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ABSTRACT

The Career Effects of Union Membership*

We combine exogenous variation in union membership with detailed administrative data and a novel field survey to estimate the career effects of labor union membership. In the survey, we show how workers perceive the role of unions in setting wages and determining work amenities. In the administrative data, we causally examine through which channels unions influence worker outcomes, whether unions influence workers differently across their careers, and what the overall long-run effects of individual union membership are. Our results highlight that the career effect of union membership differs greatly depending on the age at which workers enroll. In addition, we show that focusing on a restricted set of outcomes, such as wages and employment, generates a fractionalized understanding of the multidimensional career effect that union membership has on workers.

JEL Classification: J51, J31, J32, J16, J63, J65, J81

Keywords: unions, wage premiums, job protection, work environment

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1 Introduction

Modern labor unions date back to the industrial revolution in Europe, and they have played a pivotal role in shaping the dynamics of labor markets for more than 200 years. By possessing monopolistic power over labor supply and representing workers in the bargaining process, unions exert substantial theoretical influence over workers' labor market outcomes. However, despite a consensus on the role of unions—to maximize worker welfare—there is little agreement on union success in serving worker interests and shaping their careers.

In this paper, we exploit exogenous variation in union membership to provide the first comprehensive analysis of the career effects of unions across the life cycle of workers. First, we examine the channels through which unions affect worker careers: monetary compensation, job security, work environment, promotion possibilities, and welfare usage. Then, we study whether unions influence workers differently across their careers. Finally, we provide insights on the aggregate reduced-form impact of all these career effects on the very long-run labor market outcomes of individuals, showing results on labor market and welfare outcomes ten years after unionization took place. For identification, we exploit government-induced changes in the price of union membership, which affects the incentive for workers to join unions. These changes impact workers of all ages and therefore provide an ideal setting for examining whether the career effects of unions differ across the life cycle of workers, and what the sum total of all these effects is in the long run.

The core contribution of this paper is to move beyond the existing union literature and demonstrate that focusing on average effects among workers across their careers misses a great deal. Specifically, our results highlight that the effect of union membership differs greatly depending on the age at which workers enroll and that individuals benefit differently depending on where in their career they are when they secure union membership. In addition, we show that focusing on a restricted set of outcomes, such as the short-run union wage premium, generates a fractionalized understanding of the multidimensional career effect that union membership has on workers. Specifically, not only do unions impact the monetary compensation of workers, but also their promotion possibilities, job security, work environment, and welfare usage. As a consequence, the long-run union earnings premium is very different from the short-run union wage premium.

To perform our analysis, we use linked employer-employee data from Norway, including information on union membership, union dues, and each worker's occupation. A unique personal identifier enables us to combine these data with information from various population-wide administrative registers, such as the central population register, the education register, the tax and income register, the social benefit registers, and the residency and workplace location registers. Consequently, we can construct an extensive panel covering the universe of

Norwegian workers and much of their demographic, education, labor, welfare, and employer information.

In addition to the rich register data, we conduct an extensive survey on a nationally representative sample of more than 5,000 workers in Norway. The survey asks about workers' ranking of core career amenities, their perceptions of unions' ability to influence these amenities, and whether they believe individual union membership matters above and beyond union presence at the workplace. Finally, the survey examines the price sensitivity of union membership through hypothetical scenario analyses, asking if workers would reconsider joining (leaving) the union if the net-of-due union due decreased (increased) by a randomized amount.[1]

We first provide descriptive evidence on the dynamics of labor union membership in Norway, including the distribution of union member age, the persistence of union membership over time, trends across industries, and the union earnings premium. This helps us better understand who enrolls in and utilizes labor unions. Next, we present our survey results to document how workers value different types of work amenities, both overall and across the lifecycle. We also use these results to document workers' perceptions of the ability of unions to influence specific work amenities and the extent to which workers consider their own union membership important—above and beyond union density at the firm—for enjoying union-provided benefits. Finally, we use the survey results to provide external validation of our first-stage effect for the price sensitivity of union membership.

After the descriptive results and survey evidence, we proceed to identify the causal effect of union membership on individuals' careers, exploiting government-induced (national) changes in tax deductions for union dues as exogenous shocks to the probability of joining a union. These tax deductions led to significant changes in the net price of union membership among workers at firms whose union due subsidies were previously bounded by a tax deduction cap (Barth, Bryson and Dale-Olsen, 2020*b*). This generates exogenous variation in the incentive to join a union depending on the firm at which the worker is employed and, therefore, different union enrollment probabilities across individuals, which we model in a simple two-stage least squares approach. The key assumptions underlying our empirical method are that (1) workers respond to changes in union membership price and (2) the union-due subsidies only affect individual career outcomes through their impact on unionization.

We present four sets of core results. First, consistent with prior literature, we document a substantial wage premium associated with union membership. Specifically, for the average

[1]We use the price sensitivity questions as a means to externally verify that changes in membership price are likely to generate shifts in membership probability – something that we also examine formally via the linked employer-employee data.

worker we find a union membership wage premium of approximately 0.08 log points, which is slightly smaller than the typical 0.1-0.2 log point effect that has been found in previous studies (e.g., Farber, Herbst, Kuziemko and Naidu (2021); Sojourner, Frandsen, Town, Grabowski and Chen (2015); Card, Lemieux and Riddell (2004)).[2] However, in contrast to prior literature, we show that the union wage premium varies greatly across a worker's career. Specifically, while individuals enjoy large union wage premiums at the beginning of their working lives, this premium monotonically declines until age 45 at which point it ceases to be economically meaningful or statistically significant. Overall, union membership flattens the age-wage profile relative to non-union workers. We find that part of the differential wage effect across the life cycle is driven by the union's impact on individuals' work hours, an effect that also is slightly larger for young workers. The differential effects on hours and wages across the life cycle highlight the role of unions in shaping individual career advancements over the course of their working lives. It also showcases the role of unions in shaping overall wage inequality among workers across the age distribution.

Second, we uncover substantial heterogeneity in how union membership influences other key dimensions of a worker's career across the life cycle: job protection, promotion facilitation, and work environment. For job protection, we show that unions provide considerable security to older workers while there are less substantial gains for workers at the beginning of their careers.[3] With respect to career advancement, which we measure through switches to better-paying within-firm occupations, we again find that unions provide considerable benefits to more senior workers while there are limited benefits accruing to young workers. At the same time, we find that unions reduce the probability of workers switching to other firms that are paying higher average wages. This suggests that unions have a certain lock-in effect on workers, an effect that makes the long-run impact of unions on worker careers ambiguous. In terms of work environment, as measured by take-up of sick leave, we identify a strong negative effect among young workers, suggesting that unions may protect them against the risky and nonpromotable routine tasks that often fall on new labor market entrants. For older workers over age 55, the effect on sick leave take-up is positive, which we interpret as older workers feeling more secure in their jobs to take (longer) sick leave at the end of their career without having to worry about potential layoff effects. Taken together, the effect patterns uncovered in this paper suggest that unions play an important role at the hiring stage through monetary compensation and work environment and at the separating stage through promotion facilitation and job protection. We rationalize these effects through the

[2]While the 0.1-0.2 log point effect corresponds to the typical finding in the literature, there are also studies finding effects close to zero (e.g., DiNardo and Lee (2004)) and effects that are considerably larger than 0.2 (e.g., Fortin, Lemieux and Lloyd (2023) find effects of around 0.35 log points).

[3]This result is consistent with the last-in-first-out concept of union employment protection.

lens of a simplified employee career lifecycle framework.

Third, by examining the effect of union membership on individuals' use of the national welfare system, we reveal that workers are considerably less dependent on transfers from the government when unionized, even after taking out the effects on sick leave discussed above. This effect has a U-shape, with mid-career workers reducing their dependence on government transfers the most. Workers near retirement (age 60-64) see no net change in their use of government transfers. This result highlights another important dimension of the union debate that has previously been overlooked in the literature: not only may unions affect worker welfare through wages and work conditions, but they may also affect government welfare expenditures and workers' reliance on—and use of—the social insurance system. This has important implications for public finance.

Our final set of results revolves around the long-term career implications of union membership as measured 10 years after the government-induced change in union due subsidies. As summary measures, we focus on annual earnings and total taxable government transfers regardless of source. These results should be interpreted as the sum total of all the differential impacts discussed above (including those we cannot observe). We find that the long-term earnings effects of union membership are the smallest for very young workers and the largest for mid-career and senior workers. This result is consistent with the fact that senior workers benefit more from job protection and promotion facilitation relative to young workers. These are job characteristics that usually are associated with stable and permanent wage gains in the long run. This result is particularly interesting as it stands in contrast to the short-run wage effects in which young workers benefit the most. The finding, therefore, highlights the importance of accounting for the dynamics of union membership and its interaction with all aspects of a worker's career when evaluating its overall impact on individuals.

Regarding the long-run effect on government transfers, we see a decline in the long-run use of the social security system across all ages, though the effects are smaller for workers closer to retirement. This is consistent with the increase in sick leave take-up among older workers in the short-run analysis. The effect pattern is relatively similar to that of the long-run earnings effects. This implies not only an increase in overall wages for workers who unionize but also a substantial reduction in welfare payments from the government due to union presence. Based on a simple back-of-the-envelop calculation, we estimate that the increase in union membership due to the national subsidy policy generated a 0.4 percent increase in overall wage levels and a reduction of 12 billion NOK in welfare payments. At the same time, we calculate that the overall cost of the program amounts to less than a third of the reduced welfare payments; 3.65 billion NOK.

After having presented our main results, we note that some union-provided benefits

often are perceived as collective goods while others are perceived as private goods (e.g., Boeri, Brugiavini and Calmfors (2001)). Failing to take this important nuance into account could not only lead to a fractionalized understanding of the role of unions for workers' careers, but the presence of such spillovers also could generate an attenuation bias of our baseline estimates. At the same time, we note that the survey results strongly suggest that workers themselves perceive each of the amenity bundles (monetary compensation, job security, work environment, and promotion possibilities) to contain significant private good components. To examine the relative importance of the private and public components across our outcomes and assess the extent of spillovers to non-union members, we estimate our core model controlling for the union density at the firm. The difference in point estimates from our main result for log wages is not statistically significant, and we conclude that union membership in itself plays a crucial role in a worker's ability to reap the benefits of unions over the life cycle. The estimates for other outcomes are larger when we control for union density. This result is consistent with our findings from the survey and adds to a relatively sparse empirical literature on the public-private nature of union-provided goods.

The main contribution of our paper is to combine exogenous variation in union membership with rich register data to identify the career effect of union membership across the life cycle of workers on key career dimensions: monetary compensation, job protection, promotion facilitation, work environment, and welfare usage. The paper helps advance three large strands of research within economics.

First, there is an impressive literature that causally identifies the union wage effect through quasi-experimental research designs, using anything from regression discontinuity designs and propensity score matching techniques (e.g., DiNardo and Lee (2004); Lee and Mas (2012); Frandsen (2021); Sojourner, Frandsen, Town, Grabowski and Chen (2015); Card and De La Rica (2006); Bryson (2002)) to instrumental variable methods based on Right-to-Work laws in the United States and changes in national union due subsidies in Norway (e.g., Fortin, Lemieux and Lloyd (2023); Barth, Bryson and Dale-Olsen (2020*b*); Dodini, Salvanes and Willén (2022)).

These studies provide important insights into the union wage premium, but they do not explore how the wage premium may vary for union members depending on where in their careers they are at the time of enrollment. In addition, they do not explore the channels through which these union wage effects may operate. Our contribution relative to this literature is to show that unions can have substantially different effects depending on the age of enrollment, both with respect to the magnitude of the wage premium as well as which career dimensions they influence. We see this paper as opening up a new avenue of research on the heterogeneity of union effects across the life cycle, and through which channels these

effects may occur.

Second, there is an emerging literature exploring non-wage effects of unions on individual workers, including stable work hours (e.g., Finnigan and Hale (2018)), pensions (e.g., Frandsen and Webb (forthcoming)), health insurance (e.g., Hagedorn, Paras, Greenwich and Hagopian (2016)), and maternity leave (e.g., Park, Lee and Budd (2019)). These studies highlight that union membership may impact individual workers on multiple dimensions, all of which may feed into the reduced-form union wage effect that has been documented in prior work. We develop this literature by examining the impact of union membership on a large number of career outcomes for the same sample of workers using a unified empirical framework, including work environment, job protection, promotion potential, and welfare usage. In addition, we note that several of these non-wage benefits may matter differentially to workers depending on where in their careers they are, which we verify through the use of our survey results. For example, protection from job termination may matter more among individuals close to retirement and salary negotiations may be more important at the start of a work contract. By tracing the effect of union membership on a rich set of career outcomes across the life cycle of workers, we are able to provide a more nuanced understanding of labor unions and their impact on workers.

Third, there is a small literature exploring how labor market shocks and reforms differentially impact individuals across the life cycle, highlighting that a focus on mean impacts misses a great deal (e.g., Salvanes, Willage and Willen (2022); Rinz (2022)). We contribute to this literature by demonstrating that the effects of worker interactions with established social institutions fundamentally differ across the life cycle.

In terms of policy implications, our results highlight that the effect of union membership differs greatly depending on the age at which workers enroll and that focusing on a restricted set of outcomes generates an incomplete accounting of the multidimensional career effect that union membership has on workers. While our focus in this paper is on unions, these results allude to a more general policy implication: that age-neutral labor market policies, institutions, and regulations, may affect individuals differently across their careers. Importantly for our context, marginal union membership appears to save the government a significant amount in welfare system payouts, particularly for mid-career workers and when considering the long run. This suggests that unions, as market actors, may reduce the need for more intensive transfers by increasing career stability and predictability. This matters to social planners when trying to design optimal labor market interventions.

When interpreting our results, it is worth noting that Norway has a unionization rate slightly below 50 percent, which places the country in the middle of the OECD union density distribution. This is in contrast to other Scandinavian countries with considerably higher

union densities.[4] While it is always difficult to extrapolate findings from one country to another, that the country under examination has a unionization rate comparable to that of other OECD countries makes it particularly interesting to look at.

The rest of this paper proceeds as follows. In Section 2, we provide information on unions in Norway, discuss the key institutional background, and present our conceptual framework. In Section 3, we introduce our data, describe our sample, provide descriptive evidence on workers and unions in Noway, and present and discuss our survey results. In Section 4, we describe our empirical method. In Section 5, we present evidence on the labor market effect of union membership across the life cycle. In Section 6, we conclude and provide policy recommendations.

2 Background

2.1 Unions in Norway

Labor unions in Norway date back to 1848 and the formation of the Drammen Labor Union for landless agricultural workers and crofters. This movement was led by Marcus Thrane who later emigrated to Chicago after being imprisoned in 1851, and the organization collapsed (Galenson, 1949). With an increasing degree of industrialization in Norway during the late 19th century, local unions gained prominence among workers and were established all across the country. In 1899 the National Confederation of Workers (LO) was established as the national trade union. Today, unions have become an integral part of the employer-employee dynamics in the country and are considered one of the most powerful institutions that workers can use for advancing their careers. Similar to other countries, the stated goals of Norwegian labor unions are to strengthen members' rights and work conditions, and they play an important role in contract negotiations.

The rights and regulations of employers, employees, and unions, are governed by the national *Working Environment Act* (WEA). According to the WEA, every worker has the legal right to unionize, and firms are required to enter a collective bargaining process if at least 10 percent of the workers at the firm request it. On behalf of their members, unions can negotiate not only wages but also help settle legal disputes, push for better work conditions, provide counsel in the event of strategic career decisions, protect against unfair work conditions and dismissals, aid in the event of occupational injuries and poor health standards, provide individualized information about welfare programs, and provide non-work related non-pecuniary benefits (such as, for example, discounted insurance plans or better interest rates on mortgages).

[4] One reason for this is that unemployment benefits are part of a union's purview in other Nordic countries such as Sweden, while they are governed by national law in Norway.

In terms of organizational structure, unions are organized by professional area or sector, and each local union is associated with a national federation of trade unions within that professional area or sector. Each of these federations is then linked to one of four national confederations of trade unions. This structure is not unique to Norway and has much in common with the structure of unions in the US, where the American Federal of Labor and Congress of Industrial Organizations (AFL-CIO) coordinates and supports union efforts across more than 50 individual unions.

The wage bargaining process in Norway is a two-step process. First, industry-wide collective bargaining agreements are established to set wage floors and guaranteed wage increases. Then, local negotiations take place in which unions and employers discuss not only firm-specific wage increases for union members but also individual-specific wage increases. While the national and sectoral wage agreements have played a key role in setting worker wages in the past, local negotiations now account for more than 70 percent of total negotiated wage increases (Bhuller, Moene, Mogstad and Vestad (2022)). For a more detailed discussion on the institutional details surrounding the wage bargaining process, please see Dodini, Lovenheim and Willén (2021).

