Journal of Economic Behavior and Organization 229 (2025) 106855

Contents lists available at ScienceDirect

Journal of Economic Behavior and Organization

journal homepage: www.elsevier.com/locate/jebo

Turning non-members into members: Do public subsidies to union membership matter?

Erling Barth [a], Alex Bryson [b], Harald Dale-Olsen [a,*]

[a] Institute for Social Research, Oslo, Norway
[b] University College London, England

ARTICLE INFO

JEL codes:
J01
J08
J50
J51

Keywords:
Trade unions
Union membership
Wages
Tax subsidies

ABSTRACT

Using linked employer-employee data for Norway's private sector we estimate the impact of changes in tax subsidies for union membership on individuals' membership probabilities. Increased subsidisation of the union members increases union take-up, while increased union fees reduce the demand for membership. The subsidy elasticity of demand for union membership was 0.29 in 2012, though effects are heterogeneous across workers. In the absence of the hikes in tax subsidies and holding workforce composition constant aggregate private sector union membership density would have fallen by 5 percentage points between 2001 and 2012. The elasticity of union membership with respect to subsidies is higher in segments of the labour market where unions have low representation in the first place, such as among temporary workers, youth, immigrants, and among workers in low-wage firms.

1. Introduction

Union membership is on the decline and has been falling for several decades. This is true in major industrial countries such as the UK and Germany, but also in the previously strongly organised Nordic countries (Addison et al., 2011; Schnabel, 2013; Bryson et al., 2019; OECD, 2017).[1] The decline in union membership rates appears to go hand in hand with an increase in non-typical employment relationships, such as temporary work, part-time jobs, and with growth in transitory low-wage jobs in the service sector. By sorting and selection, these jobs are dominated by immigrants and workers with weaker attachment to the labour market, e.g. youths. These groups of workers have lower membership rates than the typical male adult worker (Bryson et al., 2005; Aleks et al., 2021; Cools et al., 2021; Høgedahl and Møberg, 2022). Recent trends towards a polarization in the labour market (Autor et al., 2006; Goos and Manning, 2007; Goos et al., 2014), with increasing demand for workers at the bottom of the occupational earnings distribution, appear to occur in parallel with a deterioration of pay and working conditions. The dwindling influence of unions is likely to amplify the impacts of these trends. The role of unions and collective bargaining for the creation of more and better jobs and for economic performance in general has received renewed interest, see for example OECD (2018), revitalizing policy discussions on how to respond to the ongoing decline in unionization. Tax subsidization of union fees is one policy measure that may help to uphold union membership rates. Union membership attracts a tax subsidy in many countries including Germany (where work membership is deductible) and the UK, and until recently attracted a tax subsidy in the United States. In December 2017, President Trump signed the Tax Cuts and Jobs Acts into law,

* Corresponding author.
E-mail address: hdo@socialresearch.no (H. Dale-Olsen).

[1] According to the OECD (2017), average unionisation rates among employees have almost halved in three decades from 33 percent in the mid-80s to 17 percent today.

https://doi.org/10.1016/j.jebo.2024.106855
Received 12 March 2024; Received in revised form 18 November 2024; Accepted 3 December 2024
Available online 25 December 2024
0167-2681/© 2024 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

removing this tax subsidy opportunity. Previously, dues and initiation fees paid for union membership were entered as unreimbursed employee expenses on Line 21 of Schedule A (Form 1040) Itemized Deductions. Therefore, analyses of how such tax instrument work, is highly pertinent.

In this paper we study the effect public subsidies on union fees for union membership in different segments of the labour market, utilizing changes in a tax subsidy scheme in Norway. A tax subsidy has a direct effect on the net membership fee paid by union members and should be expected to affect individuals' membership decision in the same way as tax subsidies affect the demand for other workplace-provided goods and services.

Unlike most of the OECD where unionisation rates are in the decline, unionization rates in Norway have been relatively stable. In the period from 2000 to 2012, union membership was practically flat in Norway, whereas the decline continued in most other countries. During the same period, the tax subsidy on union membership fees quadrupled in Norway, raising a question as to whether this policy played a part in maintaining unionization rates. Although these tax changes have been explored in several recent papers (e.g., Dodini et al. (2023b)[2]), nobody has previously shown the importance of these tax reforms for overall unionisation and for union uptake in groups less attached to the labour market.

In this paper we analyse how the demand for unionisation has responded to changes in the tax subsidies. Our counterfactual analyses show the development in unionisation from 2001 to 2012 if *no* tax subsidy changes would have occurred. Our focus is on the impacts of tax subsidies on different segments of the labour market since this is of key importance from a policy point of view. Perhaps tax benefits only stimulate membership rates of high wage workers in stable jobs in firms where unions are already strong? In that case, tax subsidies of union fees might exacerbate the impacts of polarization and increase inequality in the labour market. On the other hand, if the subsidies stimulate membership rates among marginal workers in low paying jobs, they may tend to offset the impacts of polarization on inequality.

Although the empirical literature on the determinants of union membership is rich, until recently it did not consider the price of union membership. Abowd and Farber (1982), Farber and Krueger (1993), and Riddell (1993) are examples of papers adopting a supply and demand framework which assumes prices are set at the intersection of demand and supply for the union good settled in equilibrium, but this price is in practice usually not observed.[3] Recently, however, we have seen several papers (see review later) utilising the Norwegian tax reform to shed light on labour market outcomes and thereby implicitly examining the effects of tax subsidisation on the demand for the union good. These studies do not focus on groups less attached to the labour market, i.e., workers previously found less inclined to unionise.

Our contribution to this literature, which is reviewed in Section Two, is to establish the subsidy elasticity of demand for the union good, holding the quality of the union good constant, using exogenous variance in its net union fee arising from changes in its tax subsidisation. Based on a theoretical analysis of the choice of joining a union, we estimate a model where union membership may depend on the amount of subsidy over the net union fee and the net union fee inverse. Our modelling explicitly allows us to identify the union demand elasticity with respect to the subsidy, i.e., the key parameter necessary to answer whether tax policies can affect union uptake. The interaction between the amount of subsidy and the net union fee provides us with variation in membership incentives across unions at any given point in time, even if all workers face the same amount of subsidy at any given point in time. The capped nature of the tax deduction also contributes to making pre-treatment high union dues workers more intensively affected than low union dues workers.

Union fees are set by unions and may potentially respond endogenously to changes in membership. To obtain estimates of the subsidy elasticity of the demand for union membership that may be given a causal interpretation we use an instrumental variable approach where the subsidy ratio and the net union fee inverse are both instrumented using measures based on historical (period 0) union fees and the current amounts of subsidy. In this way we utilize only variations in the subsidy ratio and net fees that do not incorporate supply responses from the unions.

The identifying variation comes from exposing workers in the same union, or the same worker, to different "subsidy-ratio shocks" that varies across unions and over time, depending on the year, caps in the subsidies and the historic dues of the different unions. The identifying assumption implicit in our models is that conditional on time varying covariates, union membership would follow the same pattern over time across unions.

We know from studies of other workplace-provided goods and services that their demand is strongly linked to tax subsidisation. For example, Gruber and Lettau (2004) estimate that removing the subsidization of employer-provided health care would reduce insurance spending by 45 percent. Similarly, Gutiérres-i-Puigarnau and Van Ommeren (2011) find that the subsidization of a "company" car by the tax system leads to households demanding a more expensive car and driving more miles privately. Beneficial tax treatment increases employees' demand for stock options (Austin et al., 1998) as well as employers' supply, since employees tend to exercise

[2] See Section 2 for a detailed discussion on the contribution of these (Barth et al., 2020; Kostøl and Svarstad, 2023; Dodini et al., 2022a, 2023a;2023b; Svarstad, 2023).

[3] There is a substantial literature discussing the nature of the 'good' that workers buy when they purchase union membership (see, for example Bryson and Forth, 2023 and Bryson and Gomez, 2003). There is a recognition, going back to Olsen (1965) and earlier, that it has a strong public good component. Nevertheless, there are privately appropriable returns to union membership arising from unions' ability to bargain on behalf of their members for better terms and conditions of employment through collective bargaining; representation through worker 'voice' (Freeman and Medoff, 1984) for example, with respect to job design; and an insurance component whereby the union seeks to protect members from discriminatory and other practices initiated by the employer. In addition, since unions might use market power to get goods and services at discounted prices, workers "buy" the opportunity to purchase these discounted products as well.

stock options when corporate taxable income is high, shifting corporate tax deductions to years with higher tax rates (Babenko and Tserlukevich, 2009).

We find that increased subsidisation of the union good increases union take-up, while increased union fees reduce the demand for membership. The subsidy elasticity of demand for union membership was 0.29 in 2012 (the last year for which we have data), implying that a 10 percent increase in the subsidy amount increases union membership by 2.9 percent.

Our results show that tax subsidies tend to stimulate union membership in segments of the labour market where workers are more vulnerable. We find that young workers, immigrants, part-time workers, and low-wage workers have a significantly larger elasticity of union membership with respect to the subsidy than their counterparts. Workers in typical entry level occupations for youth and occupations with a higher share of temporary workers also respond more to the subsidy than other occupations. Furthermore, workers in small firms, young firms, and firms with low productivity and levels of capital are more sensitive to the subsidy. Although more marginalised and less-advantaged workers appear more sensitive to the subsidy, there is one exception: high-skill workers appear to be more sensitive to the subsidy than low-skill workers. While high-skilled workers are not among the vulnerable groups in the labour market, they are still among the groups with low union membership.

We find the elasticity of response to tax subsidies is lower where initial workplace union density was higher. Thus, the tax subsidy stimulates union membership in the segments of the labour market where unions have low representation in the first place, including segments of the labour market where workers are most vulnerable.

The structure of the remainder of the paper is as follows. In the next section we discuss the current literature on the demand for unionisation and of the relationship between unionisation and wages. In Section 3, we present a simple model of how union membership take-up might be influenced by tax subsidies. In Section 4 we describe the Norwegian system for tax deductions for union membership fees and their development over time. In Section 5 we study the relationship between the tax deductions, union fees and union membership. Finally, in Section 6 we study in more detail who responds by how much and where they work. Section 7 briefly concludes.

2. Previous literature

In many industrialised countries the number of individuals purchasing membership began to decline in the early 1980s. This has serious consequences for unions for a number of reasons. First, in most countries, including Norway, unions are voluntary membership organisations largely reliant on membership fees for their revenue. Their financial viability, and thus the supply of the union good, can be jeoparised if workers are less inclined to pay union dues (Willman et al., 2019; Willman and Bryson, 2009). Second, union density is often treated as a proxy for union bargaining power on the grounds that unions' ability to restrict the supply of labour to an employer (for example, through the threat of strike action) rises as the proportion of workers it represents rises. There is ample evidence from the union wage effects literature to confirm that this is the case (eg. Stewart, 1987; Lee and Mas, 2012). If that bargaining power wanes, so too does unions' ability to procure the union good that members are paying for.

The reasons why union membership is in decline are disputed, but analysts point to a number of proximate causes which, it is often asserted, are consistent with a decline in the demand for the union good. One part of the literature emphasises the role played by structural changes in the economy, such as the decline in employment in heavy industries characterised by manual labour where the demand for unionisation has been traditionally strong (Bain and Elsheik, 1976). Others speculate that cohort effects may be at play, with younger workers – referred to by Bryson et al. (2010) as the Facebook generation - less inclined to think in terms of collective action than the previous generations of workers who entered the labour market as the proportion union members was rising. Acemoglu et al. (2001) suggest skills-biased technological change has resulted in deunionisation by increasing the outside (non-union) options of skilled workers (effectively reducing their desire for union membership), thus undermining coalitions of skilled and unskilled workers in support of unions.

