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Does collective bargaining reduce health inequalities between labour market insiders and outsiders?

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Abstract

Collective bargaining institutions are correlated with better population health. However, there are still major gaps in our understanding regarding the impact of collective bargaining on health inequalities, particularly between labour market 'insiders' and 'outsiders'. In this study, we investigate the effect of collective bargaining coverage on individuals' self-rated health, and whether the impact varies according to labour market status. We use four waves of the European Values Survey (1981–2018) and three-level nested random intercept models across 33 OECD and European countries ($N = 66\,301$). We find that stronger and more inclusive collective bargaining institutions reduce health inequalities between the unemployed and the employed by disproportionately improving the health of the unemployed. This study implies that targeting the political institutions that shape the distribution of power and resources is important for reducing health inequalities.

Key words: collective bargaining, unemployment, inequality, Europe

JEL classification: I14: health and inequality, J52: dispute resolution: strikes, arbitration, and mediation, collective bargaining

1. Introduction

Collective bargaining institutions are likely to have positive effects on health. In part, this is because collective bargaining typically empowers trade unions, which strive for higher and more equal wages, greater job security, and better working conditions and safety at work, all important social determinants of health (Hagedorn *et al.*, 2016). However, there are still important gaps in our understanding of the health effects of collective bargaining.

First, health scholars have typically focussed on the health effects of trade union membership rather than collective bargaining institutions (Reynolds and Brady, 2012; Reynolds and

Buffel, 2020; Wels, 2020; Eisenberg-Guyot *et al.*, 2021), finding mixed results, particularly when using more causal methods (Wels, 2020; Eisenberg-Guyot *et al.*, 2021). On the other hand, union density and other measures of collective bargaining appear to be more consistently associated with better health (Eisenberg-Guyot *et al.*, 2020; Reynolds and Buffel, 2020; Muller and Raphael, 2021; Reeves, 2021) and life satisfaction (Radcliff, 2005). In this paper, we focus on collective bargaining institutions rather than union membership, because individuals' health outcomes are likely to be influenced by the ways in which unions, employers' organizations, and, in some countries, governments, come together to shape labour and welfare policy, as well as settlements for specific firms or sectors. A strength of our paper is that we define collective bargaining institutions in multiple ways across different models, with highly consistent results.

Secondly, we consider *whose* health is improved by collective bargaining. Understanding health inequalities in the context of collective bargaining is crucial because of how these institutions can facilitate or protect against dualized labour markets, and the health consequences that might flow from 'insider' or 'outsider' positions. In dualized markets, highly protected 'insider' employees retain job security, wages and generous benefits at the expense of precarious 'outsiders', who work in atypical jobs and suffer high unemployment risks (Busemeyer and Kemmerling, 2020). Collective bargaining institutions play a role in shaping the extent to which the risk of unemployment is fairly distributed among the population, as well as the material and psychological conditions under which people experience both insecure employment and unemployment (Rueda, 2005). What is less clear, however, is whether the health effects of collective bargaining are also dualized. Because unemployment and precarious work have important negative effects on mental and physical health (Kim and Von Dem Knesebeck, 2015), collective bargaining could potentially exacerbate health inequalities between insiders and outsiders; we empirically evaluate this possibility in our paper for the first time.

The third way we extend existing work is methodological and moves in two directions. To date, the single study on the relationship between collective bargaining and health has been conducted using average measures of health at the country level (Reeves, 2021). Existing studies that exploit individual data across countries cover only short periods of time (e.g. Reynolds and Buffel, 2020; Reeves *et al.*, 2021), and are therefore unable to allow for the slow pace of change in collective bargaining institutions. Potential non-linear health effects of collective bargaining are not explored in the current literature (Reynolds and Buffel, 2020). In contrast, our paper uses cross-sectional individual-level data from the European Values Survey (EVS), with data from 33 countries, covering a nearly 40-year period from 1981 to 2018. This allows us to (a) Explore labour market inequalities within and between countries; (b) Do so over a period in which important historical changes to collective bargaining institutions have taken place in Europe (Visser *et al.*, 2015). Individual-level data on self-reported health is matched to country-level information on collective bargaining institutions, and is analysed using a three-level random effects model (individuals nested in country-years nested in countries). Furthermore, this study explicitly explores non-linear health effects across different levels of collective bargaining coverage, in order to evaluate the comparative strengths of power resources theory (Korpi, 1983) vs. the insider–outsider hypothesis (Rueda, 2005).

Focussing on health also makes a contribution to our understanding of dualization more broadly. Work on dualization has examined political preferences (Vlandas, 2020), union inclusiveness (Benassi and Vlandas, 2016), employment (Biegert, 2019), wage equality (Visser and Checchi, 2012) and low pay (Benassi and Vlandas, 2021), among other topics. This

work has shown that in dualized systems, outsiders are likely to experience a cycle of unemployment and precarious work, characterized by low pay and poor working conditions (Schwander and Hausermann, 2013). Looking at health, which has the advantage of being observable for individuals inside and outside of the labour force, allows us to capture the cumulative scarring effect of this low pay/no pay cycle over the life course (though our data do not permit us to isolate this mechanism). Another advantage of looking at a non-labour market outcome, like health, is that dualized systems may have consequences for the experience of unemployment itself, not only the level or distribution of unemployment.

In this study, we show that the effect of collective bargaining (primarily measured using the share of the workforce that is covered by a collective bargaining agreement) on self-rated health varies according to insider–outsider status (primarily measured according to labour market status). Surprisingly, we find that the effect of collective bargaining on health is largest for those who are not currently in work. This finding is robust to the inclusion of a large battery of country-level controls and sensitivity tests, and is not driven by welfare regimes or Ghent systems. We further show that the effect of collective bargaining on insider–outsider health inequalities is non-linear: only systems with very high levels of coverage, above 75%, succeed in achieving lower health inequalities between the employed and the non-employed.

2. Dualization, collective bargaining and health

Collective bargaining is associated with improved population health—but does it affect everyone's health in the same way? The share of the population that belongs to a union (union density) is associated with lower mortality in the population (Muntaner *et al.*, 2002), better self-reported health (Dollard and Neser, 2013) and lower depression amongst the workforce, even for those who are not unionized (Reynolds and Buffel, 2020). Reeves (2021) shows that collective bargaining institutions reduce mortality and raise life expectancy at the country level. What is less well understood is for whom these beneficial effects apply.

This section explains why these questions are important and what the existing evidence can tell us about them: many high-income countries' labour markets have become dualized, with unequal working conditions, employment protection and benefits for insiders compared to outsiders. Outsiders are therefore much more likely to repeatedly experience unemployment or to become inactive. Unfortunately, we also know that these experiences cause poor health. At the same time, there is some evidence that when trade unions represent the whole workforce, they support policies that protect outsiders—policies that have previously been shown to improve outsiders' health. Taken together, then, this raises the question of whether collective bargaining institutions protect both insiders and outsiders' health, and whether these benefits are distributed equally.

2.1 Dualization

The issue of who benefits from collective bargaining is important because many high-income countries' labour markets have become 'dualized'. In dualized labour markets, there is significant labour market inequality between 'outsiders' and 'insiders' (Rueda, 2005; Rueda *et al.*, 2006). 'Insiders' benefit from employment protection and generous work-related benefits such as a pension, unemployment insurance, maternity leave, health coverage, etc. 'Outsiders' are employed in jobs with much higher unemployment and under-employment

risk and limited opportunities to accrue work-related benefits, relying instead on minimal state-provided social benefits aimed at preventing poverty (Busemeyer and Kemmerling, 2020). The two labour markets are related, since firms can afford to grant secure employment and generous benefits to insiders *because* they can maintain flexibility in a globalized market by hiring and laying off outsiders when necessary.

2.2 Outsiders' health

Dualization does not just affect labour market risk but may also harm health. We already know that unemployment can be particularly detrimental to health (Bambra and Eikemo, 2009; Norström *et al.*, 2014; Kim and Von Dem Knesebeck, 2015). Unemployment causes mental distress, in both the short-term (Huijts *et al.*, 2015) and the long-term (Roelfs *et al.*, 2011; Daly and Delaney, 2013). Periods out of work aggravate and trigger depression and anxiety disorders (Paul and Moser, 2009), increase working-age mortality (Roelfs *et al.*, 2011), and increase the risk of suicide (Stuckler *et al.*, 2009; Milner *et al.*, 2013).[1] Longitudinal data also show evidence that mortality risks increase with the length of unemployment (Garcy and Vågerö, 2012). Unemployment causes poor health because of financial strain, the psychosocial stress caused by uncertainty about the future, and stigma (particularly among those who are out of work for long periods). Coping behaviours like drinking and smoking have also been implicated, especially for the short-term unemployed (Garcy and Vågerö, 2012; Huijts *et al.*, 2015).