Approximately half of Norway's workforce are members of trade unions. The unionization rate in Norway is not particularly high relative to other OECD countries and is lower than the unionization rate in other Nordic countries (such as Sweden and Denmark). In the private sector, union density has been around 40 percent for the past several decades. In the public sector, union density is approximately 79 percent. The union density rate differs across sectors and industries, with almost 60 percent in the manufacturing sector and slightly less than 30 percent in the private services sector. More women than men are members of labor unions (57 percent versus 44 percent), partially reflecting women being more likely to sort into the public sector. There is also considerable heterogeneity in union membership rates as a function of worker age, with older workers being much more likely to join unions than young workers. We provide detailed descriptive evidence on this in the next section.

2.2 Union Tax Deductions

Similar to other countries, trade union membership in Norway is not free, and prospective members must make a monthly payment to the union to benefit from its services. These payments are used by the union to finance a wide variety of programs and activities, including (but not limited to) the salaries and benefits of the union leadership, the legal representation offered by the union, lobbying activities, the strike fund, and potential campaign programs. Different from some other countries, closed-shop union agreements are not legal in Norway.

Baseline union dues are commonly set during the union's annual national meeting. Some unions collect a percentage of each worker's pay, others allow the percentage to vary on a

sliding scale, and others may set dues to a specific level. On average, dues typically range from 1 to 3.5 percent of a worker's pre-tax income. Most union payments are facilitated through a "dues checkoff" mechanism in which the employer agrees to deduct the union due from the worker's paycheck directly (provided that the worker has decided to become a member) and transfer that amount to the union. These transfers are explicitly shown on the wage statement that the worker receives each month.

In order to encourage organized labor, the Norwegian government provides a tax deduction for union dues. This tax deduction acts as a subsidy for union membership and is automatically entered on an individual's tax return, making the price subsidy very salient to the worker. Beginning in the early 2000s, the Norwegian government increased the maximum allowable tax deduction for union dues multiple times, effectively quadrupling the maximum from 2001 through 2010.

For our empirical analysis, we exploit the changes in the union dues subsidy as an instrument for individual union membership. These changes reduce the cost of joining a union for those workers whose subsidies were previously bounded by the tax deduction cap. As such, workers employed at firms that had high union dues prior to the reform are more intensely treated by the changes in the deduction schedule relative to workers employed at firms with lower baseline dues. This generates exogenous variation in the predicted union membership enrollment probability of workers and allows us to trace the causal career effect of union membership.

2.3 Conceptual Framework

This paper examines the interaction of union membership and individual career progression and the extent to which the timing of membership matters for the impact unions have on workers. In the main analysis, we focus on five key career dimensions: monetary compensation (wages and hours), job protection, promotion facilitation (vertical moves within firms as well as across firms), work environment (proxied by sick leave), and overall use of the social security system. We highlight that this does not represent an exhaustive list of the career outcomes that may be influenced by union membership. However, they represent key aspects of work life that are commonly perceived to be influenced by unions.

We begin by noting that an individual worker would join a labor union if and only if the perceived benefits of union membership exceed the costs. The benefits include improvements on any of the dimensions highlighted above while the costs primarily include the union dues that have to be paid monthly. Crucially, the value of the benefits, and the union's ability to help workers secure those benefits, may vary across workers depending on where in their careers they are.

For example, consider a simplified version of the employee life cycle model, in which a

career can be divided into three distinct stages: recruitment, development, and separation. Workers may value promotion possibilities and the quality of the work environment more during the initial stages of employment, as promotions will ensure large and permanent career gains while the quality of the work environment will protect them from the nonpromotable and risky routine tasks that oftentimes are assigned to new workers. At the separation stage, however, workers may value job protection more as skill depreciation and obsolescence pose an increasing threat of job termination. To examine the pattern of job preferences and perceived union benefits over the career life cycle—and to what extent this aligns with the suggested framework above—we have incorporated detailed questions on variation in job amenity preferences over the lifecycle in the survey we conduct. These results are presented in Section 3.3.

Even though workers may have differential amenity preferences across the life cycle, it is not certain that unions are able to act on those preferences. For example, unions may find it easier to provide monetary compensation gains to new workers—rather than promotion possibilities—as they simply can leverage a worker's outside option in the hiring market to push for higher entry wages. At the same time, it may be easier to provide promotion possibilities and work protection to old workers following the first-in-last-out principle and tenure reward system that unions usually pursue. Thus, workers' valuation of the work amenities and the union's ability to help workers secure those benefits may not always align and may vary across workers depending on where in their careers they are. The theoretical predictions in this context would be highly uncertain and ambiguous, as it would entail solving an optimization problem that relates heterogeneous worker amenity preferences over the life cycle to unions' bargaining ability with employers over these amenities across heterogeneous workers. This necessitates an empirical examination of this question, in which we can trace out the reduced-form effect of union membership on all work dimensions across heterogeneous employee ages.

One way to quantify the sum total of the differential union career effects across the life cycle (including those we cannot observe) is to examine the long-run career implications of union membership. Such effects will be driven by the direct impact of union membership on wages and also by all the indirect effects operating through the other work dimensions discussed above. Identifying such aggregate reduced-form effects represents an important contribution to the existing literature on labor unions, and provides the first summary measure of how beneficial union memberships are for individuals at different stages of their careers in the long run. We measure this long-run effect in two ways, focusing both on long-term effects on total earnings as well as on government transfers (welfare usage).

A priori, the extent to which the potential short-term effects discussed above help or

hinder the long-run job prospects of individual workers is unclear. On the one hand, several of the potential effects are likely to improve workers' careers and boost their labor market payoffs. On the other hand, there are also indirect effects that could worsen the future career prospects of individual workers. For example, there may be a lock-in effect in a poorly matched occupation or a reduction in across-establishment mobility.

Although we cannot decompose the long-run effects on earnings and transfers into that driven by the specific career effects discussed above, we can provide a sum total effect of all these changes. We achieve this by exploiting the rich Norwegian administrative data and examining the impact on annual earnings and transfers 10 years after unionization. We believe this provides sufficient time for each of the career effects to spill over into earnings and transfers. When interpreting these effects, we acknowledged that our list of shorter-run career effects is not exhaustive and that any long-run effect is driven both by documented short-term effects and through unobserved short-run effects.

3 Data and Descriptive Evidence

3.1 Data

We leverage rich population-wide administrative data on the universe of workers in Norway. A unique personal identifier allows us to follow individuals over time and across registers, such that we can build an extensive longitudinal panel covering all workers in the country and much of their demographic, education, and labor market information.

Our main data source is the linked employer-employee register of Norway. These data provide us with information on each worker's employer, work characteristics, work location, establishment, occupation, and contractual hours.

We link the employer-employee data to the income tax register, which provides detailed information on earnings. Earnings are defined as pre-tax income (income from labor and self-employment) excluding any government transfers (such as parental leave, sick leave, and unemployment benefits). We also construct a measure of hourly earnings, obtained by dividing total earnings by hours worked. To calculate work hours, we note that we do not have information on the exact number of work hours before 2015. Rather, we have categories of work hours. To convert these to actual hours, we use the midpoint of each category except for the highest category (30+ hours) which we assign 37 hours. This assignment is based on the observed distributions of hours from the data on detailed work hours we have access to beginning in 2015.

In addition to earnings and hours, we use the employer-employee data to construct measures of promotions. First, we generate an indicator variable that takes the value of one if a worker shifts to an occupation located higher up on the wage distribution. Since we include

firm fixed effects in the main specification, the outcome examines the impact on within-firm vertical occupation moves. Second, we construct a variable that takes the value of one if the worker shifts firm to one that is located higher up in the earnings distribution relative to the current firm. While the first promotion variable captures vertical moves within the firm, the second captures vertical moves across firms.

Next, we use the central population register and the national education register to incorporate detailed demographic characteristics of the individuals, including information on sex, age, place of residence, and highest completed level of education.

Acknowledging that unions may impact workers' involvement with the country's social insurance system (through, for example, its effect on work environment and job protection), we also incorporate information from the tax and transfer registers in Norway. This allows us to collect information on the individual use of the most common welfare programs in the country (e.g. sick leave, unemployment benefits), as well as create a summary measure of the total amount of transfers an individual received from the government in any given year.

Finally, crucial to our analysis is the ability to observe individual-level union information over time. We obtain this data from a register-based union membership data set constructed by the national tax authority, which provides detailed information on each individual's involvement with labor unions and how much they have paid in union dues each year.

The government changes to the maximum allowable tax deduction for union dues that we exploit occurred primarily between 2003 and 2010. We have complete data on individuals and their occupations going back to 2001, and we, therefore, restrict the main analysis to the years 2001 through 2018 (the last year for which we have data). However, much of our data is available as early as 1993, so we also provide descriptive evidence starting from the early 1990s.

In addition to the rich individual-level administrative data, we conduct a survey on a nationally representative sample of workers in Norway. The survey provider screens workers on union membership, age, and work history, ensuring that we obtain a sample of approximately 300 union members and 300 nonunion members (all of whom are currently working) in each age bracket for which we conduct the analysis. In total, our survey sample consists of 5,200 workers. The full survey is provided in the Appendix.

In the survey, we collect information on the workers' ranking of core career amenities (monetary compensation, job protection, promotion facilitation, and work environment), their perception of unions' ability to influence these amenities, and whether workers believe that individual union membership matters above and beyond union presence at the firm (i.e., whether there are private-good components to the union-provided benefits). Finally, we collect information on workers' price sensitivity to union membership by asking whether

workers would reconsider joining (leaving) the union if the net-of-subsidy union due decreased (increased) by a specific amount. We randomize this amount in 500 NOK intervals across workers, from 500 to 2500 NOK (approximately 50-100 USD). We use these responses to validate our first-stage effect for the price sensitivity of union membership and demonstrate that workers consider union-provided benefits across all these amenities to contain substantial private-good components. We also use these results to document age variation in career amenities and perception of unions' ability to influence these amenities across the life cycle.

3.2 Descriptive Evidence

To fully understand the career effects of union membership across the life cycle of workers, it is instructive to first understand who enrolls in and utilizes labor unions. To this end, this subsection provides a series of descriptive plots that help better understand key features of the unionized workforce in Norway related to our analysis.

We begin by describing the overall union membership rate and the age distribution of union members. As noted in Section 2, workers may value different aspects of the work environment differently across their careers, and a union's ability to aid a worker may differ depending on where in the career that worker is. Thus, the costs and benefits of union membership may differ across the life cycle, something that may generate variation in the share of workers that join unions across different ages.

The results from this exercise are shown in Figure 1. Four observations are worth noting. First, few workers join unions at the beginning of their careers, with only 15 percent of 20-year-old workers being members. Second, the probability of joining a union rapidly increases over the first ten years of a worker's career, with approximately 50 percent of the workforce being members of unions at age 30. Third, the union membership probability of a worker keeps increasing beyond age 30, though the age gradient of union membership is considerably flatter after this age. Fourth, union membership peaks at age 60, with almost 70 percent of the workforce being members at that age. Interestingly, the peak unionization rate at age 60 has remained constant over the past 30 years. However, young workers have become less likely to unionize over time. The unionization rates at ages 30 and 40 were approximately 10 percentage points lower in 2015 relative to 1995.

We next explore whether union membership represents a permanent state for a worker or if there is substantial fluctuation in union membership over workers' life cycles. This is a question that has been difficult to explore in the past, owing to the limited availability of large-scale, detailed longitudinal data on individual union status. However, from a policy perspective —and the perspective of our empirical method —it is crucial to understand the extent to which individuals appear marginal to union membership. To this end, Panel A of Figure 2 shows the cumulative share of workers that have spent X share of their working

years as a member of a union using the sample from 1993 to 2017, and Panel B of Figure 2 shows the same conditional on ever having been a union member.

The results in Panel A demonstrate that about 40 percent of the workforce never joined a union during this sample period and that around 20 percent of the workforce spent 100 percent of their working lives during our sample period as members of labor unions. The remaining 40 percent of the workforce is distributed relatively equally across the intensive margin of the share distribution, revealing a substantial degree of in-and outflows from unions over the course of workers' careers. The results in Panel B of Figure 2 reinforces this observation, demonstrating that only one-third of those who ever enroll in a union remain in a union for the duration of their working lives.

To further explore the union-switching behavior of individuals, Panels C and D of Figure 2 provide information on the share of workers switching into and out of unions each year by age. The figure illustrates that there is considerable movement into and out of unions across the entire age distribution. However, the flows are substantially larger among young and early career workers, and there are clear monotonic declines in these flows across the life cycle of the individuals.

Next, we examine whether certain industries and sectors are more represented among union members than others, and if there are significant trends in union density across industries over time. The results from this exercise are shown in Figure 3. Consistent with existing literature, the public sector represents the most unionized sector in the economy, with more than 70 percent of workers in the public sector belonging to a union. In the private sector, there is a considerable spread in union representation across industries. While manufacturing, mining, transportation, and finance, have union densities of more than 50 percent, wholesale trade, agriculture, and hotels have densities below 30 percent. While all industries have experienced a slight decline in union density over the past 30 years, the relative ranking of these industries as measured by union density has remained stable. Thus, the composition of industries covered by unions does not appear to have shifted dramatically since the early 90s. Notably, the downward trend in union density after 1993 beings to level off for many industries (and in some cases even reverse) between 2003 and 2007, which coincides with the expansion of tax subsidies for union dues in Norway.

Having documented descriptive trends in age structure, industry composition, and permanency of union membership, we investigate the union wage premium across the life cycle of workers and whether we can eliminate any such premium by controlling for worker characteristics. The results from this exercise are shown in Panels A and B of Figure 4. Several observations are worth noting. First, there is a substantial union wage premium among young workers, with a wage difference of approximately 40 percent. Second, while the age-

wage profile for non-unionized workers is relatively steep during the first 20 years of their careers, the age-wage profile for unionized workers is flat. As a consequence, by the time individuals reach age 40, there is no longer a wage premium for unionized workers. Third, while the age-wage gradient slopes downwards for non-unionized workers after having peaked at age 45, the age-wage gradient remains flat for unionized workers.

Acknowledging that much of the correlations in Panel A are likely driven by endogenous worker selection into unions, we re-estimate the age-wage relationship but control for gender, immigration status, industry, education level, and year. The result, shown in Panel B, demonstrates that accounting for observable characteristics has a limited impact on the overall pattern shown in Panel A. Specifically, we still observe a meaningful union earnings premium among young workers (about 25 percent) and that this premium declines over the working lives of individuals. By the time individuals reach age 40, there is no longer an earnings premium for unionized workers. We emphasize that the results in Panels A and B of Figure 4 provide correlations between union status and earnings and that they cannot be conclusively interpreted as causal relationships. Nevertheless, we consider this a useful starting point for identifying the lifecycle effect of union membership on wages and a helpful benchmark with which we can compare the causal estimates that we present in the next section.

In addition to examining the descriptive wage pattern of union and non-union members over the life cycle, we also provide information on individuals' use of the public transfer system as a function of union status over the course of workers' careers. This includes government transfers excluding parental and sick leave payments. The results from this exercise are shown in Panels C and D of Figure 4. The figure suggests that union members receive much less (nearly 10,000 NOK) in direct transfers from the government at the start of their careers relative to nonunion members. This gap narrows during their 30s and early 40s and widens significantly after age 45. These gaps persist after controlling for various industry and education sorting as well as time trends.

The correlation between social support and union status over a worker's career shown in Figure 4 suggests that the average worker is less dependent on transfers from the government when unionized, an effect that could potentially operate through effects on job protection, work environment, and promotion possibilities. However, we reiterate that these figures are descriptive, and we cannot make causal statements based on these results alone. Nevertheless, we believe that this alludes to another potentially important dimension of the union debate that has previously been overlooked in the literature: not only may unions affect worker welfare through wages and work conditions, but they may also shift the magnitude of government spending that is directed towards welfare programs.

Next, we discuss our survey evidence after which we describe our empirical method and explain how we isolate the causal effects of union membership across the lifecycle.

3.3 Survey Evidence

Before estimating the causal effect of union membership on workers using union-due subsidies as an instrument for union membership, it is helpful to examine workers' own perception of the influence unions have on their careers and how price sensitive they are to union membership. To this end, this subsection provides a series of descriptive plots based on results from the survey we introduced in Section 2. These results help us better understand key features of the workforce's perception of unions and what they do as it relates to our analysis. Overall, the survey provides four key results that help interpret the results from our analysis.

First, Figure 5 shows that workers are extremely price sensitive to union membership. Specifically, approximately 40 percent of the surveyed union members would consider leaving the union if the monthly net-of-tax union due increased by 500 to 1000 NOK (approximately 50-100 USD). Similarly, approximately 30 percent of nonunion members would consider joining a union if the net-of-tax union due decreased by 500 to 1000 NOK. Even if we interpret these survey results as an upper bound of the true price sensitivity to union membership, this implies that the price elasticity of union membership is substantial. Unsurprisingly, Figure 5 also reveals that there is a steep age gradient associated with the price sensitivity of union membership. Specifically, young workers are considerably more price sensitive to union membership than older workers. For example, while 55 percent of unionized workers aged 25 through 29 would consider leaving the union if the price increased by 500 to 1000 NOK, only 20 percent of unionized workers aged 60 through 64 years old would do the same. This result also aligns well with the nonunion members' response to why they do not join unions: more than half of nonunion members state that the cost of union membership is too high (Figure 9). In addition to providing the first evidence on the price elasticity of union membership, this result suggests that using changes in union dues as an instrument for a worker's probability to unionize likely is associated with a strong first stage. Empirically, the age gradient of price sensitivity to union membership holds when we consider the costs of joining a union relative to the earnings of workers over the age distribution as well as the base rates of unionization over age, which we explore in Section 5.2.