Another tranche of the literature suggests aspects of the union good face increased competition from union substitutes, effectively reducing demand for the union good. For instance, in European countries like Germany unions are increasingly facing competition from statutory-based forms of worker representation, such as works councils, which can be accessed without a membership fee (Addison, 2009). Unions also face competition from employer-led initiatives to generate worker voice. In a series of papers Willman and co-authors track the growth in non-union employer-made mechanisms in Britain which, they argue, indicate employers choosing to 'make' voice as opposed to the 'buy' option implied by contracting worker voice out to trade unions (Willman et al., 2019). These employer-based systems have the potential to reduce employee demand for union-generated voice.[4]

New statutory entitlements at work may undermine union efforts to bargain for better terms and conditions of employment, thus reducing the net benefits to membership, and thus demand for the union good. For example, Forth and Bryson (2019) show statutory increases in holiday entitlements reduced the paid holiday premium associated with union membership. Similarly, growth in employment protection legislation may limit the value of the insurance component of the union good.

In a recent development in the literature unions are viewed as a cost disease sector (Willman et al., 2019). Cost disease organisations are highly labour intensive and, as such, unable to avail themselves of the productivity-increasing advantages of technological inovation. This, in turn, leads to sluggish productivity growth, resulting in price stickiness relative to the other goods and services

[4] Unions may increase their use of what Willman and co-authors term "off-balance sheet" resources to supply the union good. These off-balance-sheet resources include union lay-representatives, that is, volunteers from the employee workforce prepared to take on the mantle of union representative. There is indeed evidence that unions in Britain have responded by doing so (Willman and Bryson, 2009).

workers may wish to purchase. As such the relative price of the union good rises and, unless this is matched with a commensurate rise in the quality of service, so demand for the good may fall.

Whereas these trends might betoken a decline in demand for the union good, direct measures of change in demand for unionisation are lacking in most studies and the union demand story is not the only possible explanation. For instance, while it may be the case that heavy industries dominated by manual labour did engender higher demands for unionisation (eg. because they were risky, hazardous places to work), their large plants may simply have been easier for unions to organise, thus reducing the costs unions faced in supplying the union good at a given level of demand. A related literature tracking direct measures of demand for unionisation challenges the assertion that demand has fallen over time. Indeed, most of the literature for the Anglo-Saxon world suggests there is what Towers (1997) referred to as a 'representation gap' wherein many workers desirous of unionisation did not get it. This gap has been growing in recent years among workers in the United States (Bryson and Freeman, 2013). There are, perhaps, two primary reasons for the persistence of a representation gap and declining union membership. The first is a supply-side problem associated with unions' increasing inability to organize and represent workers wishing to purchase union membership. This supply-side problem may reflect the marginal costs of organizing (especially in growth sectors of the economy where workers are hard to locate, and difficult to mobilise) – what we might think of as part of Olson's (1965) first order collective action problem. It may also reflect unions' recognition that they face substantial marginal costs associated with servicing such workers (Olson's second order collective action problem) which limits the value of organizing non-union workers, even if they desire union membership.

The second possibility is that the representation gap does not really exist, in the sense that, although individuals claim they would 'vote' union or purchase union membership if it was available, in practice they discount the costs of purchasing the good when asked the question in a survey. When faced with the actual costs of organising and purchasing membership, perhaps they forgo the opportunity to generate the union good and purchase it? This is plausible, not least because the costs of unionisation to a worker extend beyond the pecuniary costs of membership. In the absence of a union, workers must organise to trigger the supply of a union good. This can often entail organising in the face of employer opposition, something that can result in vulnerability to dismissal or actions short of dismissal which limit one's career chances. These practices are well-documented in the United States but recent work by Breda (2013) has shown that, even in a country like France, those who volunteer to be union representatives suffer a substantial wage penalty relative to what they might have earned if they had not become union representatives.

Even where unions are organised, that is, where there is a supply of the union good, there is a large public good component to what unions do which can lead to free-riding behaviour whereupon non-members benefit from union coverage without paying dues. The classic solution to this problem discussed by Olson (1965) was the closed shop which required the purchase of membership where unions were present. However, in countries like the UK the closed shop is no longer legally enforceable, resulting in a sizeable rise in free-riding behaviour (Millward et al., 2000; Bryson, 2008).[5] Unions may have responded by putting more effort into the procurement of private excludable goods which were only available to members, but there is little evidence that this has happened.

The union good is co-produced by those who purchase it. In the case of the union wage premium, for example, higher union density is usually linked to a higher union wage premium due to increased union bargaining power (Stewart, 1987). One might therefore have thought that, with falling union density, the quality of the union good may have declined, such that the quality-adjusted price of membership may have risen over time.[6] But there is no clear evidence that this has happened. Indeed, evidence suggests relative stability in the union wage premium over time (Blanchflower and Bryson, 2007, 2024).

In a series of papers Gomez and co-authors have portrayed union membership as a good with both search components (the union wage premium) and experience components. The experience good model has important implications for the propensity of workers to purchase union membership once membership has begun to decline. Given the experiential component to the union good, the chief way in which workers establish the value of union membership for themselves is reports from colleagues and friends (Bryson and Davies, 2018). These recommendations are less frequent in a world where a growing percentage of employees are never-members (Bryson and Gomez, 2005).

What remains unresolved in this literature is just how much workers are prepared to pay for the union good holding the quality of the good constant. Changes in the tax subsidy for membership, plus the actual union dues paid by workers, provide an opportunity to estimate the price elasticity of demand for union membership by looking at the proportion of workers flowing into and out of union membership as the net price of membership changes. In the Norwegian case, a setting where local bargaining at workplace level remains very important, even though there are also union bargaining structures in place at sectoral and firm level (see e.g. Barth et al. 2014 and Bhuller et al., 2022), this is exactly what a series of papers have analysed implicitly (Barth et al., 2020; Dodini et al., 2022a, 2023a; Svarstad, 2023; Kostøl and Svarstad) and explicitly (Dodini et al.,2023b; S. 2024). When Barth et al. (2020) presented the Norwegian tax reform and showed that these tax deductions affected the union uptake for Manufacturing workers, it sparked a number of studies primarily utilising these tax reforms to study how unionisation affects different worker and firm outcomes such as wages, productivity and firm prices. Kostøl and Svarstad (2023) applied the tax reforms to shed light on the relationship between the process

[5] In the United States, free-riding remains relatively uncommon because states usually require workers in unionised workplaces to pay a union fee in recognition of their bargaining services, even if the individual chooses not to be a member. This arrangement does not exist in what have been called 'right to work' states, and recently more states have switched to a 'right to work' arrangement which, it is anticipated, will lead to an increase in free-riding.

[6] Booth (1985; 1994) presents a social custom model of union membership in which the cost of unionisation is partly offset by foregoing the reputational damage of non-membership in an environment where unionisation is the norm or custom. In recent times, where the norm is non-membership, this reputational damage is reduced or no longer exists, thus reducing (increasing) the relative cost of (non)-membership.

of technological change and unions, while Svarstad (2023) focuses on the role of unions in reducing the probability of having a low-paid job, particularly focussing the impacts for immigrants (as S. Dodini et al., 2024). Dodini et al. (2022) found that high levels of unionisation mitigate the negative wage and employment effects generated by imperfect competition, although considerable heterogeneity exists. In the paper by Dodini et al. (2023a), they utilise these tax reforms to identify product-market price-setting Manufacturing firms' responses when facing increased unionisation following increased subsidisation. Arguably, some exporters grow in size by exploiting their market power to increase product prices and value-added to offset higher union wages and thereby keep profits unchanged, but weaker firms shrink. The analysis of Dodini et al. (2023b) on the career effects of union membership is the paper most reminiscent of ours, in that it explicitly identifies the net price elasticity of union membership from the register data for different worker age groups (diminishing price elasticities as age increases). Dodini et al. (2023b) find a similar pattern of price sensitivity to union membership in their survey data. Interestingly, these survey data also reveal that the main reason non-union members give for not unionising, is that they don't want to spend that much money to be a union member. So even survey responses indicate that this form of monetary costs of joining a union matter for workers. However, Dodini and co-authors do not provide a full evaluation of the tax reform in form of a counterfactual analysis. Nor do they study how important such a tax policy is for the membership uptake of worker groups less attached to the labour market.

3. Union membership and tax subsidies, what to expect?

Building on a rich literature on the determination of union membership, we presented in Barth et al. (2020) a simple model of the worker's choice between becoming a union member or not in the presence of tax subsidies. Since this is the key choice that we study in our empirical analysis, we provide a brief recap of the model here to motivate our empirical strategy. The union provides two kinds of services attractive to workers; they may increase the wage, and they may provide various forms of insurance and legal services at discounted prices. Assume that the utility of each worker can be expressed by a Cobb-Douglas utility function, depending on insurance, I, and consumption (or a composite good), C:

$$U = I^{\alpha} C^{(1-\alpha)}, \tag{1}$$

Each worker faces a budget set, which differs depending on union membership:

$$\begin{aligned} &Union: \quad p_I^U I + C + P - S = W_U, \\ &Non-union: \quad p_I^N I + C = W_N, \end{aligned} \tag{2}$$

where C is the numeraire good, $p_I^U \leq p_I^N$ are the prices of insurance for union and non-union members, P is the union membership fee, S is a tax subsidy amount on union membership, and the Ws are wages. Let $\widetilde{\alpha} = \left[\alpha^{\alpha}(1-\alpha)^{1-\alpha}\right]$, so that the indirect utility functions may be written as:

$$\begin{aligned} &Union: \quad V^U = \widetilde{\alpha}\left[\frac{1}{p_I^U}\right]^{\alpha}[W_U - (P-S)(1+c)], \\ &Non-union: \quad V^N = \widetilde{\alpha}\left[\frac{1}{p_I^N}\right]^{\alpha} W_N \end{aligned} \tag{3}$$

The monetary costs of union membership are P-S, and we allow for heterogeneity across workers by discounting the monetary costs by a factor $(1 + c)$. The term c varies across workers and represents their perceived costs, attitudes, or mental rewards from being a member of a union. The average worker considers only the monetary costs and benefits of joining ($c = 0$), whereas some workers discount the costs of joining ($c < 0$), for instance because they believe in collective action, have a political leaning towards the left, have a strong attachment to the workplace, feel a responsibility towards fellow workers, or enjoy being part of the group; while other workers may have the opposite attitudes and rather tend to exaggerate the costs of joining ($c > 0$). The cost of membership may also be attenuated or magnified by both union and management's actions towards membership and non-membership. The non-monetary costs of joining a local union may be decomposed in to two components: a systematic component, γ_j representing relative costs or benefits as perceived by segment j in the labour market, and a random component ε with zero mean, such that for individual i, $c_{ij} = \gamma_j + \varepsilon_{ij}$.