2.3 Unions and dualization

The pressures driving dualization—liberalization, globalization, de-industrialization, and economic recession—are common to most European and OECD labour markets, and yet some countries have become more dualized than others (Emmenegger *et al.*, 2012). One explanation for the differing degrees to which countries have become dualized is variation in the role and power of unions. However, the ways in which unions influence this process remains contested. For scholars in the power resources tradition, strong trade unions defend the interests of the entire working class and therefore contribute to reducing dualization pressures and creating a more solidaristic labour market (Emmenegger, 2014; Brady *et al.*, 2016). Conversely, proponents of the insider–outsider hypothesis claim that trade unions will primarily protect the interests of insiders at the expense of outsiders, since insiders are much more likely to be unionized (Rueda, 2005). It is important to note that the two theories agree on the fact that unions will reduce dualization pressures when unions represent a large percentage of the workforce (Lindvall and Rueda, 2014). This is because unions necessarily represent both insiders and outsiders if they represent close to 100% of the workforce. The two theories disagree on what will happen if unions represent only part of the workforce, i.e. if unions predominantly represent insiders.

2.4 Collective bargaining, anti-dualization policies and better health

The balance of evidence demonstrates that countries with strong collective bargaining institutions are more likely to implement pro-outsider, anti-dualization policies. Protections for

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1 While poor mental and physical health are a risk factor for experiencing unemployment at the individual level (Olesen *et al.*, 2013), there is strong evidence—using longitudinal data or analysing unemployment from plant closures or recessions—that unemployment causes poor health (Paul and Moser, 2009; Roelfs *et al.*, 2011; Drydakis, 2015).

outsiders, such as unemployment benefits and active labour market policies (ALMPs), are more generous and cover more people in systems characterized by high union density, high levels of centralization in the organization of collective bargaining, and direct union involvement in the administration of unemployment benefits (Gordon, 2015). Specific attention to the needs of temporary agency workers is facilitated in systems where a large proportion of the population is covered by collective bargaining agreements and the top level of the collective bargaining system has high authority, though there is more than one combination of variables that predicts union inclusiveness with respect to workers on fixed-term contracts (Benassi and Vlandas, 2016). Union density is positively associated with a higher probability of fixed-term employees transitioning either to permanent contracts or to unemployment (Fervers and Schwander, 2014). In Germany, non-unionized workers are more likely to experience low pay in highly unionized sectors, while high bargaining coverage at the sectoral level decreases the risk of low pay for everyone, even those who are not covered by collective bargaining agreements (Benassi and Vlandas, 2021); this is because the absence of a strong tripartite collective bargaining agreement leaves labour weaker in some parts of the economy (Thelen, 2012).

Anti-dualization policy responses may, in turn, be associated with better health for outsiders. For example, high-quality ALMPs improve mental health (Wang *et al.*, 2021), decrease symptoms of depression and raise self-esteem for ALMP participants (Vuori and Silvonen, 2005), and reduce the link between unemployment and suicides (Stuckler *et al.*, 2009). Generous unemployment insurance reduces the negative effect of unemployment on self-reported health in the USA (Cylus *et al.*, 2015) and protects populations against worsening health caused by economic insecurity—for example, during the 2008 crisis in European countries (Ferrarini *et al.*, 2014). Generous severance payments and notice periods protect the health of workers who become unemployed, and also have (smaller) beneficial effects for workers who retain their jobs (Barlow *et al.*, 2019).

Two key implications emerge from this discussion. The first is that dualization may have negative health effects for outsiders, partly because they are more likely to repeatedly experience unemployment (or long-term unemployment), which has negative health implications, and partly because the experience of unemployment, given less generous unemployment benefits and ALMPs, may itself have worse health effects in dualized systems. The second is that collective bargaining—under certain conditions—may mitigate dualization pressures, and therefore avoid the negative health effects of dualization for outsiders. Importantly, no study has yet investigated whether and how collective bargaining institutions modify the health effects of being an outsider. Our study takes up these questions using individual-level data from 33 countries, covering a nearly 40-year period.

3. Data and methods

3.1 Operationalizing 'insiders and outsiders' and 'collective bargaining'

In this paper, we primarily operationalize insiders as individuals who are employed, and outsiders as individuals of working age who are unemployed. Individuals who are unemployed represent the ultimate outsiders (Lindbeck and Snower, 1986)—those for whom the threat of unemployment has become a reality. Focusing on how collective bargaining affects health inequalities between the employed and the unemployed is also a useful test case: because of the well-documented health effects of unemployment, we would expect greater health inequalities between those in work versus those not in work, compared to different

categories of employed workers (e.g. those on fixed term versus permanent contracts). We, therefore, focus on inequalities in health between the employed and the unemployed precisely because these health inequalities are the most likely to vary across bargaining regimes. Despite this advantage, conceptualizing outsiders as the unemployed diverges from those who conceptualize outsider status in terms of labour market risk, persisting beyond a person's current labour force status and incorporating different employment experiences in the past (Häusermann and Schwander, 2009). Whilst acknowledging these additional layers of complexity, we would still expect the unemployed group in a more dualized system to be made up of a greater proportion of persons who have experienced repeated short-term unemployment, long-term unemployment, or worse working conditions when they were employed. That is, we expect the unemployed in dualized labour markets to be comprised of a large share of outsiders (conceptualized in terms of labour market risk). These past experiences are also relevant to their current health, because of the scarring effect of unemployment and insecure working conditions.

We also include the inactive as 'outsiders' in our analysis. Although some persons in the inactive group have chosen not to work and cannot, therefore, be conceptualized as outsiders, others may have been pushed out of the labour force through repeated or long-term unemployment combined with punitive ALMPs, a lack of inclusive workplace policies for people with disabilities, or expensive childcare and the gender wage gap. In addition to our primary results comparing health inequalities for employed vs. unemployed and inactive individuals, we also include analyses within the employed group, comparing unionized vs. non-unionized workers, part-time vs. full-time workers, comparing white collar, skilled blue-collar, and unskilled blue-collar workers, and comparing workers according to the amount of decision-making power they have in their job.

We operationalize 'collective bargaining' as adjusted bargaining coverage: the proportion of employees covered by a collective bargaining agreement (among the employees with the right to bargain). There are many other ways of measuring collective bargaining institutions, including through the level and extent of coordination, as well as through union density. We have chosen bargaining coverage as our main measure of collective bargaining institutions for theoretical, empirical, and practical reasons. Theoretically, high coverage represents unions' capacity to prevent or moderate the effects of dualization: in systems with high coverage, agreements bargained by unions will apply to a large segment of the population—a greater share than those who are union members, especially in countries that make use of automatic extensions (Visser *et al.*, 2015). High coverage also alters union incentives, as they will de facto represent a greater percentage of outsiders (Benassi and Vlandas, 2016) (though high levels of coverage do not guarantee that outsiders will have as much voice or power as insiders within union decision-making, nor that the same federation or confederation will represent both insiders and outsiders (Durazzi, 2017)). Bargaining coverage is also empirically important. In an analysis of 14 European countries using Qualitative Comparative Analysis, high levels of bargaining coverage were found to be the only necessary (though not sufficient) condition for union inclusiveness towards temporary agency workers (Benassi and Vlandas, 2016). A practical reason for selecting bargaining coverage is that it is a unidimensional, continuous measure that is associated with a set of other important institutional dimensions (Visser, 2013). These institutional dimensions are not independent of one another (union density, coordination, centralization, type of collective bargaining). Given data limitations in terms of the number of countries (33) and country-

years (66) in the analytical sample, using coverage is a convenient way to measure the strength and inclusivity of collective bargaining without having to tease out the health effects of a high number of institutional combinations. Our intent is not to claim that coverage is the defining factor of collective bargaining institutions, or that other dimensions do not matter. Rather, we conceptualize the different aspects of collective bargaining as working together in a system, for which coverage is a convenient (if imperfect) proxy.

3.2 Data sources

This study draws on four out of five waves of the EVS, a repeated cross-sectional survey of individuals conducted across European countries and some non-European OECD countries, from 1981 to 2018. The third wave of the survey, conducted in 1999, is omitted as a question on self-reported health was not included. The other waves were collected starting in 1981, 1990, 2008 and 2017, respectively, with all countries being surveyed within 3 years of the start year. Some countries, such as Great Britain, Ireland, Estonia or Germany, experienced significant changes in bargaining coverage over this nearly 40-year period (Figure 1), which allows us to disentangle the role of these institutional changes from other country characteristics. The analyses focus on 33 countries and 66 country-years ($N = 66\,301$); not all countries are surveyed in all waves (Appendix Table A1).