Second, we elicited workers' relative amenity priorities by asking them to assign a budget of 100 "points" to different bundles of work amenities. Figure 7 shows that the average worker considers monetary compensation to be the most important career component of their jobs, followed by job security, work environment, and lastly promotion possibilities. There is also interesting age heterogeneity in amenity rankings. Specifically, young workers assign a higher

value to promotion possibilities than older workers, older workers assign a higher value to job security, and mid-career workers assign a higher value to the quality of the work environment. The differences across the lifecycle are economically meaningful in promotion possibilities and job security, while they are very small with respect to work environment. Perhaps somewhat surprisingly, older workers assign considerably more value to salaries than young workers. The ranking of amenities for union members and nonunion members is largely the same. These survey results strongly align with the conceptual framework discussion provided in Section 2.

Third, we asked workers to rate a union's ability to positively affect aspect X of their work life on a scale of 0-100. Figure 8 illustrates that the workers' perception of unions' ability to influence the four core career dimensions largely aligns with their individual ranking of these amenities. Specifically, the average worker believes that unions are best able to influence monetary compensation, closely followed by job security, slightly less able to influence the quality of the work environment, and even less capable to affect the workers' promotion possibilities (though still meaningfully able to do so). Interestingly, there is very little evidence of differences in workers' perceptions of the unions' ability to influence these four work dimensions across age groups.

Fourth, we elicited perceptions of the private-good components of union membership by asking what portion of the union-induced benefits related to work amenity X are attributable to individual union membership. Figure 6 demonstrates that union members perceive union-provided career benefits to contain a substantial private-good component across each of the four amenity bundles we examine: monetary compensation, job protection, promotion facilitation, and work environment. Interestingly, members perceive wages and salary to contain a higher private good component than the other three dimensions, attributing approximately 40 percent of any union-induced salary benefits to a worker's individual membership status. This perception does not vary across the age of workers. In addition to providing the first evidence on how union members perceive individual membership relative to union presence, this result strongly supports our finding of an effect of union membership on worker careers even when controlling for the baseline union density at the workplace. We discuss that result in detail below.

Next, we turn to describing our empirical method and explaining how we isolate the causal effects of union membership across the lifecycle.

4 Empirical Method

Union membership is not exogenously given to individuals. It represents a choice people make. Traditionally, researchers have assumed negative selection into unions with the im-

plication that any raw union wage premium may be attenuated because those that choose union membership differ from those that do not choose union membership in ways that are negatively related to earnings.[5] As such, it is difficult to interpret our descriptive evidence above as causal.

To overcome the selection issue, we exploit changes in tax subsidies for union members in Norway which led to significant changes in the net price of union membership for some workers (Barth, Bryson and Dale-Olsen, 2020*b*; Dodini, Salvanes and Willén, 2022). Specifically, the maximum tax deduction for union dues nearly quadrupled between 2003 and 2010. These changes significantly reduced the monetary cost of joining a union for workers whose union-due subsidies were previously bounded by the deduction cap. In other words, individuals at firms subject to higher union dues in 2001 could expect a substantial increase in these subsidies compared to individuals at firms with lower union dues. By construction, although workers may endogenously select into firms and occupations, the policy changes we exploit are orthogonal to changes to these firm characteristics over time. This, therefore, provides us with quasi-experimental, exogenous variation in the cost of union membership to these workers. Provided that individual workers respond to changes in union membership price, an assumption strongly supported by the survey evidence presented above, we can use this as an instrument for union membership in a two-stage least squares approach.

To implement our approach, we start by estimating the probability of union membership as a function of net union dues. Since the Norwegian register data only contain information on union dues for those who are union members, we take the mean union due paid by workers in each occupation-industry cell each year and apply this to union members and non-members alike (as the cost to join a hypothetical union). As such, we do not use the information on individual union dues or wages that may be endogenously determined by individual or firm characteristics. This is identical to what the original paper using this instrument has done (Barth, Bryson and Dale-Olsen, 2020*b*). We then characterize the union dues of the firm as the average of imputed union dues across all the firm's workers.

There are two kinds of endogenous responses to the change in maximum deductions that we address in constructing our measure of the subsidy and net price of union membership. First, it is possible that firms and unions endogenously respond to the subsidy legislation by altering the occupations they decide to employ or by changing the union dues directly. Second, because our objective is to model the union membership choice for individuals rather than generate more aggregated measures of union density at the firm (Barth, Bryson and Dale-Olsen, 2020*b*), and because union membership may endogenously shape sorting across

[5]Very recent work suggests more direct evidence of this: workers with a lower individual fixed effect tend to sort into the unionized portion of their firm Lemieux (2023).

firms, we fix each worker's imputed "baseline" union due, $\overline{D^0_{f_b}}$, at the first firm in which they appear in their first year in the data with a minimum age of 25.[6] For most people and firms, this base year is 2001. We then adjust for inflation forward to nominal Norwegian Krone. This, therefore, represents what a worker would perceive as their "typical" union due at entry into the data, adjusted for overall price levels.

Once we have obtained our imputed union due measure, we calculate the value of the base subsidy for all workers. This value is equal to the lesser of the legislated maximum deduction ($MaxDeduction_t$) and the worker's imputed base union due ($\overline{D^0_{f_b}}$), which we multiply by the country's base tax rate (28 percent from 2001 to 2013 and 27 percent from 2014 onward), or:

$$Subsidy_{f_bt} = T_t * (min\{\overline{D^0_{f_b}}, MaxDeduction_t\}) \ , \tag{1}$$

where T_t is the base tax rate in year t. We apply the base tax rate to isolate changes in the guaranteed *statutory* subsidy from changes in the *realized* subsidy that may depend on marginal tax rates. Identifying variation in the subsidy comes from differences in the occupation-industry mix of the firm in each worker's base year combined with changes in the legislated maximum deduction over time.

We then use this subsidy measure to calculate the net-of-subsidy union due by subtracting the value of the subsidy from the gross imputed baseline union due ($ND_{f_bt} = \overline{D^0_{f_b}} - Subsidy_{f_bt}$). This changes within a worker's base firm over time only through the subsidy channel and represents our instrument.

Using this instrument in a two-stage least squares model, we estimate the following equations (base year fixed effects suppressed for simplicity):

$$y_{iocaf,t+1} = \alpha + \beta \hat{U}_{it} + \gamma_t + \zeta_{a_b} + \eta_a + \iota_{oc_b} + \kappa_{oc} + \lambda_{f_b} + \phi_f + \delta_{i\bar{U}} + \epsilon_{itocaf}, \tag{2}$$

$$U_{itocaf} = \tau + \pi ND_{if_b} + \gamma_t + \zeta_{a_b} + \eta_a + \iota_{oi_b} + \kappa_{oi} + \lambda_{f_b} + \phi_f + \delta_{i\bar{U}} + \mu_{itocaf}, \tag{3}$$

where Equation 3 represents the first-stage and Equation 2 represents the second-stage.

In the first-stage equation, U_{itocaf} represents the union membership status of individual i in age group a at time t in occupation-industry cell oi and firm f. The instrument, ND_{if_b}, is assigned to individuals based on the first firm the person appears in (to avoid endogenous responses to the policy change), and we always include fixed effects for both current as well as baseline characteristics. Specifically, t is year fixed effect, a (a_b) is age (at baseline) fixed effects, oi (oi_b) represents occupation-industry (at baseline) fixed effects, f (f_b) are firm (at

[6] We impose the age 25 condition because we want to characterize the career outcomes of workers after they are likely to have completed education and entered more permanent aspects of their work life. When we relax this assumption, our estimates are less precise but consistent.

baseline) fixed effects, and $\delta_{i\bar{U}}$ is an indicator for whether the person was an "always-taker." The inclusion of always-takers in the sample is important because they contribute to variation that shapes the fixed effects over (base) firm, occupation by industry, age, etc. Accounting for always-taker status makes the effect of the net union due more precisely interpretable to those that are marginal union members, not those that are always union members and contribute nothing to identification.

In the second stage equation, $y_{iocaf,t+1}$ represents an outcome of interest for individual i at time $t+1$ and β measures the effect of union membership on that outcome using the net union due ND_{if_b} as an instrument. We use the outcome the next year to capture the effect of the union with a full year of membership, as individuals could choose to join a union partway through the year, leaving little room to measure effects. All fixed effects included in Equation 2 are also included in Equation 3. We cluster the standard errors on the individual level, as this is the level of treatment assignment.

Identifying variation in the instrument comes from differences in the occupation-industry mix of each worker's base firm combined with changes in the tax policy over time. The base industry and occupation composition of the firm determines which firms are bounded by the maximum deduction or not in the minimization function. Workers whose base firms have high imputed union dues are more intensely treated with the subsidy when the deduction caps are relaxed over time, so there is a larger decrease in their net union due. Changes in the net price of union membership are therefore exogenously loading on some workers and not others for reasons unrelated to labor market or firm conditions over time, and the variation is induced only through the tax policy. In addition, our instrument also rules out any endogenous firm transitions that may be correlated with unionization or the net price of union membership at their current firm because the instrument is constructed for the worker's base firm, and we nonparametrically control for both the base firm and current firm.

To visualize the relationship between the instrument and union membership, figure A1 shows how union membership evolved over time for workers whose base firm had larger reductions in their net union dues relative to smaller reductions in net dues. The union membership rates are parallel for the 2001-2002 period, after which workers whose base firms experienced a larger reduction in net dues via the subsidy saw union membership rates increase much faster than workers with small changes to their net dues. The gaps between the two groups are relatively stable after 2010, which is notable because the subsidies did not significantly change between 2010 and 2014.

The key assumptions underlying our empirical method are that (1) workers respond to changes in union membership price (the relevance criterion), and (2) the only channel

through which the union due subsidies affect individual career outcomes is through their effect on membership probability (the exclusion restriction). We directly verify the relevance assumption in the next section through our empirical first-stage estimation. Although the exclusion restriction cannot be tested directly, we can think of no other pathway through which the union due subsidy may impact worker's outcomes given our setup, and we further note that previous papers using similar instruments have found no reason to suspect that the assumption is being violated (e.g., Barth, Bryson and Dale-Olsen (2020*b*); Dodini, Salvanes and Willén (2022)).[7]

Overall, our estimates of the causal effects of union membership using this instrument will represent the local average treatment effect (LATE) among the "compliers," i.e. those that joined a union as a result of the subsidy-induced reduction in the costs of joining a union based on where people were working at the beginning of their time in the sample.

In an alternative approach, we estimate an individual fixed effects model in which we examine the relationship between our two main outcomes and union membership with fixed effects for age, year, occupation by industry cells, and firms. We then use age-by-union membership status interactions to trace out union membership effects over time. Identifying variation in the model comes from individual workers switching into and out of union status over their working lives. While the determinants of when or if a worker switches union status are likely endogenously related to other determinants of wages and work, this approach provides a separate check on the raw outcomes in Figure 4. We include these in Appendix Figure A5. For earnings, there is a similar downward shift in the returns to union membership between age 25 that flattens by age 40. For transfers, union membership has a larger effect on those over the age of 45. Overall, the individual fixed effects model suggests significant earnings premiums and declines in the use of the public transfer system associated with union membership.

Before presenting the results from our empirical analysis, we note that certain union-provided benefits oftentimes are perceived as collective goods while others are perceived as private goods (e.g., Boeri, Brugiavini and Calmfors (2001)). Failing to take this important nuance into account could not only lead to a fractionalized understanding of the role of unions for workers' careers, but the presence of such spillovers also could generate an attenuation bias of our baseline estimates. At the same time, we note that the survey results strongly suggest that workers themselves perceive each of the amenity bundles (monetary compensation, job security, work environment, and promotion possibilities) to contain significant private-good

[7]Monotonicity is another implicit assumption for our instrument. However, a violation of monotonicity in this setting could only occur if union membership is a Giffen good at certain prices, which is highly unlikely. To ease computational constraints, we estimate our models on a 50% random subsample of workers.

components. To examine the relative importance of the private and public components across our outcomes and assess the extent of spillovers to non-union members, we estimate our core model controlling for the union density at the firm. The difference in point estimates from our main results is not statistically significant for log earnings, and we conclude that union membership in itself plays a crucial role in a worker's ability to reap the benefits of unions over the life cycle. The treatment effects for union membership are larger when we control for firm union density for some other outcomes, implying that union members benefit even more than non-union members at the same level of firm unionization in some of the other aspects of working life. This result is consistent with our findings from the survey and adds to a relatively sparse empirical literature on the public-private nature of union-provided benefits to workers.

5 Results

In this section, we present our core findings of the effect of union membership on the career outcomes of individuals across the life cycle. Unless otherwise specified, all results are based on the estimation of Equations 2 and 3 as described above. We begin by showing the average effects of union membership on workers across the career dimensions discussed in Section 3: monetary compensation, job protection, promotion facilitation, work environment, and welfare usage. We then proceed to estimate age-specific union membership effects, dividing workers into 5-year age bins. Comparing the average effects with the age-specific effects allows us to build a more complete understanding of the role unions play in the career development of individuals. Finally, we estimate gender-specific long-run union membership effects over age. Examining such heterogeneity is interesting as men and women differ in their career development and occupational choices (e.g., (Cortes and Pan, 2018; Napari, 2009; Blau and Kahn, 2017; Johnsen, Vaage and Willen, 2022; Salvanes, Willage and Willen, 2022)), and may therefore experience differential gains from union membership, both overall and across different career segments.

5.1 Average Effects Across Workers

Table 1 provides results from estimating the mean impact of union membership on a series of core career outcomes related to monetary compensation (Columns 1 and 2 of Panel A), job protection (Column 3 of Panel A), promotion facilitation (Columns 4 and 5 of Panel A), work environment (Column 1 of Panel B), and transfer usage (Columns 2 through 3 of Panel B), using Equations 2 and 3 from Section 3.

For monetary compensation, columns (1) and (2) of Panel A demonstrate that union membership both results in a substantial wage premium as well as a considerable increase in the number of hours worked. The union wage premium identified through our estimation

approach, 0.08 log points, is slightly smaller but comparable to that which has been estimated in the prior literature based on a range of different empirical methods. For example, using novel data from the late 1930s to the early 2010s, Farber, Herbst, Kuziemko and Naidu (2021) finds a consistent descriptive union income premium of approximately 0.1-0.2 log points in the US over the past 80 years. The economically meaningful and statistically significant effect on hours worked highlights that the effect of union membership on the overall take-home wage is even larger than that shown in column (1). The reason is that union membership appears to not only boost a worker's wage conditional on the number of hours worked but also increase the total number of hours worked.[8]

With respect to job protection, the results in column (3) show that union membership generates a reduction in the probability of workers losing their jobs and being placed on unemployment benefits. Specifically, union members consume an average of 14,600 NOK less in unemployment benefits a year. This suggests that union membership bestows a certain degree of job security to members, protecting them against layoffs at the workplace. For promotion possibilities, columns (4) and (5) show results consistent with the idea that union membership facilitates vertical moves within the worker's existing firm, and discourages moves to other firms. In terms of magnitudes, the table shows that union membership increases the probability of a vertical move within the firm by approximately 8 percentage points, roughly double the non-union baseline value, and reduces the probability of a vertical move across firms with approximately 13 percentage points, which eliminates a substantial share of the baseline firm upgrading probability. In the next subsection, we will show that these average effects mask considerable heterogeneity across the life cycle of workers.

With respect to work environment, which we proxy by workers' use of Norway's generous sick leave system, we see a small and not statistically significant reduction in sick benefit take-up as a consequence of joining a labor union. As we will show in the next section, the effects on sick leave take-up mask considerable heterogeneity over age.

To summarize the impact of union membership on the average worker's use of the tax and transfer system in Norway, column (2) of Panel B shows the overall impact of union membership on the amount of money received from the central government through the social insurance programs in the country (excluding sick pay and parental benefits) and column (3) shows the effect on the probability of receiving any safety net transfers. In response to union membership, transfers are reduced by approximately 89,000 NOK and the probability of using the safety net system drops by 16 percentage points. The result in column (2) can be viewed as a combined intensive and extensive effect of union membership on safety

[8]The wage effects in column (1) may be imprecise as a result of the measurement of hours, which is rounded in the data; see the discussion in the data section for additional information.

net usage, while the result in column (3) can be interpreted as a pure extensive margin effect. The effects in Panel B demonstrate that labor unions may reduce individual workers' dependence on the welfare system through improved job protection and a higher-quality work environment.

