip, Erwan Gautier, Daphne Momferatou, and Melanie Ward-Warmedinger. 2009. "Institutional Features of Wage Bargaining in 23 European Countries, the U.S. and Japan." *Ekonomia* 12 (2):57–108.

Dube, Arindrajit. 2019. "Policy Brief 4: Using Wage Boards to Raise Pay."

Dube, Arindrajit and Attila S Lindner. 2024. "Minimum Wages in the 21st Century." .

Dustmann, Christian, Bernd Fitzenberger, Uta Schönberg, and Alexandra Spitz-Oener. 2014. "From Sick Man of Europe to Economic Superstar: Germany's Resurgent Economy." *Journal of Economic Perspectives* 28 (1):167–88.

Dustmann, Christian, Chiara Giannetto, Lorenzo Incoronato, Chiara Lacava, Vincenzo Pezone, Raffaele Saggio, and Benjamin Schoefer. 2024. "Opting Out of Centralized Collective Bargaining: Evidence From Italy." *Working Paper* .

Dustmann, Christian, Attila Lindner, Uta Schönberg, Matthias Umkehrer, and Philipp Vom Berge. 2022. "Reallocation Effects of the Minimum Wage." *The Quarterly Journal of Economics* 137 (1):267–328.

Dustmann, Christian, Johannes Ludsteck, and Uta Schönberg. 2009. "Revisiting the German Wage Structure." *The Quarterly Journal of Economics* 124 (2):843–881.

Dustmann, Christian and Uta Schönberg. 2009. "Training and Union Wages." *The Review of Economics and Statistics* 91 (2):363–376.

Eidlin, Barry. 2015. "Class Vs. Special Interest: Labor, Power, and Politics in the United States and Canada in the Twentieth Century." *Politics & Society* 43 (2):181–211.

Ellguth, Peter, Hans-Dieter Gerner, and Jens Stegmaier. 2014. "Wage Effects of Works Councils and Opening Clauses: the German Case." *Economic and Industrial Democracy* 35 (1):95–113.

Ellwood, David T and Glenn Fine. 1987. "The Impact of Right-to-work Laws on Union Organizing." *Journal of Political Economy* 95 (2):250–273.

Eriksson, Tor and Niels Westergaard-Nielsen. 2009. "Wage and Labor Mobility in Denmark, 1980-2000." In *The Structure of Wages: An International Comparison*. University of Chicago Press, 101–123.

Eurostat. 2018. "Structure of Earnings Survey 2018 Eurostat's Arrangements for Implementing the Council Regulation 530/1999, the Commission Regulations 1916/2000 and 1738/2005." Eurostat. Retrieved from `https://ec.europa.eu/eurostat/cache/metadata/Annexes/earn_ses2018_esms_an_2.pdf`.

Fairris, David and Philippe Askenazy. 2010. "Works Councils and Firm Productivity in France." *Journal of Labor Research* 31:209–229.

Fanfani, Bernardo. 2023. "The Employment Effects of Collective Wage Bargaining." *Journal of Public Economics* 227:105006.

Fanfani, Bernardo, Claudio Lucifora, and Daria Vigani. 2024. "Employer Associations in Italy: Trends and Economic Outcomes." *British Journal of Industrial Relations* 62 (2):206–232.

Farber, Henry. 1986. "The Analysis of Union Behavior." *Handbook of Labor Economics* 2:1039–1089.

———. 2005. "Nonunion Wage Rates and the Threat of Unionization." *Industrial and Labor Relations Review* 58 (3):335–352.

Farber, Henry, Daniel Herbst, Ilyana Kuziemko, and Suresh Naidu. 2021. "Unions and Inequality Over the Twentieth Century: New Evidence From Survey Data." *The Quarterly Journal of Economics* 136 (3):1325–1385.

Farber, Henry and Bruce Western. 2001. "Accounting for the Decline of Unions in the Private Sector, 1973–1998." *Journal of Labor Research* 22 (3):459–485.

Feigenbaum, James, Alexander Hertel-Fernandez, and Vanessa Williamson. 2018. "From the Bargaining Table to the Ballot Box: Political Effects of Right to Work Laws." Tech. rep., National Bureau of Economic Research.

Fitzenberger, Bernd, Karsten Kohn, and Alexander C Lembcke. 2013. "Union Density and Varieties of Coverage: the Anatomy of Union Wage Effects in Germany." *Industrial and Labor Relations Review* 66 (1):169–197.

Fortin, Nicole M, Thomas Lemieux, and Neil Lloyd. 2021. "Labor Market Institutions and the Distribution of Wages: the Role of Spillover Effects." *Journal of Labor Economics* 39 (S2):S369–S412.

———. 2023. "Right-to-work Laws, Unionization, and Wage Setting." In *50th Celebratory Volume*. Emerald Publishing Limited, 285–325.

Frandsen, Brigham. 2010. "Union Wage Setting and the Distribution of Employees Earnings: Evidence From Certification Elections." *Working Paper* .

———. 2017. "Party Bias in Union Representation Elections: Testing for Manipulation in the Regression Discontinuity Design When the Running Variable Is Discrete." In *Regression Discontinuity Designs: Theory and Applications*. Emerald Publishing Limited, 281–315.

———. 2021. "The Surprising Impacts of Unionization: Evidence From Matched Employer-employee Data." *Journal of Labor Economics* 39 (4).

Freeman, Richard B. 1980. "Unionism and the Dispersion of Wages." *Industrial and Labor Relations Review* 34 (1):3–23.

———. 2010. "Labor Regulations, Unions, and Social Protection in Developing Countries: Market Distortions or Efficient Institutions?" *Handbook of Development Economics* 5:4657–4702.

Friedman, Eli. 2014. *Insurgency Trap: Labor Politics in Postsocialist China*. Cornell University Press.

Friedman, Milton. 1951. "Some Comments on the Significance of Labor Unions for Economic Policy." *The Impact of the Union: Eight Economic Theorists Evaluate the Labor Union Movement* :204–59.

Frymer, Paul and Jacob M Grumbach. 2021. "Labor Unions and White Racial Politics." *American Journal of Political Science* 65 (1):225–240.

Gans, Joshua S and Michael Smart. 1996. "Majority Voting With Single-crossing Preferences." *Journal of Public Economics* 59 (2):219–237.

Garcia-Louzao, Jose and Ruben Perez-Sanz. 2024. "Women's Voice at Work and Family-friendly Firms." *Working Paper* .

Garin, Andrew and Filipe Silvério. 2024. "How Responsive Are Wages to Firm-specific Changes in Labour Demand? Evidence From Idiosyncratic Export Demand Shocks." *Review of Economic Studies* 91 (3):1671–1710.

Garnero, Andrea. 2017. "Les Extensions Administratives Des Accords De Branche En France: Effets Et Pistes De Réformes." *Oecd Working Paper* .

———. 2018. "The Dog That Barks Doesn't Bite: Coverage and Compliance of Sectoral Minimum Wages in Italy." *IZA Journal of Labor Policy* 7:1–24.

Garnero, Andrea and Claudio Lucifora. 2022. "Turning a 'blind Eye'? Compliance With Minimum Wage Standards and Employment." *Economica* 89 (356):884–907.

Ge, Ying. 2014. "Do Chinese Unions Have "Real" Effects on Employee Compensation?" *Contemporary Economic Policy* 32 (1):187–202.

Godfrey, Shane. 2018. *Multi-employer Collective Bargaining in South Africa*. International Labour Office, Inclusive Labour Markets, Labour Relations and Working Conditions Branch.

Goldschmidt, Deborah and Johannes Schmieder. 2017. "The Rise of Domestic Outsourcing and the Evolution of the German Wage Structure." *The Quarterly Journal of Economics* 132 (3):1165–1217.

Gourevitch, Alex. 2018. "The Right to Strike: a Radical View." *American Political Science Review* 112 (4):905–917.

Green, David A, Benjamin Sand, and Iain G Snoddy. 2022. "The Impact of Unions on Nonunion Wage Setting: Threats and Bargaining." *Working Paper* .

Grossman, Gene M. 1983. "Union Wages, Temporary Layoffs, and Seniority." *The American Economic Review* 73 (3):277–290.

Gunderson, Morley, Byron Y Lee, and Hui Wang. 2016. "Union Pay Premium in China: an Individual-level Analysis." *International Journal of Manpower* 37 (4):606–627.

Gunderson, Morley K, Byron Y Lee, and Hui Wang. 2024. "Worker Congresses in China: Do They Matter?" *Industrial Relations: a Journal of Economy and Society* 63 (1):43–58.

Gürtzgen, Nicole. 2009. "Rent Sharing and Collective Bargaining Coverage: Evidence From Linked Employer-Employee Data." *The Scandinavian Journal of Economics* 111 (2).

Hall, Robert and Paul Milgrom. 2008. "The Limited Influence of Unemployment on the Wage Bargain." *American Economic Review* 98 (4):1653–1674.

Harju, Jarkko, Simon Jäger, and Benjamin Schoefer. forthcoming. "Voice at Work." *American Economic Journal: Applied Economics* .

Haucap, Justus, Uwe Pauly, and Christian Wey. 1999. "The Incentives of Employers' Associations to Raise Rivals' Costs in the Presence of Collective Bargaining." *Wzb Discussion Paper* .

Hermo, Santiago. 2023. "Collective Bargaining Networks, Rent-sharing, and the Propagation of Shocks." *Working Paper* .

Hertel-Fernandez, Alexander, Suresh Naidu, and Adam Reich. 2021. "Schooled by Strikes? the Effects of Large-scale Labor Unrest on Mass Attitudes Toward the Labor Movement." *Perspectives on Politics* 19 (1):73–91.

Hibbs, Douglas A and Håkan Locking. 1996. "Wage Compression, Wage Drift and Wage Inflation in Sweden." *Labour Economics* 3 (2):109–141.

Hijzen, Alexander and Pedro Martins. 2016. "No Extension Without Representation? Evidence From a Natural Experiment in Collective Bargaining." *IZA Journal of Labor Economics* 9 (1).

———. 2020. "No Extension Without Representation? Evidence From a Natural Experiment in Collective Bargaining." *IZA Journal of Labor Economics* 9 (1).

Hilson, Mary. 2008. *The Nordic Model: Scandinavia Since 1945*. Reaktion books.

Hirsch, Boris, Philipp Lentge, and Claus Schnabel. 2022. "Uncovered Workers in Plants Covered by Collective Bargaining: Who Are They and How Do They Fare?" *British Journal of Industrial Relations* 60 (4):929–945.

Hirsch, Boris and Steffen Mueller. 2020. "Firm Wage Premia, Industrial Relations, and Wage Sharing in Germany." *Industrial and Labor Relations Review* 73 (5):1119–1146.

Holden, Steinar. 1988. "Local and Central Wage Bargaining." *The Scandinavian Journal of Economics* 90 (1):93–99.

———. 1989. "Wage Drift and Bargaining: Evidence From Norway." *Economica* :419–432.

Holmes, Thomas. 1998. "The Effect of State Policies on the Location of Manufacturing: Evidence From State Borders." *Journal of Political Economy* 106 (4):667–705.

Hyman, Richard. 2001. "Understanding European Trade Unionism: Between Market, Class and Society." *Working Paper* .

Izquierdo, Mario and José Luis Herrera. 2022. "Box 6: Recent Indexation Clauses: an Analysis." In *Quarterly report on the Spanish economy*, vol. 3/2022. Banco de España, 59–61.

Jacoby, Sanford. 1986. "Employee Attitude Testing at Sears, Roebuck and Company, 1938–1960." *Business History Review* 60 (4):602–632.

Jäger, Simon, Shakked Noy, and Benjamin Schoefer. 2022. "Codetermination and Power in the Workplace." *Journal of Law and Political Economy* 3 (1).

Jäger, Simon, Shakked Noy, and Benjamin Schoefer. 2022a. "The German Model of Industrial Relations: Balancing Flexibility and Collective Action." *Journal of Economic Perspectives* .

———. 2022b. "What Does Codetermination Do?" *Industrial and Labor Relations Review* 75 (5):857–890.

Jäger, Simon, Benjamin Schoefer, and Jörg Heining. 2021. "Labor in the Boardroom." *Quarterly Journal of Economics* 136 (2):669–725.

Janssen, Simon. 2018. "The Decentralization of Wage Bargaining and Income Losses After Worker Displacement." *Journal of the European Economic Association* 16 (1):77–122.

Jaumotte, Florence and Carolina Osorio Buitron. 2020. "Inequality: Traditional Drivers and the Role of Union Power." *Oxford Economic Papers* 72 (1):25–58.

Johnson, Matthew. 2020. "Regulation by Shaming: Deterrence Effects of Publicizing Violations of Workplace Safety and Health Laws." *American Economic Review* 110 (6):1866–1904.

Jung, Sven and Claus Schnabel. 2011. "Paying More Than Necessary? the Wage Cushion in Germany." *Labour* 25 (2):182–197.

Kaplan, Ethan and Suresh Naidu. 2025. "Between Government and Market: the Political Economics of Labor Unions." *Annual Reviews of Economics* .

Katz, Lawrence, Jonathan Roth, Richard Hendra, and Kelsey Schaberg. 2022. "Why Do Sectoral Employment Programs Work? Lessons From WorkAdvance." *Journal of Labor Economics* 40 (S1):S249–S291.

Kaufman, Bruce. 2002. "Models of Union Wage Determination: What Have We Learned Since Dunlop and Ross?" *Industrial Relations: a Journal of Economy and Society* 41 (1):110–158.

Kaufman, Roger and Geoffrey Woglom. 1986. "The Degree of Indexation in Major U.S. Union Contracts." *Industrial and Labor Relations Review* 39 (3):439–448.

Kennan, John. 1986. "The Economics of Strikes." *Handbook of Labor Eonomics* 2:1091–1137.

Knepper, Matthew. 2020. "From the Fringe to the Fore: Labor Unions and Employee Compensation." *Review of Economics and Statistics* 102 (1):98–112.

Kochan, Thomas A, Duanyi Yang, William T Kimball, and Erin L Kelly. 2019. "Worker Voice in America: Is There a Gap Between What Workers Expect and What They Experience?" *Industrial and Labor Relations Review* 72 (1):3–38.

Koester, Gerrit and Helen Grapow. 2021. "The Prevalence of Private Sector Wage Indexation in the Euro Area and Its Potential Role for the Impact of Inflation on Wages." *Economic Bulletin Boxes* 7.

Kohli, Nikita. 2024. "The Role of Unions in Labor Markets With Informality: Evidence From Brazil." *Working Paper* .

Kremer, Michael and Benjamin Olken. 2009. "A Biological Model of Unions." *American Economic Journal: Applied Economics* 1 (2):150–175.

Krusell, Per and Leena Rudanko. 2016. "Unions in a Frictional Labor Market." *Journal of Monetary Economics* 80:35–50.

Kuruvilla, Sarosh. 2018. "Editorial Essay: From Cautious Optimism to Renewed Pessimism: Labor Voice and Labor Scholarship in China."

Kuziemko, Ilyana, Nicolas Longuet Marx, and Suresh Naidu. 2023. ""Compensate the Losers?" Economic Policy and Partisan Realignment in the U.S." *Working Paper* .

Kuziemko, Ilyana, Suresh Naidu, Joshua Thomas, and Christian Vogt. 2024. "The Great North American Union Divergence: New Evidence From Survey Data." *Working Paper* .

Lagos, Lorenzo. 2024. "Union Bargaining Power and the Amenity-Wage Tradeoff." *IZA Discussion Paper* .

Landais, Camille and Johannes Spinnewijn. 2021. "The Value of Unemployment Insurance." *The Review of Economic Studies* 88 (6):3041–3085.

Larsen, Trine Pernille and Anna Ilsøe. 2022. "Varieties of Organised Decentralisation Across Sectors in Denmark: a Company Perspective." *Industrial Relations Journal* 53 (4):368–389.

Lash, Scott. 1985. "The End of Neo-corporatism?: the Breakdown of Centralised Bargaining in Sweden." *British Journal of Industrial Relations* 23 (2).

Lee, David and Alexandre Mas. 2012. "Long-run Impacts of Unions on Firms: New Evidence From Financial Markets, 1961-1999." *Quarterly Journal of Economics* 127 (1):333–378.

Legree, Scott, Tammy Schirle, and Mikal Skuterud. 2014. *The Effect of Labour Relations Laws on Union Density Rates: Evidence From Canadian Provinces*. Department of Economics, University of Waterloo.

Lemieux, Thomas. 1998. "Estimating the Effects of Unions on Wage Inequality in a Panel Data Model With Comparative Advantage and Nonrandom Selection." *Journal of Labor Economics* 16 (2):261–291.

Leonardi, Marco, Michele Pellizzari, and Domenico Tabasso. 2019. "Wage Compression Within the Firm: Evidence From an Indexation Scheme." *The Economic Journal* 129 (624):3256–3291.

Lerman, Robert and Felix Rauner. 2011. "Apprenticeship in the United States." In *Work and Education in America: The Art of Integration*. Springer, 175–193.

Lewis, Gregg. 1986. "Union Relative Wage Effects." *Handbook of Labor Economics* 2:1139–1181.

Lipowski, Cäcilia, Anna Salomons, and Ulrich Zierahn. 2024. "Expertise at Work: New Technologies, New Skills, and Worker Impacts." *Zew-centre for European Economic Research Discussion Paper* (24-044).

Liu, Mingwei. 2010. "Union Organizing in China: Still a Monolithic Labor Movement?" *Industrial and Labor Relations Review* 64 (1):30–52.

———. 2014. "The Future of Chinese Labor Relations." *Perspectives on Work* 18:76–79, 116–119.

Logan, John. 2006. "The Union Avoidance Industry in the United States." *British Journal of Industrial Relations* 44 (4):651–675.

Lorenzoni, Guido and Iván Werning. 2023. "Wage Price Spirals." *Brookings Papers in Economic Activity* .

Lucifora, Claudio and Daria Vigani. 2021. "Losing Control? Unions' Representativeness, Pirate Collective Agreements, and Wages." *Industrial Relations: a Journal of Economy and Society* 60 (2):188–218.

Lumsden, Keith and Craig Petersen. 1975. "The Effect of Right-to-work Laws on Unionization in the United States." *Journal of Political Economy* 83 (6):1237–1248.

Lünnemann, Patrick and Ladislav Wintr. 2010. "Downward Wage Rigidity and Automatic Wage Indexation: Evidence From Monthly Micro Wage Data." *ECB Working Paper* .

Lynch, Lisa. 1992. "Private-sector Training and the Earnings of Young Workers." *The American Economic Review* 82 (1):299–312.

Ma, Xinxin. 2024. "Union Membership and the Wage Gap Between the Public and Private Sectors: Evidence From China." *Journal for Labour Market Research* 58 (1):3.

Magruder, Jeremy. 2012. "High Unemployment Yet Few Small Firms: the Role of Centralized Bargaining in South Africa." *American Economic Journal: Applied Economics* 4 (3):138–166.

Manacorda, Marco. 2004. "Can the Scala Mobile Explain the Fall and Rise of Earnings Inequality in Italy? a Semiparametric Analysis, 1977–1993." *Journal of Labor Economics* 22 (3):585–613.

Martins, Pedro. 2020. "What Do Employers' Associations Do?" *IZA Discussion Paper* .

Martins, Pedro S. 2021. "30,000 Minimum Wages: the Economic Effects of Collective Bargaining Extensions." *British Journal of Industrial Relations* 59 (2):335–369.

Massenkoff, Maxim and Nathan Wilmers. 2024. "Economic Outcomes of Strikers in an Era of Weak Unions." *Journal of Labor Economics* 42 (1):25–51.

Matsa, David A. 2010. "Capital Structure as a Strategic Variable: Evidence From Collective Bargaining." *The Journal of Finance* 65 (3):1197–1232.

Matzat, Johannes and Aiko Schmeißer. 2022. "Do Unions Shape Political Ideologies at Work?" *Arxiv Preprint Arxiv:2209.02637* .

Medici, Carlo. 2023. "Closing Ranks: Organized Labor and Immigration." *Working Paper* .

Meine, Hartmut. 2005. "'Arbeiter und Angestellte': vom Ende und Beharrungsvermögen alter Scheidelinien." *WSI Mitteilungen* 2.

Moene, Karl Ove and Michael Wallerstein. 1995. "How Social Democracy Worked: Labor-Market Institutions." *Politics & Society* 23 (2):185–211.

———. 1997. "Pay Inequality." *Journal of Labor Economics* 15 (3):403–430.

Moene, Karl Ove, Michael Wallerstein, and Michael Hoel. 1993. *Bargaining Structure and Economic Performance*, vol. 4. Oxford University Press, USA.

Mosimann, Nadja and Jonas Pontusson. 2017. "Solidaristic Unionism and Support for Redistribution in Contemporary Europe." *World Politics* 69 (3):448–492.

Mueller, Steffen and Georg Neuschaeffer. 2021. "Worker Participation in Decision-making, Worker Sorting, and Firm Performance." *Industrial Relations: a Journal of Economy and Society* 60 (4):436–478.

Mukherji, Ronit. 2021. "Deunionization and Immigrant Entry." *Working Paper* .

Naidu, Suresh. 2022. "Is There Any Future for a U.S. Labor Movement?" *Journal of Economic Perspectives* 36 (4):3–28.

Neumark, David and Michael L Wachter. 1995. "Union Effects on Nonunion Wages: Evidence From Panel Data on Industries and Cities." *Industrial and Labor Relations Review* 49 (1):20–38.

Nickell, Stephen and Richard Layard. 1999. "Labor Market Institutions and Economic Performance." *Handbook of Labor Economics* 3:3029–3084.

Oberfichtner, Michael and Claus Schnabel. 2018. "The German Model of Industrial Relations: (Where) Does It Still Exist?" *Jahrbücher Für Nationalökonomie Und Statistik* 239 (1):5–37.

OECD. 2013. "The 2012 Labour Market Reform in Spain." .

OECD. 2018. "The Role of Collective Bargaining Systems for Good Labour Market Performance." In *OECD Employment Outlook 2018*. Paris: OECD Publishing.

———. 2021. "oecd/aias Ictwss Database." 'https://www.oecd.org/employment/ictwss-database.htm' accessed April-04-2022.

Ogeda, Pedro, Emanuel Ornelas, and Rodrigo R. Soares. 2024. "Labor Unions and the Electoral Consequences of Trade Liberalization." *Journal of the European Economic Association* .

Parsons, Nick. 2013. "Legitimizing Illegal Protest: the Permissive Ideational Environment and 'Bossnappings' in France." *British Journal of Industrial Relations* 51 (2):288–309.

Patault, Bérengère. 2021. *Firms' Growth in Frictional Markets*. Ph.D. thesis, Institut Polytechnique de Paris.

Patault, Bérengère and Antoine Valtat. 2020. "Large Firms' Collusion in the Labor Market: Evidence From Collective Bargaining." *Mimeo* .