The bargaining power of the union is represented by the difference, Δ, between the union and non-union wage:

$$W_U = \Delta + W_N, \tag{4}$$

Union dues may be used to improve on workers' bargaining power, for instance through the size of strike funds, such that: $\Delta = \delta P + d$ with $\delta > 0$.[7] Different segments in the labour market typically possess different initial bargaining power, such that $\Delta_j = \delta P + d_j$ for segment j, but $\Delta_j \geq 0$.[8]

A worker becomes a union member if $V^U - V^N > 0$. The utility differential is given by:

[7] d is a constant expressing a bargaining power shifter not related to the union's financing situation, reflecting e.g. union merit and bargaining competence (making d positive) or employer characteristics strengthening the employers' bargaining position (making d negative).

[8] Potentially Δ might also depend on firm union density, e.g., comprising thresholds, but such effects would make the model unduly complex for our purpose.

$$V^U - V^N = K\{\Delta + g - (P-S)(1+c)\}, \tag{5}$$

whose sign is independent of K=$\widetilde{\alpha}\left[\frac{1}{p_I^U}\right]^{\alpha} > 0$. g= $\left(1 - \left[\frac{p_I^U}{p_I^N}\right]^{\alpha}\right) W_N \geq 0$ is the value of the price discount on insurance for union members and Δ is the difference between union and non-union wage. We may write the condition that $V^U - V^N > 0$ as:

$$\delta - 1 + \delta\left(\frac{S}{P-S}\right) + (d+g)\frac{1}{P-S} - \gamma > \varepsilon, \tag{6}$$

We define $\frac{S}{P-S}$ as the subsidy ratio. Eq. (6)) shows that conditional on the union membership fee, the probability of becoming a union member is increasing in the subsidy ratio. The choice of becoming a union member may be analysed using a simple linear regression model of union membership on the inverse of the net membership fee and the subsidy ratio:

$$M = a + b\frac{1}{P-S} + \delta\frac{S}{P-S} - \gamma + u, \tag{7}$$

where M is a dummy variable for union membership.[9] We have b = d + g. Given this functional form, the relationship between membership and S and P are given by $\frac{\partial M}{\partial S} = \left[\frac{1}{P-S}\right]^2 [\Delta + g] > 0$ and $\frac{\partial M}{\partial P} = -\left[\frac{1}{P-S}\right]^2 [d + g + \delta \cdot S] < 0$ and the elasticity of membership with respect the subsidy is given by:

$$E_{m,S} = \frac{\partial M}{\partial S}\frac{S}{\overline{M}} = \frac{S}{P-S}\frac{1}{1 - \frac{(P-S)(1+\gamma)}{\Delta+g}}, \tag{8}$$

for the average level of membership, while the elasticity of membership with respect to the union fee is:

$$E_{m,P} = \frac{\partial M}{\partial P}\frac{P}{\overline{M}} = -\frac{P}{S}\left[\frac{d+g+\delta S}{d+g+\delta P}\right] E_{m,S} \text{ for } S > 0, \text{ and } E_{m,P} = -\frac{d+g}{d+g-(1-\delta+\gamma)P} \text{for } S = 0 \tag{9}$$

Note that there is a difference in the absolute value of the subsidy elasticity and the price elasticity. First there is the obvious difference arising from the level of subsidies versus the level of the price as a one percent increase in the subsidy may be different from a one percent increase in the price. Second, there is a difference arising from the positive impact of the fee on the bargaining power of workers, δ. An increase in the fee increases the quality of the union good via higher wages, tending to attenuate the negative impact of a price hike towards zero. For a given fee, an increase in the subsidy has only a pure money-saving effect for the union members, without any wage-effects. Since the price elasticity is potentially contaminated by an unobserved quality effect we focus this paper on the estimation of the subsidy elasticity below, measuring the shift in the demand for union membership induced by public subsidies. From a governmental policy point of view, this is also the key tax device that they control.[10]

- Segments of the labour market

We note that the elasticity of membership with respect to the subsidy is expected to be lower for segments of the labour market where the gains of membership, $\Delta_j + g$, are large. In these segments average membership levels are already high. The gains of membership are larger where firms have higher revenue per workers, such as capital intensive- or high tfp-firms as well as in industries where firms have more market power in the product market. These segments of the labour market are characterised by high wages, good working conditions, and high union density.

On the other hand, the elasticity of membership with respect to the subsidy is expected to be high where the relative non-monetary costs of membership, represented by γ_j, are perceived as large, or similarly, where the relative non-monetary gains are perceived as small. Workers with low attachment to the labour market, or perhaps with little experience, such as temporary workers, part-time workers, or youth or immigrants, may typically be workers with shorter employment spells and lower attachment towards fellow workers, and thus both smaller perceived gains and higher coordination costs, together with workers in younger firms who may face relatively larger start-up costs related to coordination efforts to solve free-rider problems. All of these are typically workers in more marginal segments of the labour market, characterized by low unionization rates, lower pay, and worse working conditions.

From this discussion, we hypothesise that the subsidy is likely to have the largest relative effect among workers with low attachment to the labour market, lower unionization rates, lower pay, and worse working conditions, while it is likely to have a smaller relative effect in segments where overall conditions for workers are better. We investigate this hypothesis by comparing the derived elasticities from our estimated models between groups of workers representing the different segments of the labour market. Note that

[9] The average union membership is 43 percent in our sample and the membership rates are within the range of 22 to 69 percent for all segments considered in this paper, and we have chosen a simple linear probability model to estimate the parameters in our model.

[10] Note that Equation 5) might also be used to analyze the impact of the *net* union fee on union membership uptake. Analyses of the impact of the *net* union fee on union membership uptake has been conducted in several of the recent contributions (see review section and e.g., Dodini et al. (2023b)).

we estimate the coefficients for the subsidy ratio and the inverse of the net fee separately for each segment (using interaction terms), allowing these coefficients to vary freely between segments, so that the estimated differences are not just artifacts of functional form.

4. Data, descriptives and method

We exploit population-wide administrative register data provided by Statistics Norway. *The administrative register data*, collected by the Norwegian Tax Authorities and Social Services, comprise the whole Norwegian population of workers, workplaces and firms during the period 2001–2012 (around 2500,000 worker observations each year) and provide information on individuals and jobs including income, earnings, work hours, occupations,[11] wages and union membership fees. Unique identifying numbers exist for individual workers, workplaces, and firms, thus allowing us to track these units over time. We denote the workerXfirm-combination as a worker's job. We limit the data to workers aged 20–60 years of age in private sector jobs. Our final data set contains 12,097,568 job observations of 1,731,149 workers employed each year.

Workers' hourly wage is constructed from the tax data based on job- and spell-specific annual earnings, spell length and contracted weekly working hours.

- Union membership

Workers' union status is apparent from the administrative tax data containing annual union fees. To avoid volatility in union fees arising from spells of individuals not working, we focus on employed workers by October 15 reporting taxable income in year t, t∈ (2001,2012), above 1 G (G is the Social Service's baseline figure, 1 G is equivalent to £8685 in 2011), i.e., we restrict the analyses to roughly 2000,000 jobs each year or 24,200,641 observations over the whole period.

While the OECD (2017, 2018) documented a decline over time in union membership in western economies, they also show that membership rates in Norway have been more stable. Table 1 shows trends in union density in our data separately for different industries and segments of the labour market.

Overall, private sector union density over the period 2001–2012 was roughly static, slightly above 43 percent. There is also substantial and persistent heterogeneity in union density rates across different parts of the private sector: almost six-in-ten workers in Manufacturing and Transport were members in 2012, compared with one-third in Construction and a quarter in Trade.

Not surprisingly, Table 1 also reveals that membership is low in the more vulnerable segments of the labor market. Young workers, immigrants, and part-time workers have lower membership rates, as have workers in typical entry level occupations for youth and occupations with a higher share of temporary workers. Furthermore, workers in low paying firms, small firms, young firms, and firms with low productivity and levels of capital show lower membership rates.

- Union fees, tax subsidies, and the subsidy ratio

Since it is not possible to know the union fee for union-non-members, we have followed the simple rule of designating each worker a job class based on their main economic activity (2-digit SIC code X 3-digit occupational code, resulting in a total of roughly 3500 cells in the private sector). The job cell is used as a proxy for the trade union where the worker would belong. We then calculate the average union fee for each job class based on union members only, and then link this fee to every worker in the job class, regardless of membership status.

Union membership is subsidized in Norway as a deduction on taxable income. Fig. 1 shows the development of the average union membership fees and the corresponding deductions for membership given by the tax system over the period 2001–2012. The figure on the left reveals the development of the average fees for all private sectors workers and for selected industries. The figure on the right shows the development of the gross deduction and the tax subsidy, where these are measured on the left-hand axis (in NOK). Employees benefit from the tax subsidy amount, calculated as 28 % of the deduction in income, since that is the marginal tax rate on income after deductions.[12] The subsidy amount rose more than four-fold over the period, whereas the average membership fee rose 1.5 times, such that the subsidy was equivalent to 7 % of the average private sector membership fee in 2001, rising to 21 % in 2012. This development in the tax subsidy rate for the private sector workers, we depict on the right-hand side axis. Between 2012 and 2022 the subsidy amount has been kept constant, and for that reason we do not use data after 2012 in our analysis.

The government determines the size of the subsidy at the end of the previous tax year. No explicit pronouncements were made as to why the tax subsidy rose, but it is linked to changes in political power in Norway. The tax subsidy associated with union membership was cut by 50 % between 1998 and 99 by the liberal-conservative Bondevik-coalition government (from 1800 NOK to 900 NOK) leading to union protests. In the October 2005 election the Labour Party gained power at the expense of a liberal-conservative coalition. It retained power in the election of 2009.

[11] Occupational codes are registered from 2003, but we let these identify occupations for workers employed previously (2001-2002). Of roughly 24 million observations, 286 000 workers have unidentified occupations, whereof 200 000 and 70 000 are employed in 2001 and 2002, respectively. For workers with missing information on occupation, we impute occupational codes based on 3-digit educational qualification codes (occupational codes and educational qualification codes do not overlap).

[12] Norway has a progressive tax system, but the progressivity arises at the level of gross taxable income. For income after deductions, the tax rate is basically flat at 28 percent over the period we consider.

Table 1
Union membership rate across sectors and across worker, firm and occupational characteristics (in percent). 2001/2012. Private sector.