Taken together, this section has examined the impact of union membership on the average worker in the labor market. While the results on wages are consistent with prior literature, the causal effects identified with respect to job security, promotion potential, work environment, and welfare usage, are relatively new to the literature. These results help create a more complete picture of the role unions play in the career outcomes of individual workers. Relating these results to the survey responses discussed above, it is interesting to note that the magnitude and statistical significance of these effects both appear to largely correspond to workers' ranking of career amenities shown in Figure 7. Specifically, the figure shows that the average worker considers monetary compensation to be the most important career component of their jobs, followed by job security, work environment, and lastly promotion possibilities. This pattern is strongly consistent with the results presented in Table 1.

As demonstrated by the survey results in Figure 7, we know that worker preferences for various career outcomes vary across their careers. In addition, a union's ability to bargain for a particular worker may also depend on where in the career that worker stands. As such, it is possible that there is substantial heterogeneity in the effect of union membership on the career outcomes of workers across their life cycles and that the mean impacts shown in this section mask significant nuance. In the next section, we examine union membership effects on workers as a function of their age at the time of union enrollment.

5.2 Heterogeneous Effects Across the Life Cycle

To provide empirical support for the patterns of differential price sensitivity from our survey in Figure 5, we present the different first-stage responses in Table 2. After accounting for differences in baseline earnings and differences in base unionization rates over age, large differences emerge. Relative to their baseline propensities to unionize, workers ages 25-29 are more than 1.5 times more sensitive to a 1% change in the total earnings cost of joining a union than their counterparts over age 45. This follows closely the relative differences in Figure 5, where approximately 30% of non-union workers ages 45-49 would reconsider their choice compared to nearly 50% of those ages 25-29.

To examine variation in the causal effect of union membership effects across the life cycle, we estimate versions of Equations 2 and 3 in which we fully interact the treatment variable with 5-year age bins depending on how old the worker is at the time of the national union due subsidy adjustments. To facilitate the interpretation of the results, we then plot the relevant coefficients in figures together with 95 percent confidence intervals, providing us

with a detailed overview of how the union membership effects change as a function of the worker age.

Concerning monetary compensation, Panel A of Figure 10 provides estimates of the effect of union membership on wages as well as hours worked across the life cycle of workers. For wages, the results show that the union wage premium varies greatly across a worker's career. Specifically, while individuals enjoy large union wage premiums at the beginning of their working lives, this premium monotonically declines in size until age 45 at which point it ceases to be economically meaningful or statistically significant. This effect closely mirrors the descriptive patterns in Section 3.2. This finding helps advance prior literature on the union wage premium, which has documented substantial wage effect of union membership (e.g., (Card, Lemieux and Riddell, 2004; Farber, Herbst, Kuziemko and Naidu, 2021)) for the average worker without considering heterogeneous effects across their careers. Panel A also shows that the union membership effect on hours worked is slightly larger for the very young workers aged 25 through 29, suggesting that part of any differential earnings effect across the life cycle is driven by the union's impact on individuals' work hours. However, there is much less variation in the hours effect across the life cycle, and it is oftentimes not significantly different across the various age bins.

With respect to job security and employment protection, Panel B provides estimates of the effect of union membership on the amount of unemployment insurance used. Two observations are worth noting. First, the union effect on job protection rapidly increases over the first ten years of a worker's career, with 40 through 44-year-olds using the unemployment insurance system to a much smaller degree than workers at the beginning of their careers. Second, the union effect on work protection flattens beyond age 44. These effects are in line with the notion that job protection may matter more for individuals during the separation phase of their careers, as skill depreciation and obsolescence pose an increasing threat of job termination. The figure suggests substantial savings to the government through reduced unemployment benefits on the order of 16,000 NOK (USD 1,600) per union member per year for those over 44.

In terms of promotion probabilities, Panel C plots the effect of union membership on advancing to a higher-paying occupation and on transferring to a higher-paying firm. The figure illustrates that unions have little impact on workers' promotion possibilities at the beginning of their careers. However, as workers age, union membership is providing workers with an increasing probability of moving up the career ladder. Specifically, the union effect on job promotions rapidly increases over the first 20 years of a worker's career, with 45 through 49-year-olds being almost 15 percentage points more likely to experience an occupational advancement due to enrollment in labor unions. After age 49, the age gradient of the union

effect on occupational advancements is flat. Combined with the negative effects on firm mobility we document below, much of the increase in occupational advancement is coming from within the same firm.

With respect to across-firm mobility, Panel C also paints a more nuanced picture. Specifically, union membership has a negative effect on the likelihood that a worker upgrades to a higher-paying firm the next year. This negative effect is much larger for young workers but is both economically meaningful and statistically significant among old workers as well. This result suggests that unions may generate a lock-in effect for workers, encouraging them to remain at the existing workplace to reap the benefits of the union membership rather than transferring to other firms.

Finally, in terms of work environment—an outcome which we proxy with the probability of utilizing the sick leave system of Norway—Panel D shows the effect of union membership on the amount of sick leave taken as a function of the worker's age. The results reveal substantial effect heterogeneity over a worker's career, with relatively sizable negative effects on sick leave usage among young workers, and positive effects on sick leave usage among old workers. While speculative, we postulate that the negative usage effects among young workers are coming from an improved work environment and protection against non-promotable and risky tasks that disproportionately tend to fall on new workers, while the positive usage effects among old workers are coming from improved job protection such that fear of negative worker replacement effects in the event of sick leave are removed. Unfortunately, we are unable to test this empirically in the data, but we note that it is a valuable area of future research. The average effect on transfer amounts from the national government for sick leave suggests modest savings of approximately 2,500 NOK per marginal union member per year.

Given these wage, promotion, job protection, and sick leave effects, how does union membership affect a worker's interaction with the public transfer system? Figure 11 shows that the marginal union membership leads to approximately 80,000 NOK less in transfers for those age 25-29. This amount grows to a peak of approximately 110,000 (approximately 11,000 USD) NOK by age 40 and then falls gradually. For those age 60-64, there is no reduction in these transfers to union members. Overall, these results suggest the largest positive fiscal externalities for workers during their peak years in the labor force.

An interesting question to ask is how well these identified effects correspond to the belief workers have regarding the unions' ability to influence key work amenities across the life cycle. As shown in Figure 8, the average worker believes that unions are best able to influence monetary compensation, closely followed by job security, slightly less able to influence the quality of the work environment, and even less capable to affect the workers' promotion possibilities (though still meaningfully able to do so). Interestingly, there is very

little evidence of differences in workers' perceptions of the unions' ability to influence these four work dimensions across age groups. This implies a substantial information imperfection regarding workers' understanding of the union's role in their careers. Alternatively, survey respondents may distinguish between short-run benefits from unions (the focus of our paper up until now) and the long-run effects that unions have on workers. In the next section, we will show evidence in favor of the second of these explanations.

When interpreting the results from this section, it is important to note that some of the goods and services that unions provide traditionally are believed to contain substantial collective goods components while others are considered to be pure private goods (e.g., (Boeri, Brugiavini and Calmfors, 2001)). For example, while all individuals at the workplace may to some extent benefit from a union's collective bargaining over wages with the employer (the collective aspect of the union wage component), only union members would benefit from individual counseling and support for job security and promotions. Failing to take this important nuance into account could not only lead to a fractionalized understanding of the role of unions for workers' careers, but the presence of such spillovers also could generate an attenuation bias of our baseline estimates.

To examine the role of individual membership conditional on union density effects, we estimate our model controlling for the union density at the firm. The results from this exercise are shown in Figures A2 through A4. The union membership effects generally become slightly larger relative to our baseline results, but the difference in point estimates is not statistically significant for wages, which is the margin that has been examined in the past. The differences in the coefficients are largest for job protection and use of sick pay. We conclude that union membership in itself plays a crucial role in a worker's ability to reap the benefits of unions, especially with regard to non-monetary benefits. This is an interesting result that contrasts with some of the previous literature (e.g., Barth, Raaum and Naylor (2000)). However, prior work has not been able to explore this question through the use of exogenous variation in individual membership, so comparisons require caution.

In light of the above results, it is also important to note that the results from the survey in Figure 6 demonstrate that union members perceive union-provided career benefits to contain a substantial private-good component across each of the four amenity bundles we examine. Interestingly, members perceive wages to contain a higher private good component than the other three dimensions, attributing approximately 60 percent of any union-induced wage benefit to a worker's individual membership status. While this aligns well with the wage bargaining process outlined in Section 2, the perceived importance of the private good component of wage bargaining in this paper is perhaps greater than traditionally believed. In addition to providing the first evidence on how union members perceive individual mem-

bership relative to union presence, this result strongly supports our finding of an effect of union membership on worker careers even when controlling for the baseline union density at the workplace.

Taken together, the results presented in this section demonstrate that the value of a union membership varies substantially across a worker's career and that average effects miss a great deal of detail. It further demonstrates that unions do much more than influence wages and that they generate a net reduction in government welfare expenditures. More specifically, the results show that unions play an important role at the hiring stage via monetary compensation and work environment, and at the separating stage via promotions and job protection. While this differential effect of union membership across workers' careers could be driven by a number of different factors, the overall implication of this finding is that the role of unions varies greatly depending on where in the career workers are. This result is crucial for policymakers when considering the interaction of social institutions and market structures, and how such interactions influence both individual workers as well as society.

5.3 Long-Term Career Impacts of Union Membership

So far, our results have shown that the career effects of union membership differ greatly depending on the age at which workers enroll. In addition, we have shown that focusing on a restricted set of outcomes, such as wages and employment, generates a fractionalized understanding of the multidimensional career effect that union membership has on workers. These two sets of results have important implications for how we should think about the overall long-term effects of union membership on workers. Specifically, while the relationship between union membership and contemporaneous career outcomes is of independent interest, these two sets of results also mean that the long-term effects of union membership likely differ substantially from the short-run effects.

First, workers enjoy much larger contemporaneous union wage premiums at the beginning of their working lives, and after age 45 there appears to be no short-run wage benefit associated with union membership. To the extent that future wages depend on benchmarking against current wages, this finding implies that younger workers are likely to experience larger long-run wage gains as well. Second, unions provide considerable job security and promotion opportunities to mid-career and senior workers while there is little gain for workers at the beginning of their careers (other than a lock-in effect at the current employer). Given that promotions and job security are associated with increased work stability and higher pay, this finding suggests that mid-career and senior workers may benefit relatively more through long-run wage gains. Third, unions provide considerable work environment benefits to both young and old workers, but in opposite directions. If work environment has a positive impact on productivity and ability, this may lead to differential long-run effects.

To explore how these differential contemporaneous effects impact the long-run payoff of union membership, we estimate the long-term career implications of union membership as measured 10 years after the policy introduction. We focus on annual earnings and government transfers ten years after the unionization decision, two outcomes that help provide overall summaries of the effect of union membership on a worker's long-term welfare. These results should be interpreted as the sum total of all the differential impacts discussed above (including those we cannot observe).

The results from this exercise are provided in Figure 12. Panel A shows that the long-term earnings effects of union membership are the smallest for the youngest workers and the largest for the mid-career and senior workers. While the effect differences are not always statistically significantly different from each other, this result is consistent with the finding that senior workers benefit more from job protection and promotion possibilities relative to young workers. These types of amenities represent job characteristics that are usually associated with stable and permanent earnings gains in the long run. This result is particularly interesting as it stands in contrast to the short-run wage effects in which the young workers benefit the most.

It is important to emphasize that the long-run earnings effects across age groups—approximately 0.4 log points—are substantially larger than any of the short-run earnings effects identified in the previous section. The accumulation of union wage premia over time is likely an implication of all the other career effects that union membership has on workers through job security, promotion potential, and work environment quality. This finding highlights the importance of accounting for the dynamics of union membership and its interaction with all aspects of a worker's career when evaluating its overall impact on individuals.

Another aspect alluded to in Figure 2 is that union membership is more persistent among older workers. The persistence of union membership may be another aspect of the accumulation of longer-run benefits for older workers despite lower short-run wage effects. It is also particularly interesting to note that the long-run wage premium effect pattern shown in Figure 12 is closely aligned with the workers' own perception of union-induced wage benefits across the life cycle, shown in Figure 8. In other words, when asked if unions are able to affect salary, respondents may be thinking about the long-term effects of unions rather than the short-term effects.

In terms of the long-run effect on taxable transfers, in Panel B, we see a decline in the long-run use of the social security system across all ages, though the effects are smaller for workers close to retirement. This implies a substantial reduction in welfare payments from the government due to union presence, primarily driven by the union's effect on job protection and work environment quality. In total, the marginal union member saves the

government approximately 120,000 Norwegian crowns, or approximately 12,000 US dollars, ten years after enrollment (while at the same time enjoying higher wages and therefore providing increased tax revenue to the government).

5.4 Effects by Gender

As discussed in Section 2, there is a growing literature documenting that men and women differ in occupational choice, career wage growth, promotions and career progressions, the use of welfare systems, and responses to labor market shocks. It is therefore possible that the impact of union membership varies across genders. To this end, we estimate the effect of union membership separately for men and women across their life cycles with respect to the long-run earnings and transfer outcomes analyzed in Section 5.3. The results from our gender analysis are provided in Figure 13.

Panel A of Figure shows that men and women display a very similar pattern in terms of union membership earnings effects in the long run. However, Panel A also illustrates that women benefit more than men across the entire age distribution, suggesting that the marginal female union member is better off relative to the marginal male union member and that union membership in itself contributes to a narrowing of the gender wage gap among its members. This is an interesting and important result that helps us better understand how existing social structures interact with the labor market to affect wage parity in society. To the best of our knowledge, we are among the first to document the *causal* role of unions in narrowing the gender wage gap among members.

In terms of the long-term use of the social safety net, Panel B of Figure shows that union membership contributes to a reduction in safety net reliance both among men and women. While the effects are not statistically significantly different across genders between ages 25 through 49, they begin to diverge among senior workers. Specifically, women aged 50 through 60 that are in unions utilize the safety net even less compared to their non-union counterparts than younger female workers; however, the pattern is the opposite for men aged 50 through 60. While speculative, we believe that this gender divergence at older ages could be an implication of unions improving the work environment and career prospects of women in a way that makes them delay retirement until a later age. Because the majority of men already work until the legally mandated compulsory retirement age of 67, there is likely no such delay effect among men.

6 Discussion

Labor unions are as old as the industrial economies, and they have played a pivotal role in shaping the dynamics of labor markets for more than 200 years. Through their involvement in the employee-employer dialogue, they exert substantial theoretical influence over workers'

careers, both with respect to pay and working conditions. However, despite a consensus on the role of unions—to maximize worker welfare—there is little agreement on union success in serving worker interests.

In this paper, we exploit exogenous variation in union membership to provide the first comprehensive empirical analysis of the career effects of unions across the life cycle of workers. Specifically, we examine through which channels unions influence worker outcomes, whether unions influence workers differently across their careers, and what the overall long-run effects of union membership are.

From a theoretical perspective, it is very difficult to identify the effect of unions across worker careers as a function of worker age. Even though workers may have differential amenity preferences across the life cycle, it is not certain that unions are able to act on those preferences. Obtaining theoretical predicts would entail solving an optimization problem that relates heterogeneous worker amenity preferences over the life cycle to unions' bargaining ability with employers over these amenities across heterogeneous workers. If there is incomplete information available to prospective union members regarding what unions can do, such models quickly become intractable. This necessitates an empirical examination of this question in which we can trace out the reduced-form effect of union membership on all work dimensions across heterogeneous employee ages. Our empirical exercise may guide the theoretical literature by highlighting a set of important parameters to use in future work and encourage future empirical work to better understand the disconnects between worker preferences and what unions are able to do across the career life cycle.

To perform our analysis, we exploit government-induced changes in the price of union membership, which affects the incentive of workers to organize. These changes affect workers of all ages and therefore provide an ideal setting for examining whether the career effects of unions differ across the life cycle of workers, and what the sum total of all these effects are in the long run.

We present four sets of results. First, we show that the contemporaneous union wage premium varies greatly across a worker's career. Specifically, while individuals enjoy large union wage premiums at the beginning of their working lives, this premium monotonically declines in size until age 45 at which point it ceases to be economically meaningful or statistically significant. We find that part of the differential wage effect across the life cycle is driven by the union's impact on individuals' work hours, an effect that also is larger for young workers.

Second, we uncover substantial heterogeneity in how union membership influences other key dimensions of a worker's career across the life cycle: job protection, promotion facilitation, and work environment. Specifically, while unions play an important role at the hiring

stage with respect to monetary compensation and work environment, they matter much more with respect to promotions and job protection for senior workers.

Third, by examining the effect of union membership on individuals' overall use of the national welfare system, we reveal that young workers are considerably less dependent on transfers from the government when unionized. This effect monotonically declines over the worker's careers until just before retirement at which point the effect is no longer economically meaningful or statistically significant.

Our final set of results revolves around the long-term career implications of union membership as measured 10 years after the policy introduction, focusing on wages and government transfers. These results should be interpreted as the sum total of all the differential impacts discussed above (including those we cannot observe). We find that the long-term wage effects of union membership are the smallest for very young workers and the largest for mid-career and senior workers. This result is consistent with the fact that senior workers benefit more from job protection and promotion possibilities relative to young workers (who instead experience a larger lock-in effect at the current employer). These are job characteristics that are usually associated with stable and permanent wage gains in the long run. The long-run earnings effects across age groups (approximately 0.4 log points) are substantially larger than any of the short-run earnings effects identified in the paper. The accumulation of union wage premia over time is likely an implication of all the other career effects that union membership has on workers via job security, promotion potential, and work environment quality. This finding highlights the importance of accounting for the dynamics of union membership and its interaction with all aspects of a worker's career when evaluating its overall impact on individuals.