Pecheu, Vladimir, Simon Jäger, and Thomas Breda. 2024. "Union Ideology." *Working Paper* .

Pissarides, Christopher A. 1986. "Trade Unions and the Efficiency of the Natural Rate of Unemployment." *Journal of Labor Economics* 4 (4):582–595.

Popp-Madsen, Benjamin Ask. 2024. "Governing Labor: Transformations of Collective Bargaining in Denmark." In *Associative Governance in Scandinavia*. Routledge, 90–119.

Pratap, Surendra. 2011. "Collective Bargaining in India: Recent Trends." *Labour Na I a S* :21.

Pyka, Vinzenz and Claus Schnabel. 2023. "Unionization of Retired Workers in Europe." *European Journal of Industrial Relations* :09596801241253570.

Rasmussen, Magnus Bergli and Jonas Pontusson. 2018. "Working-Class Strength by Institutional Design? Unionization, Partisan Politics, and Unemployment Insurance Systems, 1870 to 2010." *Comparative Political Studies* 51 (6):793–828.

Rho, Sungmin. 2023. *Atomized Incorporation: Chinese Workers and the Aftermath of China's Rise*. Cambridge University Press.

Riddell, Chris. 2004. "Union Certification Success Under Voting Versus Card-check Procedures: Evidence From British Columbia, 1978–1998." *Industrial and Labor Relations Review* 57 (4):493–517.

Rios-Avila, Fernando and Barry T. Hirsch. 2014. "Unions, Wage Gaps, and Wage Dispersion: New Evidence From the Americas." *Industrial Relations: a Journal of Economy and Society* 53 (1):1–27.

Ronconi, Lucas. 2021. "How Do Labor Unions Affect Inequality and Efficiency in Latin America and the Caribbean." *Working Paper* .

Rosen, Sherwin. 1969. "Trade Union Power, Threat Effects and the Extent of Organization." *The Review of Economic Studies* 36 (2):185–196.

Sharma, Garima. 2024. "Collusion Among Employers in India." *Working Paper* .

Skans, Oskar Nordström, Per-Anders Edin, and Bertil Holmlund. 2009. "Wage Dispersion Between and Within Plants: Sweden 1985-2000." In *The Structure of Wages: An International Comparison*. University of Chicago Press, 217–260.

Skorge, Øyvind Søraas and Magnus Bergli Rasmussen. 2022. "Volte-face on the Welfare State: Social Partners, Knowledge Economies, and the Expansion of Work-family Policies." *Politics & Society* 50 (2):222–254.

Statistics Canada. 2024. "Quality of Employment in Canada: Collective Bargaining Coverage Rate, 2023." Statistical Report 14-28-0001, Government of Canada.

Stepan-Norris, Judith and Maurice Zeitlin. 2003. *Left Out: Reds and America's Industrial Unions*. Cambridge University Press.

Streeck, Wolfgang and Anke Hassel. 2003. "Trade Unions as Political Actors." *International Handbook of Trade Unions* 335.

Taschereau-Dumouchel, Mathieu. 2020. "The Union Threat." *The Review of Economic Studies* 87 (6):2859–2892.

Thelen, Kathleen Ann. 1991. *Union of Parts: Labor Politics in Postwar Germany*. Cornell University Press.

U.S. Bureau of Labor Statistics. 2024. "Union Members – 2023." News Release USDL-24-0096, U.S. Department of Labor.

Uusitalo, Roope and Juhana Vartiainen. 2009. "Finland: Firm Factors in Wages and Wage Changes." In *The Structure of Wages: An International Comparison*. University of Chicago Press, 149–178.

Valtat, Antoine. 2019. *Essays on Sectoral-Level Wage Bargaining*. Ph.D. thesis, Université Paris Saclay (COmUE).

Vartiainen, Juhana. 2011. "Nordic Collective Agreements–a Continuous Institution in a Changing Economic Environment." In *The Nordic Varieties of Capitalism*. Emerald Group Publishing Limited, 331–363.

Venturini, Miriam. 2023. "The Imperfect Union: Labor Racketeering, Corruption Exposure, and Its Consequences." *Working Paper* .

Visser, Jelle. 2016. "What Happened to Collective Bargaining During the Great Recession?" *IZA Journal of Labor Policy* 5 (1):9.

———. 2019. "ICTWSS Database."

———. 2021. "OECD/AIAS ICTWSS Database: Detailed Note on Definitions, Measurement, and Sources." *OECD* .

Wallerstein, Michael. 1990. "Centralized Bargaining and Wage Restraint." *American Journal of Political Science* :982–1004.

Wang, Sean and Samuel Young. 2022. "Unionization, Employer Opposition, and Establishment Closure." .

Weil, David. 2014. *The Fissured Workplace*. Harvard University Press.

Western, Bruce. 1995. *Between Class and Market*. Princeton University Press.

Western, Bruce and Jake Rosenfeld. 2011. "Unions, Norms, and the Rise in U.S. Wage Inequality." *American Sociological Review* 76 (4):513–537.

Wittenberg, Martin and Andrew Kerr. 2019. "Wage Determination in South Africa: the Case of the Union Wage Premium Since the End of Apartheid." *Unpublished Paper. Cape Town: University of Cape Town* .

Yan, Alan. 2024. "The Minimal Effects of Union Membership on Political Attitudes." *Working Paper* .

Zwysen, Wouter and Jan Drahokoupil. 2024. "Collective Bargaining and Power: Wage Premium of Collective Agreements in Europe 2002–2018." *British Journal of Industrial Relations* 62 (2):335–357.

7 Print Appendix A (for Inclusion in Chapter): Tables

Table 1: Data Overview

	Source	Year	Age	Industry	Workers	Estabs.	Cells	In Sample	Coverage	Cov. (Sample)
Belgium	SES	2018	10-year	NACE	137,339	6,344	32	0.77	0.89	0.96
Bulgaria	SES	2018	10-year	NACE	147,007	11,979	32	0.77	0.27	0.22
Canada	LFS	2018	5-year	NAICS	282,793		64	0.59	0.31	0.20
Cyprus	SES	2018	10-year	NACE	17,968	932	32	0.74	0.31	0.24
Czech Republic	SES	2018	10-year	NACE	1,560,042	6,713	32	0.80	0.43	0.40
Germany[1]	SES	2018	10-year	NACE	407,035	29,809	32	0.49	0.34	0.28
Denmark	SES	2018	10-year	NACE	1,140,807	36,237	32	0.59	0.88	0.86
Estonia	SES	2018	10-year	NACE	94,300	4,214	32	0.68	0.06	0.06
Spain	SES	2018	10-year	NACE	159,885	19,293	32	0.70	0.90	0.93
Finland[2]	SES	2018	10-year	NACE	194,618		32	0.72	0.96	0.96
Greece	SES	2018	10-year	NACE	29,645	4,305	32	0.74	0.93	0.94
Croatia	SES	2018	10-year	NACE	59,428	1,849	32	0.79	0.58	0.53
Hungary	SES	2018	10-year	NACE	251,190	10,920	32	0.65	0.15	0.21
Lithuania	SES	2018	10-year	NACE	26,553	2,963	32	0.66	0.20	0.23
Luxembourg[3]	SES	2014	10-year	NACE	17,845	1,933	32	0.77	0.61	0.60
Latvia	SES	2018	10-year	NACE	82,095	3,564	32	0.54	0.26	0.26
Malta	SES	2018	10-year	NACE	14,809	1,100	32	0.62	0.51	0.44
Netherlands	SES	2018	10-year	NACE	67,292	25,276	32	0.51	0.74	0.67
Norway[3]	SES	2014	10-year	NACE	742,653	33,166	32	0.62	0.75	0.86
Poland	SES	2018	10-year	NACE	537,452	15,128	32	0.71	0.31	0.39
Portugal	SES	2018	10-year	NACE	76,209	8,280	32	0.82	0.88	0.88
Romania	SES	2018	10-year	NACE	231,169	15,279	32	0.80	0.94	0.94
Sweden[4]	SES	2018	10-year	NACE	159,555	3,620	30	0.71	0.93	0.91
Slovakia	SES	2018	10-year	NACE	655,986	5,570	32	0.74	0.59	0.51
United Kingdom[5]	SES	2014	10-year	NACE	81,614	49,814	32	0.53	0.43	0.34
United States	CPS	2018	1-year	US Census	66,867		319	0.56	0.12	0.09
US - West	CPS	2018	1-year	US Census	18,026		318	0.57	0.14	0.10
US - Southeast	CPS	2018	1-year	US Census	24,892		317	0.58	0.06	0.05
US - Midwest	CPS	2018	1-year	US Census	13,489		317	0.56	0.13	0.11
US - Northeast	CPS	2018	1-year	US Census	10,460		316	0.53	0.18	0.13

Note: The table describes the datasets used in our empirical analysis. The public use file of the European Structure of Earnings Survey (SES) has some data limitations: [1] Germany: Some coverage cells and regions censored, which explains the low collective bargaining coverage rate as some covered observations are excluded from the estimation sample. [2] Finland: No Firm ID. [3] Luxembourg and Norway: No coverage information in SES 2018, use SES 2014 instead. [4] Sweden: Some cells with the highest education category missing in the not covered estimation sample. [5] United Kingdom: Not in SES 2018, use SES 2014 instead. "Age" describes the width of the age bins in the sample. "Workers" and "Estabs." denotes the number of distinct employee and establishment observations in the data (note that the LFS and CPS are not employer-employee linked). "Cells" is the number of distinct gender x age bin x education cells. "In Sample" is the share of the data set in the estimation sample which excludes part time workers, industries dominated by the public sector, and managers. "Cov. (Sample)" is the collective bargaining coverage in this estimation sample.

Table 2: Descriptives

Country	Wage, 2018 EUR				Female		Age				Experience (Years)				Less than HS		High School		Undergraduate		Post-Graduate	
	Not Cov.		Covered		Not Cov.	Covered	Not Cov.		Covered		Not Cov.		Covered		Not Cov.	Covered	Not Cov.	Covered	Not Cov.	Covered	Not Cov.	Covered
	Mean	SD	Mean	SD	Mean	Mean	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Belgium	3,365	1,311	3,361	1,269	0.50	0.56	40.2	10.5	40.4	10.5	27.0	11.2	27.2	11.1	0.17	0.12	0.39	0.48	0.18	0.20	0.25	0.20
Bulgaria	538	491	602	428	0.52	0.53	41.0	10.2	44.6	9.9	28.0	10.7	31.4	10.4	0.06	0.06	0.65	0.61	0.16	0.16	0.14	0.17
Canada	2,982	1,643	3,329	1,435	0.40	0.24	38.5	11.2	40.7	11.2	24.0	11.6	26.6	11.6	0.07	0.08	0.22	0.24	0.43	0.53	0.28	0.15
Cyprus	1,435	776	1,972	933	0.54	0.55	39.6	10.5	42.1	10.0	26.6	11.2	29.0	10.8	0.11	0.14	0.49	0.43	0.33	0.31	0.08	0.12
Czech Republic	1,073	671	1,230	568	0.54	0.59	40.1	10.4	41.7	10.3	27.7	10.7	29.3	10.6	0.11	0.09	0.73	0.77	0.04	0.03	0.13	0.11
Germany	3,268	1,813	3,776	1,828	0.71	0.74	41.0	11.0	41.9	11.1	28.4	11.1	29.4	11.2	0.10	0.11	0.69	0.68	0.09	0.09	0.12	0.12
Denmark	5,454	2,303	4,770	1,834	0.59	0.49	40.5	10.4	41.9	10.6	26.6	11.0	28.6	11.1	0.08	0.11	0.39	0.45	0.28	0.30	0.25	0.14
Estonia	1,298	735	1,323	625	0.52	0.48	41.0	10.6	43.0	11.0	28.0	10.5	29.9	10.8	0.11	0.09	0.53	0.57	0.20	0.21	0.16	0.13
Spain	2,302	1,376	1,855	978	0.38	0.60	44.2	10.0	42.1	9.7	30.6	10.9	30.3	10.4	0.22	0.47	0.20	0.21	0.31	0.19	0.27	0.13
Finland	3,803	1,687	3,260	1,258	0.48	0.51	40.0	10.5	42.2	10.5	25.5	10.8	28.8	10.7	0.05	0.08	0.29	0.48	0.34	0.32	0.32	0.13
Greece	1,555	859	1,389	954	0.51	0.56	43.6	9.1	41.2	9.6	31.0	9.6	28.6	10.1	0.12	0.13	0.60	0.60	0.22	0.23	0.06	0.05
Croatia	8,155	5,547	8,974	4,999	0.54	0.55	40.0	10.1	42.8	10.3	27.4	10.7	30.0	10.9	0.12	0.13	0.66	0.61	0.06	0.09	0.16	0.18
Hungary	911	615	1,055	516	0.54	0.66	40.8	10.3	42.8	10.1	28.4	10.7	30.5	10.5	0.15	0.10	0.62	0.73	0.16	0.10	0.08	0.06
Lithuania	864	537	972	496	0.55	0.43	40.5	10.9	43.0	10.5	27.4	11.4	29.7	11.0	0.03	0.04	0.61	0.61	0.26	0.20	0.09	0.15
Luxembourg	3,662	1,786	3,950	1,808	0.64	0.69	37.6	10.0	40.3	10.0	24.9	10.8	28.4	10.7	0.24	0.32	0.39	0.43	0.20	0.18	0.17	0.07
Latvia	1,080	788	1,076	726	0.56	0.46	40.2	10.6	43.0	10.6	27.3	11.0	30.1	11.0	0.09	0.11	0.57	0.53	0.27	0.27	0.07	0.09
Malta	1,900	1,085	2,214	1,189	0.60	0.63	36.9	10.1	40.8	10.8	25.2	10.8	28.8	11.3	0.37	0.35	0.39	0.34	0.19	0.25	0.05	0.07
Netherlands	3,614	2,083	3,175	1,544	0.71	0.69	39.4	10.8	40.5	11.1	26.0	11.4	28.2	11.7	0.13	0.21	0.39	0.51	0.29	0.19	0.20	0.09
Norway	5,264	1,577	5,631	2,339	0.25	0.70	42.4	10.2	39.7	10.6	28.6	10.8	27.4	10.8	0.10	0.27	0.29	0.42	0.48	0.22	0.14	0.09
Poland	963	632	1,106	628	0.54	0.59	39.6	10.3	41.3	10.4	26.5	11.0	28.2	11.1	0.07	0.05	0.63	0.64	0.10	0.10	0.21	0.21
Portugal	1,291	830	1,150	787	0.56	0.52	39.0	10.1	41.1	10.1	26.9	11.1	29.9	11.0	0.34	0.49	0.32	0.29	0.30	0.18	0.05	0.03
Romania	864	887	878	697	0.53	0.54	40.0	10.1	42.2	9.9	27.3	10.6	29.7	10.3	0.07	0.07	0.67	0.69	0.24	0.19	0.03	0.04
Sweden	3,740	1,563	3,370	1,161	0.66	0.54	39.2	10.4	41.2	10.8	26.1	10.9	28.3	11.1	0.07	0.08	0.49	0.55	0.44	0.37	0.00	0.00
Slovakia	1,057	654	1,167	614	0.58	0.51	41.7	10.3	42.2	10.3	29.0	10.7	29.3	10.8	0.13	0.07	0.65	0.69	0.03	0.04	0.19	0.19
United Kingdom	3,211	2,041	3,439	1,919	0.63	0.58	38.1	10.9	40.7	10.9	25.0	11.3	27.6	11.4	0.15	0.16	0.41	0.39	0.33	0.33	0.10	0.12
United States	3,645	3,316	4,243	3,096	0.38	0.24	38.2	11.3	41.2	11.2	25.2	11.5	28.4	11.3	0.10	0.07	0.51	0.60	0.31	0.29	0.08	0.04
US - West	3,886	3,676	4,335	3,164	0.37	0.24	37.9	11.1	41.6	11.1	25.1	11.4	28.8	11.3	0.14	0.09	0.48	0.56	0.30	0.31	0.08	0.04
US - Southeast	3,440	3,106	4,242	3,331	0.38	0.26	38.2	11.3	40.2	11.5	25.3	11.5	27.3	11.6	0.11	0.06	0.54	0.61	0.29	0.28	0.06	0.05
US - Midwest	3,575	3,016	4,222	2,752	0.38	0.20	38.3	11.6	41.5	11.2	25.2	11.7	28.8	11.3	0.07	0.07	0.53	0.64	0.33	0.25	0.07	0.03
US - Northeast	3,899	3,588	4,164	3,151	0.39	0.26	38.3	11.4	41.4	11.1	25.0	11.6	28.4	11.2	0.08	0.06	0.47	0.57	0.34	0.30	0.11	0.06

Note: Mean and standard deviation in the sample covered and not covered by collective bargaining. All values apply sample weights and are rounded.

Table 3: Estimation Results for Cross-Country Analysis

Country	β (κ=0)	β	κ	a	σ	Coverage	Cov.T1	Cov.T2	Cov.T3	Var(Emp.)	Var(2EQ)	Var(2EQ,0%)	Var(2EQ,100%)	Var(DFL,0%)	Var(DFL,100%)	Adj. R2	Obs.
Belgium	0.05	0.05	0.00	-0.01	-0.28	0.96	0.96	0.97	0.96	0.12	0.08	0.08	0.08	0.13	0.12	0.58	1,467
Bulgaria	0.17	0.23	0.33	0.02	-0.00	0.22	0.23	0.19	0.24	0.27	0.07	0.07	0.03	0.27	0.23	0.22	32,656
Canada	0.12	0.15	0.21	0.09	0.07	0.20	0.15	0.21	0.22	0.19	0.05	0.05	0.03	0.20	0.16	0.22	66,661
Cyprus	0.27	0.25	-0.10	0.16	0.37	0.24	0.20	0.25	0.27	0.17	0.07	0.05	0.06	0.16	0.16	0.27	2,973
Czech Republic	0.17	0.18	0.04	0.01	0.18	0.40	0.38	0.43	0.38	0.16	0.04	0.04	0.03	0.17	0.12	0.19	171,239
Germany	0.15	0.16	0.02	0.02	0.41	0.28	0.27	0.28	0.27	0.21	0.09	0.09	0.08	0.20	0.20	0.35	89,823
Denmark	-0.09	-0.08	0.03	-0.10	-0.38	0.86	0.88	0.86	0.86	0.10	0.04	0.04	0.04	0.13	0.10	0.32	41,833
Estonia	0.11	0.12	0.14	-0.05	0.29	0.06	0.07	0.06	0.05	0.22	0.04	0.04	0.03	0.23	0.14	0.15	27,218
Spain	0.01	0.07	0.29	-0.12	-0.47	0.93	0.97	0.94	0.89	0.17	0.05	0.10	0.05	0.19	0.17	0.44	3,120
Finland	-0.05	-0.03	0.09	-0.07	0.15	0.96	0.97	0.97	0.94	0.09	0.03	0.04	0.03	0.11	0.09	0.34	1,772
Greece	-0.12	-0.14	-0.14	-0.05	0.29	0.94	0.95	0.94	0.93	0.21	0.05	0.04	0.05	0.15	0.21	0.21	726
Croatia	0.10	0.12	0.09	0.09	-0.24	0.53	0.50	0.52	0.57	0.20	0.08	0.08	0.07	0.21	0.18	0.33	9,058
Hungary	0.20	0.21	0.09	-0.03	0.19	0.21	0.18	0.27	0.18	0.18	0.07	0.06	0.05	0.18	0.16	0.30	67,864
Lithuania	0.17	0.17	-0.01	-0.07	0.21	0.23	0.26	0.20	0.22	0.21	0.05	0.04	0.04	0.21	0.18	0.18	5,903
Luxembourg	0.11	0.10	-0.05	-0.08	0.18	0.59	0.60	0.61	0.57	0.14	0.06	0.05	0.06	0.14	0.13	0.35	2,246
Latvia	0.06	0.09	0.16	-0.10	-0.09	0.26	0.29	0.22	0.26	0.25	0.06	0.06	0.05	0.27	0.21	0.21	15,531
Malta	0.12	0.16	0.18	0.22	-0.04	0.45	0.42	0.42	0.53	0.18	0.05	0.05	0.03	0.21	0.15	0.24	1,085
Netherlands	-0.01	0.01	0.11	-0.22	-0.05	0.68	0.71	0.72	0.59	0.15	0.07	0.08	0.07	0.16	0.14	0.39	7,031
Norway	0.08	0.07	-0.16	-0.22	-0.04	0.86	0.88	0.89	0.81	0.10	0.04	0.03	0.04	0.05	0.10	0.44	48,807
Poland	0.14	0.16	0.09	0.07	0.59	0.39	0.36	0.42	0.39	0.19	0.05	0.05	0.04	0.19	0.17	0.23	93,944
Portugal	-0.00	0.01	0.05	-0.11	0.08	0.88	0.91	0.89	0.83	0.17	0.08	0.08	0.07	0.18	0.17	0.43	3,219
Romania	0.10	0.16	0.24	-0.01	-0.24	0.94	0.94	0.94	0.93	0.24	0.08	0.13	0.07	0.25	0.24	0.37	4,698
Sweden	-0.07	-0.04	0.29	-0.04	-0.52	0.91	0.92	0.91	0.91	0.07	0.02	0.03	0.01	0.08	0.07	0.25	2,622
Slovakia	0.10	0.10	-0.00	0.05	0.06	0.51	0.52	0.51	0.51	0.17	0.05	0.05	0.05	0.18	0.16	0.27	54,913
United Kingdom	0.06	0.07	0.05	0.11	-0.33	0.34	0.31	0.35	0.37	0.19	0.04	0.04	0.04	0.20	0.17	0.19	15,893
United States	0.17	0.23	0.21	0.04	0.26	0.09	0.06	0.11	0.09	0.43	0.13	0.13	0.08	0.44	0.33	0.27	18,128
US - Midwest	0.22	0.27	0.18	0.02	0.80	0.12	0.09	0.16	0.10	0.38	0.12	0.12	0.08	0.39	0.29	0.24	3,706
US - Northeast	0.08	0.19	0.33	0.02	-0.11	0.13	0.11	0.16	0.12	0.46	0.15	0.15	0.07	0.48	0.33	0.30	2,796
US - Southeast	0.18	0.20	0.06	0.03	0.18	0.05	0.04	0.05	0.07	0.42	0.12	0.11	0.10	0.42	0.36	0.25	7,006
US - West	0.15	0.24	0.28	0.04	0.19	0.10	0.07	0.13	0.11	0.46	0.14	0.14	0.07	0.47	0.32	0.31	4,854

Note: The table reports further descriptive results as well as estimation results of the two-equation model and the DFL procedure. Cov.T1-3 denotes collective bargaining coverage by predicted wage tercile. Var(Emp.) refers to the variance of the empirical log wage. Var(2EQ,Pred.), Var(2EQ,0%), Var(2EQ,100%) refer to the variance in the two equation model at the actual, 0, and 100% coverage. Similarly, Var(DFL,0%) and Var(DFL,100%) refer to the variance of the log wage using DFL reweighting. The reported adjusted R^2 and observation count stem from the Mincer regression in the 30% prediction sample not covered by collective bargaining.