Country-years are matched to the most widely used data on collective bargaining institutions, the ICTWSS database Version 6.1 (Visser, 2019), which includes data up to 2016. Since 2021, the ICTWSS has been managed and hosted by the OECD/AIAS. However, there are more missing data prior to 2016 in the OECD/AIAS-ICTWSS database than in the original ICTWSS database (e.g. adjusted coverage for Germany)—therefore the original ICTWSS data was taken as the reference, with missing data inputted where available from the
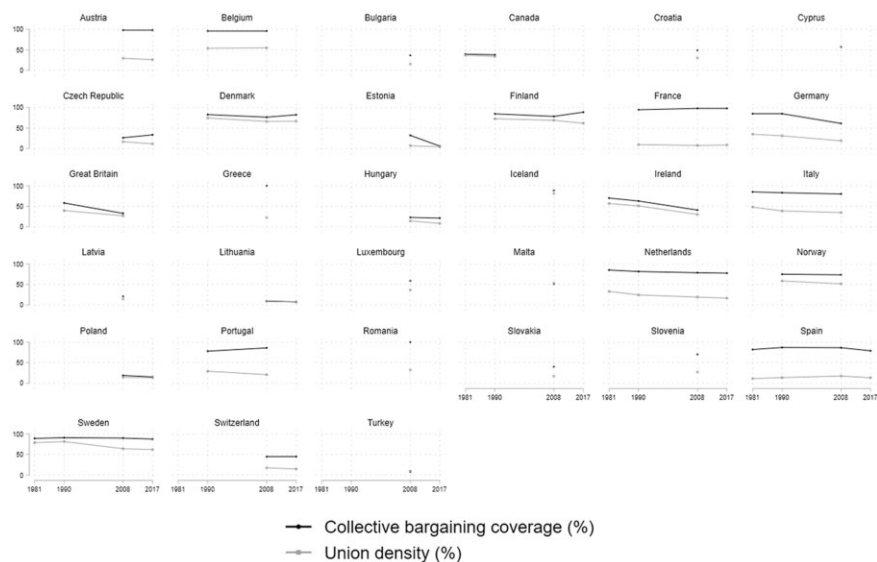

Figure 1 Levels of coverage and union density, 1981–2018 ICTWSS database, sample countries.

OECD/AIAS-ICTWSS database. An indicator variable indicating the source of the data was included in all regressions to adjust for any systematic differences between the two sources.

3.3 Methods

The analytical sample is comprised of working-age adults aged 18–64, excluding students and the self-employed. We use three-level nested random intercept models, with individuals i nested in country-years jt, nested in countries j (Schmidt-Catran and Fairbrother, 2016). This hierarchical structure models the fact that individuals interviewed in the same year and the same country are more similar to each other than to the rest of the sample. We also include a linear term for year. Given the relatively low number of years per country (Appendix Table A1), and the fact that some countries see little variation in the independent variable over time (Figure 1), we prefer this model to a country fixed effects model. This is justified by an analysis showing that within effects (variation within countries across years, i.e. the variation captured by fixed effects) and between effects (variation between countries) are not significantly different from each other (Appendix Table A2). A random effects model that combines the estimation of within and between effects is therefore most appropriate (Bell *et al.*, 2019). However, our results also hold with a model that combines country random effects and year fixed effects, as well as with a model that combines country and year fixed effects (Appendix Table A3). In a sensitivity test, we further include cluster robust standard errors at the country level (Appendix Table A6).

We use linear probability models instead of logit models (Equation 1) in order to facilitate the interpretation of interaction terms (Angrist and Pischke, 2009) and because linear random effects models are less biased than logit random effects models (Bryan and Jenkins, 2016).

$$Y_{ijt} = \beta_0 + \beta_1 COV_{jt} + \beta_2\ LABSTAT_{ijt} + \beta_3 COV_{jt} \cdot LABSTAT_{ijt} + \beta_4\gamma_{ijt} + \beta_5\delta_{jt} + \beta_5 YEAR_t + \mu_{jt}^{(2)} + \mu_j^{(3)} + \varepsilon_{ijt} \tag{1}$$

In Equation 1, Y_{ijt} is self-rated health. Self-rated health is measured from 1 (very poor health) to 5 (very good health). In all analyses, this variable is recoded into a binary variable 'poor health' (=1 if individual declares 'poor' or 'very poor' health, 0 otherwise). Self-rated health is a highly comprehensive measure that strongly predicts objective measures such as future mortality, functional decline and healthcare use (Jylhä, 2009; Ganna and Ingelsson, 2015). The main disadvantage of self-rated health is that different cultures respond differently given 'objective' health conditions (Jylhä, 2009). This risk is mitigated by using a binary variable to minimize the measurement error caused by differential interpretation of the 5-point scale across countries.

3.4 Variables

COV_{jt} is the independent variable of interest: 'adjusted bargaining coverage', the proportion of employees covered by a collective bargaining agreement (among the employees with the right to bargain) (Figure 1—see Appendix Figure A1 for a graph showing coverage and health over time across countries).

All models further control for union density (UDENSITY). In sensitivity analyses, we additionally control for the dominant level (LEVEL) and extent of coordination (COORD) in collective bargaining, as well as how this is achieved (TYPE). In country-years where

coverage and union density are missing, these are interpolated before merging with the EVS dataset (Biegert, 2019). LEVEL, TYPE and COORD are re-coded from five to three levels (Speckesser *et al.*, 2015).

LABSTAT$_{ijt}$ is a categorical variable of labour force status with three levels: employed, unemployed, and inactive. In the main analytical sample, 69.9% of the sample is employed, 7.2% is unemployed and 23.0% of the sample is inactive. Interactions between COV and LABSTAT allow us to determine whether the association between collective bargaining coverage and self-reported 'poor health' differs according to labour force status. In Section 4.4, we examine whether collective bargaining institutions have differential associations with poor health according to type of work, specifically whether an employee is UNIONIZED (binary variable), working FULLTIME (binary variable), how much decision-making power a person has in their job, DECJOB (ordinal variable from 1 to 10) and their OCCUPATION (recoded from the 11 EGP class schema to three levels: white-collar, skilled blue-collar, unskilled blue-collar).

γ_{ijt} represents a vector of individual-level controls. Studies have identified women, individuals with low education, and younger persons as being particularly likely to belong to the outsider group (Biegert, 2019). We include AGE as a continuous variable; GENDER as a binary variable, male or female; EDUCATION as a categorical variable with 11 levels, including no formal education, less than 12 years of education and 21 and more years of education; and MARITAL status as a categorical variable with six levels. It is important to control for these individual characteristics to rule out a situation where the level of health inequality between insiders and outsiders is explained by the relative composition of the outsider group, since women, older people and less educated people tend to report worse health on average.

δ_{jt} is a vector of country-level controls, which are potentially associated both with coverage and with country-level self-reported health. These include: GDPPC, real GDP at constant 2017 national prices divided by population, from the Penn World Tables v10.0; LEFTWING, share of left-wing seats won in the most recent parliamentary election, from ParlGov and the Comparative Welfare States dataset. The following variables are sourced from the EUROSTAT/ESSPROS and OECD/SOCX databases: HEALTHEXP, the annual amount spent on health as a % of GDP; DISABEXP, the annual amount spend on disability (non-health care) as % of GDP; SOCEXP, the annual amount spent on social protection as % of GDP (including health, unemployment and disability as well as other items); UNEMPRATE, the unemployment rate for 15- to 64-year-olds. In some models, the following controls are also included: INACTRATE, the inactivity rate for 15- to 64-year-olds; UNEMPEXP, the annual amount spent on unemployment and ALMPs as % of GDP; pHEALTHEXP, the share of health expenditure from private sources; pHOSPBEDS, the share of hospital beds in private hospitals; HEALTHCOV, the share of the population covered by private or public health insurance (OECD only). Descriptives of key variables are provided in Appendix Table A4.

$\mu_{jt}^{(2)}$ is a country-years random intercept and $\mu_j^{(3)}$ is a country-level random intercept. Both random effects are assumed to be normally distributed with a mean of zero and variances $\sigma_{\mu2}^2$ and $\sigma_{\mu3}^2$, respectively. The random effects are assumed to be uncorrelated with each other and with the individual-level error term, given covariates. The random effects and the individual error term are assumed to be uncorrelated across countries; $\mu_{jt}^{(2)}$ and the individual error term are assumed to be uncorrelated across years; the individual error terms are assumed to be uncorrelated across individuals (Rabe-Hesketh and Skrondal, 2008).

4. Results

4.1 Average effects

We start by estimating the association between collective bargaining coverage and self-reported health. In our sample, we find that the proportion of the workforce covered by a collective bargaining agreement is only modestly associated with better self-reported health at the individual level. After adding all country controls, each additional percentage point (p p.) increase in adjusted coverage decreases the probability that an individual reports poor health by 0.03 p.p. (Table 1). This is a very small effect, comparable to one-eighth of the effect of being 1 year younger on self-reported health (not shown). Union density is not associated with poor health when coverage is controlled for.

4.2 Heterogeneous effects by labour force status

This modest association between adjusted coverage of collective bargaining agreements and better health may mask variation in the effect of collective bargaining on people in different positions in the labour market. Given collective bargaining's importance for wages and working conditions, and the importance of such factors for health, we might expect that widespread coverage of collective bargaining mainly benefits employed persons, but not the unemployed or the inactive. This is not what we find, however. Instead, pervasive collective bargaining coverage seems to benefit the unemployed and the inactive significantly more than those with a job (Figure 2), even when controlling for individual characteristics, GDP, a time trend, the electoral power of Left parties, social spending, and the unemployment rate.