In terms of the long-run effect on taxable transfers, we see a decline in the long-run use of the social security system across all ages, though the effects are smaller for workers close to retirement. The effect pattern is relatively similar to that of the long-run wage effects. This implies a substantial reduction in welfare payments from the government due to union presence, primarily driven by the union's effect on job protection and work environment quality. This result highlights another important dimension of the union debate that has previously been overlooked in the literature: not only may unions affect worker welfare through wages and work conditions, but they may also affect government welfare expenditures and workers' dependence on the social security system.

To the best of our knowledge, this is the first paper to trace the impact of union membership across the life cycle and examine how it affects workers' careers in terms of monetary compensation, job security, promotion possibilities, work environment, and welfare usage. It is also one of the first papers in the literature to explore the long-run career effects of

union membership, examining the impact as long as 10 years after enrollment. While the relationship between union membership and contemporaneous career outcomes is of independent interest, it is also of great value to understand the aggregate effect on labor market outcomes in the long run.

On an aggregate societal level, the union subsidy program is estimated to have generated an overall increase in union membership of approximately 5 percentage points (Barth, Bryson and Dale-Olsen, 2020*a*), or 137,500 workers by the end of our sample. Using this number coupled with our baseline estimates in Table 1, we can perform some back-of-the-envelope calculations of the overall impact of union membership on the Norwegian economy. Abstracting away from any spillovers to non-union members at the firm, we calculate that the government-induced union membership increase generated a 0.4 percent increase in wage levels ($8 * 0.05$) and a reduction of 12.2 billion NOK in welfare payments ($137500 * 88953$). In terms of costs, approximately 1,900,000 individual workers are members of trade unions in Norway. Using the average base subsidy in 2014 (1,000 NOK) and assuming a top marginal tax rate of 47.2% in 2014, the program would cost 3.65 billion NOK (since the subsidy applies to all members, new and current). This cost amounts to less than a third of the reduced welfare payments we document. The increased marginal income tax revenue operating through the higher wages further increases the benefit-cost ratio of this calculation.

In terms of policy implications, our results highlight that the effect of union membership differs greatly depending on the age at which workers enroll and that focusing on average impacts masks important heterogeneity. In addition, we show that men and women are affected in different dimensions of their careers. While our focus in this paper is on unions, these results allude to a more general policy implication: that age-neutral labor market policies, institutions, and regulations, may affect individuals differently across their careers. This matters to social planners when trying to design optimal labor market interventions, highlighting the importance of taking into account age and career heterogeneity across the life cycle and illustrating how that may shape the overall effects of proposed interventions.

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Tables

Table 1: Average Effects of Union Membership

	Panel A				
	(1)	(2)	(3)	(4)	(5)
	Compensation		Job Protections	Advancement	
VARIABLES	Log(Hourly Wage)	Log Hours	Unemployment Benefits	Pr(Advancement)	Pr(Firm Upgrade)
Union Effect	0.0822*	0.0925**	-14,634***	0.0798***	-0.127***
	(0.0495)	(0.0362)	(1,884)	(0.0244)	(0.0256)
1st Stage (1,000 NOK)	-0.114***	-0.114***	-0.116***	-0.114***	-0.114***
	(0.0058)	(0.0058)	(0.0052)	(0.0051)	(0.0051)
Non-Union Mean	5.62	3.47	3,461	0.0671	0.1168
Non-Union Mean | >0	-	-	50,344	-	-
Observations	10,745,934	10,751,060	12,538,920	12,596,786	12,596,786
Kleibergen-Paap F stat	387.39	386.45	490.73	510.59	510.59

	Panel B		
	(1)	(2)	(3)
	Work Environment	Transfer System	
VARIABLES	Sick Pay	Total Transfers, Excl Sick, Parental	Pr(Safety Net)
Union Effect	-2,012	-88,953***	-0.163***
	(5,220)	(8,248)	(0.0508)
1st Stage (1,000 NOK)	-0.116***	-0.116***	-0.116***
	(0.0052)	(0.0052)	(0.0052)
Non-Union Mean	14,486	22,620	0.2666
Non-Union Mean | >0	54,595	59,421	-
Observations	12,555,423	12,240,286	12,555,423
Kleibergen-Paap F stat	513.64	490.73	490.01

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

Source: Authors' calculations of Norwegian registry data from 2001 to 2015.
Notes: Estimates come from the two-stage least squares specification in Equations 2 and 3. Standard errors are clustered at the individual level. Outcomes are measured with a one-year lag. The model includes fixed effects for year, base and current 5-year age bin, base and current occupation-by-industry cell, base and current firm, and always union status. Current union status is instrumented by the base firm's net union due.

Table 2: Measured Price Elasticities by Age

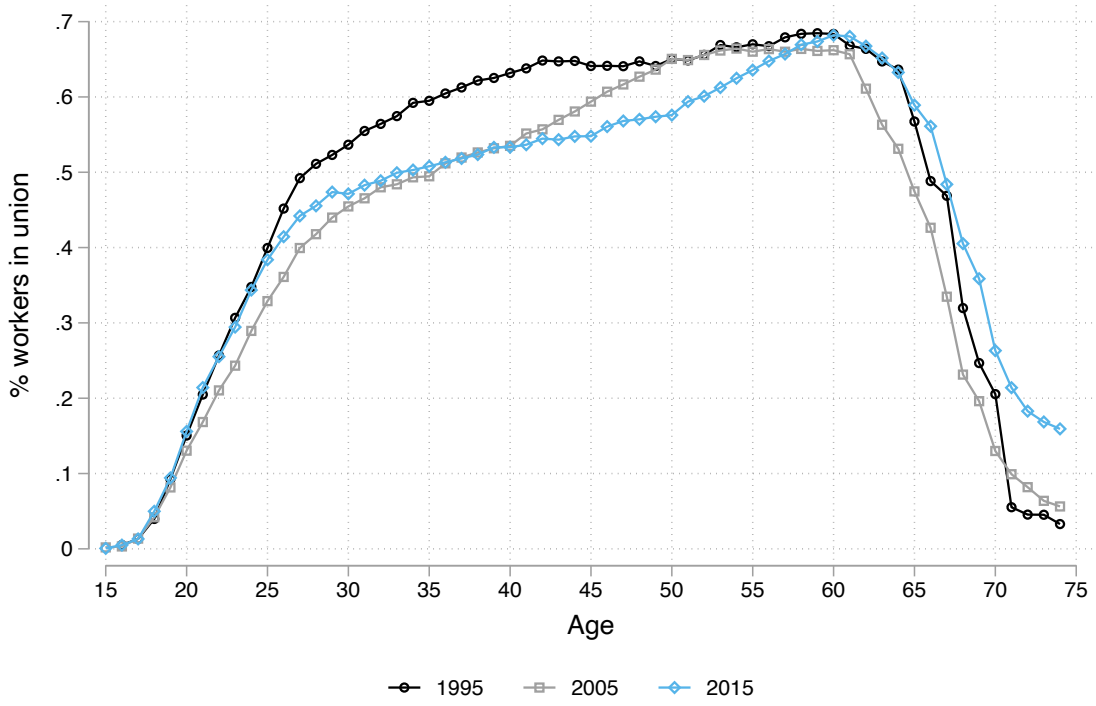
Age Group	(1) Percent Change|1% Change Income Cost, Base Rates
25-29	-0.0667
30-34	-0.0467
35-39	-0.0504
40-44	-0.0543
45-49	-0.0394
50-54	-0.0393
55-59	-0.0382
60-64	-0.0361

Source: Authors' calculations of Norwegian registry data for 2001-2015.

Notes: Estimates divide the relevant first stage coefficients for each age group in Equation 3 by age-group mean annual earnings and age-group mean unionization rates.

Figures

Figure 1: Union Membership Rates by Age

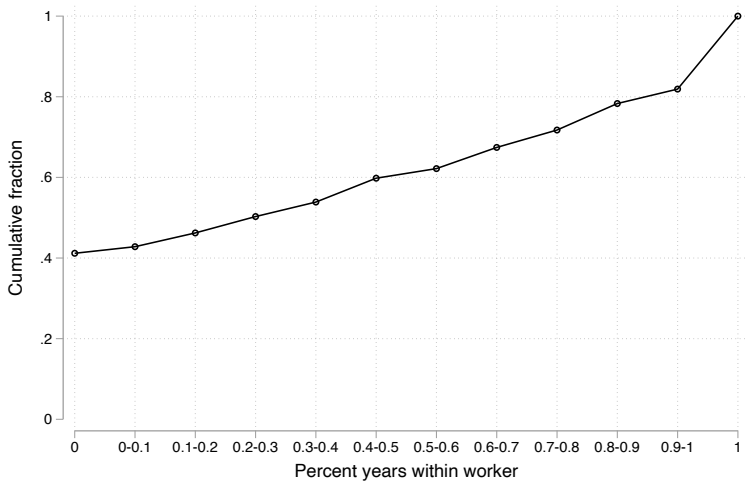


Source: Authors' calculations of Norwegian registry data.
Notes: Shares reflect raw shares of workers in unions by age as of the years 1995, 2005, and 2015. Union membership is defined by having taken a union deduction in the tax register for that year.

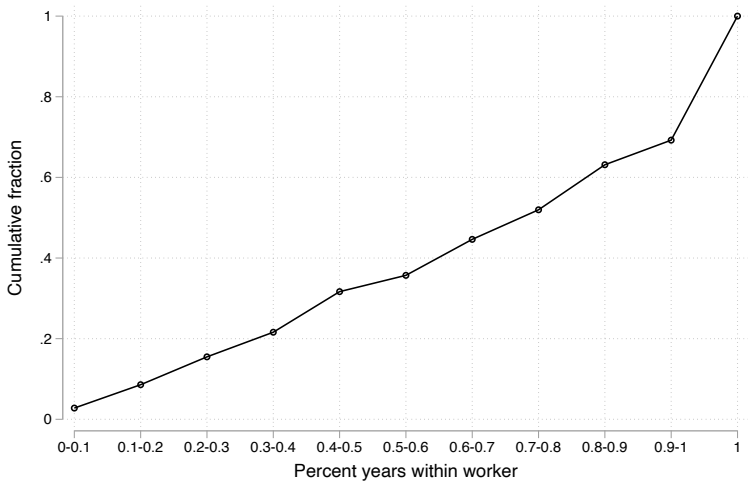
Figure 2: Share of Working Years in a Union and Union Switching Rates

Share of Years in Union

Panel A: All Workers

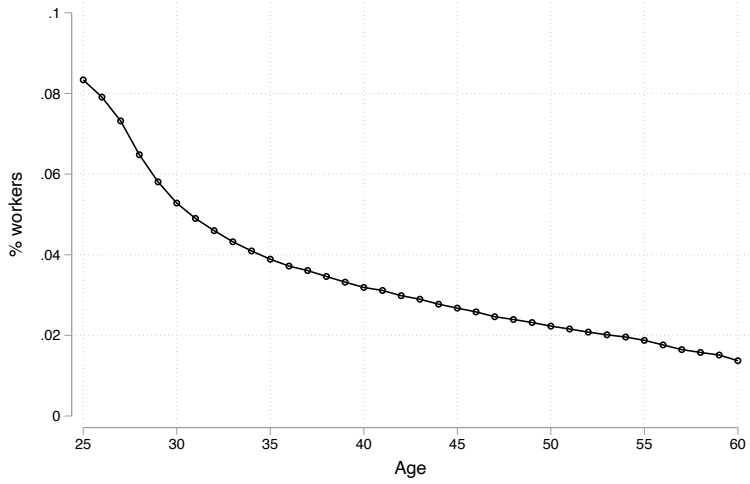


Panel B: Conditional on Ever Being in a Union

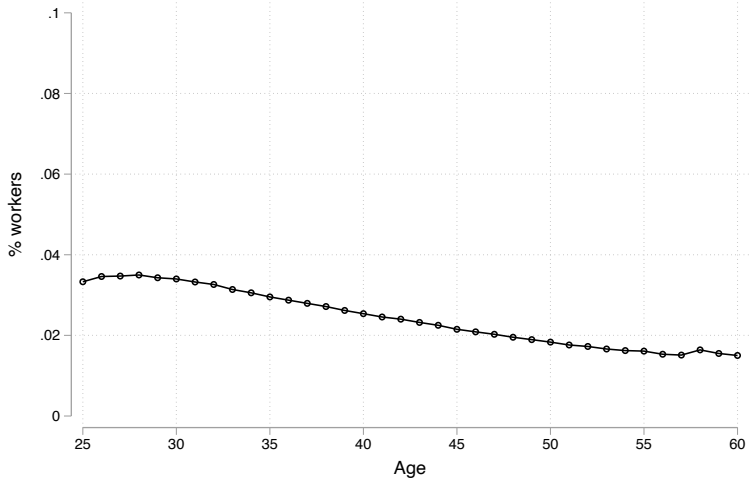


Share Switching Into (Out of) Union

Panel C: Switching into Union



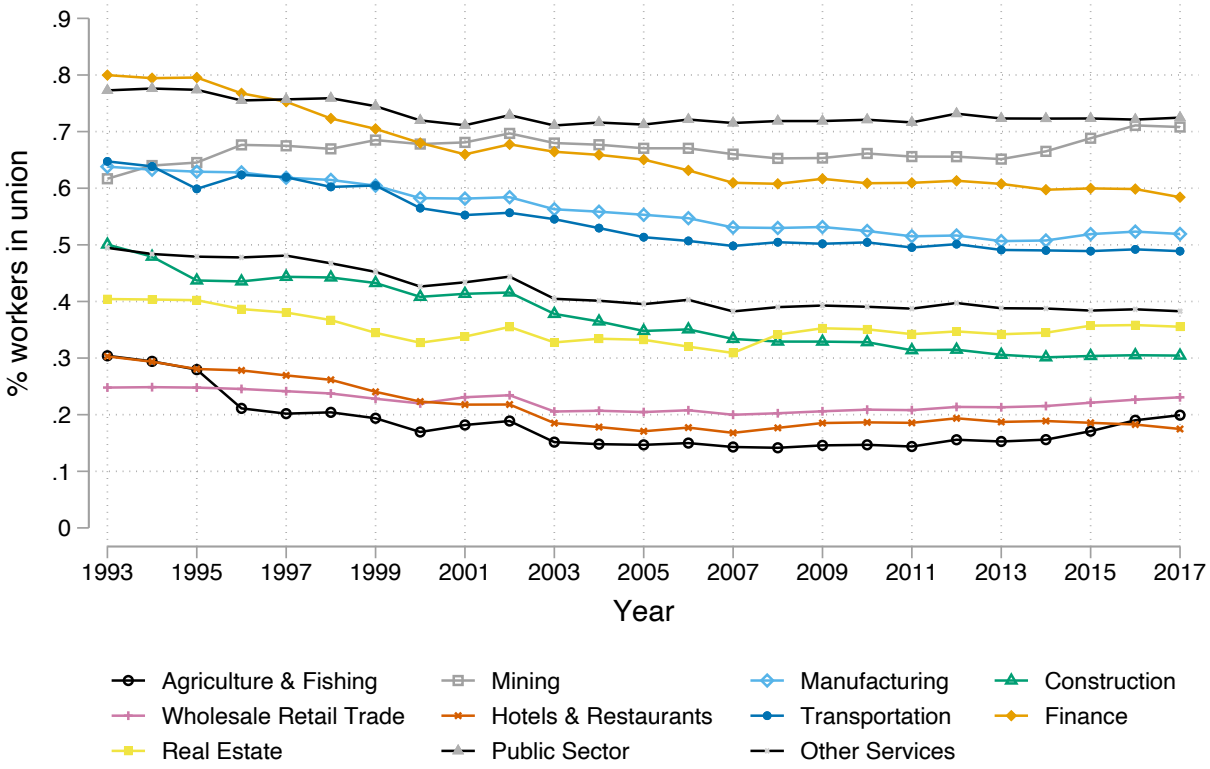
Panel D: Switching out of Union



Source: Authors' calculations of Norwegian registry data from 1993 to 2017.

Notes: In Panel A, the Y axis represents the cumulative share of workers that spent X share of their working years as a member of a labor union during our sample period. In Panel B, the Y axis is the share of workers switching into (out of) a union by age.