Table 4: Estimates of Coverage Effects on Inequality

	Mean						P50/P90						P90/P10						Gini					
	Empirical	DFL		2EQ			Emp.	DFL		2EQ			Emp.	DFL		2EQ			Emp.	DFL		2EQ		
		0%	100%		0%	100%		0%	100%		0%	100%		0%	100%		0%	100%		0%	100%		0%	100%
BE	8.05	8.08	8.05	8.05	8.00	8.05	1.58	1.67	1.58	1.26	1.26	1.26	1.60	1.61	1.60	1.68	1.68	1.68	0.20	0.20	0.20	0.17	0.17	0.17
BG	6.11	6.06	6.25	6.12	6.08	6.25	1.46	1.34	1.72	1.21	1.15	1.10	2.55	2.76	2.08	1.68	1.78	1.47	0.32	0.32	0.28	0.15	0.15	0.10
CA	7.91	7.89	8.00	7.91	7.88	8.01	1.73	1.71	1.75	1.34	1.32	1.25	1.84	1.92	1.63	1.31	1.34	1.26	0.25	0.26	0.22	0.12	0.12	0.10
CY	7.24	7.19	7.44	7.25	7.19	7.46	1.51	1.46	1.65	1.28	1.21	1.23	1.91	1.90	1.79	1.56	1.42	1.48	0.24	0.23	0.23	0.15	0.13	0.14
CZ	6.92	6.85	7.03	6.93	6.86	7.04	1.70	1.66	1.56	1.23	1.19	1.18	1.68	1.75	1.57	1.36	1.40	1.38	0.23	0.24	0.20	0.12	0.11	0.10
DE	8.02	7.98	8.12	8.01	7.97	8.12	1.73	1.68	1.83	1.52	1.44	1.43	1.84	1.86	1.74	1.50	1.56	1.54	0.25	0.25	0.24	0.17	0.16	0.16
DK	8.42	8.47	8.42	8.42	8.50	8.41	1.41	1.51	1.40	1.34	1.29	1.28	1.61	1.66	1.59	1.31	1.38	1.37	0.18	0.20	0.18	0.12	0.12	0.11
EE	7.04	7.04	7.11	7.03	7.03	7.13	1.95	1.97	1.69	1.28	1.28	1.23	1.81	1.84	1.61	1.27	1.27	1.23	0.27	0.27	0.22	0.11	0.11	0.09
ES	7.43	7.47	7.43	7.44	7.43	7.43	1.54	1.76	1.53	1.16	1.24	1.16	1.91	1.92	1.90	1.62	1.86	1.55	0.24	0.25	0.24	0.14	0.19	0.13
FI	8.03	8.07	8.03	8.04	8.08	8.04	1.38	1.44	1.38	1.21	1.23	1.21	1.59	1.67	1.58	1.32	1.30	1.27	0.18	0.19	0.17	0.11	0.12	0.10
GR	7.10	7.19	7.09	7.11	7.22	7.10	1.67	1.60	1.67	1.35	1.38	1.44	1.94	1.73	1.96	1.32	1.25	1.29	0.26	0.22	0.27	0.13	0.11	0.13
HR	8.92	8.86	8.97	8.93	8.87	8.98	1.68	1.62	1.70	1.22	1.29	1.26	1.89	2.05	1.76	1.68	1.71	1.63	0.26	0.27	0.24	0.16	0.16	0.15
HU	6.72	6.68	6.88	6.72	6.68	6.87	1.53	1.53	1.56	1.20	1.17	1.16	1.97	2.01	1.84	1.57	1.59	1.53	0.25	0.26	0.23	0.15	0.14	0.13
LT	6.65	6.61	6.78	6.65	6.61	6.79	1.71	1.65	1.71	1.23	1.22	1.22	1.99	2.09	1.81	1.43	1.46	1.47	0.27	0.27	0.25	0.13	0.12	0.12
LU	8.17	8.11	8.20	8.17	8.10	8.21	1.49	1.45	1.48	1.30	1.35	1.37	1.79	1.89	1.73	1.42	1.46	1.48	0.22	0.22	0.21	0.14	0.13	0.14
LV	6.82	6.80	6.84	6.82	6.81	6.86	1.86	1.87	1.82	1.37	1.46	1.38	2.04	2.15	1.83	1.44	1.44	1.36	0.29	0.30	0.26	0.14	0.15	0.12
MT	7.50	7.53	7.56	7.51	7.46	7.58	1.69	1.77	1.63	1.27	1.22	1.18	1.78	1.90	1.68	1.52	1.56	1.43	0.24	0.26	0.22	0.13	0.13	0.11
NL	8.01	8.03	8.00	8.00	8.01	7.99	1.59	1.58	1.58	1.34	1.35	1.31	1.71	1.80	1.67	1.56	1.57	1.49	0.22	0.23	0.21	0.15	0.16	0.15
NO	8.56	8.51	8.58	8.56	8.49	8.58	1.38	1.28	1.41	1.20	1.17	1.19	1.61	1.31	1.65	1.33	1.27	1.32	0.18	0.13	0.19	0.11	0.09	0.11
PL	6.79	6.73	6.88	6.80	6.75	6.89	1.74	1.61	1.71	1.23	1.23	1.20	1.90	1.95	1.78	1.55	1.43	1.38	0.26	0.26	0.24	0.13	0.13	0.12
PT	6.93	6.94	6.93	6.94	6.94	6.94	1.33	1.34	1.33	1.21	1.22	1.21	2.11	2.13	2.10	1.80	1.81	1.75	0.25	0.25	0.25	0.16	0.17	0.16
RO	6.59	6.48	6.59	6.60	6.51	6.61	1.59	1.35	1.61	1.11	1.14	1.11	2.24	2.44	2.22	1.84	2.24	1.84	0.30	0.31	0.30	0.15	0.20	0.15
SE	8.08	8.14	8.07	8.08	8.15	8.08	1.34	1.36	1.34	1.17	1.25	1.17	1.49	1.55	1.48	1.16	1.23	1.16	0.16	0.16	0.15	0.07	0.10	0.07
SK	6.90	6.85	6.95	6.91	6.85	6.96	1.65	1.67	1.59	1.22	1.17	1.17	1.80	1.80	1.78	1.49	1.42	1.42	0.24	0.24	0.23	0.13	0.12	0.12
UK	7.97	7.95	8.01	7.98	7.96	8.02	1.69	1.68	1.68	1.26	1.26	1.24	1.86	1.93	1.74	1.36	1.34	1.32	0.25	0.26	0.24	0.12	0.12	0.11
US	7.98	7.97	8.15	7.96	7.94	8.12	1.95	1.92	1.92	1.58	1.56	1.42	2.49	2.58	2.06	1.59	1.60	1.45	0.38	0.39	0.33	0.20	0.20	0.16
US-WE	8.03	8.01	8.18	8.01	7.99	8.16	1.88	1.82	1.84	1.59	1.59	1.40	2.69	2.80	2.17	1.66	1.67	1.45	0.40	0.41	0.33	0.22	0.22	0.16
US-SO	7.93	7.92	8.09	7.90	7.89	8.07	1.94	1.92	2.10	1.55	1.55	1.51	2.47	2.50	1.99	1.53	1.54	1.50	0.38	0.38	0.34	0.19	0.19	0.18
US-MW	8.00	7.98	8.18	7.96	7.94	8.16	1.94	1.97	2.00	1.60	1.58	1.45	2.31	2.33	1.88	1.47	1.50	1.39	0.36	0.36	0.30	0.20	0.19	0.16
US-NE	8.02	8.01	8.11	8.02	8.01	8.10	2.05	2.04	1.99	1.60	1.61	1.37	2.40	2.47	2.02	1.73	1.81	1.49	0.39	0.40	0.32	0.22	0.22	0.15

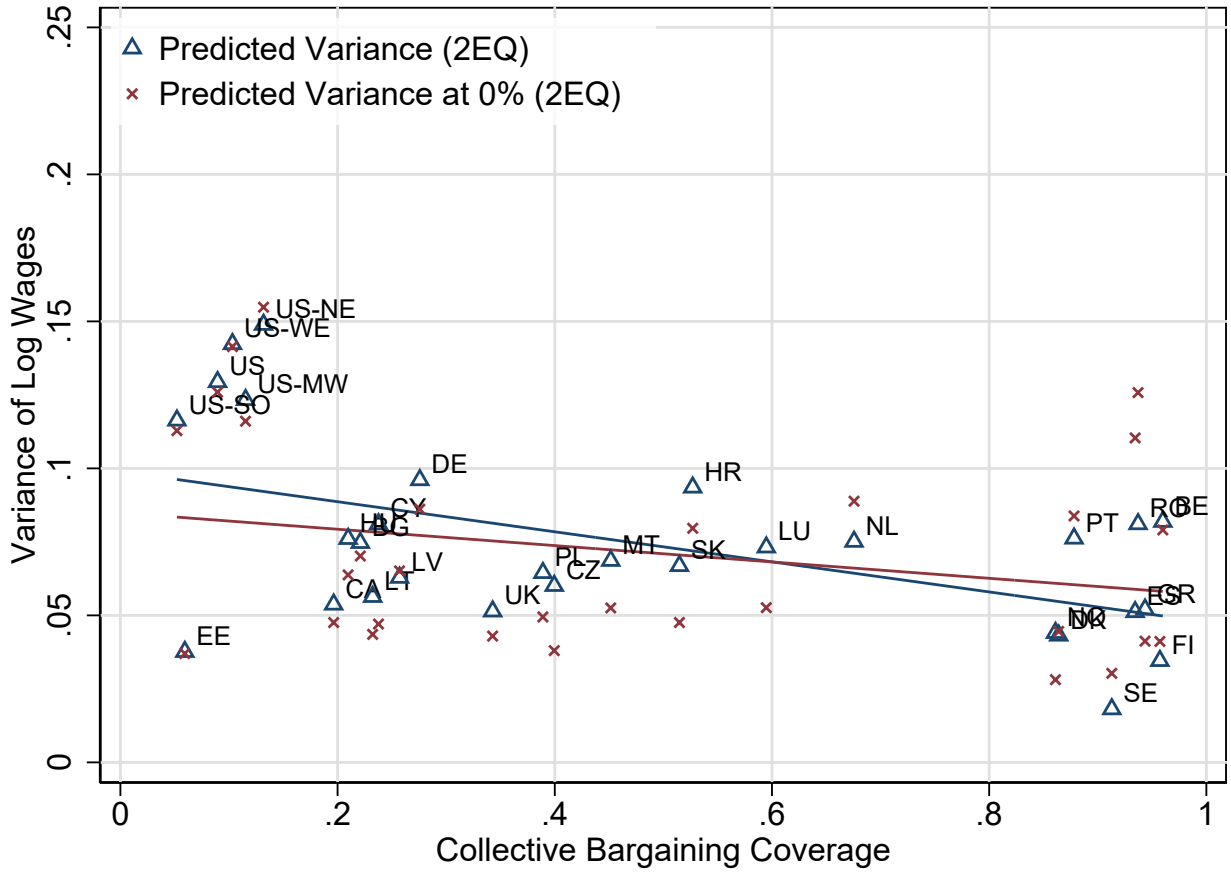
Note: The table reports the mean of the log wage and the P50/P90, P90/P50, and Gini coefficient in wage levels of several specifications. There are no spillovers and κ is included in the model. The first entry of each statistic refers to the empirical wage, followed by the DFL method at 0% and 100% coverage and then the two-equations model at the empirical, 0%, and 100% coverage.

Table 5: Estimates of Coverage Effects on Inequality with Calibrated Spillovers

	Mean				P50/P90				P90/P10				Gini			
	Empirical	2EQ			Emp.	2EQ			Emp.	2EQ			Emp.	2EQ		
			0%	100%			0%	100%			0%	100%			0%	100%
BE	8.05	8.28	7.79	8.30	1.58	1.32	1.23	1.24	1.60	1.67	1.68	1.68	0.20	0.17	0.16	0.16
BG	6.11	6.14	6.04	6.50	1.46	1.25	1.15	1.10	2.55	1.66	1.80	1.48	0.32	0.16	0.15	0.10
CA	7.91	7.92	7.84	8.26	1.73	1.38	1.31	1.23	1.84	1.36	1.36	1.27	0.25	0.13	0.12	0.10
CY	7.24	7.27	7.14	7.71	1.51	1.28	1.21	1.23	1.91	1.59	1.41	1.47	0.24	0.17	0.13	0.14
CZ	6.92	6.98	6.78	7.29	1.70	1.33	1.18	1.17	1.68	1.38	1.41	1.38	0.23	0.14	0.11	0.10
DE	8.02	8.03	7.91	8.37	1.73	1.47	1.45	1.43	1.84	1.52	1.56	1.54	0.25	0.18	0.16	0.16
DK	8.42	8.62	8.30	8.66	1.41	1.28	1.28	1.27	1.61	1.37	1.39	1.38	0.18	0.12	0.12	0.11
EE	7.04	7.04	7.01	7.38	1.95	1.27	1.27	1.23	1.81	1.32	1.27	1.23	0.27	0.11	0.11	0.09
ES	7.43	7.66	7.23	7.68	1.54	1.18	1.24	1.16	1.91	1.54	1.90	1.53	0.24	0.13	0.19	0.13
FI	8.03	8.27	7.88	8.29	1.38	1.22	1.23	1.21	1.59	1.28	1.30	1.26	0.18	0.11	0.12	0.10
GR	7.10	7.33	6.99	7.35	1.67	1.42	1.37	1.43	1.94	1.31	1.26	1.30	0.26	0.13	0.11	0.13
HR	8.92	9.01	8.76	9.23	1.68	1.35	1.31	1.27	1.89	1.70	1.72	1.64	0.26	0.18	0.16	0.15
HU	6.72	6.74	6.64	7.13	1.53	1.21	1.17	1.15	1.97	1.58	1.60	1.53	0.25	0.16	0.14	0.13
LT	6.65	6.67	6.57	7.04	1.71	1.29	1.23	1.23	1.99	1.44	1.45	1.46	0.27	0.14	0.12	0.12
LU	8.17	8.26	7.97	8.46	1.49	1.38	1.34	1.36	1.79	1.43	1.46	1.49	0.22	0.15	0.13	0.14
LV	6.82	6.84	6.76	7.12	1.86	1.41	1.45	1.37	2.04	1.45	1.46	1.37	0.29	0.14	0.15	0.12
MT	7.50	7.57	7.38	7.83	1.69	1.34	1.23	1.18	1.78	1.54	1.53	1.41	0.24	0.15	0.13	0.11
NL	8.01	8.13	7.86	8.25	1.59	1.48	1.35	1.30	1.71	1.41	1.59	1.50	0.22	0.15	0.17	0.15
NO	8.56	8.77	8.39	8.83	1.38	1.25	1.14	1.15	1.61	1.32	1.28	1.32	0.18	0.12	0.09	0.11
PL	6.79	6.84	6.66	7.14	1.74	1.31	1.21	1.19	1.90	1.56	1.44	1.39	0.26	0.15	0.13	0.12
PT	6.93	7.14	6.75	7.19	1.33	1.25	1.22	1.21	2.11	1.73	1.81	1.75	0.25	0.16	0.17	0.16
RO	6.59	6.82	6.28	6.86	1.59	1.12	1.14	1.10	2.24	1.83	2.25	1.85	0.30	0.16	0.20	0.15
SE	8.08	8.29	7.93	8.33	1.34	1.18	1.26	1.18	1.49	1.22	1.22	1.15	0.16	0.08	0.10	0.07
SK	6.90	6.98	6.74	7.21	1.65	1.33	1.18	1.18	1.80	1.48	1.41	1.41	0.24	0.15	0.12	0.12
UK	7.97	8.02	7.89	8.27	1.69	1.30	1.24	1.22	1.86	1.38	1.34	1.32	0.25	0.13	0.12	0.11
US	7.98	7.96	7.93	8.38	1.95	1.58	1.55	1.42	2.49	1.59	1.61	1.45	0.38	0.21	0.20	0.16
US-WE	8.03	8.01	7.97	8.41	1.88	1.57	1.58	1.39	2.69	1.66	1.67	1.45	0.40	0.22	0.22	0.16
US-SO	7.93	7.90	7.88	8.32	1.94	1.57	1.54	1.50	2.47	1.53	1.54	1.50	0.38	0.19	0.19	0.18
US-MW	8.00	7.97	7.91	8.41	1.94	1.57	1.58	1.45	2.31	1.48	1.50	1.39	0.36	0.20	0.19	0.16
US-NE	8.02	8.03	7.98	8.35	2.05	1.62	1.61	1.37	2.40	1.74	1.81	1.48	0.39	0.22	0.23	0.15

Note: The table reports the mean of the log wage and the P50/P90, P90/P50, and Gini coefficient in wage levels of several specifications. Spillovers are fixed at 25% and κ is included in the model parameters. The first entry of each statistic refers to the empirical wage, followed by the two-equations model at the empirical, 0%, and 100% coverage.

Figure 16: Collective Bargaining Coverage and Wage Inequality: Model Performance with Spillover



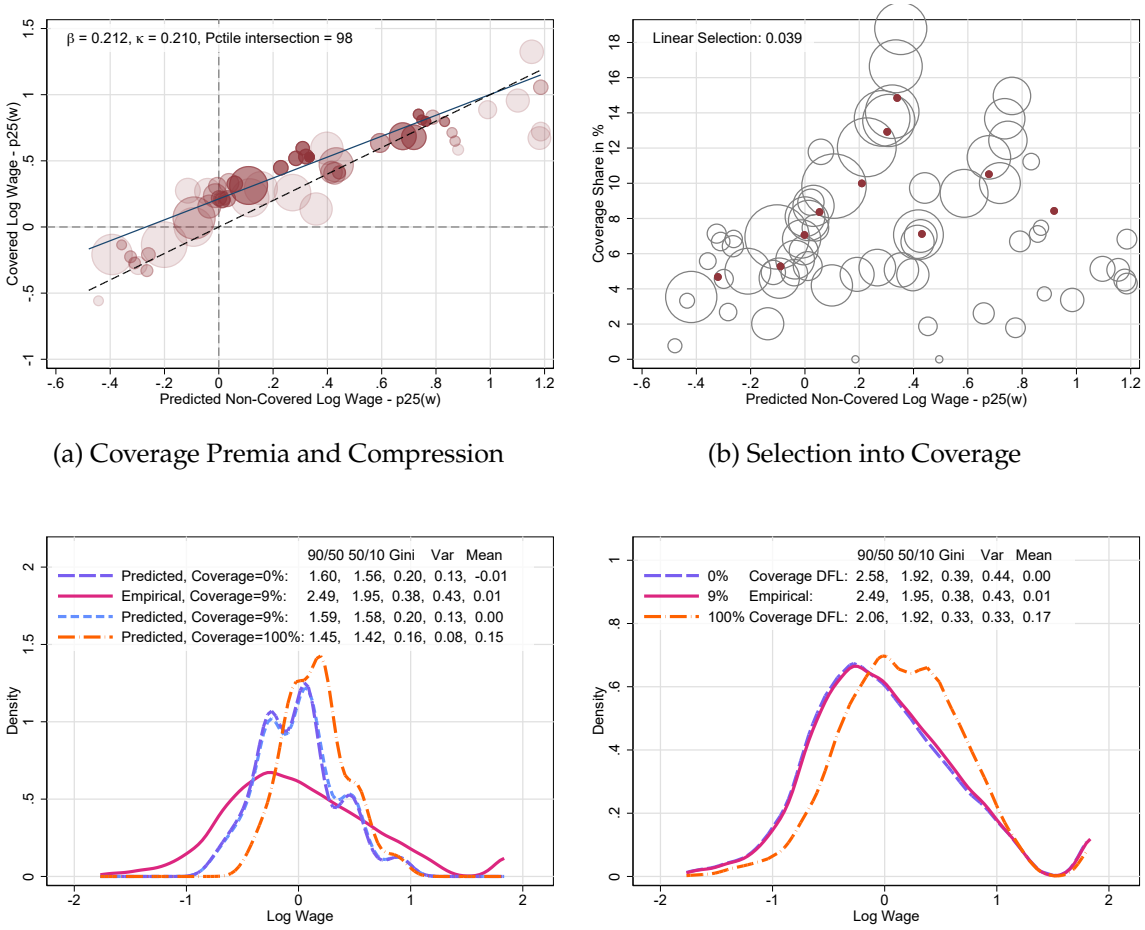
(a) Variance of (log) Wages from Parametric Model, and No-Coverage Model-Based Counterfactual vs. Coverage.

Note: This Figure replicates Figure 15 Panel (b) with spillovers fixed at 25%.

Print Appendix B: Controlling for Bargaining Cells

Extension: Zooming into Bargaining Cells—United States While we so far took a national approach to effects of coverage on the wage structure, collective bargaining may shape wages most directly at the bargaining cell. For the U.S., the basic bargaining cell is the workplace, such as a firm. Hence, as a simple proxy, we check whether including controls for the interaction of firm size bins, industry and state in the wage equation (i.e., among covered workers) may affect the estimates. Figure 17 reports the results, again replicating the previous figures for this robustness check.

Figure 17: Results Accounting for Proxies for Bargaining Cells: USA



(a) Coverage Premia and Compression

(b) Selection into Coverage

(c) Wage Structure, Model

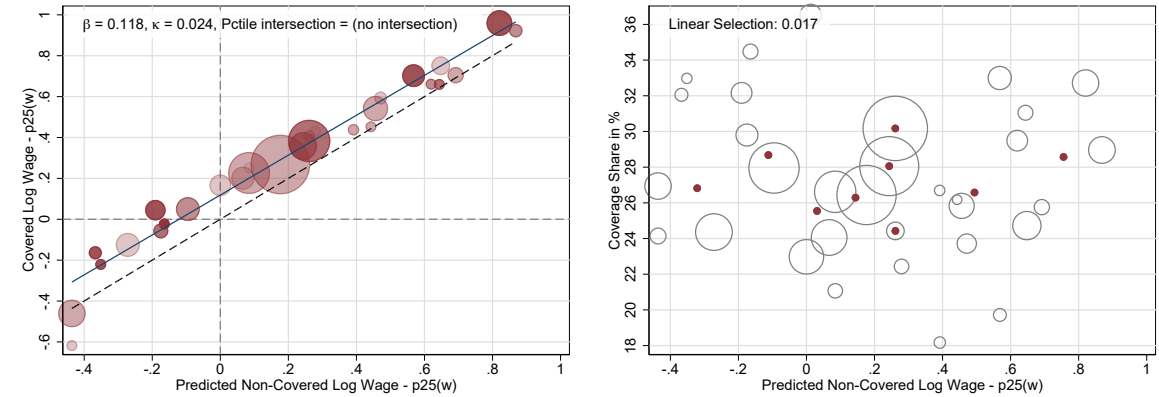
(d) Wage Structure, DFL

Note: This figure replicates the main figure for the USA but adjusts for a proxy of bargaining cells in the wage regression for covered workers via partialling out firm size x state x industry cells.