	2001	2012	Growth		2001	2012	Growth
Sectors				**Workplace/firm characteristics**			
All	**43.3**	**43.5**	**0.2**	Hourly wage (fe)-low	29.8	27.1	−2.7
Manufacturing	60.0	55.1	−4.9	Hourly wage (fe)-high	54.4	51.8	−2.6
Construction	35.4	30.7	−4.7	Workforce size-small	12.7	14.9	2.2
Trade	23.5	22.8	−0.7	Workforce size-large	64.3	60.1	−4.2
Transport	56.8	57.3	0.5	Capital (value)-low	16.2	19.4	−3.2
Worker characteristics				Capital (value)-high	62.7	61.0	−1.7
Women	38.1	36.7	−1.4	Productivity(tfp)-low	19.9	22.6	2.7
Men	43.1	39.6	−3.5	Productivity(tfp)-high	54.2	57.6	3.4
Natives	42.2	41.1	−1.1	Workplace young (2 years)	27.9	26.8	−1.1
Western immigrants	30.4	23.5	−6.9	Workplace old (30 years)	63.4	56.5	−6.9
Non-western immigrants	33.1	31.9	−1.2	**Occupational characteristics**			
Young	28.8	30.1	1.3	Temporary work –low	38.9	35.7	−3.2
Old	50.6	49.0	−1.6	Temporary work –high	35.3	32.4	−2.9
Full-time	43.7	40.5	−3.2	Physical strain-low	47.8	48.9	1.1
Part-time	31.1	29.9	−1.2	Physical strain-high	44.2	32.7	−11.5
Education-low	40.9	32.3	−8.6	Psychol. strain-low	46.7	40.6	−6.1
Education-high	37.4	39.9	2.5	Psychol. Strain-high	41.5	37.5	−4.0
Hourly wage (fe)-low	39.4	38.2	−1.2	Entry occupation youth	36.2	33.8	−2.4
Hourly wage (fe)-high	34.7	33.4	−1.3	Not entry occup. youth	45.3	40.7	−4.6

Note: Population: Workers between 20 and 60 years of age, employed by December 31st each year. Low and high (young/old, small/large) groups are defined based on the 10th and 90th percentile in the distribution of the relevant characteristic. Education is measured by years of schooling above compulsory schooling. Hourly wage (fe) for workers and firms expresses fixed worker and fixed workplace effects estimated from a log hourly wage regressions based on observation from the years t-4 to year t (i.e., for each year, estimated based on the last 5 year). Capital is measured as the value of fixed assets. Productivity is estimated for each firm as unobserved TFP based on a Trans-log value added production function using standard ACF-estimation (Ackerberg et al., 2015). Except the information on the entry occupations, the occupational characteristics are based on information from the Level of Living Surveys 2003, 2006, 2009 and 2013, and express the share of workers in the occupation that: i) respond that they work in temporary positions ii) that are physically tired each working day, and iii) psychologically tired each working day. Entry occupation youth is defined as the 10 most prevalent 3-digit occupations for workers below 26 years of age.

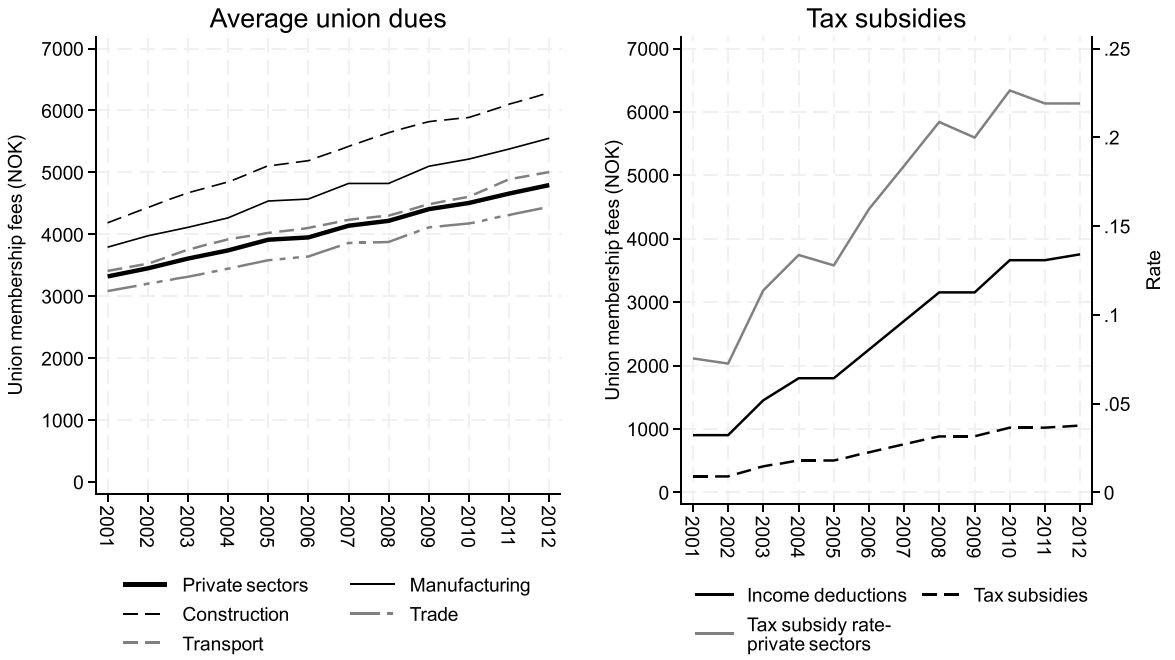

Fig. 1. Union dues and subsidy of union membership 2001–2012.
Note: Income deduction is the maximal deduction in taxable income and the tax subsidy amount is 28 % of the deduction in income (Barth et al. 2020). The average gross union fee is calculated from our data and our population of workers between 20 and 60 years of age. All measures in nominal NOK (in 2011 1£=9.032NOK and 1$=5.607NOK).

We define the subsidy ratio for union member i belonging to job class c at time t as:

$$S\_ratio_{ict} = \frac{s_t}{\overline{p_{ct\notin i}} - s_t}$$

where s_t is the subsidy amount in year t, while $\overline{p_{ct\notin i}}$ is the leave-out-mean union membership fee of workers belonging to job class c (where worker i is excluded).[13] Similarly, we define the net union fee inverse for worker i belonging to job class c at time t as:

$$Net\_fee_{ict} = \frac{1}{\overline{p_{ct\notin i}} - s_t}.$$

We allocate a potential fee to non-members as well, using information on their job class.

- Instruments

Workers' demand for union membership, given by (7), depends on the net union fee. A change in the subsidy represents an exogenous change in the net price, moving membership along the demand curve. The gross union fee, P, is set by unions to cover its costs. A simultaneity issue arises if the union fee changes with the size of union, for instance from economies of scale in the production of the union goods. In that case we have $P = P(M')$ where M' is the number of members in the union, and the standard simultaneity issue between supply and demand arises. We can only speculate about the scale properties of the production of union goods, and the bias could easily go either way. Instead of assuming constant returns to scale and exogenous unit costs, we construct two instruments where we use a union fee calculated from a base year, P_0 for each union:

i) *Subsidy ratio-IV* for union member i belonging to job class c at time t:

$$S\_ratio^I_{ict} = \frac{s_t}{\overline{p_{c0\notin i}} - s_t}$$

where s_t is the subsidy amount in year t, and p_{c0} is the union fee of job class c in the base year ($t = 0$). $\overline{p_{c0\notin i}}$ is thus the leave-out-mean union membership fee of workers belonging to job class c (where worker i is excluded) for the first year the job class c is observed.

i) *Net union fee inverse-IV* for worker i belonging to job class c at time t as:

$$Net\_fee^I_{ict} = \frac{1}{\overline{p_{c0\notin i}} - s_t}.$$

For both the subsidy ratio-IV and the net union fee inverse-IV , any subsequent changes in the union fee as a response to changes to membership changes are ruled out. It eliminates not only local performance feedback, but most importantly, any direct feed-back relationship between subsidy changes and the union fees. We thus only utilize variation in the subsidy ratio and the net union fee driven by variation in the subsidy over time. Any initial variation in these variables will be taken care of by endorsing a fixed effect approach, which ensures their validity as IVs.

Fig. A1 in the Appendix provides a graphical description of the relationships between our two endogenous variables (subsidy ratio and net union fee inverse) and their instruments (subsidy ratio-fixed and net union fee inverse-fixed). In both cases, Fig. A1 reveals strong positive relationships.

- Econometric method

Eq. (7)) presents a linear relationship between union membership uptake and union fees (inverse), the subsidy amounts and interactions. The interaction between the union membership fee (inverse) and the subsidy amount provides variation in the subsidy ratio across job-cells (proxy unions) within the same year, even if the amount of the subsidy each year is the same for all workers. The following simple linear probability model for individual i in firm j at time t utilizes this variation:

[13] The leave-out-mean is given by $\overline{p_{ct\notin i}} = \frac{\left(\sum_{jc} f_{jct} - f_{ict}\right)}{\left(n_{jct} - 1\right)}$, where j denotes all workers in job class c (including worker i).

$$M_{ijt} = \beta^X X_{it} + \beta^S S\_ratio_{ct} + \beta^F N\_fee_{ct} + \theta_a + \gamma_t + \varepsilon_{ijt}, \tag{10}$$

where M is a dummy variable for union membership, X_{it} is a control vector comprising age vigintile dummies and a dummy for part-time work,[14] the subsidy ratio (S_ratio) and membership fee inverse (N_fee) varies across job cells (proxy unions) ,[15] θ_a are fixed effects covering either job cells ($a = c$) or job-spells (a=ij, where j is the firm in which the worker is employed) in different specifications, γ_t are year fixed effects, and ε_{ijt} is a standard error term.

Our preferred specification is when we control for fixed job-spells, which controls for all fixed unobserved variation between jobs. In this case, identification arises by comparing the unionisation probability of workers after an increase in the subsidy to their unionisation probability in the same job before the subsidy increase. Identifying variation in both the subsidy ratio and the net union fee arises from changes in both union fees and in the subsidy within the union where the worker is allocated. This is also why we cluster our standard error by job-cell (union). In our IV specifications, the variation is obtained only through changes in the subsidy since the union fee is fixed at its initial level for each job-cell (union). Even if the union fee is fixed at a predetermined level, the same increase in the subsidy amount implies different changes to the subsidy ratio and inverse net fee for each worker as the subsidy ratio represents a multiplicative interaction term between the inverse net fee and the amount of subsidy. The same increase in the subsidy amount thus implies different changes to the subsidy ratio and net union fee across workers from different unions with different pre-determined fees. The main identifying assumption is that within job-spells, and conditional on the time-varying covariates, such as age and part-time work, the membership probability follows the same pattern across unions over time.

As seen by Eq. (7)), the estimation of Eq. (10)) allows us to the estimate the marginal effects of the impact of the subsidy and the union fee on the predicted union probability:

$$\frac{\partial M}{\partial S} = \left[\frac{1}{P-S}\right]^2 \left[\beta^F + \beta^S P\right] and \frac{\partial M}{\partial P} = -\left[\frac{1}{P-S}\right]^2 \left[\beta^F + \beta^S S\right], \tag{11}$$

and corresponding subsidy and price elasticities:

$$E_{m,S} = \frac{S}{\overline{M}} \cdot \frac{\partial M}{\partial S} = \left[\frac{1}{P-S}\right]^2 \left[\beta^F + \beta^S P\right] \frac{S}{\overline{M}} \; and \; E_{m,P} = \frac{\partial M}{\partial P} \frac{P}{\overline{M}} = -\left[\frac{1}{P-S}\right]^2 \left[\beta^F + \beta^S S\right] \frac{P}{\overline{M}} \tag{12}$$

5. Results: union membership, union fees and tax subsidies

In this section, we establish empirically the relationship between the subsidy ratio, the union membership fee (inverse) and union membership as outlined in our theoretical discussion in Section 3.

In Table 2 we present the estimated demand elasticities. Under Panel A), models 1 and 2 present the results when job-cells (proxy unions) are defined by 3-digit occupation and 2-digit industry. The first model conditions on job-cell fixed effects (as a proxy for union), producing an elasticity of membership with respect to the subsidy of 0.43, and a price elasticity of −0.47. Our preferred model - the second model - identifies the model based on within job-spell variation, producing the corresponding estimated elasticities of 0.20 and −0.21.

The estimated elasticities with respect to the subsidy are very similar regardless of the coarseness of the job-cell definition, while the price elasticity is smaller (in absolute value) when estimated using the coarser definitions.