The strength of the association between collective bargaining coverage and the self-rated health of unemployed and inactive persons is large. Unemployed people in country-years with high coverage (i.e. 1 SD above the mean, at 94%) are 3.9 p.p. less likely to experience poor health relative to unemployed people in country-years with low coverage (i.e. 1 SD below the mean, at 38%) (marginal effects, Appendix Table A5). For the inactive, the same difference in coverage is associated with a 4.1 p.p. difference in the probability of experiencing poor health (marginal effects, Appendix Table A5). In contrast, the marginal effect on health of a change in coverage for the employed is very small and not significant in this model. As a result, health inequalities between the unemployed and the employed are 3.5 p.p. lower in systems with collective bargaining coverage of 94% compared to systems with a coverage rate of 38% (and there is a 3.7 p.p. reduction in health inequalities between inactive and employed).

These results are not driven by any outlier country, as shown by sequentially dropping one country at a time from the analysis (Appendix Figure A2). The significance of the interaction term between unemployed and coverage remains lower than 0.01 when controlling for inactivity rates and unemployment spending, and when including clustered standard errors at the country level—though the significance of the interaction of inactive and coverage falls to 0.1 when robust clustered standard errors are included (Appendix Table A6). The significance of the interaction terms remains unaffected when controlling for characteristics of the health system: percentage of private health expenditure and private hospital beds, and the percentage of the population covered by insurance (Appendix Table A7). In fact, the strength of the interaction between coverage and being unemployed (and inactive) *increases* when private health expenditure is controlled (Appendix Table A7, Model 2).

Table 1 Probability of reporting poor health, EVS 1981–2019

	(1) Baseline	(2) + Individual controls	(3) + Left seats and social spending	(4) + Unemployment rate
Adjusted coverage	−0.0000	−0.0001	−0.0003**	−0.0003**
	(0.000)	(0.000)	(0.000)	(0.000)
Union density	−0.0003	0.0000	−0.0002	−0.0002
	(0.000)	(0.000)	(0.000)	(0.000)
% Left-seats in parliament			−0.0004*	−0.0004*
			(0.000)	(0.000)
Health expenditure (% GDP)			0.0030	0.0028
			(0.004)	(0.004)
Disability expenditure (% GDP)			0.0120***	0.0116***
			(0.004)	(0.004)
Total social expenditure (% GDP)			−0.0001	0.0001
			(0.001)	(0.001)
Unemployment rate				−0.0004
Constant	−0.4782	−0.0670	−0.3964	−0.3818
	(0.562)	(0.593)	(0.890)	(0.890)
var (country RE)	0.0001***	0.0003***	0.0002***	0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)
var (country-year RE)	0.0003***	0.0002***	0.0002***	0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)
var (residual)	0.0566***	0.0537***	0.0537***	0.0537***
	(0.000)	(0.000)	(0.000)	(0.000)
Countries	33	33	33	33
Country-years	66	66	66	66
Observations	66 301	66 301	66 301	66 301

Notes: Standard errors in parentheses. All models control for union density, logged GDP per capita and a linear year trend. Models 2–4 also control for age, gender, education, marital status and labour force status. Models 3–4 further control for % left seats, health expenditure, disability expenditure, total social expenditure. Model 4 additionally controls for the unemployment rate.
$^*P < 0.10$, $^{**}P < 0.05$, $^{***}P < 0.01$.

In this paper, we measure collective bargaining institutions according to collective bargaining (adjusted) coverage. However, our sensitivity analyses show that the strength and the significance of the interaction terms are also maintained when controlling for different dimensions of collective bargaining institutions: the strength, level and type of coordination (Appendix Table A8, Model 1). In sequential models, we include an interaction between labour force status and each of these other institutional measures of collective bargaining. As expected, we find that the unemployed and the inactive derive greater benefits under more coordinated and centralized systems, compared to the employed (Appendix Table A8, Models 2 and 3). Type of bargaining (i.e. whether bargaining is fragmented, pattern or
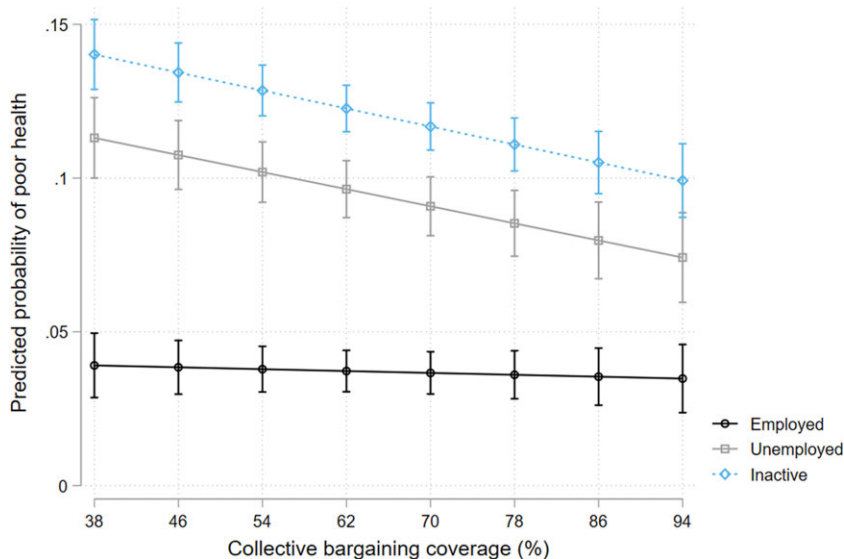
Figure 2 Health inequalities by labour market status and collective bargaining coverage, EVS 1981–2018. *Notes*: 95% confidence intervals; model controls for logged GDP per capita; a linear year trend; respondents' age, gender, education, and marital status; country-year union density; % left seats in parliament, country-year health expenditure, disability expenditure, total social expenditure and unemployment rate.

associational bargaining, or government-sponsored), however, does not significantly benefit the unemployed more than the employed when controlling for other measures of collective bargaining institutions (Appendix Table A8, Model 4).

4.3 Do these results hold everywhere?

It is possible that these heterogeneous effects are driven by different welfare regimes. Welfare regimes have important consequences for health and health inequalities via multiple social determinants of health, including the generosity of unemployment benefits (Bambra, 2005, 2011; Kim *et al.*, 2012). In addition, welfare regimes and collective bargaining institutions mutually reinforce each other—trade unions can play a key role in collaborating on government welfare policy, or be directly involved in the administration of welfare, for example, through the administration of unemployment insurance in Ghent countries (Gordon, 2015). Trade unions may influence the extent to which benefits are tied to employment, as in Bismarckian welfare regimes, or resist the liberalization of welfare regimes via their positive effect on Left party power (Becher and Stegmueller, 2020). In this sensitivity analysis, we re-run the models within welfare regimes, using the five welfare regime classification developed by Bambra and Eikemo (2009).[2] We omit country-level controls except for logged

2   We select the welfare classification used by Bambra and Eikemo (2009) because their study explores a related topic: the health effects of unemployment across welfare regimes (see Appendix Table A9 for the classification).

GDP per capita and a linear year trend, because of the multi-collinearity stemming from such small country-(years) samples.

We find that the heterogeneous health effects of coverage by labour force status hold *within welfare regimes*, particularly in the Bismarckian and Eastern European regimes, where the level of the interaction is similar to the general sample. These are also the welfare regimes with the greatest number of observations. In the Anglo-Saxon and Scandinavian regimes, the interaction between coverage and inactive is significant and much stronger than in the general sample, but the interaction term between coverage and unemployed is not significant. Southern Europe has no significant interaction terms. Finally, given the lack of variation in coverage within the Scandinavian regime (SD of only 6.3: Table 2, Model 5), we exclude countries with a Scandinavian regime type and find that interaction terms between coverage and labour force status remain strong and significant (Table 2, Model 7).

In some countries (Sweden, Denmark, Finland, Iceland and Belgium), trade unions manage the unemployment insurance system and are also involved in ALMPs. This means that unions have a stronger incentive to defend the rights of the unemployed, who are also more likely to be union members. In addition, union density (and therefore collective bargaining coverage) is very high. For these reasons, it is important to test whether collective bargaining institutions continue to benefit outsiders when Ghent countries are excluded from the analysis. We find that the exclusion of Ghent countries does not change the results (Model 3, Table 3), but that outsiders benefit much more strongly from higher levels of coverage in Ghent systems (Model 2, Table 3).

4.4 Testing the insider–outsider hypothesis using categorical measures of coverage

The insider–outsider hypothesis implies that the effects of collective bargaining coverage on health inequalities may not be linear. Specifically, the hypothesis predicts that medium levels of coverage will result in higher inequalities between insiders and outsiders compared to high levels of coverage. This is because medium levels of coverage will give unions the power to negotiate better conditions for insiders, but no incentive to improve the working conditions of outsiders. Calmfors and Driffill (1988) have also posited that trade unions are more likely to act in ways that are aligned with the greater good of society when there are high (versus medium) levels of centralization in collective bargaining. In this section, we explore the non-linear effects of coverage by converting the coverage variable to a three-level categorical variable.