Extension: Zooming into Bargaining Cells—Germany We again also consider an extension where we permit the wage effect to occur within bargaining cells rather than zooming out to the aggregate wage distribution. In Germany, the most appropriate definition of the bargaining cell is the industry

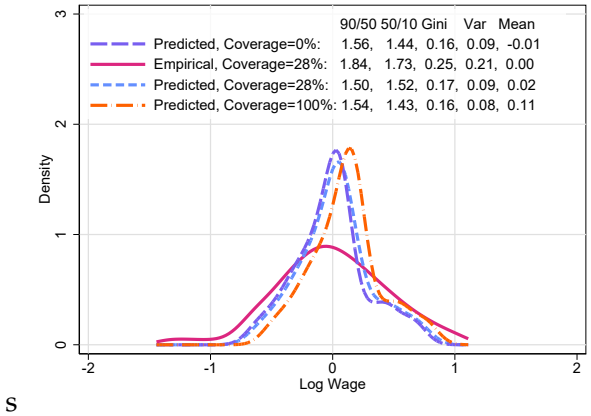
and region (state), given the sectoral bargaining system we described. Hence, we now check whether including an industry-state fixed effect in the wage equation (i.e., among covered workers) may affect the estimates. Figure 18 reports these results.

Figure 18: Results Approximating Bargaining Cells: Germany



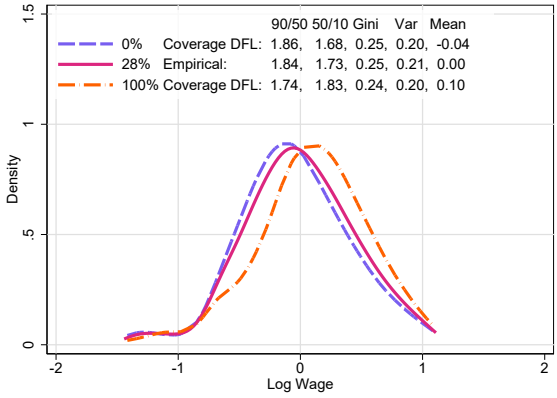
(a) Coverage Premia and Compression

(b) Selection into Coverage



s

(c) Wage Structure, DFL

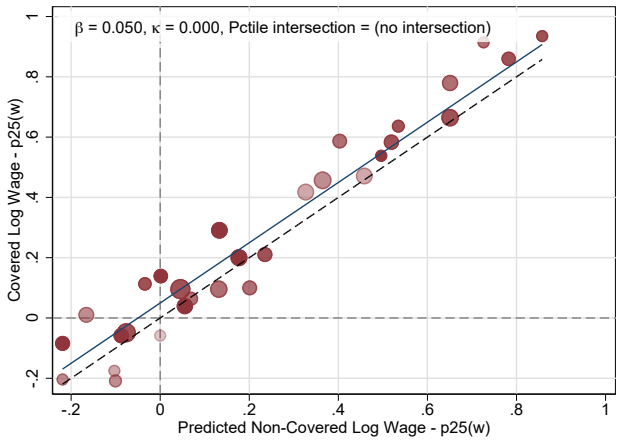


(d) Wage Structure, Model

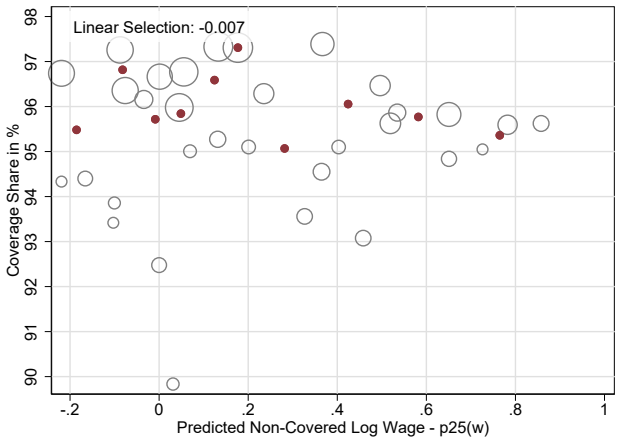
Note: This figure replicates the main figure for Germany but adjusts for a proxy of bargaining cells in the wage regression for covered workers via partialling out state x industry cells.

Print Appendix C: Country by Country Results

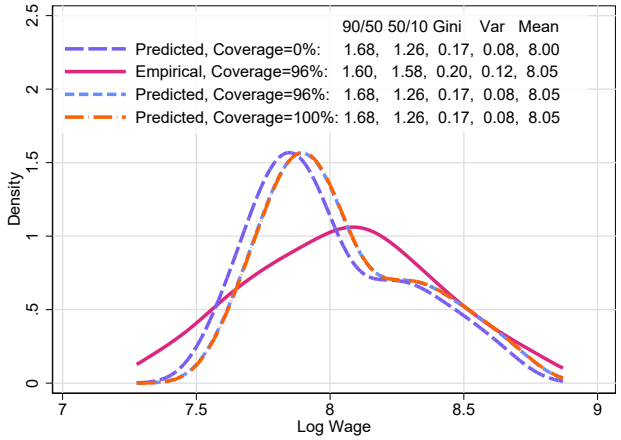
Figure 19: Belgium 2018



(a) Coverage Premium and Compression



(b) Selection into Coverage

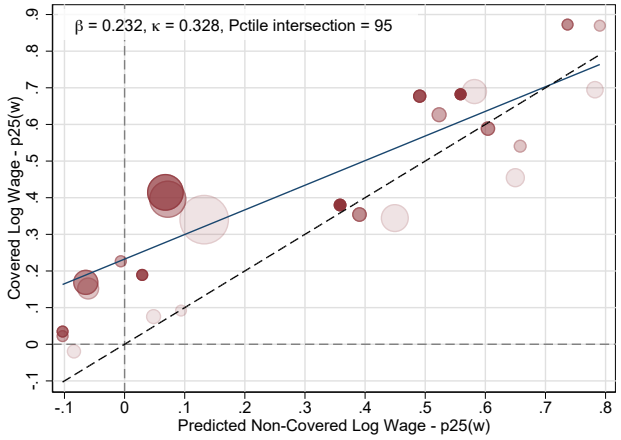


(c) Wage Structure, Model

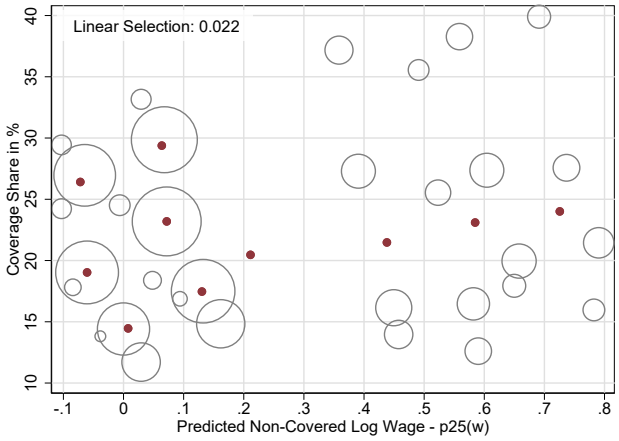
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

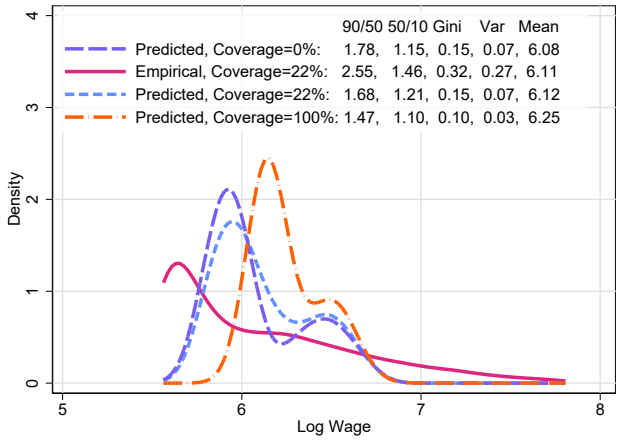
Figure 20: Bulgaria 2018



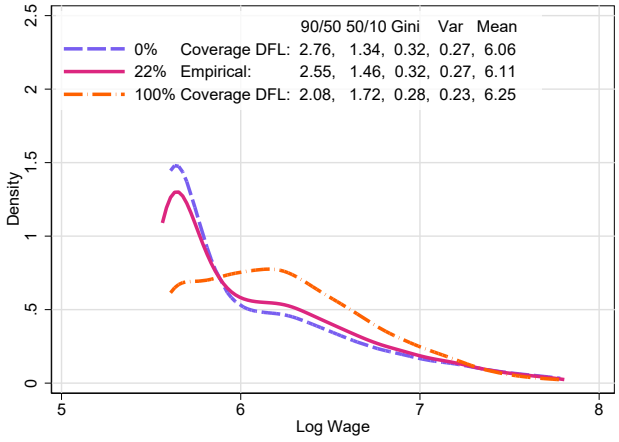
(a) Coverage Premium and Compression



(b) Selection into Coverage



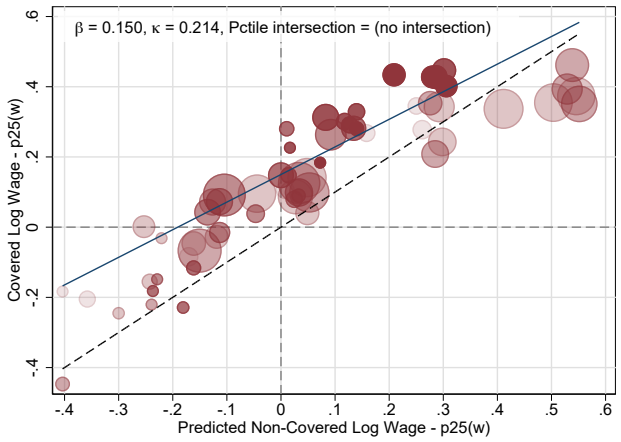
(c) Wage Structure, Model



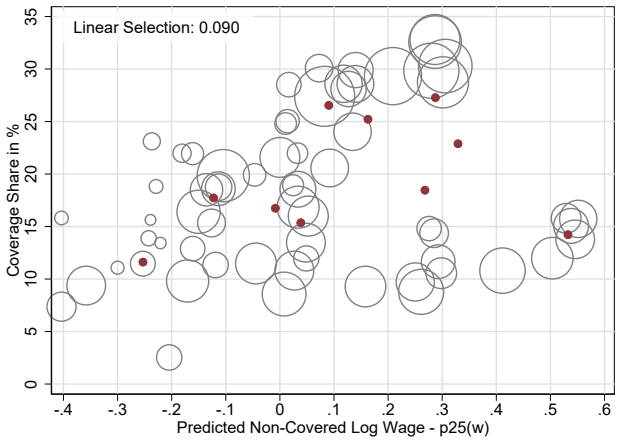
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

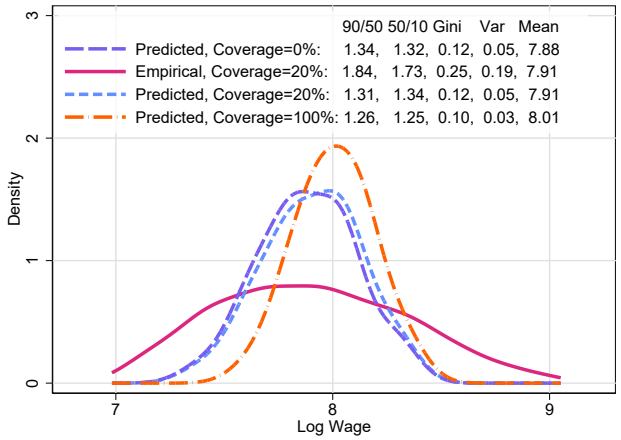
Figure 21: Canada 2018



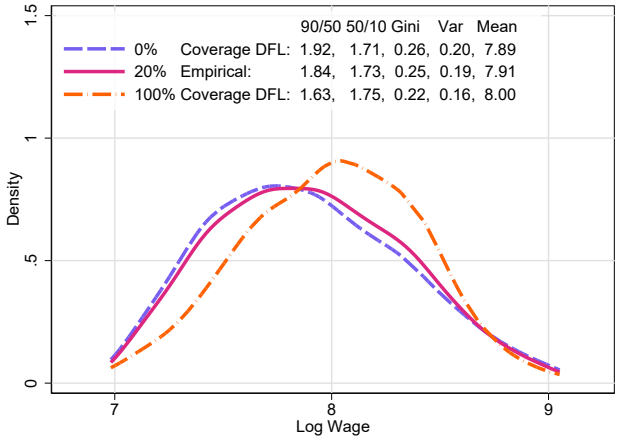
(a) Coverage Premium and Compression



(b) Selection into Coverage



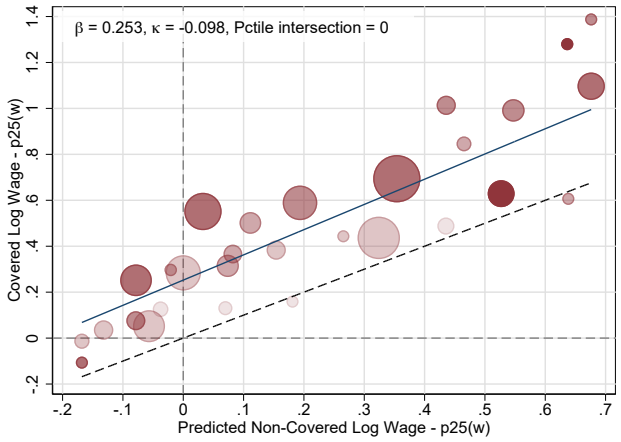
(c) Wage Structure, Model



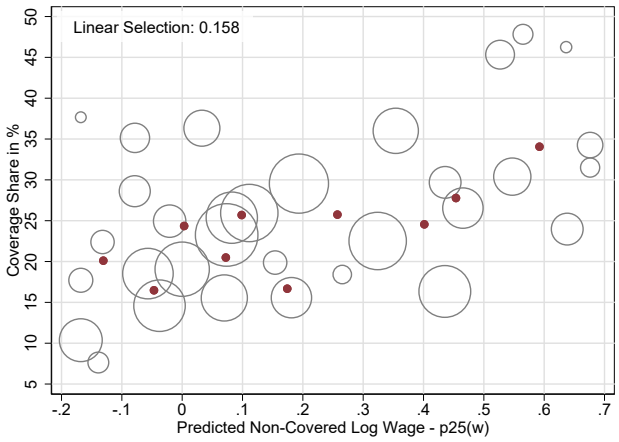
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

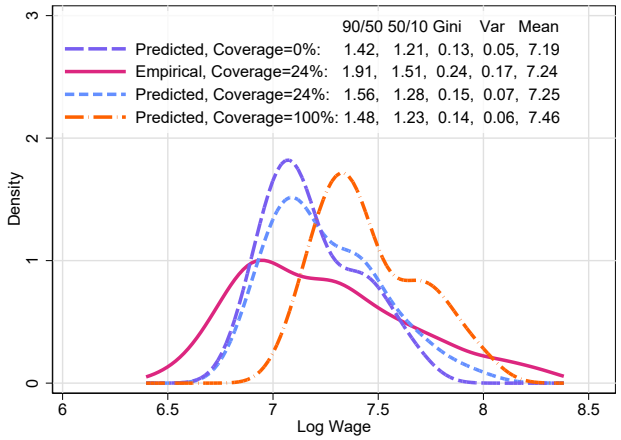
Figure 22: Cyprus 2018



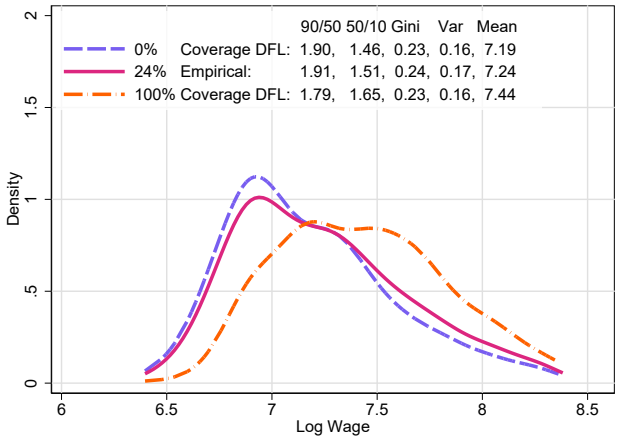
(a) Coverage Premium and Compression



(b) Selection into Coverage



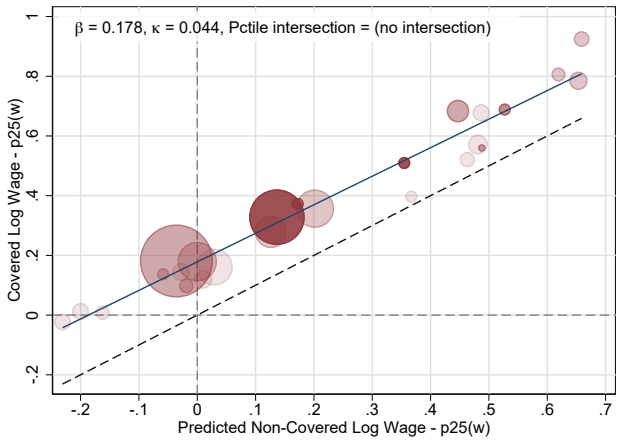
(c) Wage Structure, Model



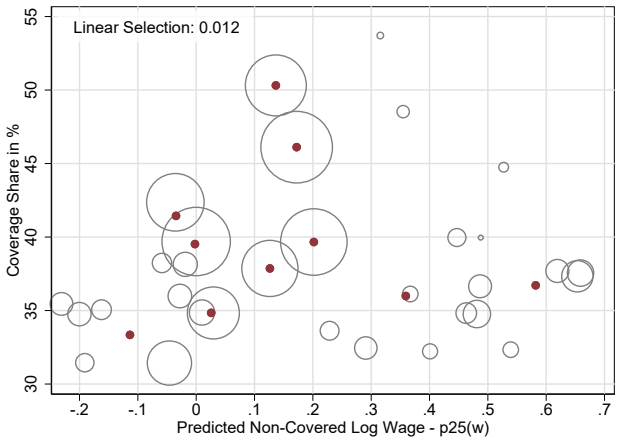
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

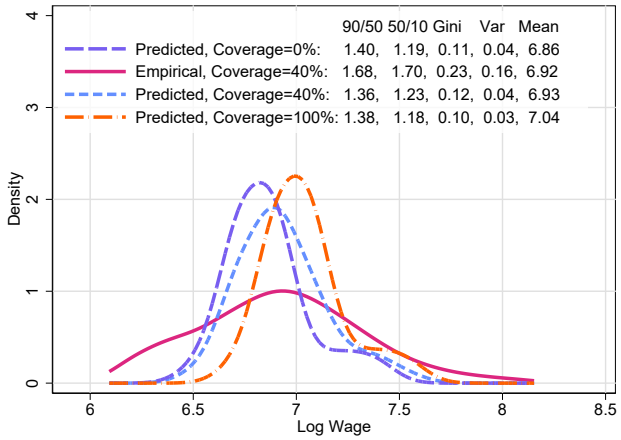
Figure 23: Czechia 2018



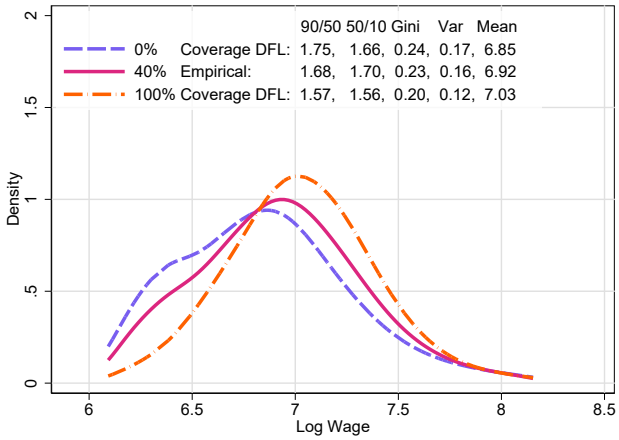
(a) Coverage Premium and Compression



(b) Selection into Coverage



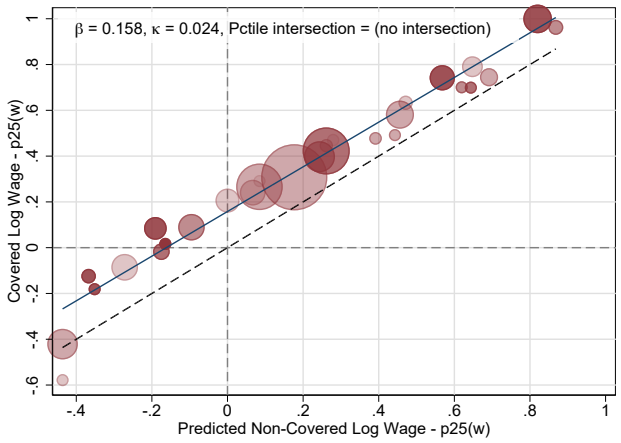
(c) Wage Structure, Model



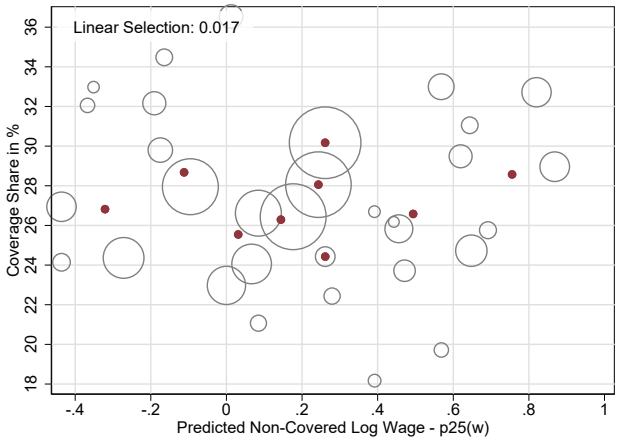
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