When we eliminate supply-side price responses using IV specifications in Panel B), the estimated price elasticity attenuates by about 40 percent, suggesting some supply responses through the union fee. However, and most importantly for our investigation, all estimates of the elasticity of union membership with respect to the subsidy remain strongly significant and positive, and if anything, they indicate a stronger sensitivity of union membership to subsidies than under Panel A). All our subsequent analyses in the paper will be based on the specification of Model 2 in Panel B), thus taking care of all fixed worker and firm characteristics, observed and unobserved, as well as well as potential union supply choices affecting the union fee. This allows us to draw causal inferences on the impact of subsidies on unionisation.

As highlighted in the theoretical discussion, the subsidy elasticity and the price elasticity may differ for two reasons. The first is that, depending on the subsidy ratio, a one percent change in the subsidy may imply a smaller percentage change in the net union fee. The other is more subtle. A change in the fee may reflect a change in the quality of the union good. In the model, the most obvious effect is through improved bargaining power (represented by the parameter δ in the model). While the subsidy provides a cut in the monetary cost of the net union fee, a change in the (gross) fee may come with a drop in the quality of the union good, tending to attenuate the positive effect on the demand for the union good. We may thus expect the price elasticity to be attenuated towards zero relative to the

[14] Since one might worry that workers respond to the tax reforms by changing their working hours, we have repeated the analyses while discarding the part-time dummy, and this does not qualitatively affect any of our results.

[15] Since the union fee is calculated as leave-out-mean it varies between workers within job-cell as well, however, since all job cells encompass large numbers of workers this source of variation is negligible and to emphasize the significant source of variation, we drop index i on the union fee.

Table 2
The subsidy elasticity and union price elasticity. 2012-values. Private sector.

Job cell:	3-digit occupation X 2-digit industry		1-digit occupation X 1-digit industry	Blue/white/ management X 1-digit industry
	Model 1	Model 2	Model 3 – robust 1	Model 4 – robust 2
Panel A) FE-regressions				
Subsidy elasticity 2012	0.4367***	0.2060***	0.2250***	0.1872***
Price elasticity 2012	−0.4712***	−0.2108***	−0.1295***	−0.0909**
Panel B) IV FE-regressions – second stage – Union price fixed at first job cell observation				
Subsidy elasticity 2012	0.3559***	0.2916***	0.2773***	0.2614***
Price elasticity 2012	−0.2890*	−0.1349***	−0.0853*	−0.1030*
Controls				
Woman	Yes		Yes	
Year, age, part-time	Yes	Yes	Yes	Yes
Fixed job cell effects	Yes		Yes	
Fixed job effects		Yes		Yes

Note: Elasticities estimated based on the estimates from Table 3 at 2012-values of subsidies and average union fees. Private sector workers between 20 and 60 years of age. Population denoted by column head. FE (within)- and IV-FE linear regressions. See Table A2a for first-stage estimates and Table A3 for second stage parameter estimates and further details. ***,** and * denote 1, 5 and 10 percent level of significance.

subsidy elasticity.

Our focus is on the effect of subsidies on union membership, and since our instrument uses the exogenous nature of changes in the subsidies, ignoring fee responses, we are reluctant to conclude too strongly regarding the interpretation of the difference between the subsidy and price elasticities. Another research design would arguably be more convincing to tease out the difference between price and quality effects and is left for future research. In the remainder of the paper, we thus focus on the subsidy elasticity.

Tables A2a and A2b in the appendix provide the results from the first stage IV-regressions and the results from the underlying second stage regressions for elasticities in Table 3, respectively. Models 1 and 2 in the tables present the results when job-cells (proxy unions) are defined by 3-digit occupation and 2-digit industry. The first model conditions on job-cell (union) fixed effects, while our preferred specification, Model 2, identifies the model based on within job-spell variation. In models 3 and 4, which are robustness checks, we calculate the subsidy ratio and net union fee by job-cells defined by 1-digit occupation and 1 digit-industry in Model 3 whereas, in Model 4, job-cells are defined by blue-/white-collar/management and 1 digit-industry.

Table A2a shows that in all models and specifications, our IVs are significantly related to the net union fee (inverse) and the subsidy ratio. They must be considered strong IVs as seen by the Kleibergen-Paap-F-values.

In Panel A) of Table A2b we treat the union fee as an exogenous variable, while Panel B shows results using historical fees for each union (job-cell) in the calculation of instruments for the net union fee inverse and the subsidy ratio. Here we thus only utilize variation in the subsidy ratio and the net union fee driven by variation in the subsidy over time, while the union fee is kept constant for each job-cell (union) at the initial level. The construction of our IVs rules out any subsequent changes in the union fee as a response to changes to membership changes, thereby eliminating not only local performance feedback, but most importantly, any direct feed-back relationship between subsidy changes and the union fees.

- Heterogeneous effects across industries

We have estimated the model separately by industry, allowing for different effects for blue- and white-collar workers within each industry using interaction terms (we cannot differentiate between blue and white-collar workers within Trade and Transport due to weak instruments). Table 3 reports the estimated elasticities.[16] We find that workers in Construction and in Trade are more sensitive to the subsidy than workers in Manufacturing and Transport. Within Manufacturing and Construction White collar are more sensitive than blue collar workers to the subsidy. As seen in Appendix Table A1 on descriptive statistics, union density for white collar workers is considerably lower than union density for blue collar workers in general and for these industries specifically, so these results are as expected given our discussion in Section 3 on segmentation in the labour market.

This section has shown that on average, across the private sector and separately for key industries, the public tax policy stimulates union membership. In the next section, we study how changes in tax rules affect different segments of the labour market. Finally, and most important, in the next section, we also conduct counterfactual analyses, to simulate what would have happened if no tax changes occurred.

6. Segments of the labour market

Does the public tax policy stimulate membership in some segments of the labour market more than others? To answer this question, we repeat the analyses based on Model 2 of Table A2b Panel B) and add appropriate interaction effects in the regressions for different

[16] The regression models are presented in Table A3 in the appendix.

Table 3
The causal impact of subsidies for union membership in selected industries and occupations. 2012.

	Manufacturing		Construction		Trade	Transport
	White	Blue	White	Blue	White and Blue	White and Blue
Subsidy elasticity	0.3093***	0.2040***	0.7374***	0.5785***	0.5276*	0.1594*

Note: Workers between 20 and 60 years of age. Population denoted by column head. White and blue denote white-collar and blue-collar workers, respectively. See Table A3 in the Appendix for details on the IV-FE-regressions. ***, ** and * denote 1, 5 and 10 percent level of significance.

worker and firm groups. Groups of workers are selected using worker, occupational, and firm characteristics. Table A1 in the Appendix provides the share of workers in each segment in our data.

The elasticities of the probability of union membership with respect to the subsidy are presented in Table 4.[17] The elasticities are calculated for 2012 (the regression results are available from the authors upon request). Consider worker characteristics first. The effect of subsidies is significantly larger for *women* than for men. This means that the same increase in the subsidy induces a larger relative impact on union density among women than among men. Similarly, there is a large difference in the impact of the subsidy between *immigrants* and non-immigrants, with membership of non-western immigrants being the most sensitive to subsidy changes. Workers *below 30 years of age* are much more impacted than workers above 50 years of age, and *part-time* workers respond more than full-time workers. There is also a significant, but not very large, difference between *low*- and high-wage workers. The pattern is clear; workers with lower pay, lower attachment, and lower unionization rates are more sensitive to changes in the subsidies.

Next, we look at characteristics of the occupation. We have defined a set of *entry jobs for youth* as the 20 most prevalent 3-digit occupations for young people in their first job after their graduation,[18] comprising about 75 percent of all the entry jobs for youth. Workers in these occupations are more sensitive to tax subsidies than worker in other occupations. We also defined a set of occupations with a high prevalence of *temporary contracts*.[19] We have also defined a set of occupations with high prevalence for physical- and psychological strain (see online appendix for details).

We see that for all groups the elasticities associated with the subsidy are significantly positive. Workers in entry jobs for youth and workers in occupations with a high share of temporary contracts have higher elasticity than other occupations. While a high share of physical strain does not appear to make a difference, occupations with a high share of psychological strain are somewhat more sensitive to tax changes than other occupations.

The elasticity of union membership with respect to tax subsidies varies considerably according to workplace characteristics as well. Membership in *young plants, low wage plants, small plants, less capital intensive, and low productivity plants* are more sensitive to tax changes. Low union density is a common factor between these categories of plants. To avoid subsequent union density changes following the unionisation subsidy changes, we measure the workplace union density distribution the first year the workplace is observed, and then see how the subsidy elasticities vary across this distribution. This reveals a strongly declining pattern by workplace union density.

- Actual and Counterfactual Trends

The estimated elasticities are statistically significant but appear not to be very large in size.[20] One way to assess the impact of the changes in tax rules is to simulate what would have happened if no tax changes occurred. We use our estimated model to predict union density each year *keeping the tax rules from 2001 unchanged* and find that union density would have declined from 43.3 percent to about 38.5 percent without the increase in subsidies, compared with the actual tiny growth from 43.3 to 43.5. Union density would thus have been 5 percentage points lower in 2012 under the constant tax regime compared to the actual development with increasing subsidies. We now turn to our key question: How did the changes in tax rules stimulate the union take up among workers less attached to the labour market?

Figs. 2 and 3 show the actual and counterfactual development of union density for five selected groups of workers and jobs (and comparison groups): entry jobs for youth, occupations with many temporary contracts, occupations with many part-timers, young workers, and immigrants.

In the upper left panel of Fig. 2 we see that the aggregate union density for *entry jobs for youth* would have been 9 percentage points

[17] Results for segments defined by typical dichotomous dimensions (e.g., gender, nationality) are presented directly, while we for continuous dimensions (e.g., productivity, pay, worker and plant age, capital, occupational strain, occupational temp) compare 10^{th} and 90^{th} percentile in the distribution of the continuous dimension.Three exceptions are entry-jobs occupations for youths where we compare these occupations to all other occupations, working hours where we compare full-time vs part-time, and union density, where we compare the intervals 1-21%, 22-49%, 50-100%.

[18] We used the sample of workers between 25 and 35 years of age in 2018 and went backwards to find the occupation of their main job in May the year after graduation from their highest attained level of education. See online appendix for a description of the entry jobs.

[19] A list of occupations with high prevalence of temporary jobs is reported in the online appendix.

[20] Compared to employer provided benefits union membership appears to be more inelastic. Consider for example health-related benefits. In their review article, Pendziak et al. (2016) find optional primary health care elasticities ranging from −0.1 to −1 in the U.S., and between −0.6 and −4.2 in Germany.

Table 4
How subsidizing union membership affects the uptake of union membership for different groups. Subsidy elasticities 2012. Private sector.