In our preferred analysis, we position the cut-offs for these categorical variables to align with gaps in the distribution of the coverage variable (Benassi and Vlandas, 2016), such that the three-level variable for coverage is defined as Low: 0–56%; Medium: 57–75%; High 76–100% (Appendix Figure A3). We conduct sensitivity tests on these cut-offs, also dividing country-years into terciles (58; 85) and according to alternative gaps in the distribution (30; 65) (Appendix Table A10).

We find that it is only High coverage systems that hold health advantages for the unemployed and inactive, with lower health inequalities between the non-employed and the employed compared to Medium and Low coverage systems (Figure 3). In systems with High coverage, and compared to systems with Low coverage, the unemployed and the inactive have a significantly lower probability of reporting poor health (−3.7 p.p. and −3.5 p.p., respectively) (marginal effects, Appendix Table A11). However, in systems with Medium

Table 2 By welfare regime—probability of reporting poor health by labour force status, EVS 1981–2019

	(1) All countries	(2) Anglo-Saxon	(3) Bismarckian	(4) Eastern Europe	(5) Scandinavian	(6) Southern Europe	(7) All except Scandi
Coverage	0.0000	0.0009	−0.0001	−0.0007**	0.0007	0.0002	0.0000
	(0.000)	(0.002)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Labour status ref: Employed	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Unemployed	0.0951***	0.0485**	0.1159***	0.1042***	0.0451	0.0194	0.0957***
	(0.008)	(0.025)	(0.032)	(0.014)	(0.148)	(0.018)	(0.008)
Inactive	0.1312***	0.1457***	0.1219***	0.1356***	0.5212***	0.0177	0.1298***
	(0.006)	(0.017)	(0.019)	(0.009)	(0.075)	(0.014)	(0.006)
Unemp # coverage	−0.0006***	−0.0000	−0.0008**	−0.0007**	0.0001	0.0001	−0.0006***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
Inactive # coverage	−0.0007***	−0.0014***	−0.0006***	−0.0006***	−0.0047***	0.0002	−0.0009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Union density	0.0002	−0.0035	0.0011*	0.0018	0.0001	−0.0005***	0.0001
	(0.000)	(0.004)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Constant	−0.2696	−0.9561	−1.2421	3.3108	−0.1612	1.9681***	0.3740
	(0.612)	(2.685)	(1.290)	(5.843)	(0.682)	(0.533)	(0.728)
var (country RE)	0.0005***	0.0000*	0.0006***	0.0002***	0.0000***	0.0000**	0.0006***
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
var (country-year RE)	0.0003***	0.0000	0.0001***	0.0000***	0.0000***	0.0000***	0.0003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
var (residual)	0.0543***	0.0350***	0.0519***	0.0733***	0.0430***	0.0529***	0.0565***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Countries	34	3	7	11	5	7	29
Country-years	77	8	20	17	17	14	60
Observations	75 674	7505	23 360	15 494	13 183	15 071	62 491
SD 'coverage'	28.1	16.7	17.8	27.7	6.3	25.9	29.7
Mean 'coverage'	67.3	52.1	81.5	35.9	83.1	74.3	64.0

Notes: Standard errors in parentheses. All models control for age, gender, marital status, education, logged GDP p.c., linear year trend.
*$P < 0.10$, **$P < 0.05$, ***$P < 0.01$.

Table 3 By Ghent system—probability of reporting poor health by labour force status, EVS 1981–2019

	(1) All countries	(2) Ghent (five countries)	(3) Not Ghent
Adjusted coverage	0.0000	0.0009**	0.0000
	(0.000)	(0.000)	(0.000)
Labour status ref: Employed	ref.	ref.	ref.
Unemployed	0.0951***	0.2355**	0.0952***
	(0.008)	(0.099)	(0.008)
Inactive	0.1312***	0.7097***	0.1280***
	(0.006)	(0.063)	(0.006)
Coverage # unemployed	−0.0006***	−0.0021*	−0.0006***
	(0.000)	(0.001)	(0.000)
Coverage # inactive	−0.0007***	−0.0070***	−0.0008***
	(0.000)	(0.001)	(0.000)
Union density	0.0002	0.0006***	0.0002
	(0.000)	(0.000)	(0.000)
Constant	−0.2696	−2.1494***	0.5210
	(0.612)	(0.764)	(0.749)
var (country RE)	0.0005***	0.0000*	0.0006***
	(0.000)	(0.000)	(0.000)
var (country-year RE)	0.0003***	0.0000***	0.0003***
	(0.000)	(0.000)	(0.000)
var (residual)	0.0543***	0.0411***	0.0573***
	(0.000)	(0.000)	(0.000)
Countries	34	5	29
Country-years	77	17	60
Observations	75 674	14 507	61 167

Notes: Standard errors in parentheses. All models control for age, gender, marital status, education, logged GDP p.c., linear year trend.
*$P < 0.10$, **$P < 0.05$, ***$P < 0.01$.

coverage, the unemployed and the inactive are not significantly less likely to report poor health compared to those in Low coverage systems. In contrast, High coverage systems perform significantly better than Medium coverage systems: −2.7 p.p. in the probability of reporting poor health for the unemployed, and −2.5 p.p. for the inactive. Health inequalities between the employed and unemployed are lower by −2.4 p.p. in High coverage compared to Medium coverage systems (marginal effects, Appendix Table A11).

This finding is consistent with the insider–outsider hypothesis, which predicts stronger dualization of the labour market when unions represent only some workers but not others. However, the insider–outsider hypothesis is silent on whether we should expect inequalities between insiders and outsiders to be higher or lower in systems with Low vs. Medium levels of coverage. Our findings show that there are no significant differences in health inequalities between Low and Medium coverage systems.
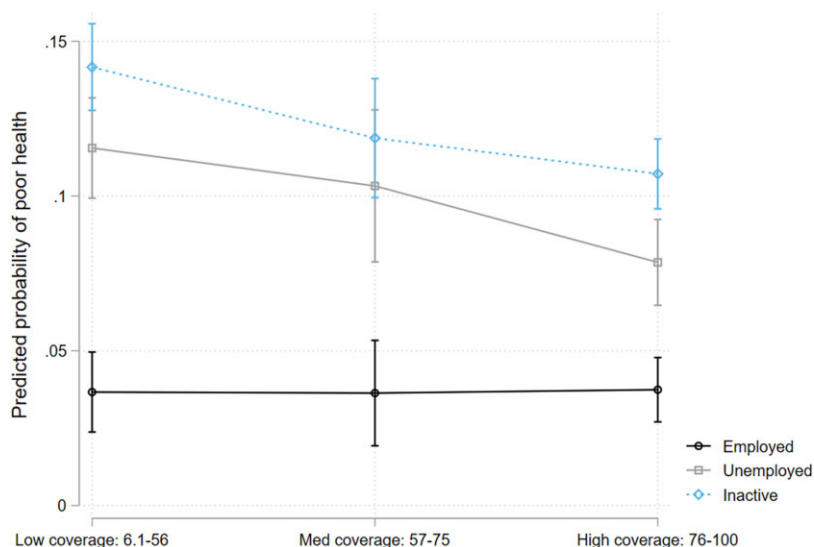
Figure 3 Predicted probability of poor health by labour force status and categorical collective bargaining coverage, EVS 1981–2018.

Notes: 95% confidence intervals; model controls for logged GDP per capita; a linear year trend; respondents' age, gender, education and marital status; country-year union density; % left seats in parliament, country-year health expenditure, disability expenditure, total social expenditure and unemployment rate.

4.5 Effects on employed outsiders

In this paper, we have primarily focused on defining insiders as employed persons, and outsiders as the unemployed. Here we extend this analysis to examine whether higher levels of bargaining coverage have a stronger positive effect on outsiders among the employed. While our data have no variables measuring whether workers are on fixed versus permanent contracts (or their employment history), we can explore health inequalities among the employed according to part-time status, occupation category, unionized status and level of decision-making power in people's jobs. We find evidence that higher levels of coverage disproportionately benefit unskilled blue-collar workers but not skilled blue-collar workers or white-collar workers; health inequalities between unskilled blue-collar and white-collar workers fall as coverage increases (Top-right graph, Figure 4) (marginal effects, Appendix Table A12). Higher levels of coverage also reduce health inequalities among those with less decision-making power in their jobs compared to those with more power (Bottom right graph, Figure 4) (marginal effects, Appendix Table A12). In contrast, there is no significant change in health inequalities between those working part-time vs. full-time, or those who are unionized vs. not unionized, as coverage increases (marginal effects, Appendix Table A12).