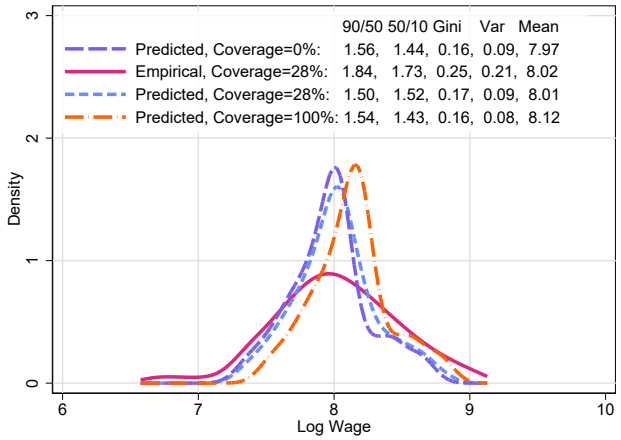
Figure 24: Germany 2018



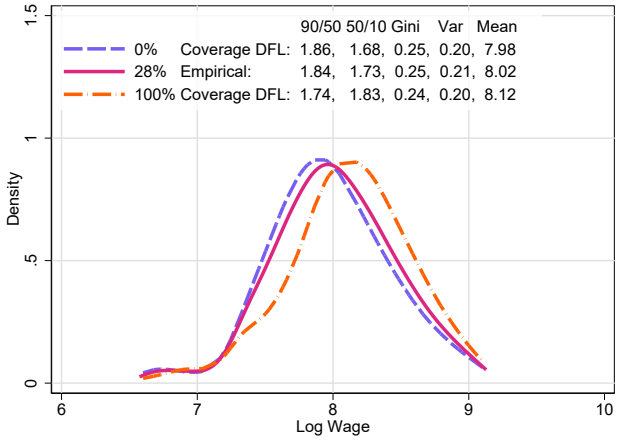
(a) Coverage Premium and Compression



(b) Selection into Coverage



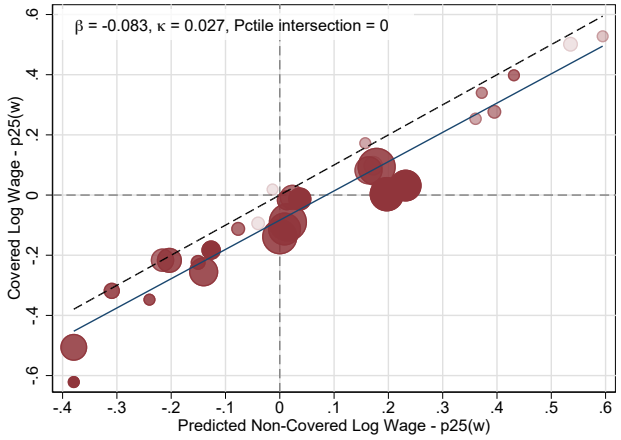
(c) Wage Structure, Model



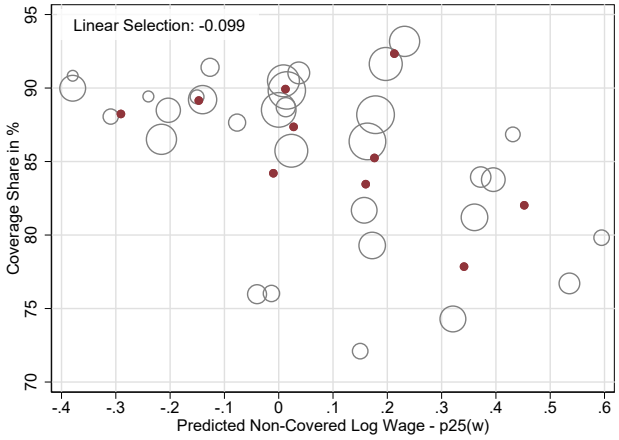
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

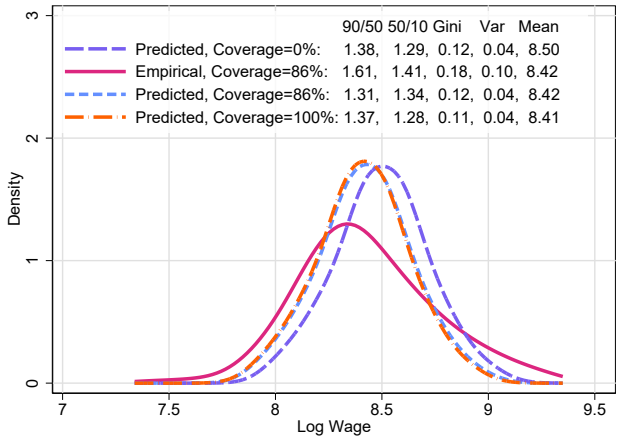
Figure 25: Denmark 2018



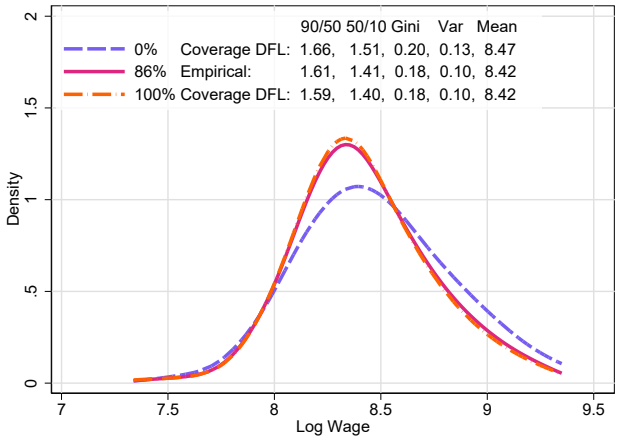
(a) Coverage Premium and Compression



(b) Selection into Coverage



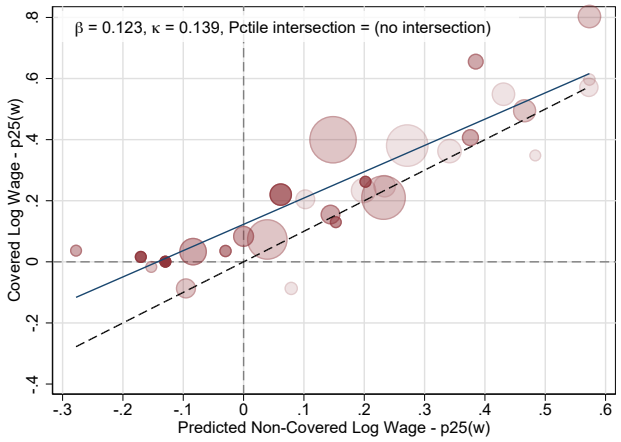
(c) Wage Structure, Model



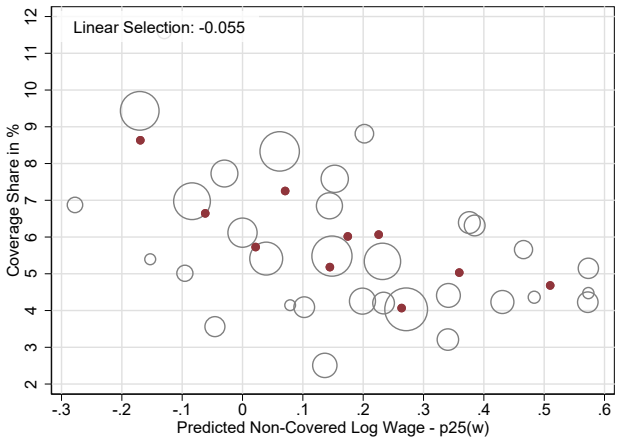
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

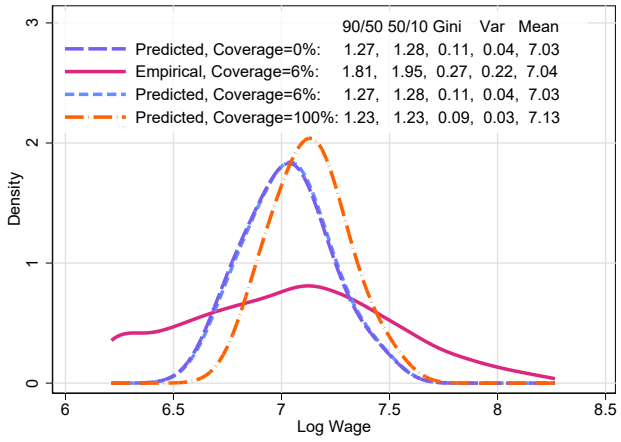
Figure 26: Estonia 2018



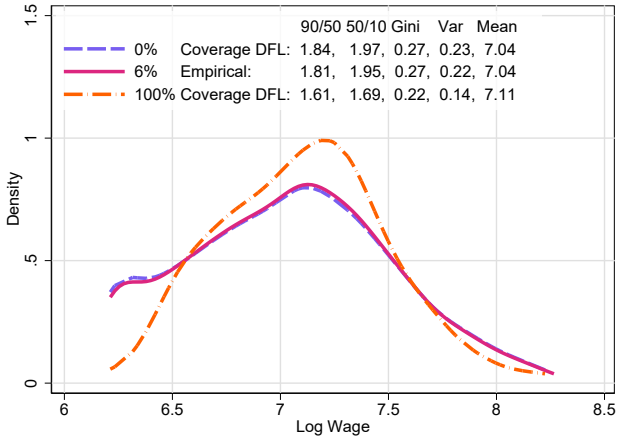
(a) Coverage Premium and Compression



(b) Selection into Coverage



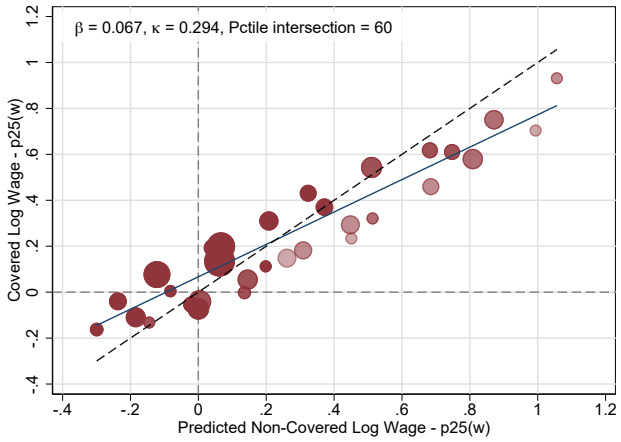
(c) Wage Structure, Model



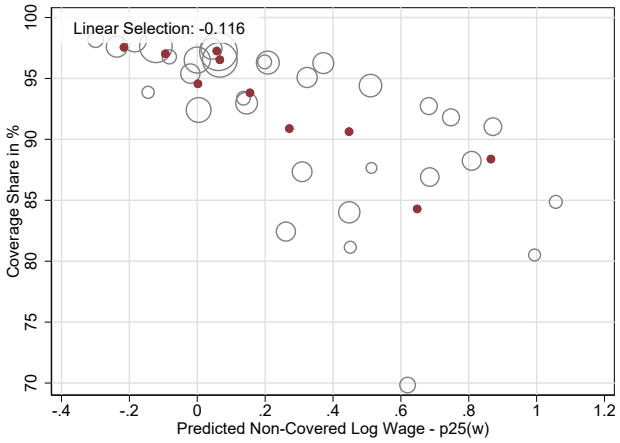
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

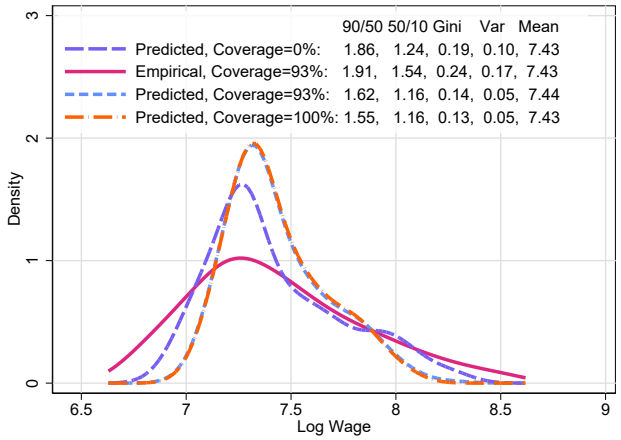
Figure 27: Spain 2018



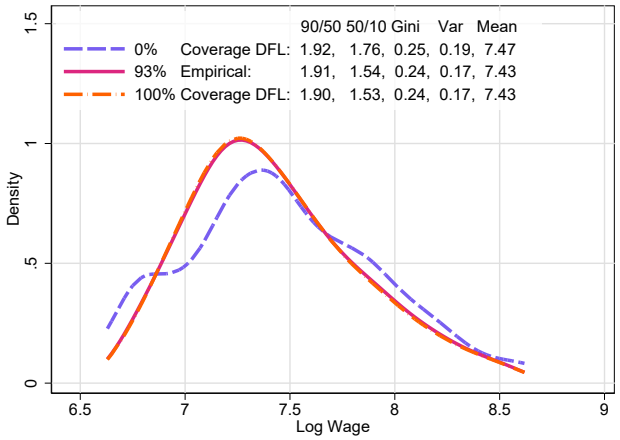
(a) Coverage Premium and Compression



(b) Selection into Coverage



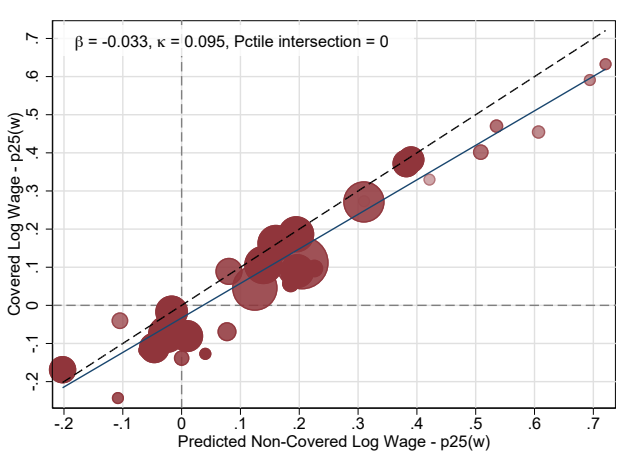
(c) Wage Structure, Model



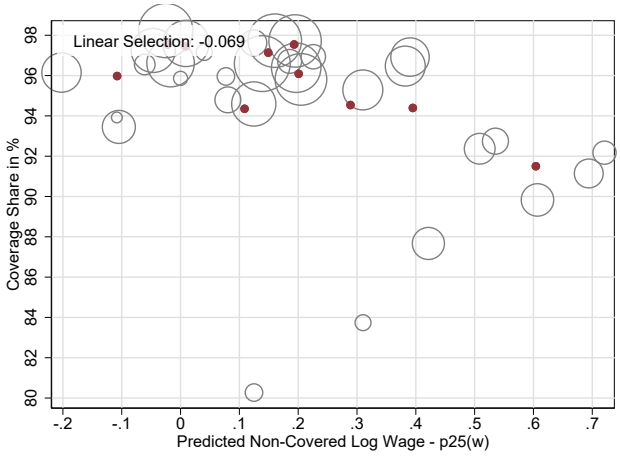
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

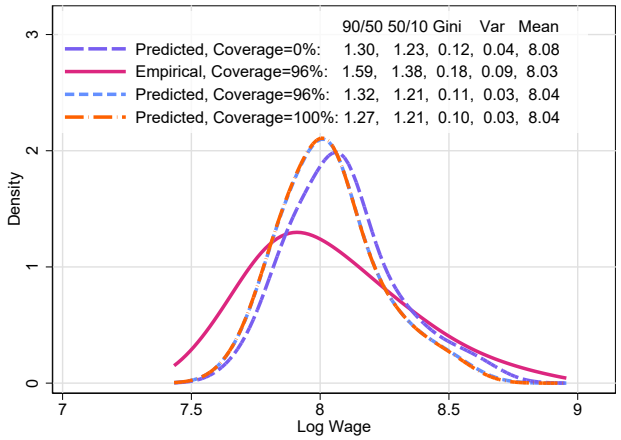
Figure 28: Finland 2018



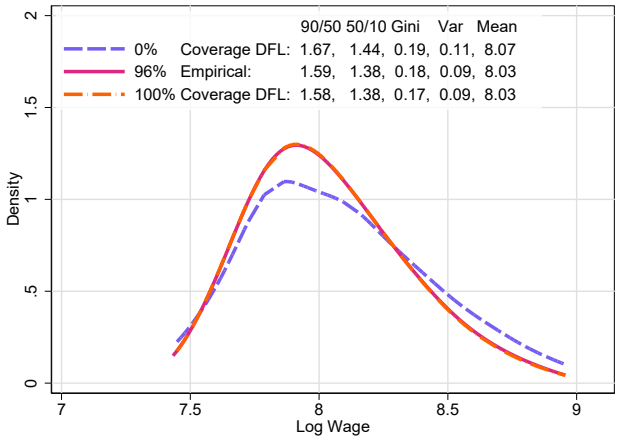
(a) Coverage Premium and Compression



(b) Selection into Coverage



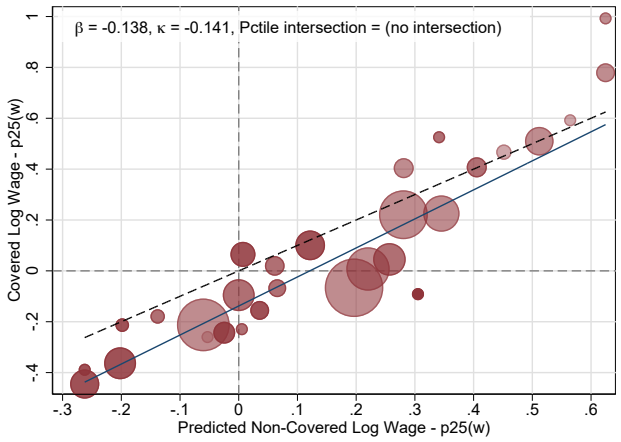
(c) Wage Structure, Model



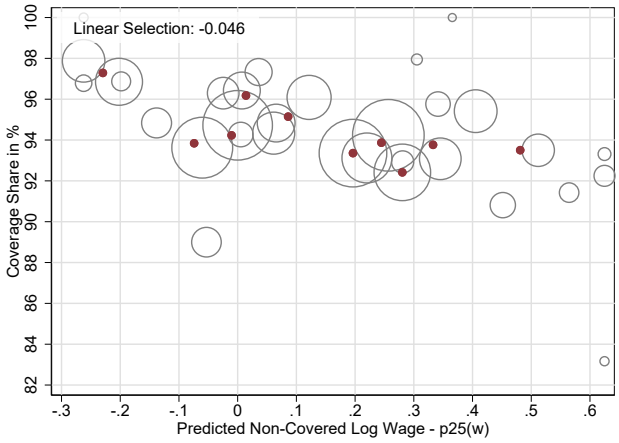
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

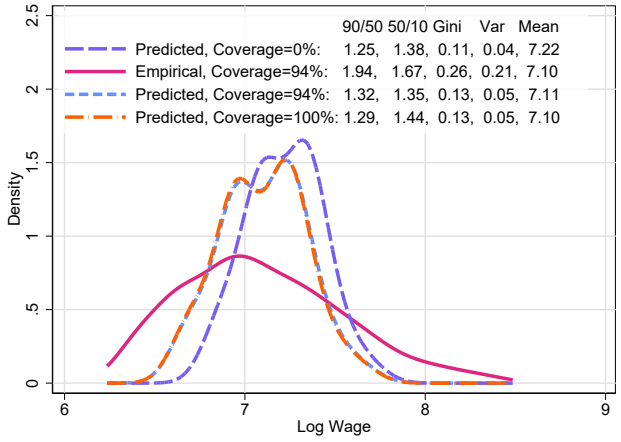
Figure 29: Greece 2018



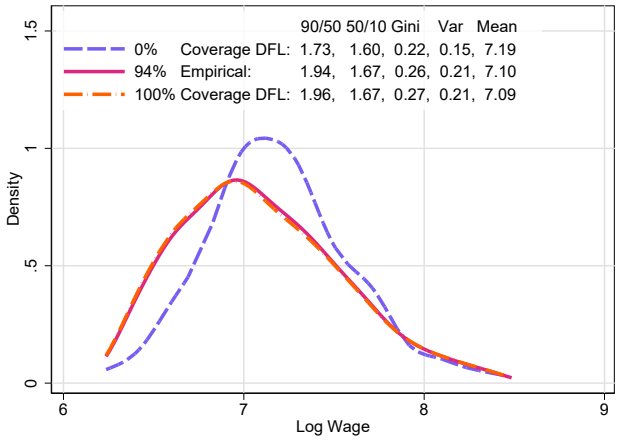
(a) Coverage Premium and Compression



(b) Selection into Coverage



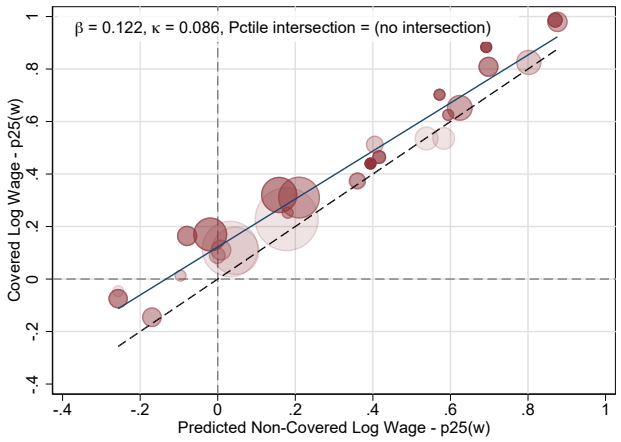
(c) Wage Structure, Model



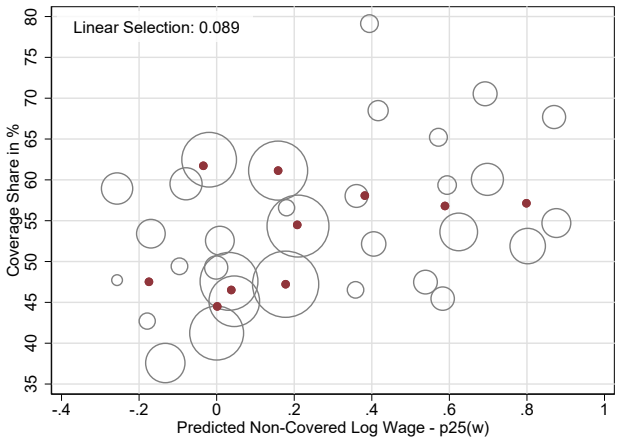
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