	Group	Subsidy elasticity	Group	Subsidy elasticity	Difference in elasticity
Worker characteristics					
Gender	Men	0.2055***	Women	0.4137***	−0.2081***
Country of origin I	Native	0.2604***	Western Immigrant	0.5638***	−0.3034***
Country of origin II	Native	0.2604***	Non-western Imm.	0.8107***	−0.5504***
Age worker	Young	0.7732***	Old	0.1795**	0.5938***
Education	Low educ.	0.3550***	High educ.	0.5020**	−0.1471***
Work hours	Fulltime	0.2177***	Part-time	0.6422**	−0.4245**
Hourly wage (worker fe)	Low wage	0.4429***	High wage	0.3795***	0.0634***
Occupational characteristics					
Entry occupation youth	Non-entry	0.2708***	Entry	0.4145**	−0.1437***
Temporary work	Low share	0.2682***	High share	0.5676***	−0.2994***
Physical strain	Low share	0.2954**	High share	0.2808**	0.0146
Psychological strain	Low share	0.2423**	High share	0.3390**	−0.0967**
Workplace/firm characteristics					
Age of plant	Young	0.5396***	Old	0.2532***	0.2864***
Hourly wage (plant fe)	Low wage	0.5468***	High wage	0.2972***	0.2496**
Workforce size	Small	0.7018**	Large	0.2613***	0.4404***
Capital (value)	Low	0.5902***	High	0.2618***	0.3289***
Productivity (tfp)	Low	0.5456***	High	0.2537***	0.2918***
Union density	1–21 %	0.9330***	22–49 %	0.4615***	0.4714***
	1–21 %	0.9330***	50–100 %	0.1653***	0.7677***

Note: The subsidy elasticities and differences are estimated based on the parameters from several linear probability models as those applied for Table 2 (see also Table A2a and A2b for additional details for Table 2), but where we have added cross-terms associated with the relevant characteristic (these parameter estimates and regression details can be found in Online Appendix Tables X1-X3). The subsidy elasticities and differences are then estimated based on the 10th and 90th percentile values in the distribution of the relevant characteristic (exception gender, country of origin, work hours). ***,** and * denote 1, 5 and 10 percent level of significance.

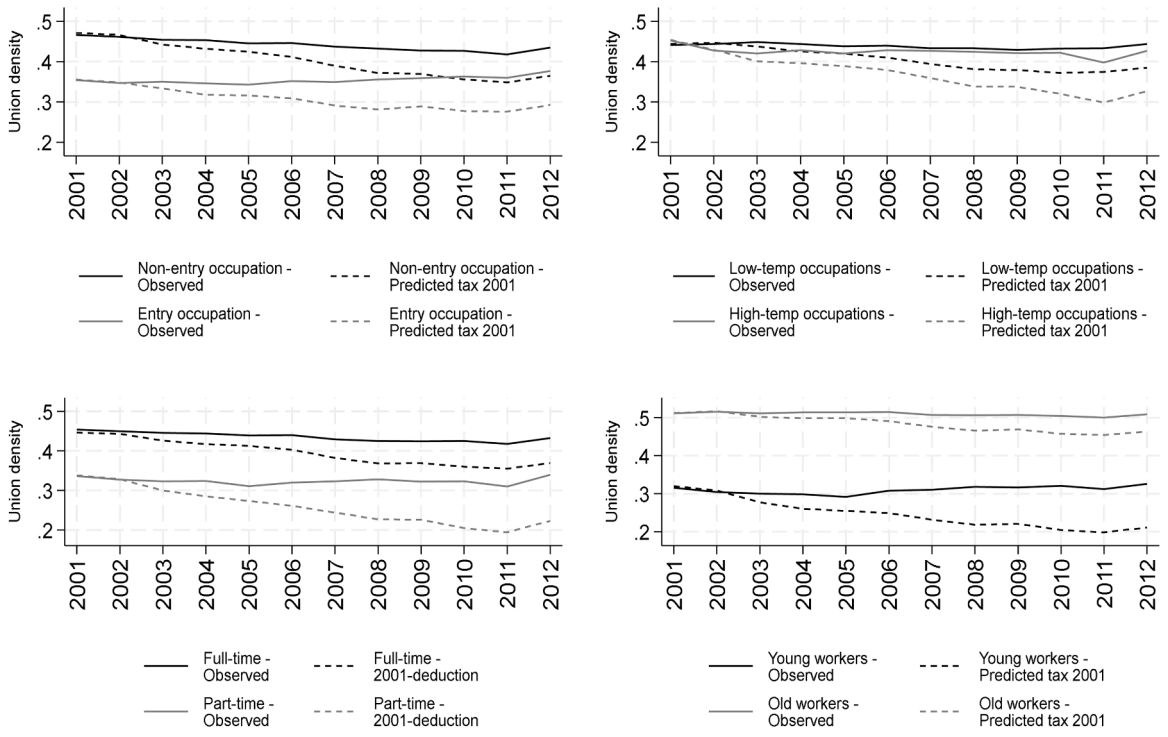

Fig. 2. Counterfactual analysis of union membership for young and old workers, entry-occupations for youths, temporary contract occupations, and part-time workers. Constant compositions of jobs.
Note: Population: Private sector workers between 20 and 60 years of age, employed by December 31st each year. Entry and non-entry denote workers employed in occupations which are typically entry occupations (or not) for youths. Low-temp and high temp denote workers employed in occupations with low share and high share of temporary contracts, respectively. Full-time and part-time denote workers employed full-time and part-time, respectively. Young and old denote young and old workers, respectively. Responses predicted based on IV-FE-regressions (see text).

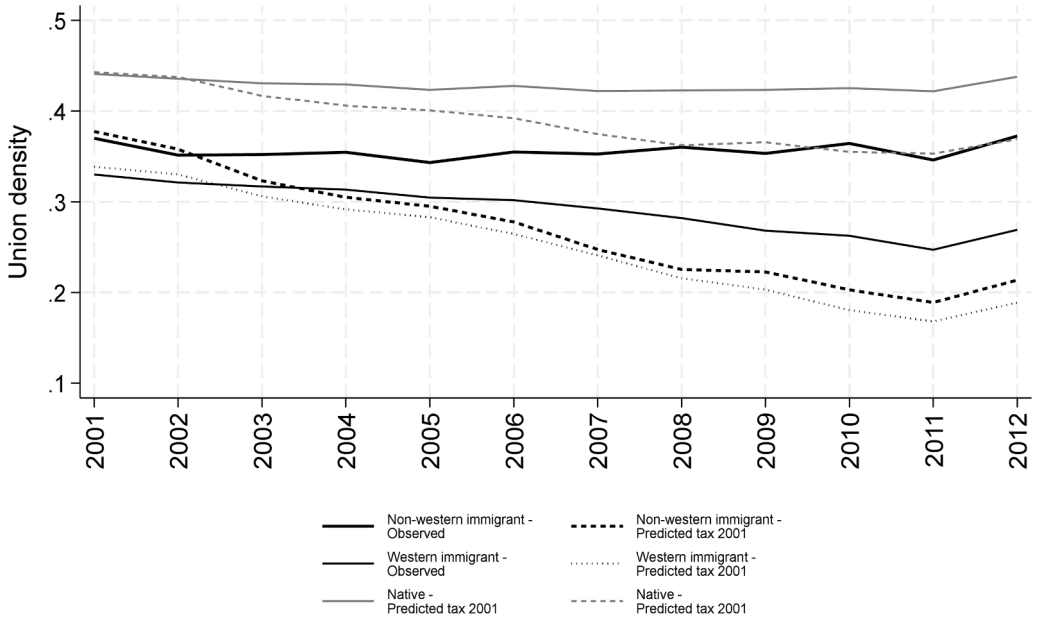

Fig. 3. Counterfactual analysis of union membership for native, western immigrant and non-western immigrant workers. Constant compositions of jobs.
Note: Population: Private sector workers between 20 and 60 years of age, employed by December 31st each year. Non-western, western and native denote non-western, western and native workers. Responses predicted based on IV-FE-regressions (see text).

lower under the 2001 tax rules. While the actual development shows a convergence in union density between entry jobs and other jobs, the counterfactual difference would be retained. In the upper right panel, we see that union density of occupations with *high prevalence of temporary contracts* would have been 10 percentage points lower. The impact on part-time occupations was also stark. In 2012 the union density of *part-time occupations* would be 10 percentage points lower, dropping by 1/3 from a level of 32 percent. Again, the actual development shows convergence between part-time occupations and the other occupations. A very similar pattern is revealed for *younger workers*, and we note that the difference between actual and counterfactual development is quite small for workers above 40 years of age.

Fig. 3 shows the results for *immigrants* by region of origin. We see a reasonably steady development of actual union membership for non-western immigrants, but a strong decline in the counterfactual case. For western immigrants the observed decline in union membership would have been magnified. Both immigrant groups would have ended up around 20 percent without the increase in subsidy.

7. Concluding discussion

Although tax subsidisation of the union good is present in several countries in Europe, it is not a policy tool that has been actively deployed to support union membership. We find, however, that tax subsidies in the form of taxable income deductions for union membership fees tend to increase union membership rates. Since other countries with lower density levels have similar tax treatment of unionisation, it would be wrong to claim that the subsidization of union membership is what determines the rather high union density level in Norway. However, the subsidization has clearly counteracted an otherwise underlying negative trend. In the absence of the hikes in tax subsidies, aggregate private sector union membership density in Norway, while keeping the job composition fixed, would have fallen by 5 percentage points since 2001.

Union tax subsidies have been promoted by a fairness argument. Employers deduct their costs before they report their taxable income, and union fees may be viewed in the same way as workers' cost related to the employment relationship. We find that union tax subsidies may have a strong influence on union membership rates, and thus strengthening workers' voice and bargaining power in the labour market.

Unions strengthen the bargaining power of workers, but they also provide workers with an important voice that improves

information flows both at the workplace and in the political arena (Freeman and Medoff, 1984). Union representation at the workplace is necessary to enhance information flows and to reap possible gains from trade within the company. In Barth et al. (2020), we find that union membership within firms increases both wages and productivity.

Comprehensive union coverage may also be a precondition for coordination among unions and is likely to shape the ability of confederations of unions to internalize workers' interests more broadly. Public policies often rely on trade unions to supply worker voice, both in fashioning policy and in delivering what the European Union often refers to as "social dialogue", that is, discussions between representatives of workers and employers. The decline in unionisation rates may reduce union effectiveness in supplying worker voice and, in many cases, workers will simply lack credible representation, raising questions about the viability of a policy approach based on social dialogue (Forth et al., 2017). In bargaining systems with coordination at higher levels of bargaining, broad-based union membership may be important to ensure that coordination internalizes externalities across bargaining units, such as the impact on prices (Calmfors and Driffill, 1988) or unemployment (Nickell et al., 1991). One's view of tax subsidies should thus reflect one's general view on trade unions' role in the economy, including possible gains and costs associated with more comprehensive coordination among unions and "social dialog" in general.

We find that tax deductions have the strongest relative impact on the margins of union membership; notably the segments of the labour market where union representation is weaker in the first place. These typically comprise newcomers to the labour market, such as younger workers, and immigrants, or workers with a more marginal attachment to the labour market, such as workers with part-time or temporary jobs. Workers in low paying firms, smaller firms, low productivity firms, and firms with low capital intensity are also more sensitive to changes in subsidies. For these worker groups, the relative non-monetary costs of membership could be perceived as large, or similarly, the relative non-monetary gains could be perceived as small.

Younger workers and immigrant workers have the largest elasticity of union membership with respect to the subsidy. They are newcomers in the labour market with low attachment and probably face obstacles in terms of associating with trade unions. They would also be important groups for unions to capture, since union membership is likely to display high persistence for each worker over time. Note, however, that while the segments we have constructed are mutually exclusive within each category of characteristics, the different characteristics are not. For instance, young workers may be more prevalent in smaller firms, immigrants in temporary jobs, and so on, and separate regressions does not capture these correlations. The possibility of such correlations between the observed categories should thus be noted when interpreting these differences.