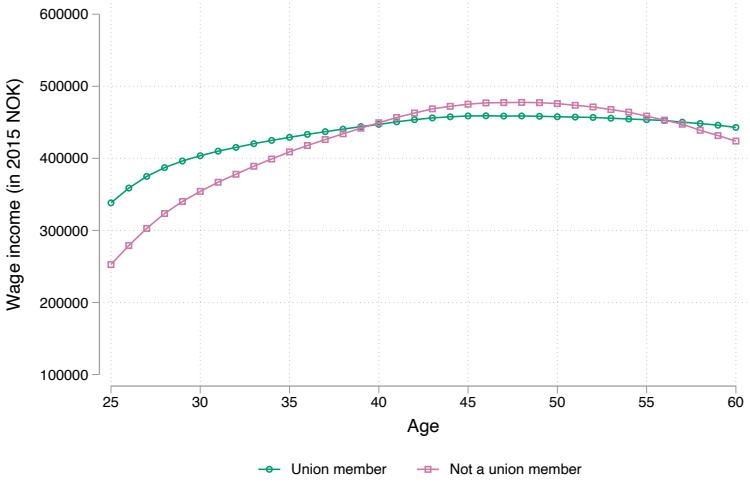
Figure 3: Unionization by Major Industry by Year



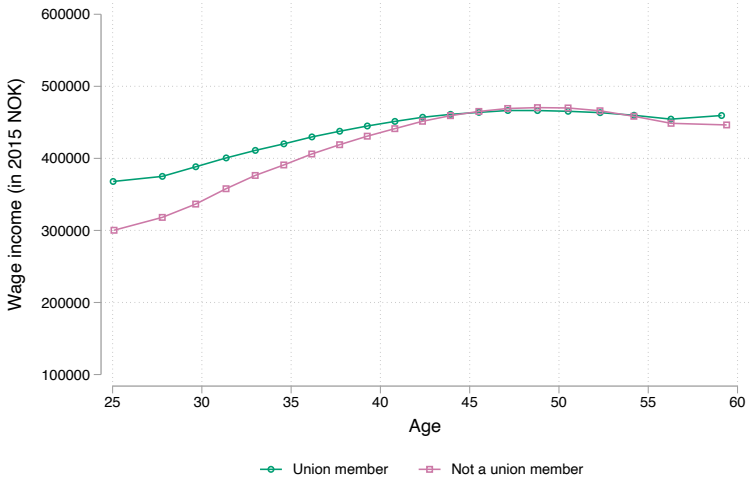
Source: Authors' calculations of Norwegian registry data from 1993 to 2017.

Figure 4: Union Membership, Earnings, and Selected Transfers by Age

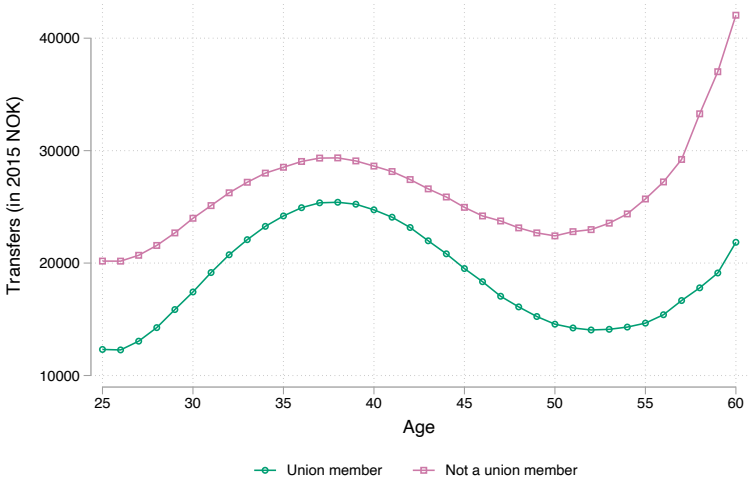
Panel A: Annual Earnings by Age, Union Status



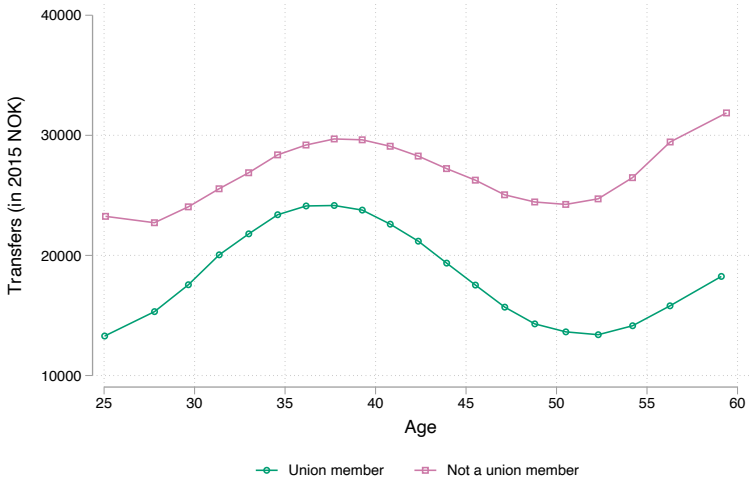
Panel B: Annual Earnings by Age, Union Status, with Controls



Panel C: Transfers (excl. Sick and Parental Leave)



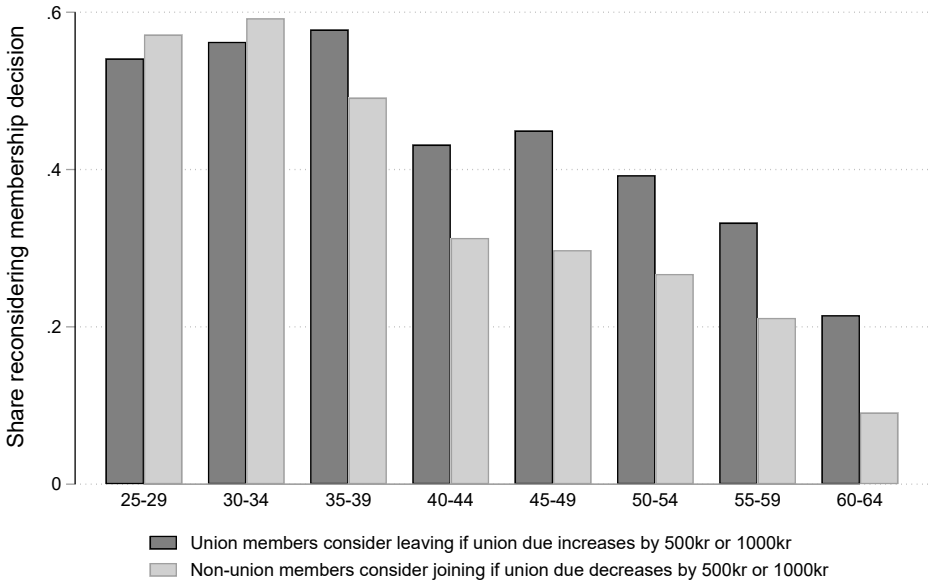
Panel D: Transfers (excl. Sick and Parental Leave), with Controls



Source: Authors' calculations of Norwegian registry data from 1993 to 2017.

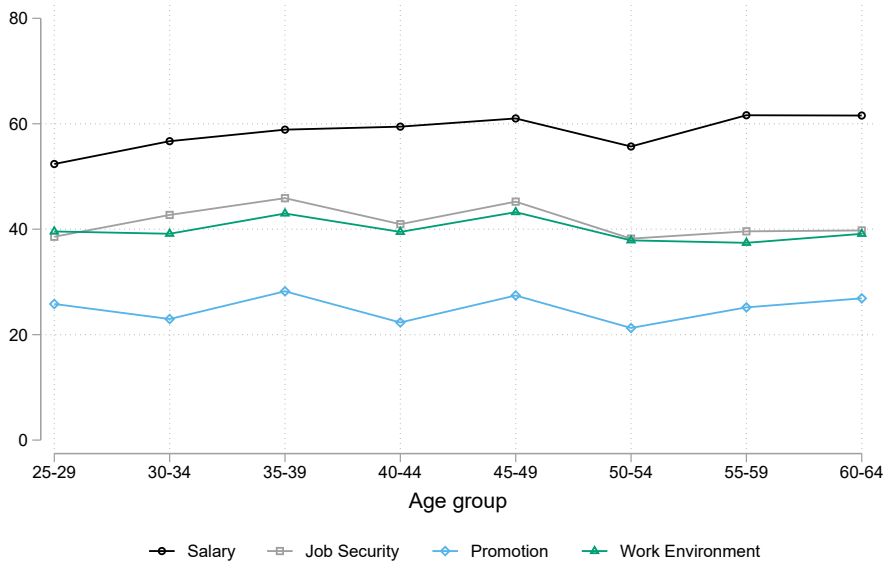
Notes: Panel B and D include fixed effect controls for gender, immigration status, industry, education (program and level), and year. Transfers are defined as total government transfers excluding sick and parental leave.

Figure 5: Price Sensitivity to Union Membership



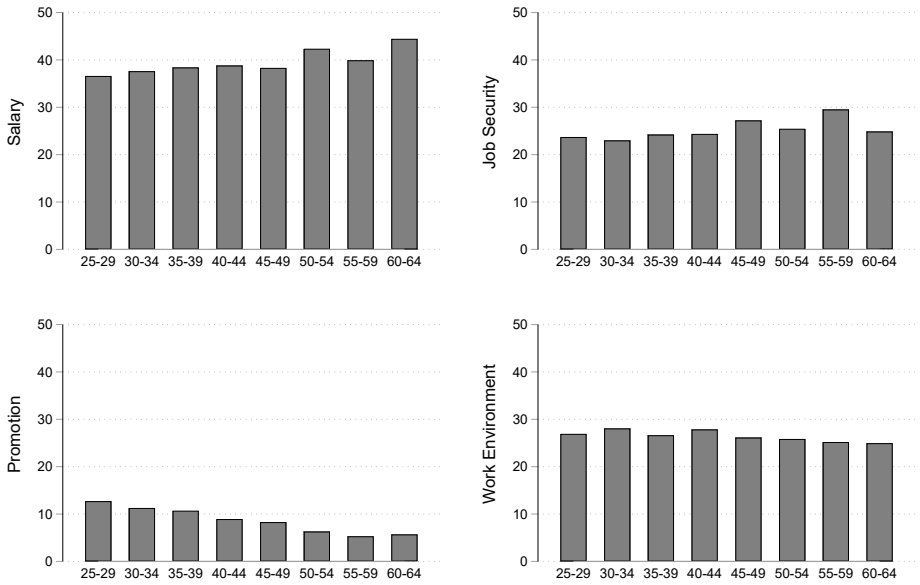
Source: Authors' calculations based on survey data collected by NORSTAT on behalf of the authors. Notes: The question on the survey asked, "If your after-tax dues for union membership were reduced [increased] by [XYZ] NOK, would you reconsider your decision to join a union?"

Figure 6: Perceived Public Good Component of Union Membership



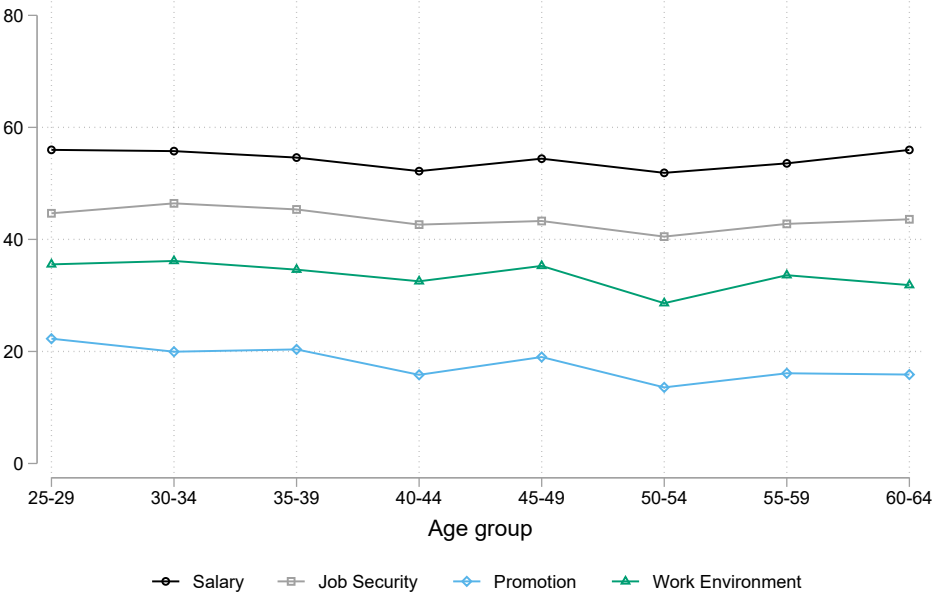
Source: Authors' calculations based on survey data collected by NORSTAT on behalf of the authors. "Compared to members, to what extent do you think nonmembers in your workplace can benefit from the presence of unions along these four dimensions? 0 means 'not at all' and 100 means 'completely.'"

Figure 7: Worker Valuation of Career Amenities



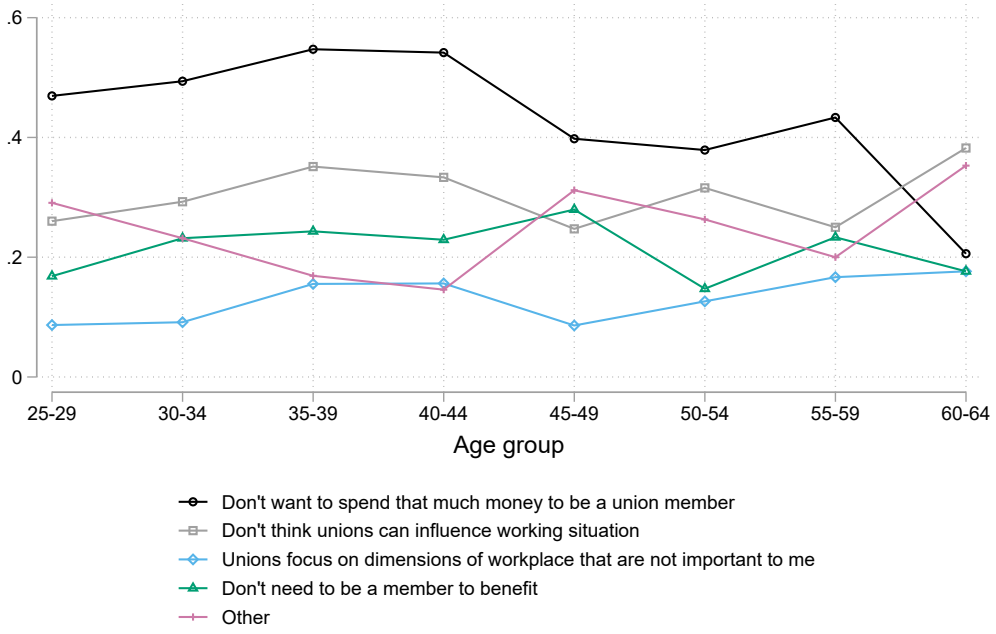
Source: Authors' calculations based on survey data collected by NORSTAT on behalf of the authors.
Notes: The question on the survey asked, "Rank the following job characteristics based on importance to your future career and well-being: Salary, Job Safety, Promotion Potential and Work Environment Quality. Here we ask you to award 100 points across the four categories. You can assign anything between 0 and 100 to any of the categories, as long as the total amount of points for all four categories is 100."

Figure 8: Worker Perception of Union Influence Over Career Outcomes



Source: Authors' calculations based on survey data collected by NORSTAT on behalf of the authors.
Notes: The question on the survey asked, "How important do you think the union is to improving your pay, job security, promotion potential and work environment quality? 0 means 'not at all' and 100 means 'completely.' The total for all four need NOT be 100."

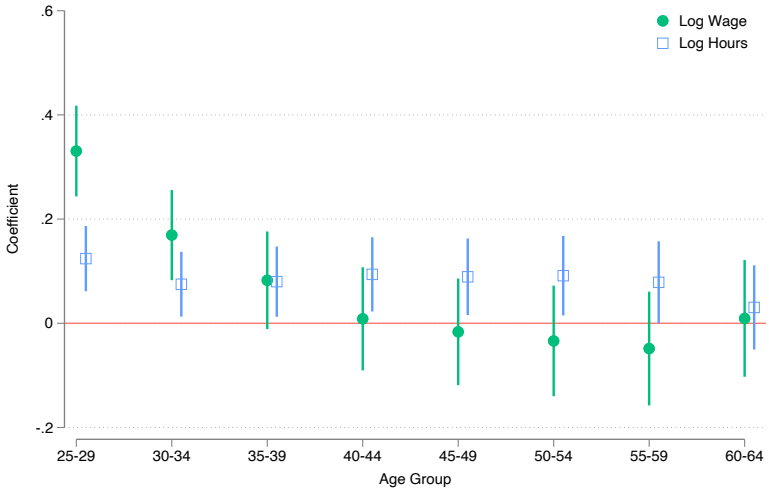
Figure 9: Nonunionized Workers Reason For Not Unionizing



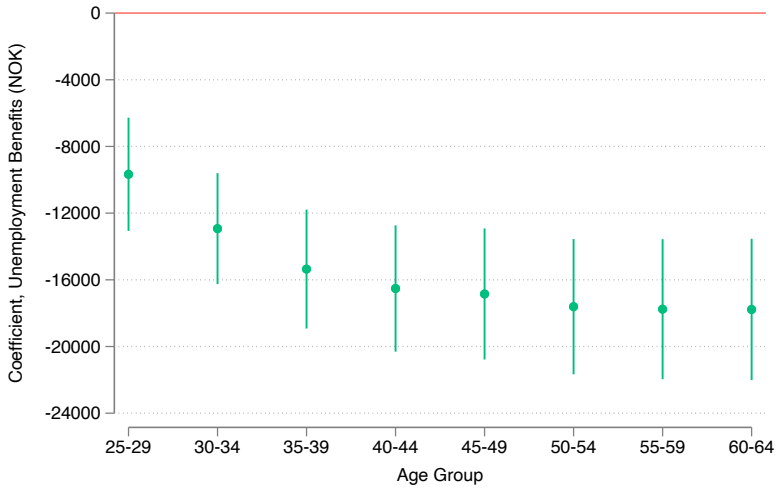
Source: Authors' calculations based on survey data collected by NORSTAT on behalf of the authors.
Notes: The question on the survey asked, "The purpose of this question is to understand the reason why you do not join a union. Check all the boxes that apply."