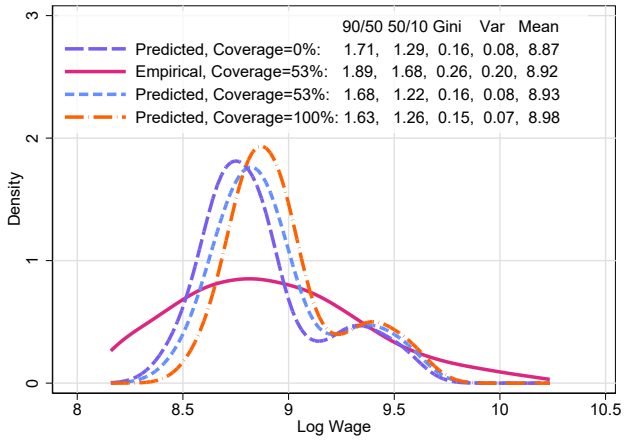
Figure 30: Croatia 2018



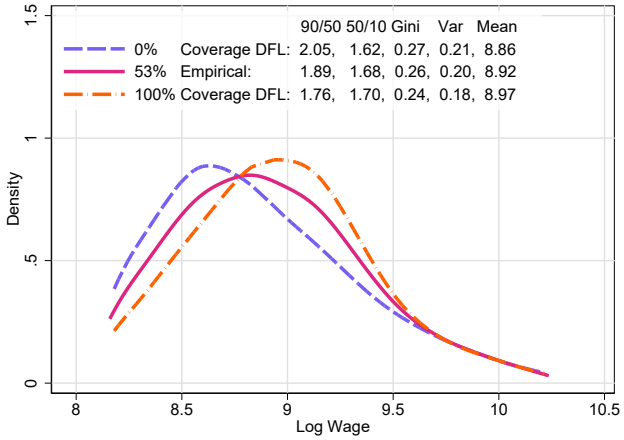
(a) Coverage Premium and Compression



(b) Selection into Coverage



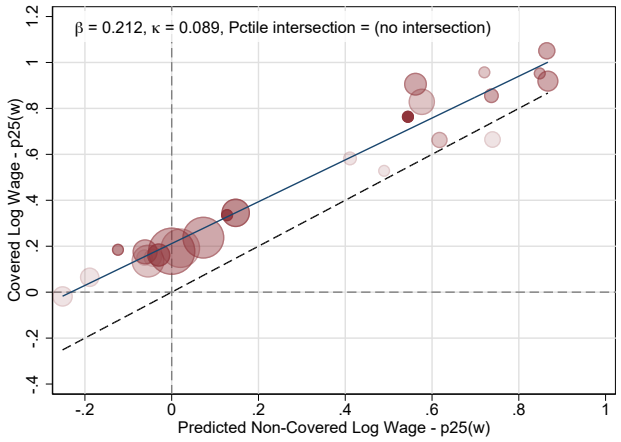
(c) Wage Structure, Model



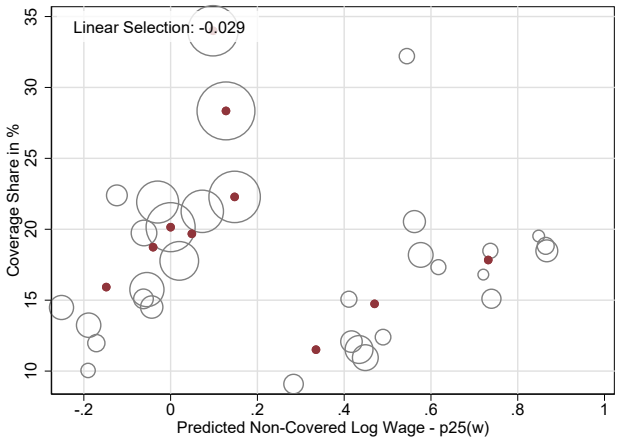
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

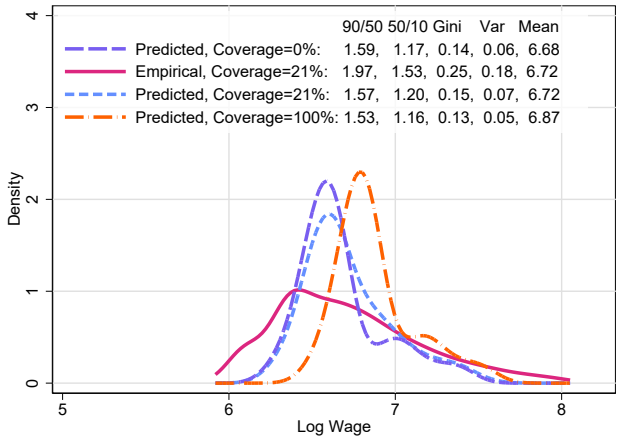
Figure 31: Hungary 2018



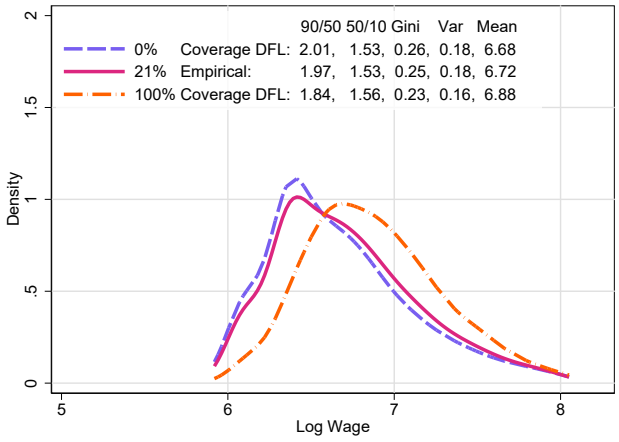
(a) Coverage Premium and Compression



(b) Selection into Coverage



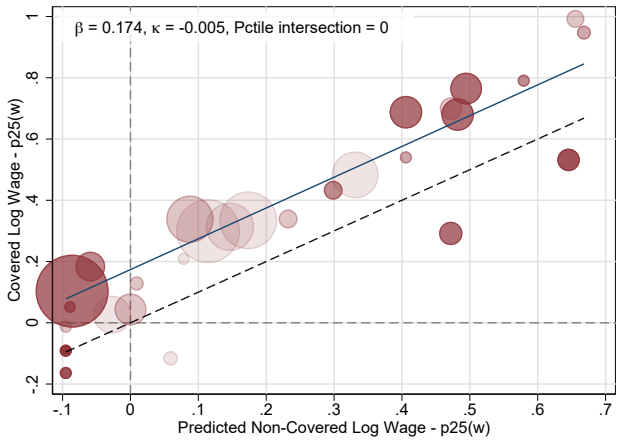
(c) Wage Structure, Model



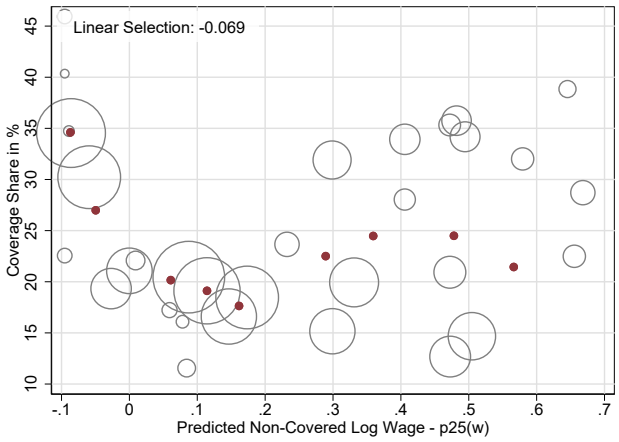
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

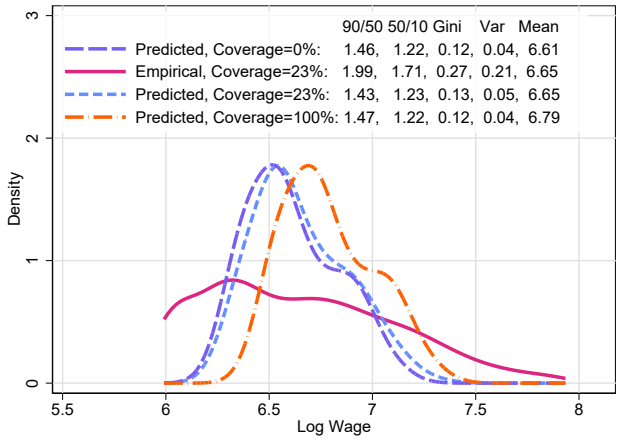
Figure 32: Lithuania 2018



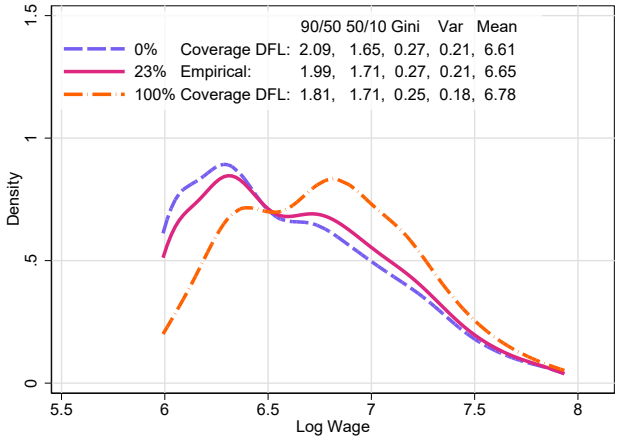
(a) Coverage Premium and Compression



(b) Selection into Coverage



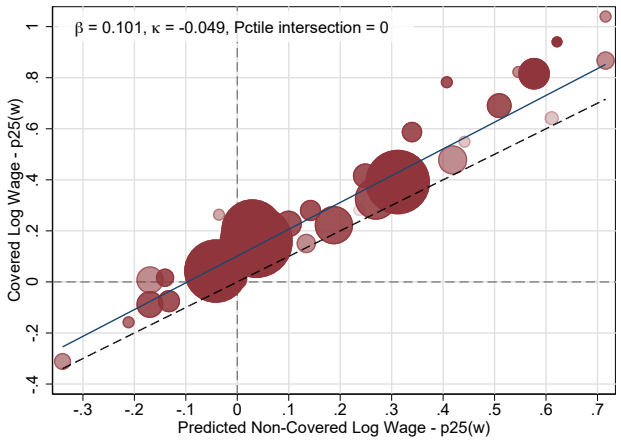
(c) Wage Structure, Model



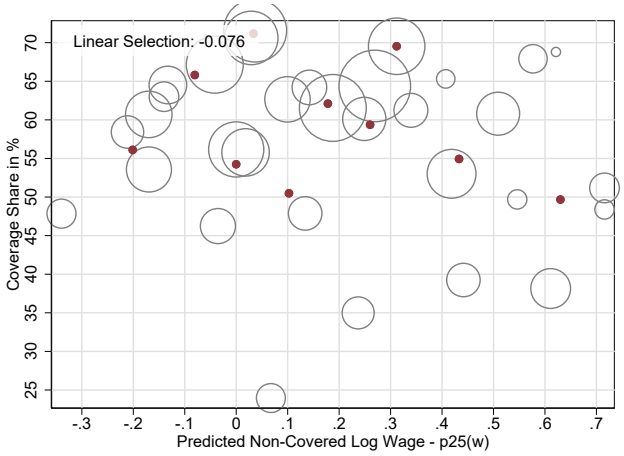
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

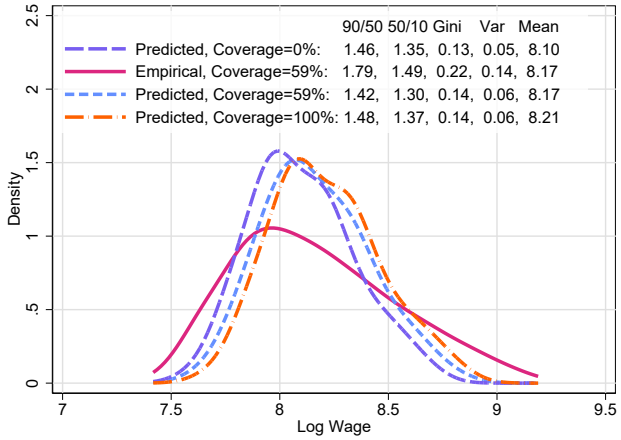
Figure 33: Luxembourg 2014



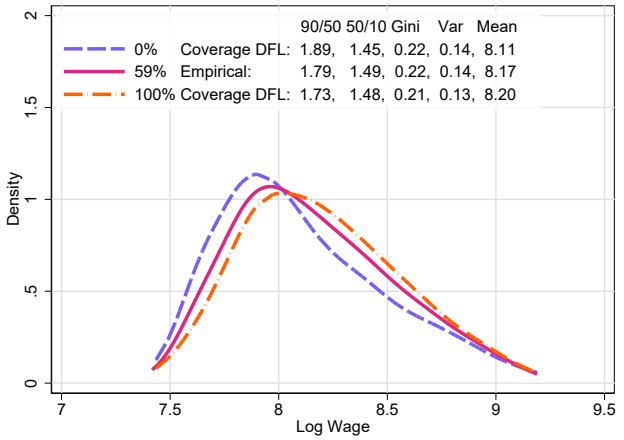
(a) Coverage Premium and Compression



(b) Selection into Coverage



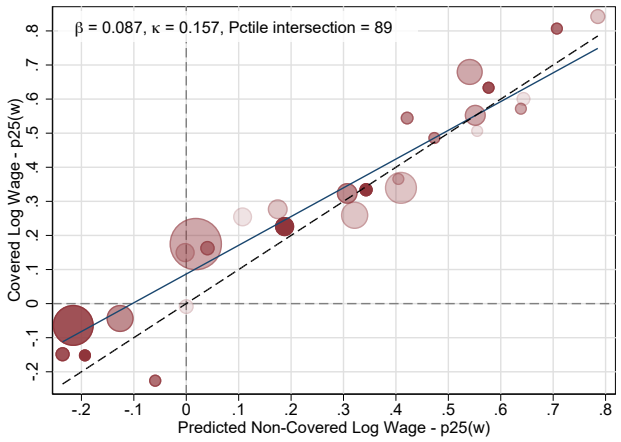
(c) Wage Structure, Model



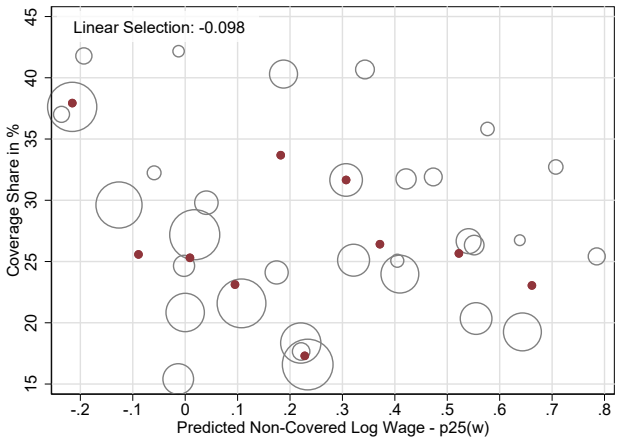
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

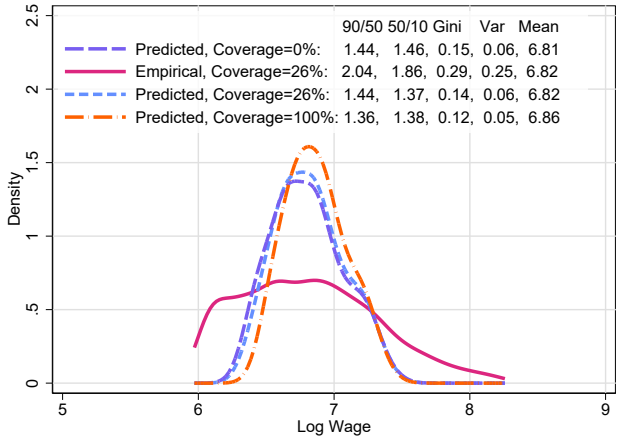
Figure 34: Latvia 2018



(a) Coverage Premium and Compression



(b) Selection into Coverage

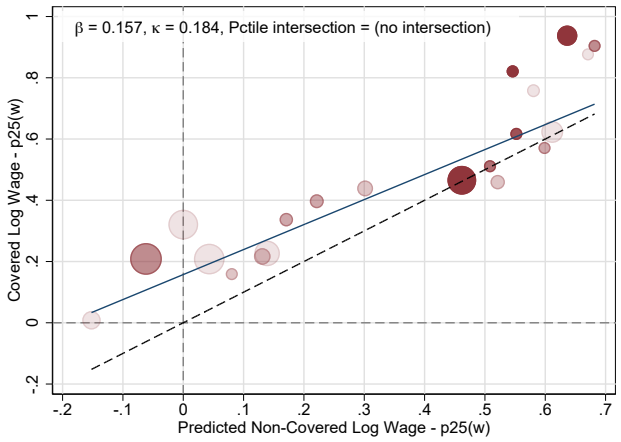


(c) Wage Structure, Model

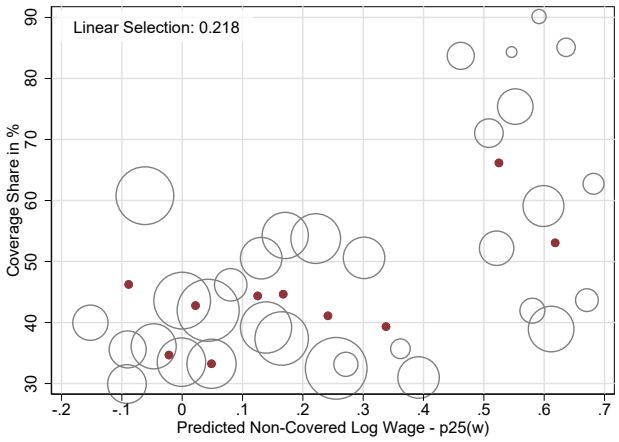
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

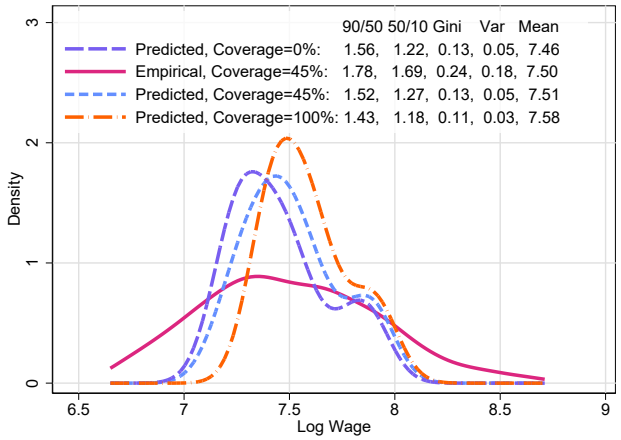
Figure 35: Malta 2018



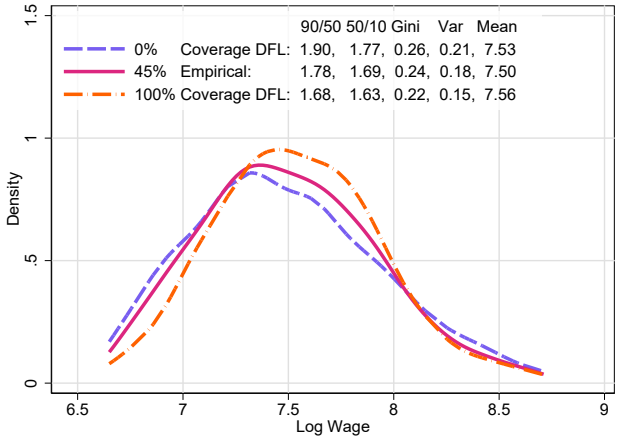
(a) Coverage Premium and Compression



(b) Selection into Coverage



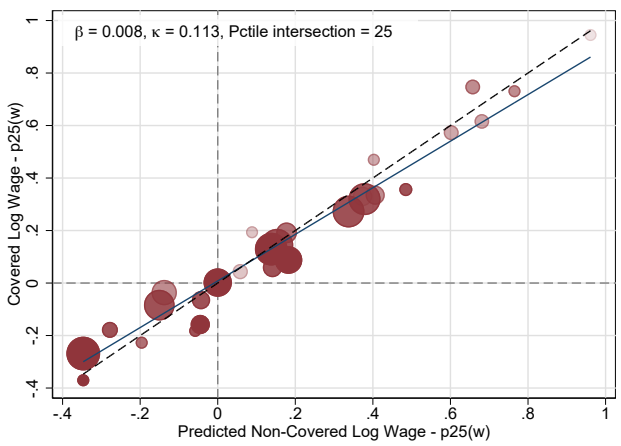
(c) Wage Structure, Model



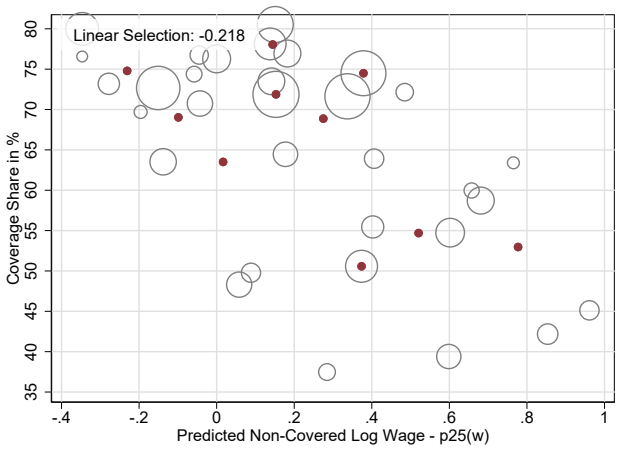
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

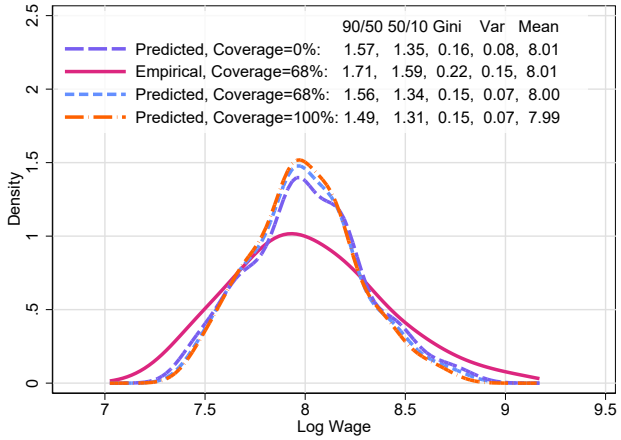
Figure 36: Netherlands 2018



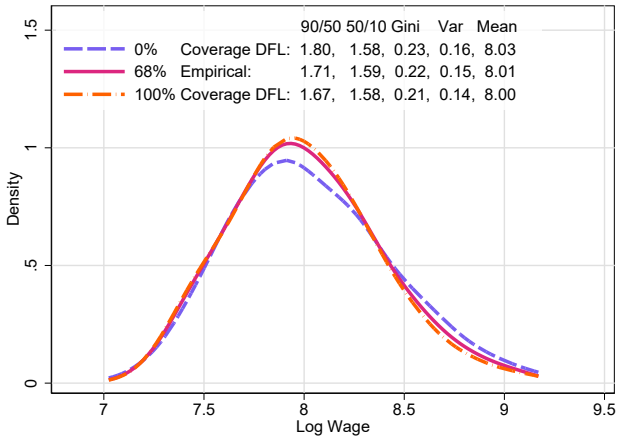
(a) Coverage Premium and Compression



(b) Selection into Coverage



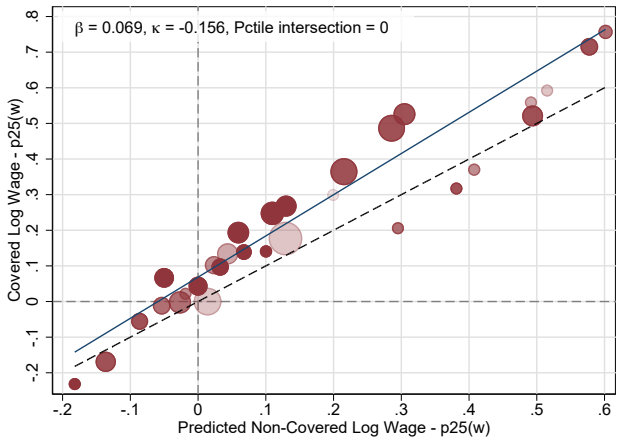
(c) Wage Structure, Model



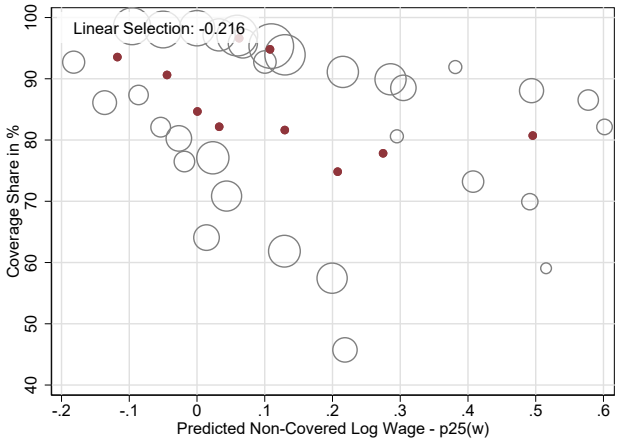
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