We also find that workers with higher education are more sensitive to the tax subsidy. While educated workers are neither vulnerable nor marginal in relation to labour market attachment, they are often marginal in relation to union membership. They often have better outside options, and based on their human capital, a stronger individual bargaining power within the firms.

In sum, we find larger impacts for workers with lower membership rates. This observation is supported by the observation of a strong negative relation between the elasticity of membership with respect to subsidy as we move from low union density firms towards firms with high union density. A higher elasticity for groups with lower union density is of course enforced by the fact that a given marginal effect produces a larger relative effect in groups with low union density. However, as the marginal effects are estimated in separate regressions, or with separate interaction terms for each segment, the estimated differences between segments of the labour market are not simply due to these mechanics but rather follows from models where the coefficients are allowed to vary freely between the segments.

Through its impact on the bargaining power of unions, tax subsidies are likely to improve workers' pay and working conditions. As the impact on union membership is relatively stronger among more vulnerable and marginal segments of the labour market, union tax subsidy is also a policy tool that may counteract the ongoing trends towards greater inequality among workers.

Funding

The paper received funding from Norwegian Research Council (grant numbers 255595, 295914 and 301280).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jebo.2024.106855.

Appendix

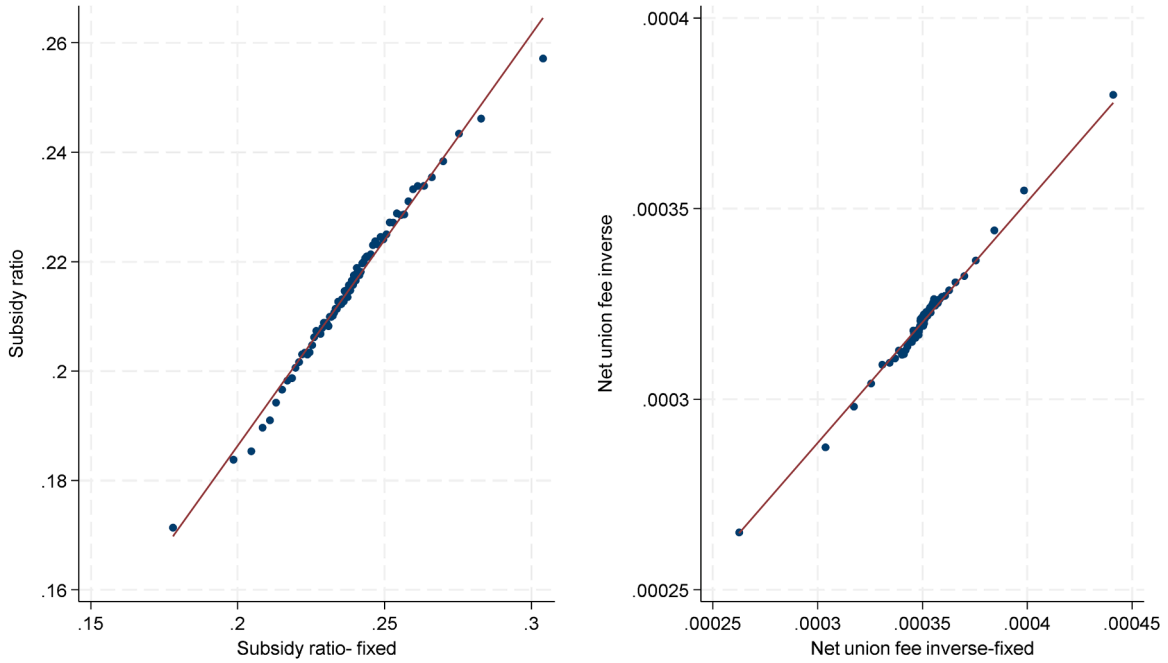

Fig. A.1. The relationships between the subsidy ratio and net union fee inverse and the corresponding measures based on fixed union fee values. Note: Workers between 20 and 60 years of age. Left-figure: Binscatter between the subsidy ratio and the subsidy ratio-fixed i.e., when the subsidy ratio-fixed is calculated using the first observed job cell-value of the gross union fee, while letting the subsidy vary freely. Right-figure: Binscatter between the net union fee inverse and the net union fee inverse-fixed i.e., when the net union fee inverse-fixed is calculated using the first observed job cell-value of the gross union fee, while letting the subsidy vary freely. For both binscatters, the data is a priori residualised with respect to year dummies, and are measured within job.

Table A1
Descriptive statistics.

	Mean	St. Dev		Mean	St. Dev
Worker characteristics			Union and tax characteristics		
Women	0.3453	0.4754	Union	0.4196	0.4902
Western immigrant	0.0597	0.2369	Union Blue-collar (B)	0.4874	0.4998
Non-western immigr.	0.0592	0.2359	Union White-collar (W)	0.3794	0.4853
Age worker	39.2097	10.6304	Union B Manufacturing	0.6569	0.4747
Years of education	3.2154	2.5536	Union W Manufacturing	0.5099	0.4999
Part-time	0.1808	0.3848	Union B Construction	0.3645	0.4813
Worker fixed effect[y]	0.1035	0.5266	Union W Construction	0.2993	0.4596
Occupational characteristics			Union fee (gross)	4074.269	1131.214
Entry occupation youth	0.3238	0.4679	Net union fee	3389.412	1043.833
Temporary work	0.0960	0.0767	Net union fee inverse	0.0003	0.0001
Physical strain[x]	0.3035	0.1072	Subsidy ratio	0.2147	0.0999
Psychological strain[x]	0.1556	0.0823			
Workplace/firm characteristics					
Age of plant	16.0185	11.9486			
Workplace fixed effect[y]	0.0034	0.4554			
LnWorkforce size[z]	4.4055	2.3094			
LnCapital (value)[z]	9.9206	3.3576			
Productivity (tfp)[z]	7.0699	1.2105			

Note: Workers between 20 and 60 years of age observed from 2001 to 2012. Note: Years of education expresses years of education in excess of compulsory schooling. Mean and standard deviation based on 13,626,763 observations, except when noted [x,y], and [z]. [x] Mean and standard deviation on 8,931,078 observations. [y] Mean and standard deviation on 10,255,820 observations. [z] Mean and standard deviation on 9,681,767 observations.

Table A2a
First-stage estimates: The impact of the subsidy ratio-IV and net union fee inverse-IV on the subsidy ratio and net union fee . Different definitions of job-cells. Private sector.

Job cell:	3-digit occupation X 2-digit industry				1-digit occupation X 1-digit industry		Blue/white/ management X 1-digit industry	
	Model 1		Model 2		Model 3 – robust 1		Model 4 – robust 2	
	Subsidy ratio	Net union fee inv.	Subsidy ratio	Net union fee inv.	Subsidy ratio	Net union fee inv.	Subsidy ratio	Net union fee inv.
Subsidy ratio IV	1.0566***	−0.0003**	0.7890***	−0.0001	0.8355***	−0.0001	0.8219***	−0.0001
Net union fee IV	−699.8594***	1.5608***	−48.8988***	0.6199***	11.8759	0.8623***	45.7272	0.9481***
Kleibergen-Paap F	19.02		198.43		479.94		87.62	
Controls								
Woman	Yes							
Year, age, part-time	Yes		Yes		Yes		Yes	
Fixed job-cells effects	Yes							
Fixed job effects			Yes		Yes		Yes	
C (job cell)	3573		3405		118		36	
J (jobs)	26,008,301		2,595,301		2,587,467		2,587,467	
N (observations)	13,627,474		12,196,503		12,154,431		12,154,431	

Note: Dependent variable: dummy taking the value of 1 if worker is a union member. Private sector workers between 20 and 60 years of age. Population denoted by column head. FE (within)- linear regressions. Panel unit: job-cell and job-spell (workerXfirm). Baseline job cell is defined as sectorX3-digit occupationX2-digit industry. In Model3, job cell is defined as just 1 digit- occupational code. In Model 4, we let job cell be defined as 1-digit occupational codeX1-digit industry code. Subsidy ratio IV and Net union fee IV are calculated using membership fees from the base year. All models include the following control-vector: year dummies, part-time dummy, age vigintile dummies. ***,** and * denote 1, 5 and 10 percent level of significance, based on standard errors adjusted for job cell-clustering.

Table A2b
The impact of the subsidy ratio and net-union-fee on the probability of union membership. Different definitions of job-cells. Private sector.

Job cell:	3-digit occupation X 2-digit industry		1-digit occupation X 1-digit industry	Blue/white/ management X 1-digit industry
	Model 1	Model 2	Model 3 – robust 1	Model 4 – robust 2
Panel A) FE-regressions				
Subsidy ratio	0.4780***	0.2292***	0.2864***	0.2437***
	(0.0476)	(0.0414)	(0.0928)	(0.0807)
Net union fee inverse	51.9251***	7.1106	−145.7976*	−147.1123*
	(17.9251)	(5.0415)	(78.1502)	(85.1965)
Panel B) IV FE-regressions – second stage – Union price fixed at first job cell observation				
Subsidy ratio	0.4228***	0.3756***	0.3764***	0.3476***
	(0.0902)	(0.0667)	(0.0918)	(0.0834)
Net union fee inverse	117.1830	−235.9489***	−293.2669***	−241.7387**
	(239.8790)	(40.6036)	(76.3168)	(73.0719)
Kleibergen-Paap F	19.02	198.43	479.94	87.62
Controls				
Woman	Yes			
Year, Age, part-time	Yes	Yes	Yes	Yes
Fixed job-cells effects	Yes			
Fixed job effects		Yes	Yes	Yes
C (job cell)	3573	3405	118	36
J (jobs)	26,008,301	2,595,301	2,587,467	2,587,467
N (observations)	13,627,474	12,196,503	12,154,431	12,154,431

Note: Dependent variable: dummy taking the value of 1 if worker is a union member. Private sector workers between 20 and 60 years of age. Population denoted by column head. FE (within)- linear regressions. Panel unit: job-cell and job-spell (workerXfirm). Baseline job cell is defined as sectorX3-digit occupationX2-digit industry. In Model3, job cell is defined as just 1 digit- occupational code. In Model 4, we let job cell be defined as 1-digit occupational codeX1-digit industry code. See Table A2a for details on First-stage estimates of Panel B). All models include the following control-vector: year dummies, part-time dummy, age vigintile dummies. Standard errors adjusted for job cell-clustering presented in parentheses. ***,** and * denote 1, 5 and 10 percent level of significance.

Table A3
The impact of the subsidy ratio on the probability of union membership within key private industries.