5. Discussion

Existing studies mostly focus on the health effects of individual-level unionization rather than collective bargaining, finding mixed results (Reynolds and Brady, 2012; Eisenberg-
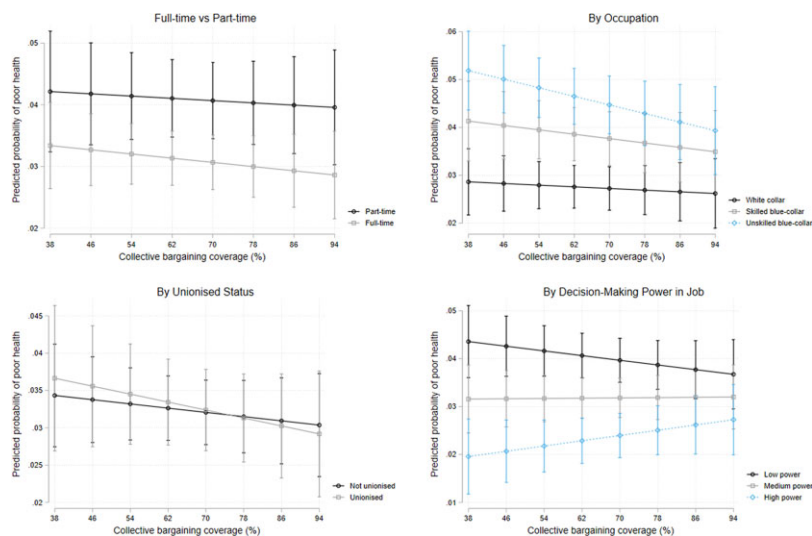
Figure 4 Health inequalities between employed insiders and outsiders by collective bargaining coverage, EVS 1981–2018.

Notes: 95% confidence intervals; model controls for logged GDP per capita; a linear year trend; respondents' age, gender, education and marital status; country-year union density; % left seats in parliament, country-year health expenditure, disability expenditure, total social expenditure and unemployment rate.

Guyot *et al.*, 2020; Wels, 2020). Only one study has previously investigated the relationship between collective bargaining (as measured by union density and centralization) and individual health (measured by depressive feelings), using comparisons across European countries and over time (Reynolds and Buffel, 2020). While they find that union density is associated with fewer depressive feelings, they include both employed and unemployed persons in their sample (Reynolds and Buffel, 2020, p. 345), without including an interaction term between union density and labour force status. Including such an interaction term in our study reveals that comprehensive collective bargaining coverage is primarily beneficial for the unemployed and the inactive, thereby reducing health inequalities between workers and nonworkers. Furthermore, we find a strong non-linearity: only in systems where over threequarters of the workforce is covered by collective bargaining are health inequalities between workers and non-workers reduced. Our findings are robust to the inclusion of many different control variables, including left party power, social spending, unemployment and inactivity rates, other measures of collective bargaining institutions, and health system measures. Our findings cannot be explained by the correlation between collective bargaining systems and welfare regimes, and the results are robust to excluding countries in the Scandinavian regime or the Ghent system. Finally, we show that higher levels of coverage are also associated with lower health inequalities between 'insiders' and 'outsiders' among those who are employed, particularly inequalities between blue-collar unskilled workers and white-collar workers, and inequalities among workers with low vs. high decision-making power in their jobs.

The non-linear analysis we present in section 4.3 shows that our findings are more consistent with insider–outsider theory than with power-resources theory: health inequalities are high when unions represent only part of the workforce, but they are lower when unions represent most or all workers. While the unequal risk of unemployment (Biegert, 2019) and transitions in and out of unemployment (Wulfgramm and Fervers, 2015) have previously been explored as outcomes in the dualization literature, the welfare of the unemployed in dualized vs. non-dualized systems, as well as the relative welfare of the unemployed compared to the employed, has not previously been examined. The health outcome used in this study fills this important gap in the literature.

Our study would be improved by data that covers a wider range of health outcomes: while there are significant advantages to self-reported health (broad measure, more predictive of mortality than many objective measures, not dependent on healthcare access), the question of comparability across countries is potentially problematic. However, this paper's main findings are based on inequalities between population groups within countries, for which the cultural interpretation of the scale is not an issue. Further, we convert self-reported health's 5-point scale to a 2-point scale, to further reduce comparability issues. The main analyses make use of 66 country-years and 33 countries—some countries have only 1 year of observation while others have four (Appendix Table A1). While this reduces the amount of variation within countries we can draw on, a key advantage of this dataset lies in the fact that it spans 1981–2018—this long timeframe is extremely important when studying slow-changing collective bargaining institutions.

Why might high levels of coverage be associated with lower health inequalities between the employed and the unemployed? Collective bargaining coverage affects the kinds of policies that unions choose to support, which affects the ways in which unemployment and insecure work are distributed and how they impact health.

Starting from the end of this causal chain, we propose three potential overlapping explanations: differences in the experience of being unemployed, differences in the experience of being employed for outsiders, and inequality in the distribution of unemployment experiences. Firstly, we know that the experience of unemployment negatively affects people's health (Bambra and Eikemo, 2009; Norström *et al.*, 2014; Kim and Von Dem Knesebeck, 2015)—but the extent to which this is true likely varies across systems. Some systems may have higher unemployment benefits—reducing deprivation or financial stress, or better ALMPs—helping people to get into work through training and without punitive conditionalities, thereby reducing the stress of unemployment (Stuckler *et al.*, 2009; Cylus *et al.*, 2015; O'Campo *et al.*, 2015; Niedzwiedz *et al.*, 2016).

Secondly, we hypothesize that people who are currently unemployed are likely to have been previously employed on a fixed term or insecure contract. Insecure working conditions can be scarring and can negatively affect health over the long term (Ferrie *et al.*, 2002, 2008; Kim and Von Dem Knesebeck, 2015; Koranyi *et al.*, 2018). However, this experience may be relatively less scarring in non-dualized systems, since regulatory protections for temporary workers such as equal treatment clauses with permanent workers protect against erosions in job security, benefits, and wages, all of which are important social determinants of health (Ferrie *et al.*, 2002; Leigh, 2018).

The third potential explanation is the extent to which unemployment experiences are equitably shared within the population. As mentioned above, unemployment negatively affects health in the present term, but also has a scarring effect (Roelfs *et al.*, 2011; Daly and Delaney, 2013;

Huijts *et al.*, 2015). Therefore health inequalities between the currently employed and currently unemployed populations will be reduced in systems where both insiders and outsiders experience some short-term unemployment (i.e. where unemployment is equitably distributed), and will be aggravated when the same group of people goes through a repeated cycle of fixed-term employment and unemployment (or long-term unemployment). The inequitable distribution of unemployment is arguably a key feature of dualized systems. Unemployment is more equitably distributed in non-dualized systems characterized by 'flexicurity' (labour market flexibility paired with generous unemployment insurance), stronger regulation around the hiring of temporary workers, and/or more equal regulatory treatment of temporary and permanent workers (Wulfgramm and Fervers, 2015). These potential mechanisms could be usefully investigated using a cross-country comparative dataset over a large number of years, that includes health questions as well as retrospective questions on labour market experiences at the individual level. It would also be particularly useful to know whether individuals are employed on (or have experienced) a temporary or permanent contract, as well as the reason for unemployment.

These explanations rely on the fact that countries with high levels of bargaining coverage implement policies that may alter the experience of being unemployed, such as unemployment benefits, supportive ALMPs, and the equal regulatory treatment of temporary and permanent workers. These policies matter because they benefit 'outsiders' more than they benefit 'insiders'. Insiders are more likely to be in favour of regulation for permanent workers, which protects their job security, in some cases at the expense of outsiders (Martin and Thelen, 2007). In contrast, the dualization literature suggests that outsiders are more likely to benefit from, and politically support, high spending on unemployment benefits and ALMPs (Rueda *et al.*, 2006). When unions represent close to 100% of the workforce, they logically represent both insiders and outsiders. In systems with high levels of coverage, unions will therefore be more likely to benefit the health of outsiders relative to systems with medium or low coverage, by being more likely to politically advocate for higher unemployment benefits, more ALMP spending, higher regulation of temporary workers, and equal treatment of regular and temporary workers. In contrast, we would expect unions that mainly represent insiders (i.e. systems with low or medium levels of coverage) to promote the stronger regulation of permanent work. Existing research supports the link between collective bargaining institutions and such policies (Gordon, 2015; Benassi and Vlandas, 2016); a structural equation model could go further to estimate explicit links between institutions, policies, labour market churn and experiences, and health inequalities.