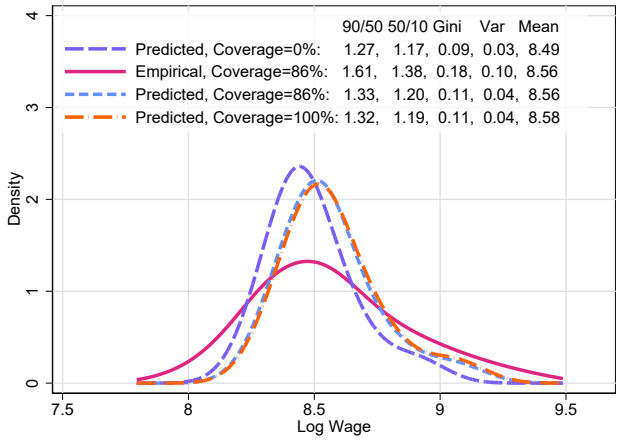
Figure 37: Norway 2014



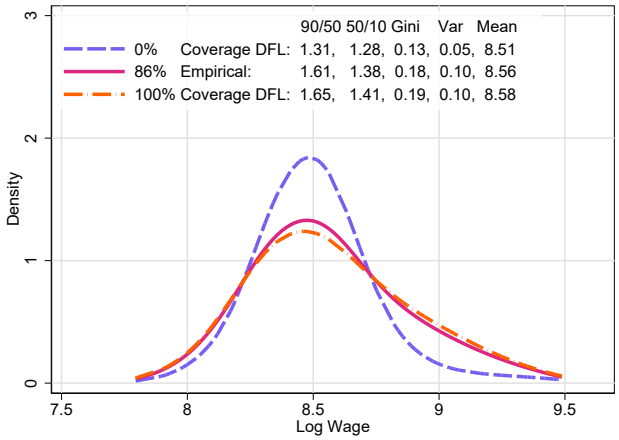
(a) Coverage Premium and Compression



(b) Selection into Coverage



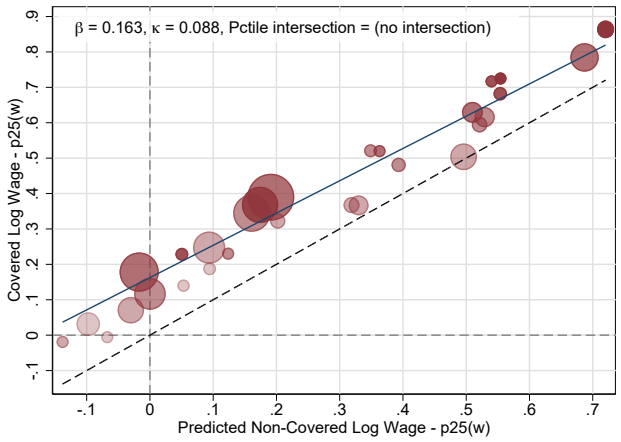
(c) Wage Structure, Model



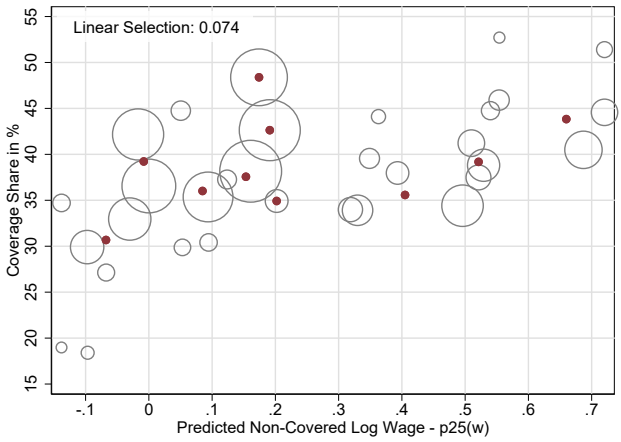
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

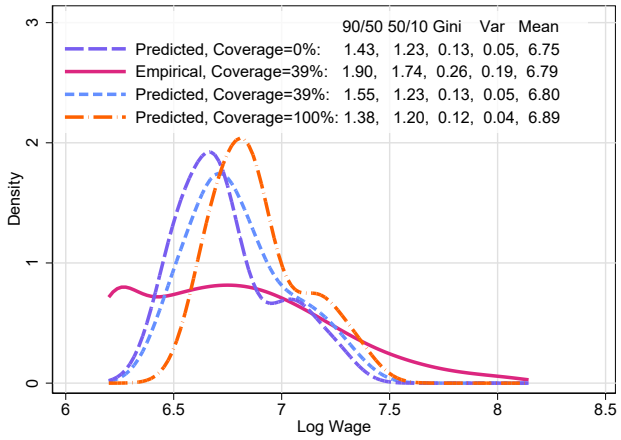
Figure 38: Poland 2018



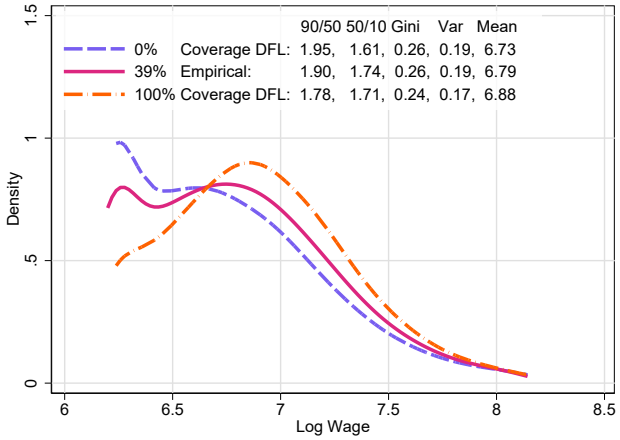
(a) Coverage Premium and Compression



(b) Selection into Coverage



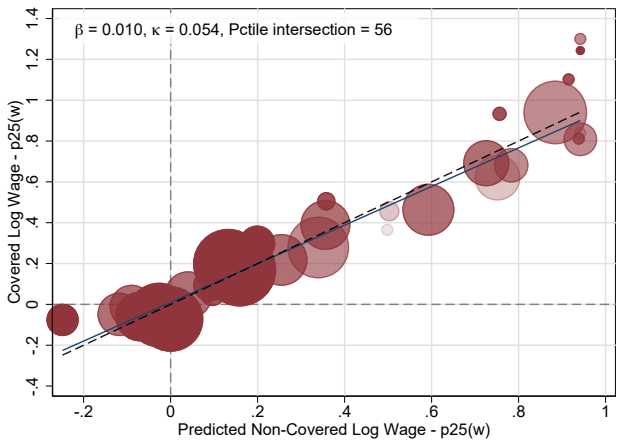
(c) Wage Structure, Model



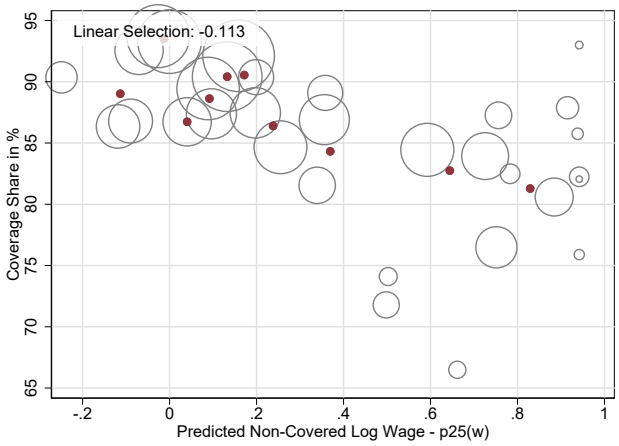
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

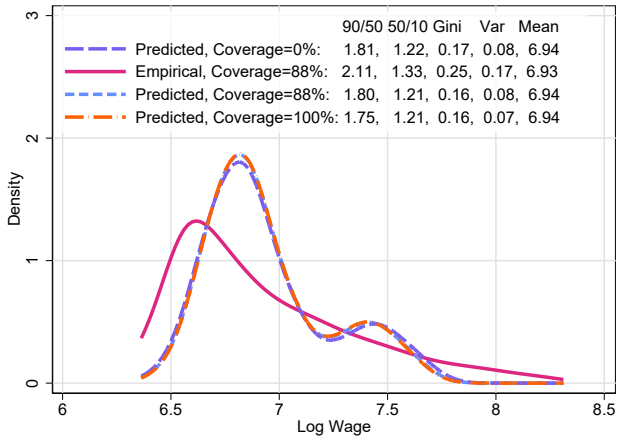
Figure 39: Portugal 2018



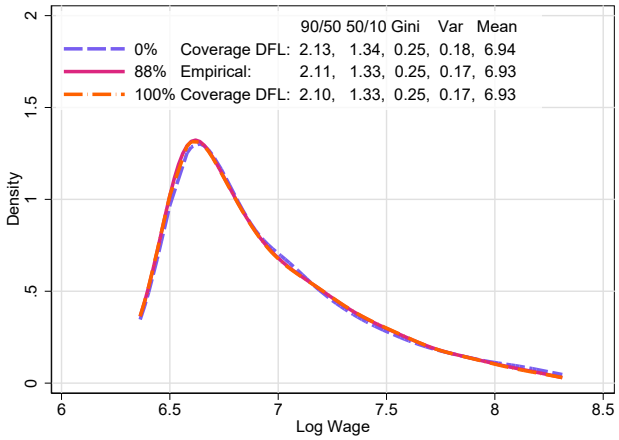
(a) Coverage Premium and Compression



(b) Selection into Coverage



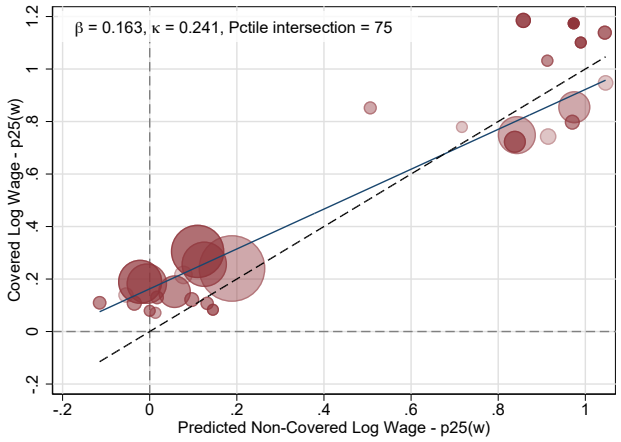
(c) Wage Structure, Model



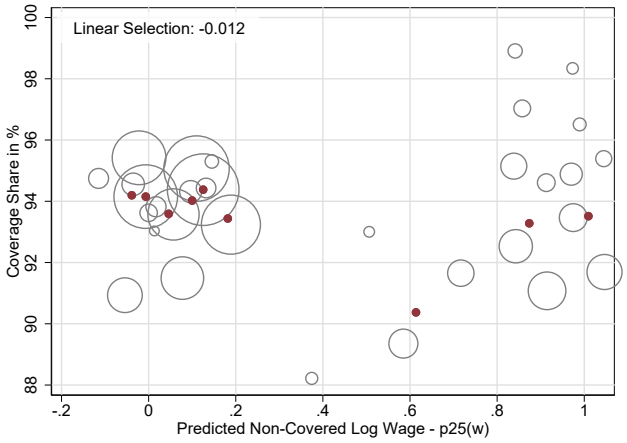
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

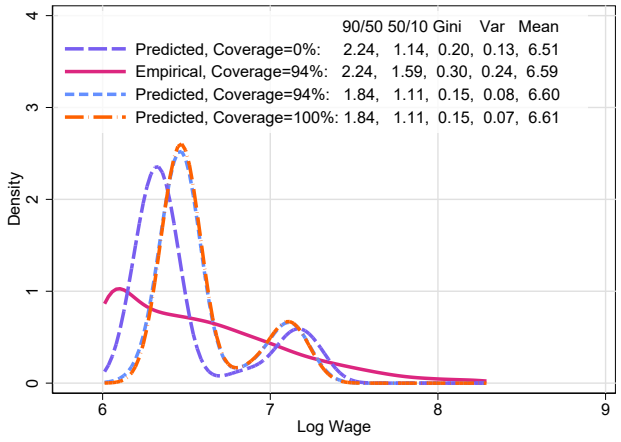
Figure 40: Romania 2018



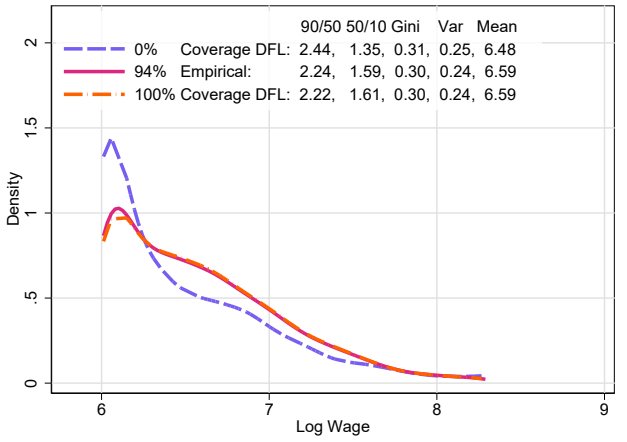
(a) Coverage Premium and Compression



(b) Selection into Coverage



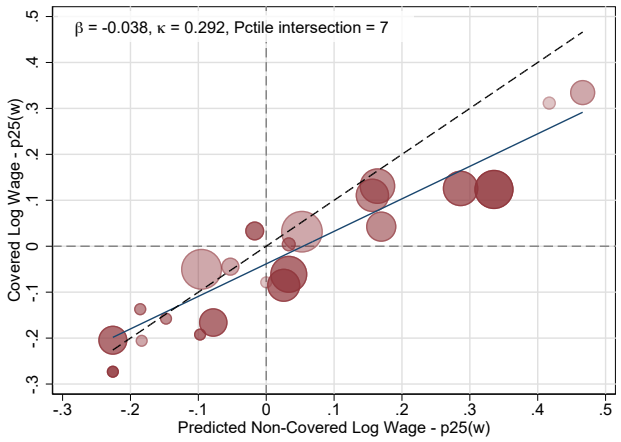
(c) Wage Structure, Model



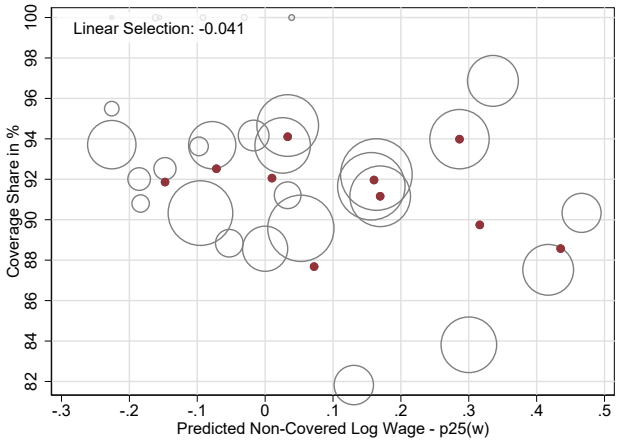
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

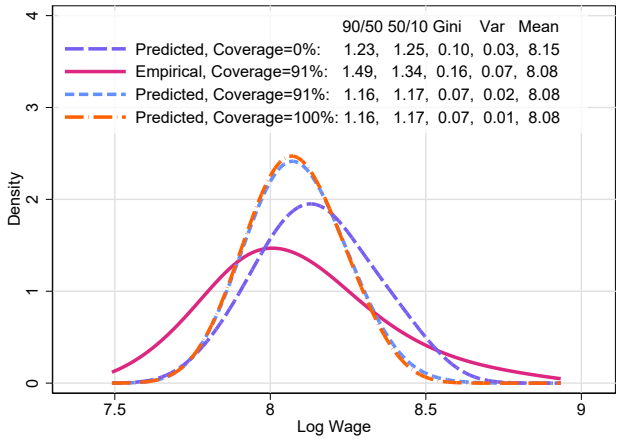
Figure 41: Sweden 2018



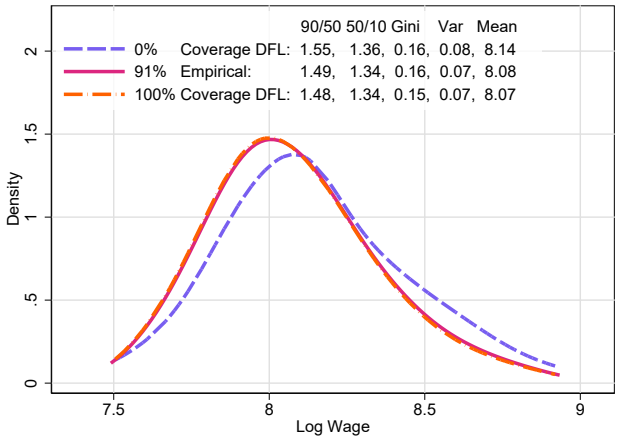
(a) Coverage Premium and Compression



(b) Selection into Coverage



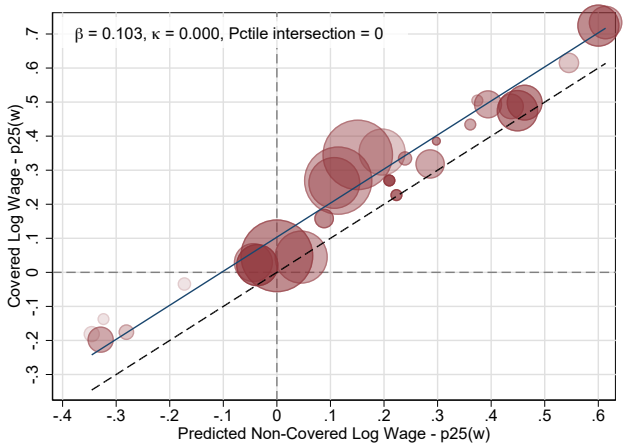
(c) Wage Structure, Model



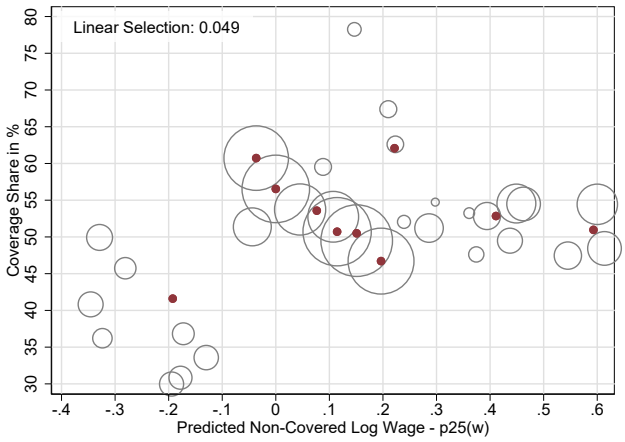
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

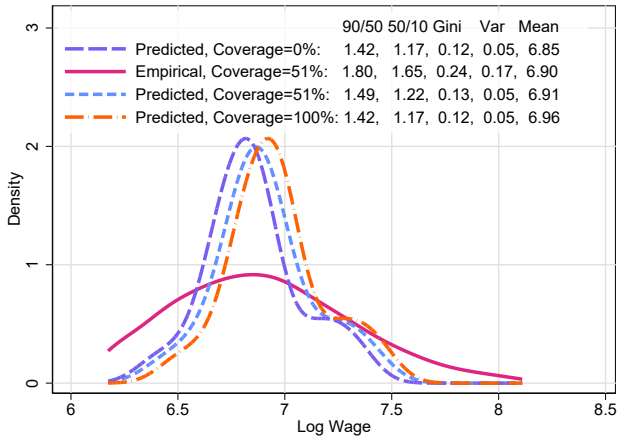
Figure 42: Slovakia 2018



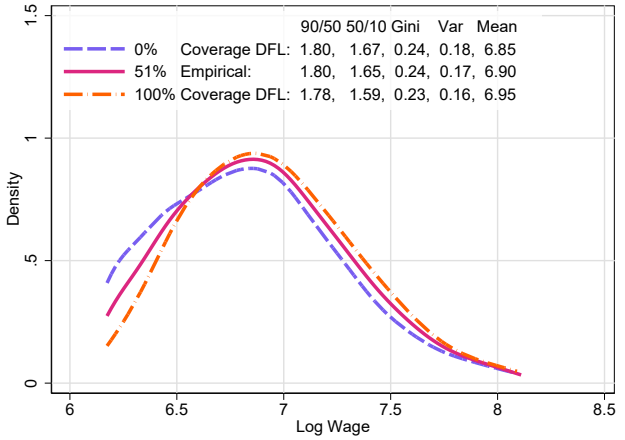
(a) Coverage Premium and Compression



(b) Selection into Coverage



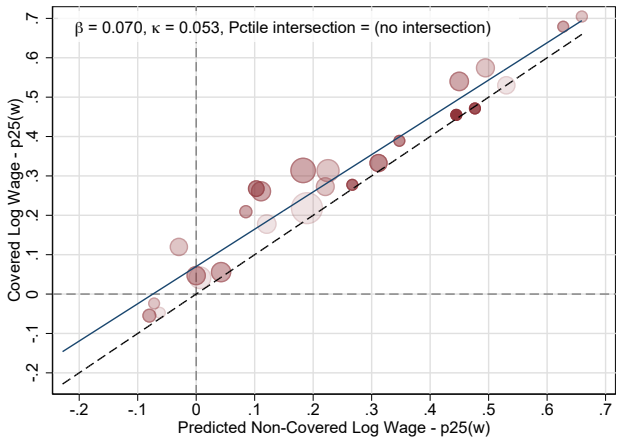
(c) Wage Structure, Model



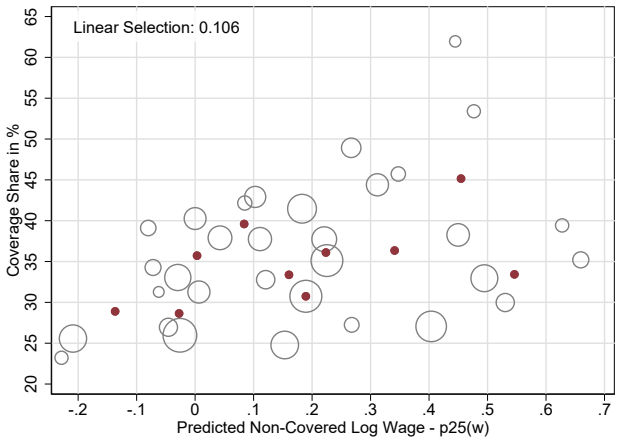
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