Figure 10: Union Membership Effects

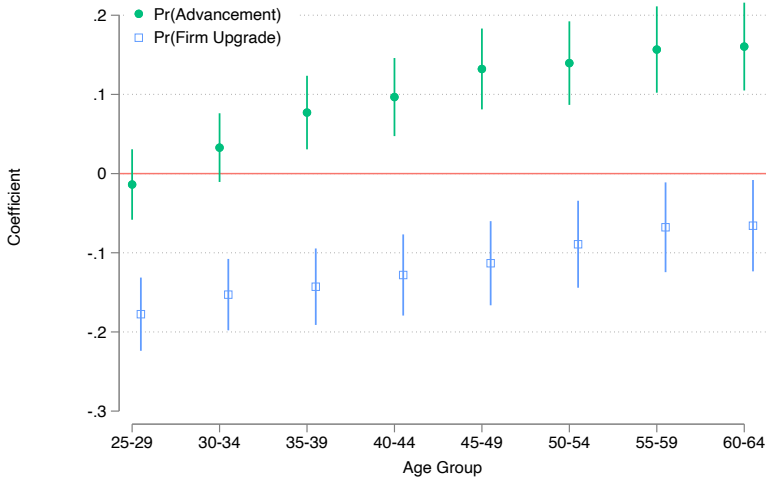
Panel A: Monetary Compensation



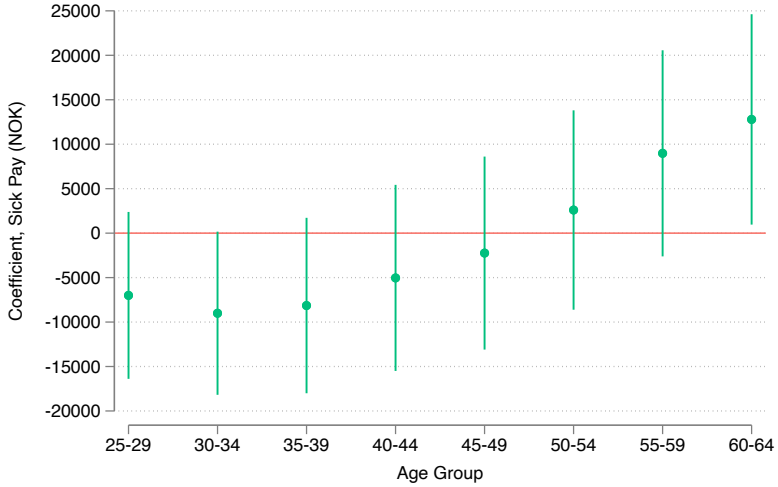
Panel B: Job Protection (Unemployment Benefits)



Panel C: Promotion Facilitation



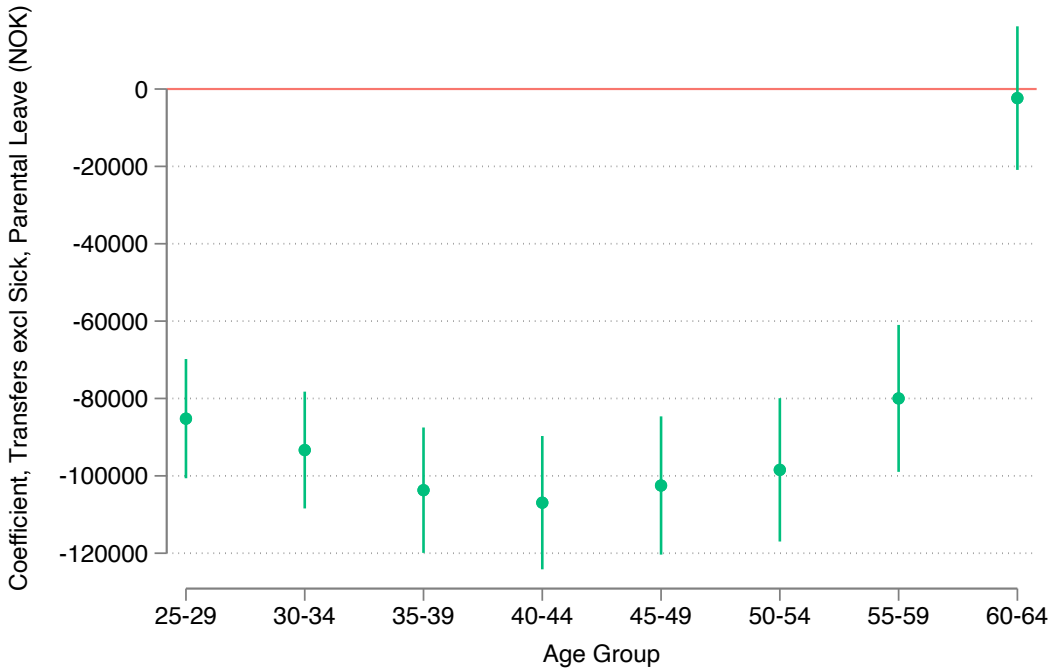
Panel D: Work Environment (Sick Leave)



Source: Authors' calculations of Norwegian registry data from 2001 to 2015.

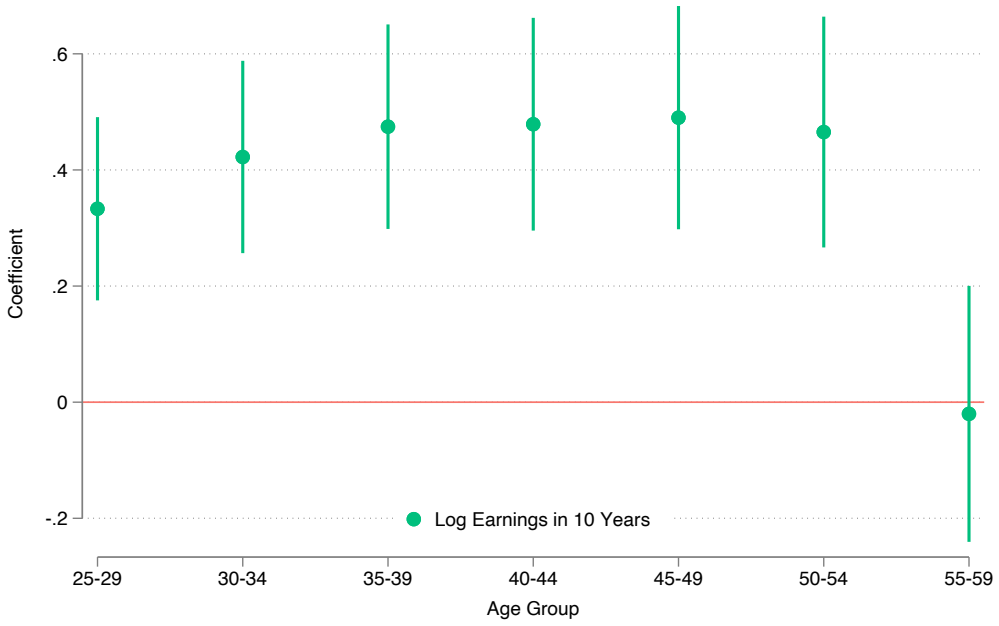
Notes: Estimates come from the two-stage least squares specification in Equations 2 and 3 with interactions for 5-year age bins. 95% confidence intervals are derived from standard errors clustered at the individual level. Outcomes are measured with a one-year lag. The model includes fixed effects for year, base and current 5-year age bin, base and current occupation-by-industry cell, base and current firm, and always union status. Current union status is instrumented by the base firm's net union due after subtracting the subsidies introduced through Norwegian tax policy.

Figure 11: Union Membership Effects on Total Transfers, Excluding Sick and Parental Leave

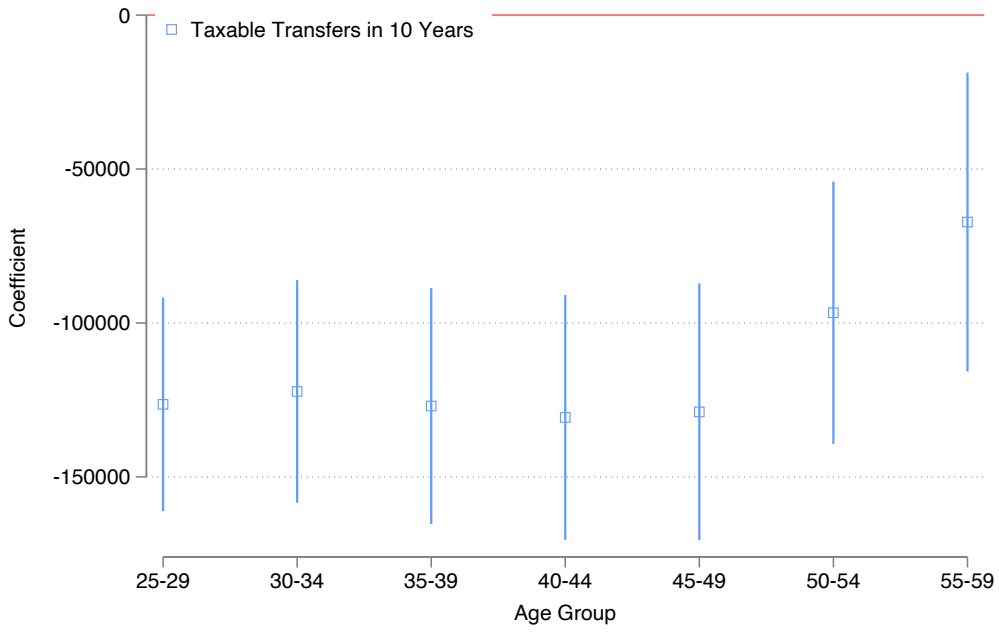


Source: Authors' calculations of Norwegian registry data from 2001 to 2015.
Notes: Estimates come from the two-stage least squares specification in Equations 2 and 3 with interactions for 5-year age bins. 95% confidence intervals are derived from standard errors clustered at the individual level. Outcomes are measured with a one-year lag. The model includes fixed effects for year, base and current 5-year age bin, base and current occupation-by-industry cell, base and current firm, and always union status. Current union status is instrumented by the base firm's net union due after subtracting the subsidies introduced through Norwegian tax policy.

Figure 12: Union Membership Effects After Ten Years
Panel A: Log Annual Earnings

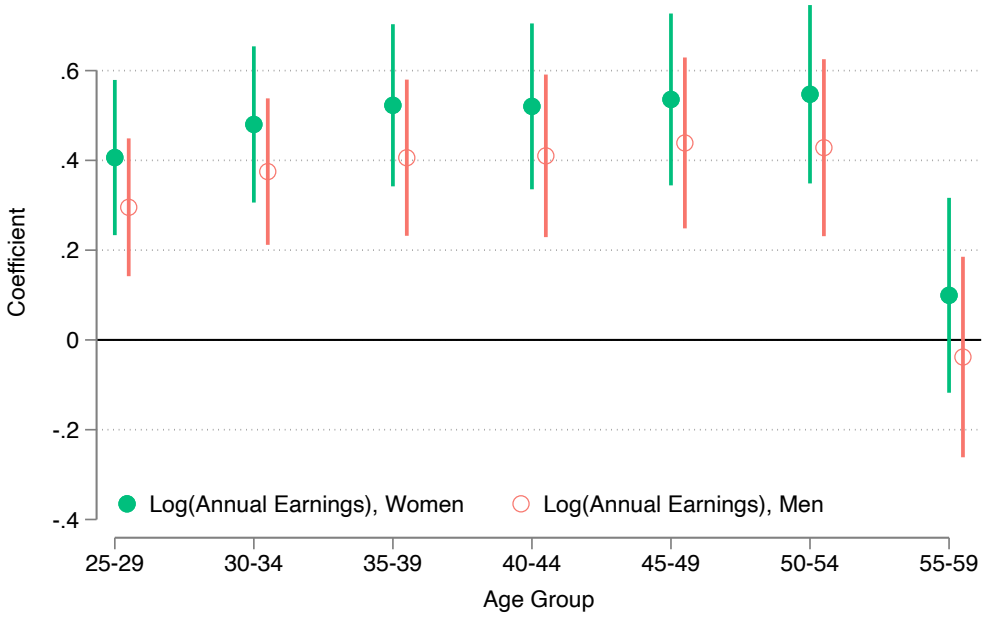


Panel B: Total Transfers, Including Sick and Parental Leave

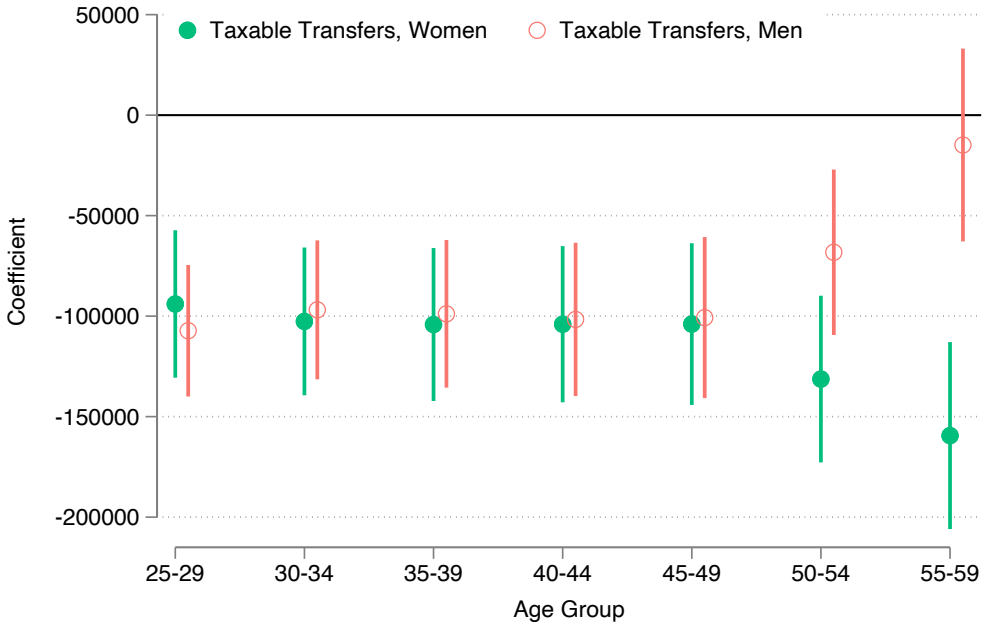


Source: Authors' calculations of Norwegian registry data from 2001 to 2018.
Notes: Estimates come from the two-stage least squares specification in Equations 2 and 3 with interactions for 5-year age bins. 95% confidence intervals are derived from standard errors clustered at the individual level. Outcomes are measured with a ten-year lag. The model includes fixed effects for year, base and current 5-year age bin, base and current occupation-by-industry cell, base and current firm, and always union status. Current union status is instrumented by the base firm's net union due after subtracting the subsidies introduced through Norwegian tax policy.