A study on collective bargaining institutions and health inequalities is particularly timely right now. Containment measures required by the COVID-19 crisis have caused widespread and unequal unemployment, hitting precarious workers and those who cannot work from home the hardest (Adams-Prassl *et al.*, 2020; Shrma and Smith, 2021). Protecting the health of the unemployed through such a crisis should be a political priority. In parallel, the risks to which on-site essential workers have been exposed during the pandemic, combined with the limited choice they had in deciding whether to take on such risks, have sparked widespread calls to 'democratise work' by giving workers more decision-power in the operation of their firms (Fraser *et al.*, 2020). These latest trends are emerging after 40 years of progressively weakened collective bargaining institutions, under the pressures of liberalization (Welz *et al.*, 2020). Some countries have decentralized collective bargaining in an organized way (Denmark), others have dismantled collective bargaining entirely (UK), while other collective bargaining systems have become less relevant due to the shrinking economic share of

industry relative to services (Germany) or the privatization of state industries (France) (Palier and Thelen, 2010; Thelen, 2014).

In contrast to this trend, this research demonstrates that strengthening collective bargaining institutions could contribute to creating more equal labour markets, a crucial social determinant of health. While our analysis was not causal, it is possible that broader coverage of collective bargaining agreements could reduce population-level health inequalities and improve population health overall. Collective bargaining coverage can be fostered by government regulation, through imposing a duty to bargain on employers, allowing solidarity strikes, and/or allowing for the automatic extension of collective agreements to non-unionized workers in the same sector or occupation (Visser, 2013).

Lynch (2020) has recently demonstrated the importance of intervening on more upstream, institutional drivers of the social determinants of health in order to resolve health inequalities. There is already ample evidence to demonstrate the health benefits of unemployment insurance, ALMPs (Vuori and Silvonen, 2005; Cylus *et al.*, 2015; Ferrarini *et al.*, 2014), and dismissal regulation (Barlow *et al.*, 2019). This study points to a key institutional avenue for catalysing these policies—and their health benefits—in a sustainable way: strong *and* encompassing collective bargaining institutions.

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Appendix

Table A1 Analytical sample, EVS 1981–2018

Country/region	1981–1984	1990–1993	2008–2010	2017–2018	Total
Austria	0	0	955	1120	2075
Belgium	0	1818	1052	0	2870
Bulgaria	0	0	943	0	943
Canada	987	1333	0	0	2320
Croatia	0	0	861	0	861
Cyprus	0	0	638	0	638
Czech Republic	0	0	952	833	1785
Denmark	0	725	1014	2020	3759
Estonia	0	0	956	745	1701
Finland	0	467	793	568	1828
France	0	730	1042	1156	2928
Germany	999	2585	1429	0	5013
Great Britain	0	1052	950	0	2002
Greece	0	0	827	0	827
Hungary	0	0	1103	901	2004
Iceland	0	0	547	0	547
Ireland	888	734	659	0	2281
Italy	914	1435	771	0	3120
Latvia	0	0	972	0	972
Lithuania	0	0	931	858	1789
Luxembourg	0	0	1065	0	1065
Malta	0	0	996	0	996
The Netherlands	836	792	935	1343	3906
Norway	0	845	723	0	1568
Poland	0	0	962	834	1796
Portugal	0	799	912	0	1711
Romania	0	0	977	0	977
Slovakia	0	0	967	0	967
Slovenia	0	0	868	0	868
Spain	1438	1792	934	788	4952
Sweden	675	709	672	658	2714
Switzerland	0	0	899	2004	2903
Turkey	0	0	1615	0	1615
Total	6737	15 816	29 920	13 828	66 301

Note: Thirty-three countries, 66 country-years, 66 301 observations.

Table A2 Equality test of within effect and between effect

Variable	Coefficient (Mean—Deviation)	Standard error	*P*-value
Coverage	−0.0000383	0.0005903	0.948
Union density	0.0005584	0.0007305	0.445

Table A3 Model comparison: random effects vs. fixed effects

	(1) Country RE and country-year RE	(2) Country RE and year FE	(3) Country FE and year FE
Adjusted coverage	−0.0001	−0.0002	−0.0005[*]
	(0.000)	(0.000)	(0.000)
Labour status ref: Employed	ref.	ref.	ref.
Unemployed	0.0975[***]	0.0977[***]	0.0981[***]
	(0.008)	(0.008)	(0.008)
Inactive	0.1260[***]	0.1265[***]	0.1274[***]
	(0.006)	(0.006)	(0.006)
Unemployed # coverage	−0.0006[***]	−0.0006[***]	−0.0006[***]
	(0.000)	(0.000)	(0.000)
Inactive # coverage	−0.0007[***]	−0.0007[***]	−0.0007[***]
	(0.000)	(0.000)	(0.000)
Union density	−0.0002	0.0001	0.0007[*]
	(0.000)	(0.000)	(0.000)
Constant	−0.3072	0.4289[***]	0.3016
	(0.887)	(0.109)	(0.265)
var (country RE)	0.0002[***]	0.0006[***]	
	(0.000)	(0.000)	
var (country-year RE)	0.0002[***]		
	(0.000)		
var (residual)	0.0537[***]	0.0537[***]	
	(0.000)	(0.000)	
Observations	66 301	66 301	66 301

Notes: Standard errors in parentheses. All models control for age, gender, education, marital status, % left-seats, social spending variables, unemployment rate.
[*]$P < 0.10$, [**]$P < 0.05$, [***]$P < 0.01$.
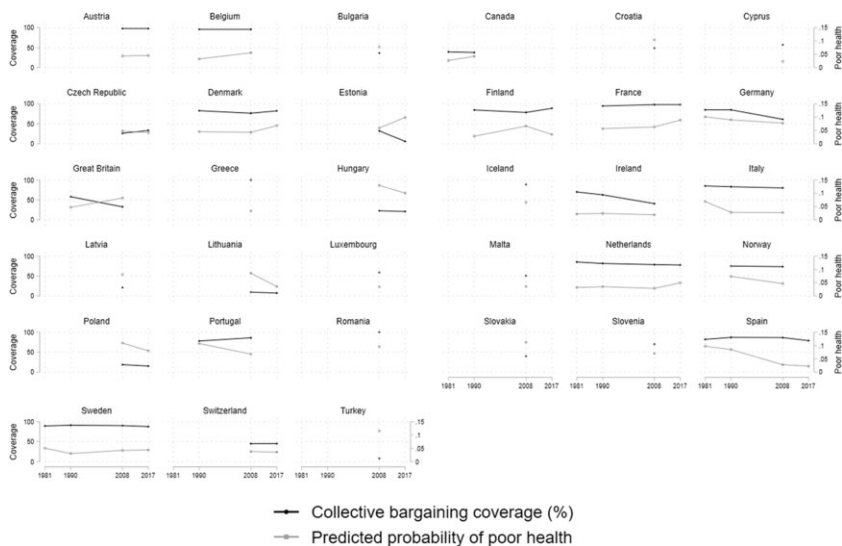
Figure A1 Levels of coverage and mean levels of poor health 1981–2018, sample countries.

Table A4 Descriptive table of key variables (main analytical sample): 1981–2018

Variables	Count	Mean	SD	Min	Max
Individual vars					
Self-reported health = poor or very poor	66 301	0.061	0.24	0	1
Age	66 301	41.8	12.9	18	64
Sex	66 301	1.55	0.50	1	2
Marital status	66 301	2.63	2.15	1	6
Age completed education (intervals)	66 301	6.93	2.79	0	10
Labour force status	66 301	1.53	0.84	1	3
Unionized individual	65 117	0.18	0.39	0	1
Full-time employed	46 211	0.87	0.34	0	1
Occupation	56 930	1.58	0.78	1	3
Decision-making in job	34 478	6.49	2.51	1	10
Country controls					
Log GDP per capita	66 301	10.5	0.36	9.69	11.4
Year survey	66 301	2003.0	12.0	1981	2018
% Left-seats in parliament	66 301	40.9	14.1	3.48	67.2
Total social expenditure (% GDP)	66 301	21.7	5.16	11.8	31.4
Health expenditure (% GDP)	66 301	5.44	1.22	2.50	8.20
Disability expenditure (% GDP)	66 301	2.31	1.22	0.40	5.90
Unemployment and ALMP expenditure (% GDP)	65 413	1.47	1.03	0.20	4.30
Unemployment rate 15–64	66 301	7.30	3.29	1.84	17.3
Inactivity rate 15–64	56 210	29.1	7.87	15.4	49.2
% Health coverage	29 425	20.4	15.7	0	59.2
% Private health exp	35 514	18.0	21.7	0.24	74.1
% population covered by health insurance	56 192	97.0	6.70	61.4	100