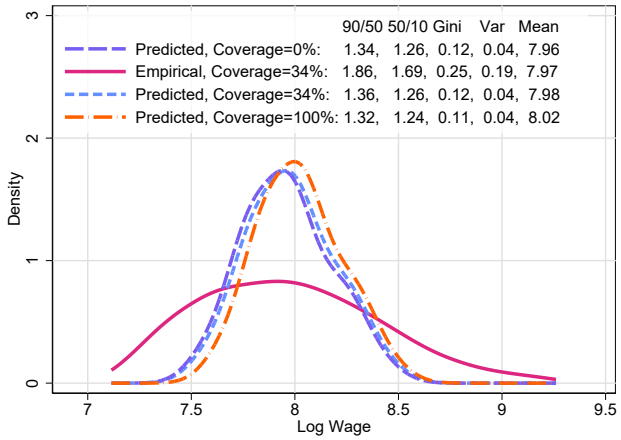
Figure 43: United Kingdom 2014



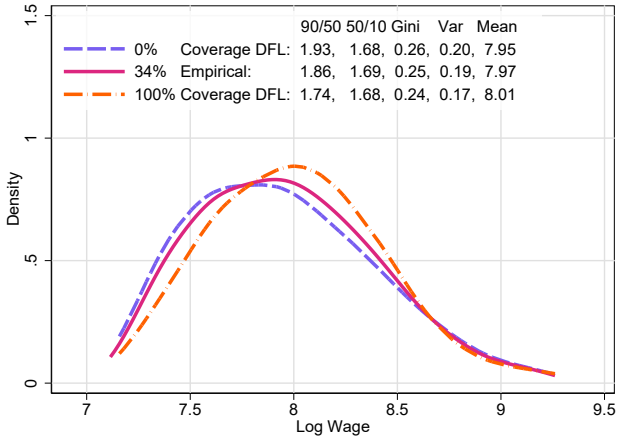
(a) Coverage Premium and Compression



(b) Selection into Coverage



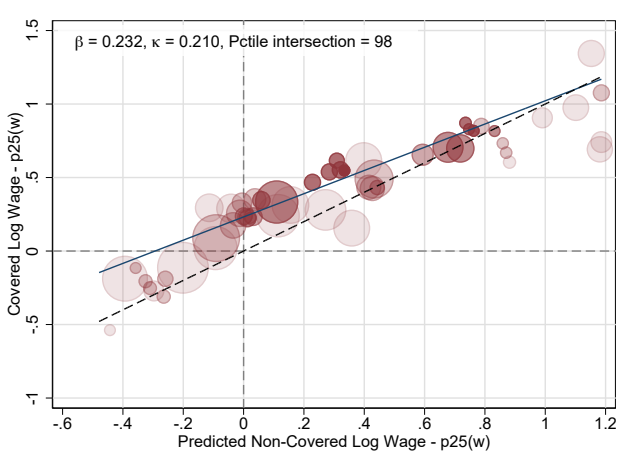
(c) Wage Structure, Model



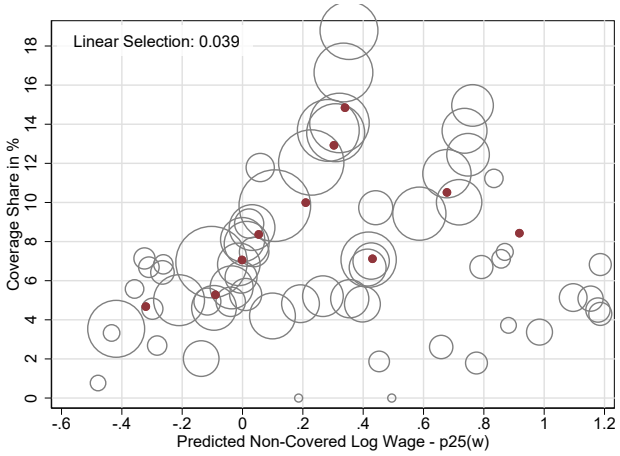
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

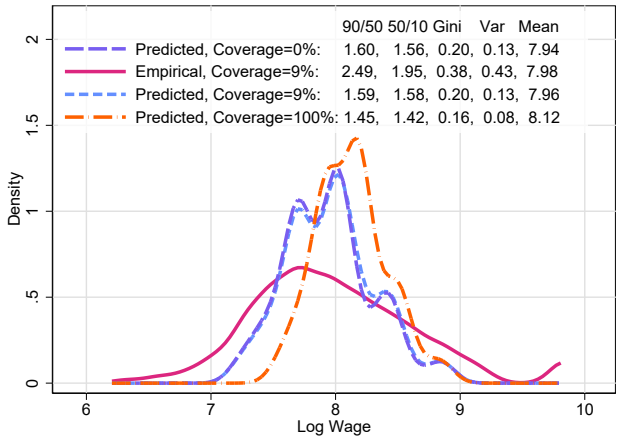
Figure 44: United States 2018



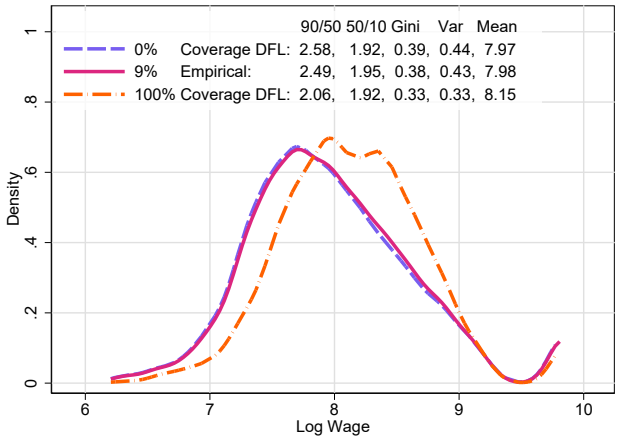
(a) Coverage Premium and Compression



(b) Selection into Coverage



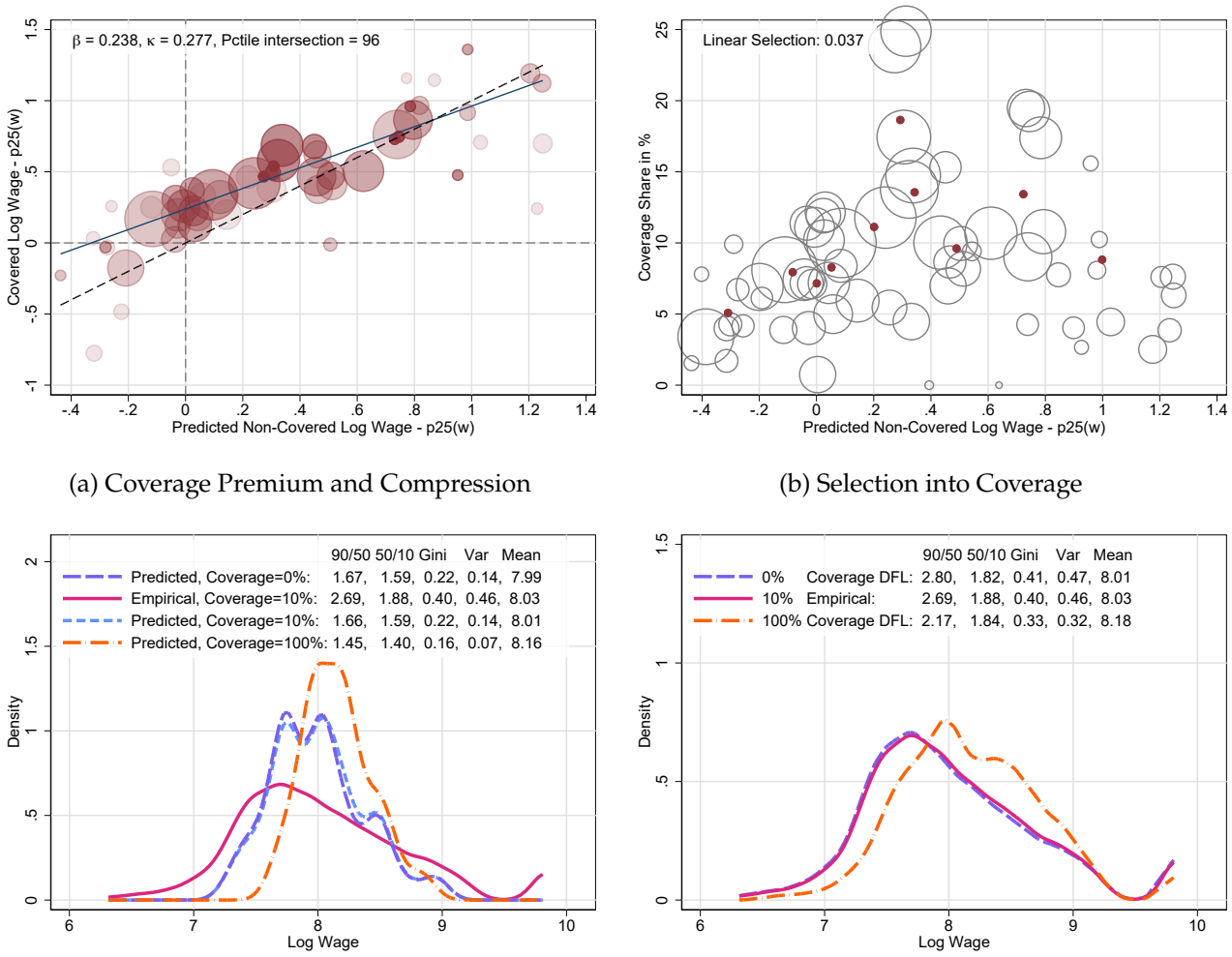
(c) Wage Structure, Model



(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

Figure 45: United States, West 2018



(a) Coverage Premium and Compression

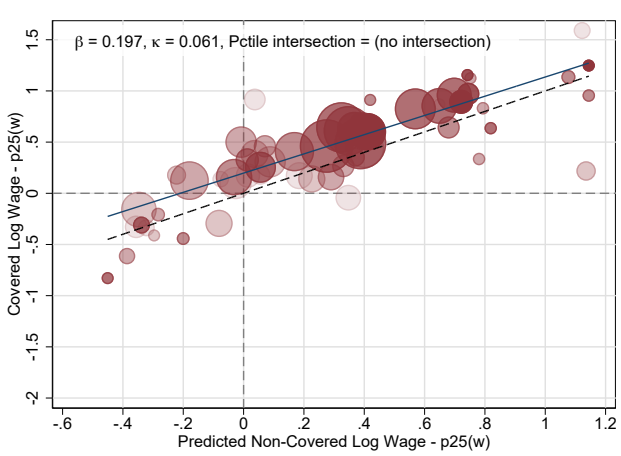
(b) Selection into Coverage

(c) Wage Structure, Model

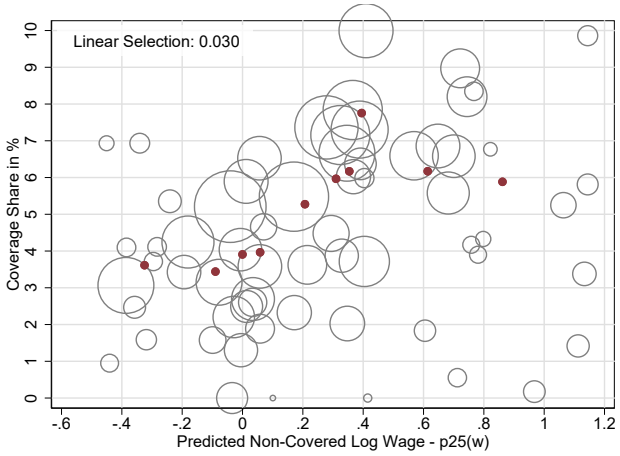
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

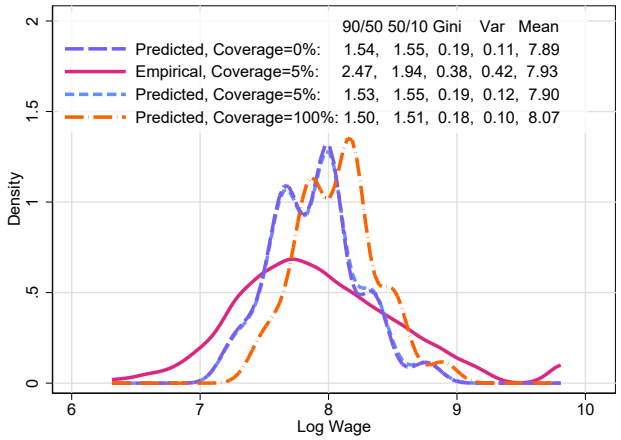
Figure 46: United States, South 2018



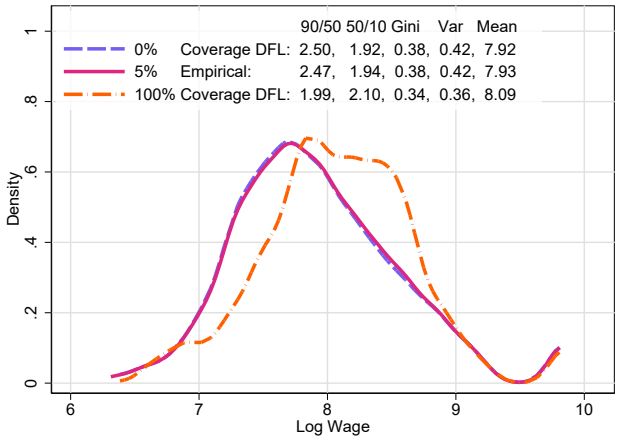
(a) Coverage Premium and Compression



(b) Selection into Coverage



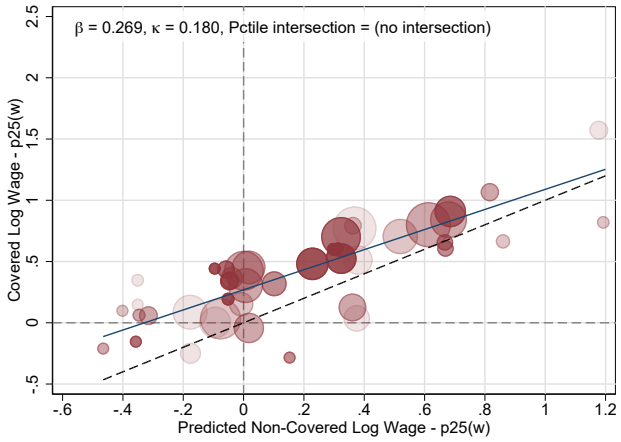
(c) Wage Structure, Model



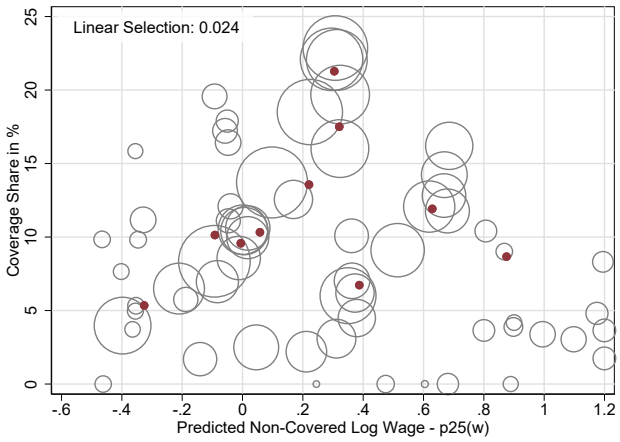
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

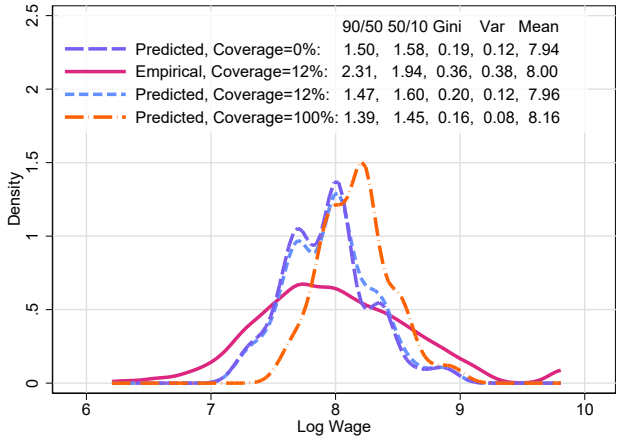
Figure 47: United States, Midwest 2018



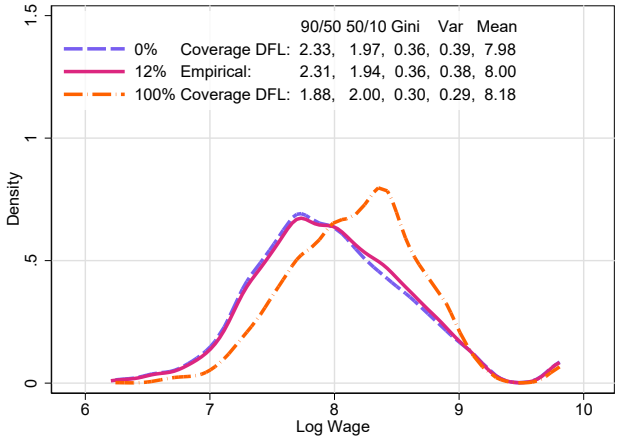
(a) Coverage Premium and Compression



(b) Selection into Coverage



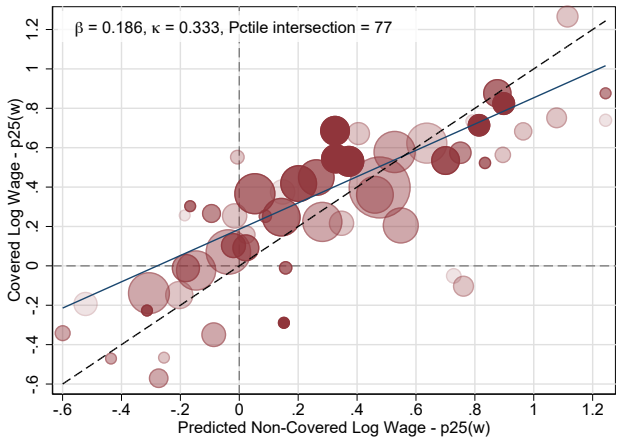
(c) Wage Structure, Model



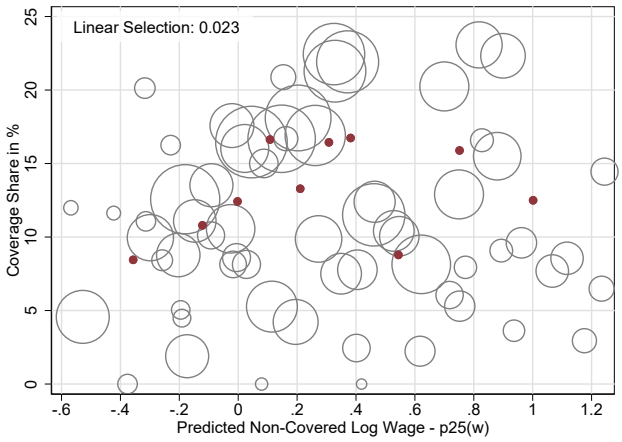
(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.

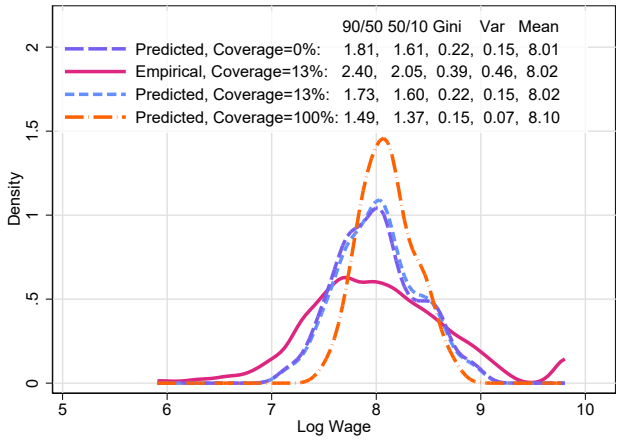
Figure 48: United States, Northeast 2018



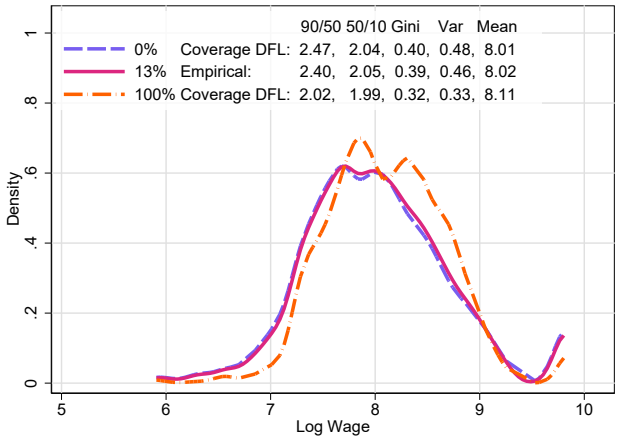
(a) Coverage Premium and Compression



(b) Selection into Coverage



(c) Wage Structure, Model



(d) Wage Structure, DFL

Note: Panels (a), (b), and (c) include results from our two-equation model with flexible kappa and no spillovers. Panel (a) shows a regression of the log wage in the covered sample on the predicted non-covered wage, with markers for each age group x gender x education cell. Markers are proportional to the overall size of the cell in the covered sample. The opacity of the marker denotes the relative coverage rate in that cell to the other cells. We subtract the 25th percentile of the overall wage distribution from the empirical and predicted wage. Panel (b) shows markers for the same bins as Panel (a) in gray which are relative in size to the overall covered and non-covered population in the bin. The red markers denote deciles in the overall wage distribution. Panel (c) reports our two-equation model-based wage simulations at different coverage rates. Panel (d) reports our DFL wage simulations with 0 and 100% coverage rate.