Figure 13: Union Membership Effects After Ten Years, by Gender
Panel A: Log Annual Earnings



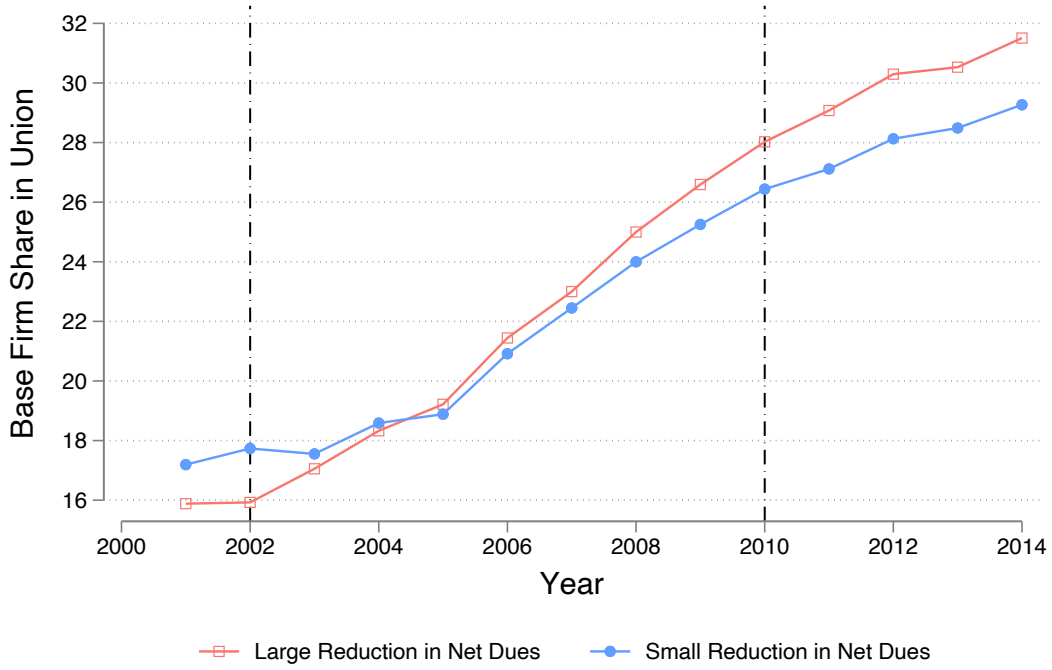
Panel B: Total Taxable Transfers, Including Sick and Parental Leave



Source: Authors' calculations of Norwegian registry data from 2001 to 2018.
Notes: Estimates come from the two-stage least squares specification in Equations 2 and 3 with interactions for 5-year age bins by gender. 95% confidence intervals are derived from standard errors clustered at the individual level. Outcomes are measured with a one-year lag. The model includes fixed effects for year, base and current 5-year age bin, base and current occupation-by-industry cell, base and current firm, always union status, and gender. Current union status is instrumented by the base firm's net union due after subtracting the subsidies introduced through Norwegian tax policy.

A Figures and Tables Appendix

Figure A1: Union Membership by Base Firm Change in Net Dues

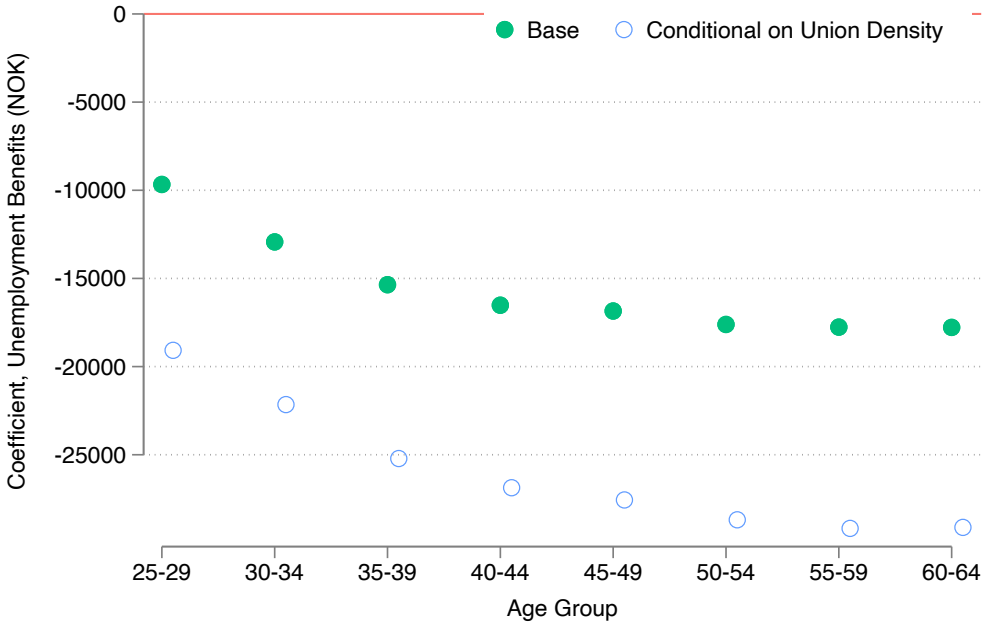


Source: Authors' calculations of Norwegian registry data.
Notes: Changes in net dues are calculated within each worker's base firm from 2003 to 2010 during the period of the largest shifts in the maximum tax deduction. "Large reduction" firms are those whose 2003-2010 reduction in net dues was above the median compared to those below the median. The figure accounts for base firm fixed effects.
The maximum deduction increased most substantially from 2003 to 2010. The maximum deduction was stable from 2001-2002 and 2010 onward, where the gap between the high- and low-subsidy groups stabilized. Union membership moved with the subsidy-induced change in net dues intensity only in the time period in which the maximum deductions changed.

Figure A2: Union Membership Effects on Wages and Hours by Age, by Model

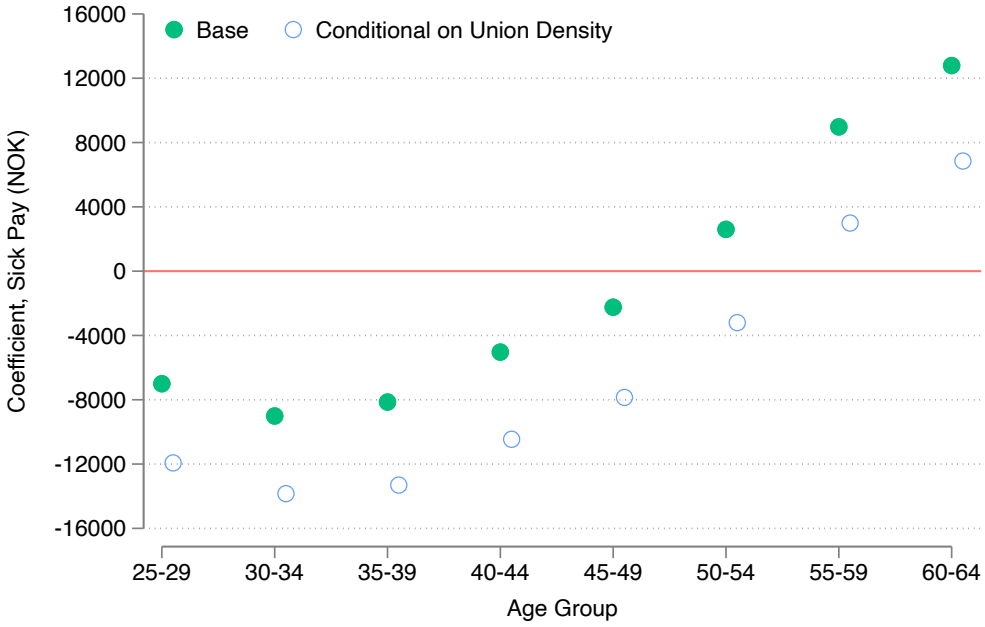
Source: Authors' calculations of Norwegian registry data from 2001 to 2015.
Notes: Estimates come from the two-stage least squares specification in Equations 2 and 3 with interactions for 5-year age bins and an additional control in both stages for firm union density. Outcomes are measured with a one-year lag. The model includes fixed effects for year, base and current 5-year age bin, base and current occupation-by-industry cell, base and current firm, and always union status. Current union status is instrumented by the base firm's net union due after subtracting the subsidies introduced through Norwegian tax policy.

Figure A3: Union Membership Effects on Unemployment by Age, by Model



Source: Authors' calculations of Norwegian registry data from 2001 to 2015.
Notes: Estimates come from the two-stage least squares specification in Equations 2 and 3 with interactions for 5-year age bins and an additional control in both stages for firm union density. Outcomes are measured with a one-year lag. The model includes fixed effects for year, base and current 5-year age bin, base and current occupation-by-industry cell, base and current firm, and always union status. Current union status is instrumented by the base firm's net union due after subtracting the subsidies introduced through Norwegian tax policy.

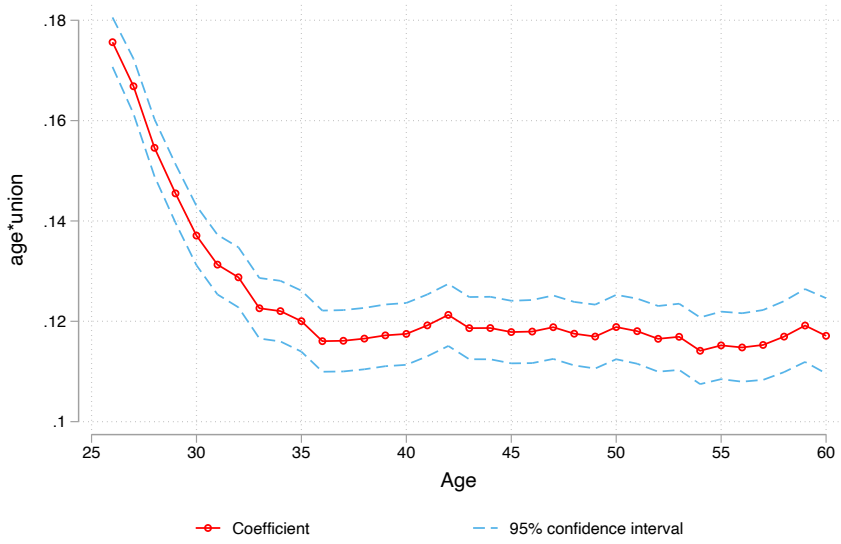
Figure A4: Union Membership Effects on Sick Pay by Age, by Model



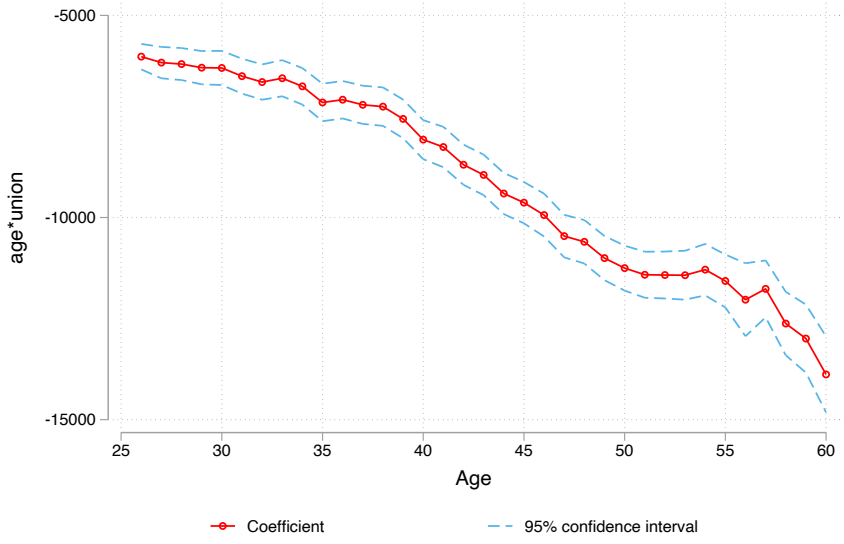
Source: Authors' calculations of Norwegian registry data from 2001 to 2015.
Notes: Estimates come from the two-stage least squares specification in Equations 2 and 3 with interactions for 5-year age bins and an additional control in both stages for firm union density. Outcomes are measured with a one-year lag. The model includes fixed effects for year, base and current 5-year age bin, base and current occupation-by-industry cell, base and current firm, and always union status. Current union status is instrumented by the base firm's net union due after subtracting the subsidies introduced through Norwegian tax policy.

Figure A5: Union Membership, Earnings, and Transfers by Age, Individual Fixed Effects Model

Panel A: Annual Earnings



Panel B: Transfers (excl. Sick and Parental Leave)



Source: Authors' calculations of Norwegian registry data.
Notes: All coefficients are for age interacted with an indicator for union membership status. 95% confidence intervals are derived from standard errors clustered at the individual level. The model includes fixed effects for individuals, age, year, occupation by industry cell, and firm. Panel A corresponds to descriptive patterns and IV estimates in Panel A of Figures 4 and 10, respectively. Panel B corresponds to descriptive patterns and IV estimates in Panel B of Figure 4 and in Figure 11.

Survey Instrument

[INTRO1] This is a survey that Norstat conducts on behalf of the Norwegian School of Economics and Business Administration. The results will be used in a research project.

All information collected through the survey is anonymized and will not be disclosed to any third party. As part of scientific publishing, anonymised data may be shared in open scientific repositories.

If you want more information about the project, you can choose the option below. If you want to start the survey, you choose it.

[R1] I want more information
[R2] I want to start the survey

[R1] Information and declaration of consent

Purpose of the project

We want to understand how individuals in Norway value their work environment and how they view unions. The results of the study will increase our understanding of workplace preferences and their relative importance.

Who is responsible for the project?

The Norwegian School of Economics (NHH) is the responsible institution for the project. Alexander Willen, professor at NHH, is the project manager. The other project members are Kjell G. Salvanes, professor at NHH, Samuel Dodini, postdoctoral fellow vid NHH, and Julia Zhu, postdoctoral fellow at NHH. If you have any questions about the project, you can contact NHH via Alexander Willen (alexander.willen@nhh.no).

What does participation mean for you?

If you choose to participate in the project, you will be asked to answer a survey by completing an online questionnaire. It takes about 7 minutes. The survey includes questions about your work situation, union status, and your job preferences. In addition, we will ask some basic demographic questions about, for example, age and gender. Participation in the survey is voluntary and you can withdraw your consent at any time without giving any reason. All information collected through the survey is anonymized and will not be disclosed to any third party. As part of scientific publishing, anonymised data may be shared in open scientific repositories. There will be no negative consequences if you choose not to participate or decide to withdraw at a later date.

Declaration of consent

I have received and understood information about the survey and hereby consent:

• to participate in the online survey.
• to enable researchers to process my anonymised data and use them for publications in scientific journals and other scientific dissemination.

[R2] Survey

[Age] What is your age?
[Gender] Are you male or female?
[Zip code] What is your zip code?
[Fylke] Which county do you live in?

What is your highest completed education?
[R1] Primary school/primary school
[R2] Upper secondary school (incl. former vocational school)
[R3] Vocational school, trade certificate/journeyman's certificate and other 1-2 year education after upper secondary school
[R4] University/college up to 3 years (Bachelor's degree)
[R5] University/college 4 years or more (Master's degree and higher)
[R98] Other

Where were you born?
[R1] Norway
[R2] Outside Norway
[R3] Don't want to answer

Can you state which country you were born in?

At what age did you move to Norway?

How many years of full-time work experience do you have?

Are you currently in part-time or full-time work?
[R1] Part-time (less than 30 hours per week)
[R2] Full-time (at least 30 hours per week)
[R3] Not working

What industry is your main job in?

Do you work in the public or private sector?
[R1] Public sector
[R2] Private sector

How many people work at your workplace?
Row:
[R1] 1-5
[R2] 6-10
[R3] 11-50
[R4] 51-100
[R5] More than 100
[R6] Don't want to answer

Rank the following job characteristics based on importance to your future career and well-being: Salary, Job Safety, Promotion Potential and Work Environment Quality.
Here we ask you to award 100 points across the four categories. You can assign anything between 0 and 100 to any of the categories, as long as the total amount of points for all four categories is 100.
Row:
[R1] Salary: Everything associated with the financial payment of your work (base salary, bonuses, overtime pay, generosity with retirement plans, etc.)
[R2] Job security: Protection and support (legal and otherwise) against being laid off and fired, both in the event of mass closures and individual layoffs (wrongful or not)
[R3] Promotion potential: Potential to move up the career ladder in the company
[R4] Work environment quality: The day-to-day quality of your work environment, including physical environment (e.g. equipment and facilities), company culture (e.g. support, feedback, collaboration, potential to influence) and working conditions (e.g. workplace safety, conditions employment, work-life balance)

Are you a member of a trade union?
[R1] Yes
[R2] No
[R3] Don't want to answer

For how many years have you been a member?

Have you been a member continuously during that time, or have you changed in and out of membership over the years?
[R1] Continuous
[R2] Not continuously

How important do you think the union is to improving your pay, job security, promotion potential and work environment quality?
0 means "not at all" and 100 means "entirely". The total for all four need NOT be 100.
[R1] Monetary compensation
[R2] Job security
[R3] Promotion potential
[R4] Working environment quality

Compared to members, the extent to which do you think nonmembers in your workplace can benefit from the presence of unions along these four dimensions
0 means "not at all" and 100 means "complete". The total for all four need NOT be 100.
[R1] Monetary compensation
[R2] Job security
[R3] Promotion potential
[R4] Working environment quality

Have you found a union membership useful for receiving non-work benefits such as lower mortgage rates, access to cheaper/better insurance, etc.?

How important has this been for your decision to join a union?

If your after-tax dues for union membership increased by [XYZ] dollars, would you reconsider the decision to join a union?
Row:
[R1] Yes
[R2] No

The purpose of this question is to understand the reason why you do not join a union. Check all the boxes that apply.
Row:
[R1] I don't want to spend so much money being a union member
[R2] I don't think unions can affect my work situation
[R3] I find that unions focus on dimensions of the workplace that are not important to me.
[R4] I don't think I need to be a member of a union to take advantage of the influence unions have on my work situation and well-being
[R5] Other reason, note:

If your after-tax dues for union membership were reduced by [XYZ] NOK, would you reconsider your decision to join a union?
Row:
[R1] Yes
[R2] No