	Manu-facturing	Construc- tion	Trade	Transport
2nd stage estimates				
Subsidy ratio	0.4999***	0.6045***	0.4115*	0.24736***
	(0.1048)	(0.1081)	(0.2145)	(0.0591)
Net union fee inverse	−354.0463***	−308.5196***	−301.8979**	7.1813
	(73.7051)	(96.6128)	(127.5466)	(7.7604)
Subsidy ratioXblue	0.0884	0.4149***		
	(0.0701)	(0.0890)		
Net union fee inverseXblue	−68.2559	−727.8008**		
	(87.4929)	(98.2665)		
1st stage estimates	Subsidy ratio	Subsidy ratio	Subsidy ratio	Subsidy ratio
Subsidy ratio fixed	0.6217***	0.7930***	0.9878***	0.3718***
Net union fee inv.fixed	−25.8015	−190.8795**	−116.0175	167.5543**
Subsidy ratio fixedXblue	−0.1121***	−0.1506***		
Net union fee inv.fixedXblue	117.4393***	219.0416***		
	Net union fee i.	Net union fee i.	Net union fee i.	Net union fee i.
Subsidy ratio fixed	−0.0003***	−0.0001	0.0003	−0.0004**
Net union fee inv.fixed	0.7420***	0.6137***	0.4727***	0.9063***
Subsidy ratio fixedXblue	−0.0001***	−0.0001		
Net union fee inv.fixedXblue	0.0947***	0.1192		
	Subsidy ratioXblue	Subsidy ratioXblue		
Subsidy ratio fixed	−0.0698***	0.0069		
Net union fee inv.fixed	20.0915	6.4075		
Subsidy ratio fixedXblue	0.6791***	0.7329***		
Net union fee inv.fixedXblue	−1.4539	−90.4075		
	Net union fee i. Xblue	Net union fee i. Xblue		
Subsidy ratio fixed	−0.0001	−0.0001		
Net union fee inv.fixed	−0.0189	−0.0561*		
Subsidy ratio fixedXblue	0.8840***	0.8020***		
Net union fee inv.fixedXblue	−0.0002***	−0.0002***		
Kleibergen-Paap F-value	129.996	52.38	13.08	11.69
Controls				
Age, part-time, blue-collar	Yes	Yes	Yes	Yes
Fixed job effects	Yes	Yes	Yes	Yes
C (job cell)	1189	86	244	329
J (jobs)	414,807	251,884	534,422	283,361
N (observations)	2,227,862	1,193,159	2,383,529	1,258,803

Note: Workers between 20 and 60 years of age. Population denoted by column head. IV-FE (within)- linear regressions. Panel unit: job (workerXfirm). Dependent variable: dummy taking the value of 1 if worker is a union member. All models comprise the following control-vector: year dummies, part-time dummy, age vigintile dummies. Standard errors adjusted for job-cell-clustering presented in parentheses. ***,** and * denote 1, 5 and 10 percent level of significance.

Data availability

The authors do not have permission to share data.

References

Abowd, J., Farber, H., 1982. Job queues and union status of workers. Ind. Lab. Relat. Rev. 35, 354–367.
Ackerberg, D.A., Caves, K., Frazer, G., 2015. Identification properties of recent production function estimators. Econometrica 83, 2411–2451.
Addison, J.T, 2009. The Economics of Codetermination: Lessons from the German Experience. Palgrave Macmillan, New York.
Addison, J.T., Bryson, A., Teixeira, P., Pahnke, A., 2011. Slip sliding away: further union decline in Germany and Britain. Scott J. Polit. Econ. 58 (4), 490–518.
Acemoglu, D., Aghion, P., Violante, G.L., 2001. Deunionization, Technical Change and Inequality. Carnegie-Rochester Conferen. Ser. Public Policy 55 (1), 229–264.
Aleks, R., Saksida, T., Wolf, A.S., 2021. Hero or villain? A cohort and generational analysis of how youth attitudes towards unions have changed over time. Brit. J. Ind. Relat. 59, 532–567.
Austin, J., Gaver, J., Gaver, K., 1998. The choice of incentive stock options vs. nonqualified options: a marginal tax rate perspective. J. Am. Tax. Assoc. 20, 1–21.
Autor, D.H., Katz, L.F., Kearney, M.S., 2006. The polarization of the US labor market. Am. Econ. Rev. 96, 189–194.
Babenko, I., Tserlukevich, Y., 2009. Analyzing the tax benefits from employee stock options. J. Finance 64, 1797–1825. https://doi.org/10.1111/j.1540-6261.2009.01480.x.
Bain, G.S., Elsheikh, F., 1976. Union Growth and the Business Cycle. Blackwell, Oxford, England.
Barth, E., Moene, K.O., Willumsen, F., 2014. The Scandinavian Model – an interpretation. J. Public Econ. 117, 60–72.
Barth, E.A.B., Dale-Olsen, H., 2020. Union density effects on productivity and wages. Econ. J. 130, 1898–1936. https://doi.org/10.1093/ej/ueaa048.
Bhuller, M., Moene, K.O., Mogstad, M., Vestad, O.L., 2022. Facts and fantasies about wage setting and collective bargaining. J. Econ. Perspect. 36, 29–52.
Blanchflower, D., Bryson, A., 2007. "What effect do unions have on wages now and would "What do unions do?" Be surprised.'. In: Bennett, J.T., Kaufman, B.E. (Eds.), What Do Unions Do?: A Twenty-Year Perspective. Transaction Publishers, New Brunswick USA and London UK, pp. 79–113.
Blanchflower, D.G., Bryson, A, 2024. NBER Working Paper #32471.
Booth, A.L, 1985. The free rider problem and a social custom model of trade union membership. Q. J. Econ. 100, 253–261.

Booth, A.L., 1994. The Economics of the Trade Union. Cambridge University Press, Cambridge.
Breda, T, 2013. Employers dealing with union representatives: a case for strategic discrimination? mimeo.
Bryson, A, 2008. Union free-riding in Britain and New Zealand. J. Ind. Relat. 50 (1), 5–24.
Bryson, A., Davies, R., 2018. Family, place and the intergenerational transmission of union membership. British J. Ind. Relat. https://doi.org/10.1111/bjir.12435.
chapter 55 in Bryson, A., Forth, J, 2023. Worker representation. In: Eriksson, T. (Ed.), Encyclopedia of Labour Studies. Edward Elgar Publishing, pp. 235–239.
Bryson, A., Freeman, R.B, 2013. Employee perceptions of working conditions and the desire for worker representation in Britain and the US. J. Labor Res. 34, 1–29.
Bryson, A., Gomez, R., 2003. Buying Into Union Membership. In: Gospel, H., Wood, S. (Eds.), Representing Workers: Union Recognition and Membership in Britain. Routledge, London.
Bryson, A., Gomez, R., 2005. Why Have Workers Stopped Joining Unions? The Rise in Never-Membership in Britain. Brit. J. Ind. Relat. 43, 67–92.
Bryson, A., Gomez, R., Gunderson, M., Meltz, N., 2005. «Youth-adult differences in the demand for unionization: are American, British, and Canadian workers all that different?". J. Labor Res. 26, 155–167.
Bryson, A., Gomez, R., Willman, P., 2010. Online Social Networking and Trade Union Membership: what the Facebook phenomenon truly means for labor organizers. Labor Hist. 51, 41–53.
Bryson, A., Freeman, R., Gomez, R., Willman, P., 2019. The twin track model of employee voice: an Anglo-American perspective on union decline and the rise of alternative forms of voice. In: Holland, P., Teicher, J., Donaghey, J. (Eds.), Employee Voice at Work. Springer, pp. 23–50.
Calmfors, L., Driffill, J., 1988. Bargaining structure, corporatism and macroeconomic performance. Econ. Policy 3 (6), 13–61. VolNo.
Cools, S., Finseaas, H., Rasmussen, M.B., 2021. The immigrant-native gap in union membership: a question of time, sorting or culture. Labour 35, 24–51.
Dodini, S., K.G. Salvanes and A. Willen (2022), The dynamics of Power in Labor Markets: monopolistic Unions versus Monopsonistic Employers. IZA DP. 15635.
Dodini, S., A. Stansbury and A. Willen (2023a), How Do Firms Respond to Unions? IZA DP. 16697.
Dodini, S., Salvanes, K.G., Willen, A., Zhu, L., 2023b. NHH Discussion Paper.
Dodini, S., Willen, A., Zhu, L., 2024. NHH Discussion Paper No. 24.
Farber, H., Krueger, A.B., 1993. Union membership in the United States: the decline continues. In: Kaufman, B., Kleiner, M. (Eds.), Employee Representation: Alternatives and Future Directions. IRRA, Madsion, pp. 70–79.
Forth, J., Bryson, A., George, A., 2017. Explaining cross-national variation in workplace employee representation. Eur. J. Ind. Relat. 23 (4), 415–433.
Forth, J., Bryson, A, 2019. State substitution for the trade union good: the case of paid holiday entitlements. J. Participat. Employ. Ownersh. https://doi.org/10.1108/JPEO-06-2018-0022.
Freeman, R., Medoff, J., 1984. What Do Unions do? Basic Books, New York.
Goos, M., Manning, A., 2007. Lousy and lovely jobs: the rising polarization of work in Britain. Rev. Econ. Stat. 89, 118–133.
Goos, M., Manning, A., Salomons, A., 2014. Explaining job polarization: routine-biased technological change and offshoring. Am. Econ. Rev. 104, 2509–2526.
Gruber, J., Lettau, M., 2004. How elastic is the Firm's demand for health insurance. J. Public Econ. 88, 1273–1293.
Gutiérres-i-Puigarnau, E, Van Ommeren, J.N., 2011. Welfare effects of distortionary fringe benefits taxation: the case of employer-provided cars. Int. Econ. Rev. (Philadelph.) 52, 1105–1122.
Høgedahl, L., Møberg, R.J., 2022. Young workers in transition: explaining the density gap by a life-course perspective. Nord. J. Work. Life Stud. 12 (S8).
Kostøl, F.B., Svarstad, E., 2023. Trade unions and the process of technological change. Lab. Econ. 84, 102386.
Lee, D.S., Mas, A., 2012. Long-run impacts of unions on firms: new evidence from financial markets, 1961–1999. Q. J. Econ. 127, 333–378.
Millward, N., Bryson, A., Forth, J., 2000. All Change at Work? Routledge, London.
Nickell, L., Jackman, 1991. Macroeconomic Performance the Labour Market. Oxford University Press.
OECD, 2017. *OECD Employment Outlook*, Chapter 4. OECD, Paris, pp. 125–173.
OECD, 2018. «Ch.3 the role of collective bargaining systems for good labour market performance". Employm. Outl. 73–122, 2017.
Olson, M. (1965) *The Logic of Collective Action: public Goods and the Theory of Groups*.
Riddell, C., 1993. 2Unionisation in Canada and the United States: a tale of two countries. In: Card, D., Freeman, R. (Eds.), Small Differences That Matter: Labour Markets and Income Maintenance in Canada and the United States. University of Chicago Press, Chicago.
Schnabel, C, 2013. Union membership and density: some (not so) stylized facts and challenges. Eur. J. Ind. Relat. 19, 255–272.
Stewart, M.B., 1987. Collective bargaining arrangements, closed shops and relative pay. Econ. J. 97 (385), 140–156.
Svarstad, E, 2023. Do unions care about low-paid workers? Evidence from Norway. Ind. Relat. (Berkeley). https://doi.org/10.1111/irel.12349.
Towers, B., 1997. The Representation Gap: Change and Reform in the British and American Workplace. Oxford University Press, Oxford.
Willman, P., Bryson, A., 2009. Accounting for Collective Action; Resource Acquisition and Mobilisation in UK Unions. Adv. Ind. Relat. 16, 23–50.
Willman, P., Bryson, A., Forth, J., 2019. UK Trade unions and the problem of collective action. Brit. J. Ind. Relat. 58, 447–470.