Table A5 Marginal effects of coverage on poor health, by labour force status

Variables	Estimate	Standard error	P-value	95% CI lower bound	95% CI upper bound
Probability of poor health					
Low coverage (38%), employed	0.039	0.005	0.000	0.029	0.050
Low coverage (38%), unemployed	0.113	0.007	0.000	0.100	0.126
Low coverage (38%), inactive	0.140	0.006	0.000	0.129	0.152
High coverage (94%), employed	0.035	0.006	0.000	0.024	0.046
High coverage (94%), unemployed	0.074	0.007	0.000	0.060	0.089
High coverage (94%), inactive	0.099	0.006	0.000	0.087	0.111
Effect of +2SD coverage (38–94%) on poor health					
Employed	−0.004	0.009	0.620	−0.021	0.013
Unemployed	−0.039	0.010	0.000	−0.059	−0.018
Inactive	−0.041	0.009	0.000	−0.059	−0.023
Unemployed vs. employed	−0.035	0.007	0.000	−0.048	−0.021
Inactive vs. employed	−0.037	0.004	0.000	−0.045	−0.028
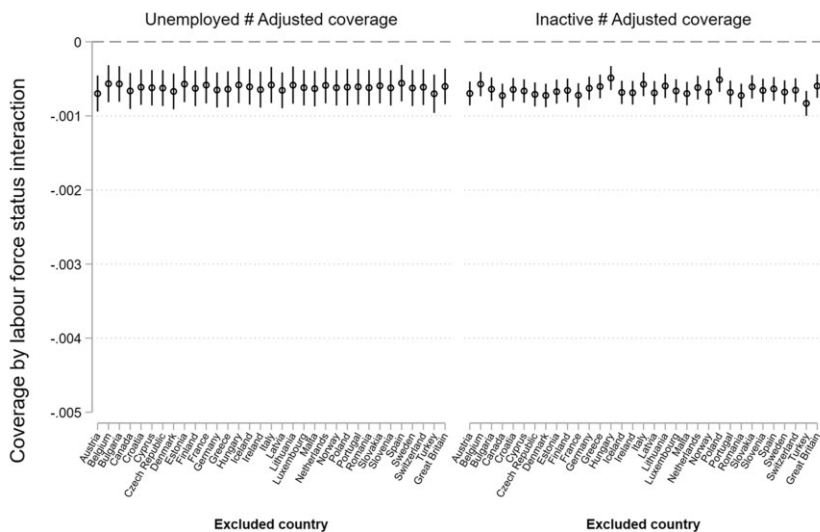
Figure A2 Leave-one-out analysis, Table 2 Model 3, EVS 1981–2018.

Table A6 Sensitivity analyses—probability of reporting poor health by labour force status, EVS 1981–2019

Variables	(1) Baseline	(2) + Inactivity rate	(3) + Unemployment spending	(4) + Clustered SEs
Adjusted coverage	−0.0001	−0.0001	−0.0001	−0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
Labour status ref: Employed	ref.	ref.	ref.	ref.
Unemployed	0.0975***	0.1024***	0.1023***	0.1023***
	(0.008)	(0.009)	(0.009)	(0.012)
Inactive	0.1260***	0.1319***	0.1318***	0.1318***
	(0.006)	(0.006)	(0.006)	(0.025)
Coverage # unemployed	−0.0006***	−0.0007***	−0.0007***	−0.0007***
	(0.000)	(0.000)	(0.000)	(0.000)
Coverage # inactive	−0.0007***	−0.0007***	−0.0007***	−0.0007*
	(0.000)	(0.000)	(0.000)	(0.000)
Union density	−0.0002	−0.0002	−0.0002	−0.0002
	(0.000)	(0.000)	(0.000)	(0.000)
Unemployment rate	−0.0005	0.0000	0.0006	0.0006
	(0.001)	(0.001)	(0.001)	(0.001)
Inactivity rate		−0.0010*	−0.0011*	−0.0011
		(0.001)	(0.001)	(0.001)
Unemployment and ALMP expenditure (% GDP)			−0.0048	−0.0048
			(0.005)	(0.005)
Constant	−0.3072	−0.2489	0.2087	0.2087
	(0.887)	(1.292)	(1.360)	(1.108)
var (country RE)	0.0002***	0.0001***	0.0001***	0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)
var (country-year RE)	0.0002***	0.0002***	0.0002***	0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)
var (residual)	0.0537***	0.0545***	0.0545***	0.0545***
	(0.000)	(0.000)	(0.000)	(0.004)
Countries	33	32	32	32
Country-years	66	55	55	55
Observations	66 301	56 210	56 210	56 210

Notes: Standard errors in parentheses. All models control for age, gender, education, marital status, % left-seats, social spending variables, unemployment rate.
*$P < 0.10$, **$P < 0.05$, ***$P < 0.01$.

Table A7 Health sector controls—probability of reporting poor health by labour force status, EVS 1981–2019

Variables	(1) Baseline	(2) Private health exp	(3) Private hosp beds	(4) Health coverage
Adjusted coverage	−0.0001	−0.0005**	−0.0004***	−0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
Labour status ref: Employed	ref.	ref.	ref.	ref.
Unemployed	0.0971***	0.1086***	0.0971***	0.0946***
	(0.008)	(0.011)	(0.010)	(0.009)
Inactive	0.1271***	0.1489***	0.1197***	0.1368***
	(0.006)	(0.008)	(0.007)	(0.006)
Coverage # unemployed	−0.0006***	−0.0009***	−0.0005***	−0.0006***
	(0.000)	(0.000)	(0.000)	(0.000)
Coverage # inactive	−0.0007***	−0.0008***	−0.0004***	−0.0008***
	(0.000)	(0.000)	(0.000)	(0.000)
Union density	−0.0002	−0.0002	−0.0002	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)
% Private health exp		0.0004		
		(0.000)		
% Health coverage			−0.0005	
			(0.000)	
% Population covered by health insurance				0.0007
				(0.001)
Constant	−0.7529	−0.0982	21.1677	−1.1638
	(0.853)	(0.864)	(14.467)	(0.866)
var (country RE)	0.0002***	0.0005***	0.0001***	0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)
var (country-year RE)	0.0002***	0.0000***	0.0000***	0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)
var (residual)	0.0532***	0.0535***	0.0614***	0.0522***
	(0.000)	(0.000)	(0.000)	(0.000)
Countries	33	17	19	26
Country-years	71	37	30	61
Observations	70 364	37 265	30 417	60 255

Notes: Standard errors in parentheses. All models control for age, gender, education, marital status, % left-seats, total social expenditure, health spending, disability spending, unemployment rate.
*$P < 0.10$, **$P < 0.05$, ***$P < 0.01$.

Table A8 Sensitivity analyses—probability of reporting poor health by labour force status, controlling for other collective bargaining institutions, EVS 1981–2019

Variables	(1) Coverage	(2) Coordination strength	(3) Coordination level	(4) Coordination type
Adjusted coverage	−0.0002	−0.0005[**]	−0.0004[**]	−0.0005[**]
	(0.000)	(0.000)	(0.000)	(0.000)
Labour status ref: Employed	ref.	ref.	ref.	ref.
Unemployed	0.0974[***]	0.0733[***]	0.0732[***]	0.0665[***]
	(0.008)	(0.007)	(0.007)	(0.006)
Inactive	0.1260[***]	0.0972[***]	0.1010[***]	0.0913[***]
	(0.006)	(0.005)	(0.005)	(0.004)
Coverage # unemployed	−0.0006[***]			
	(0.000)			
Coverage # inactive	−0.0007[***]			
	(0.000)			
Coord ref: Low coord	ref.	ref.	ref.	ref.
Some	0.0104	0.0165	0.0112	0.0109
	(0.013)	(0.013)	(0.013)	(0.013)
High	0.0207	0.0273[*]	0.0224	0.0216
	(0.016)	(0.016)	(0.016)	(0.015)
Coord: Medium # unemployed		−0.0187[**]		
		(0.009)		
Coord: Medium # inactive		−0.0182[***]		
		(0.006)		
Coord: High # unemployed		−0.0214[**]		
		(0.009)		
Coord: High # inactive		−0.0175[***]		
		(0.006)		
Level ref: Company	ref.	ref.	ref.	ref.
Sector	0.0073	0.0080	0.0132	0.0082
	(0.011)	(0.011)	(0.012)	(0.011)
Industry/central	−0.0013	−0.0008	0.0113	−0.0011
	(0.014)	(0.014)	(0.014)	(0.014)
Level: Sector # unemployed			−0.0144[*]	
			(0.008)	
Level: Sector # inactive			−0.0169[***]	
			(0.006)	
Level: Industry/central # unemployed			−0.0356[***]	
			(0.010)	
Level: Industry/central # inactive			−0.0392[***]	
			(0.007)	
Type ref: Fragmented	ref.	ref.	ref.	ref.
Pattern/assoc	−0.0050	−0.0049	−0.0049	−0.0028
	(0.010)	(0.010)	(0.010)	(0.010)
State	−0.0105	−0.0102	−0.0111	0.0008
	(0.014)	(0.014)	(0.014)	(0.014)

continued

Table A8 *Continued*

Variables	(1) Coverage	(2) Coordination strength	(3) Coordination level	(4) Coordination type
Type: Pattern/assoc # unemployed				−0.0119
				(0.008)
Type: Pattern/assoc # inactive				−0.0061
				(0.005)
Type: State # unemployed				−0.0182
				(0.012)
Type: State # inactive				−0.0371***
				(0.007)
Union density	−0.0002	−0.0001	−0.0001	−0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	−0.5041	−0.5778	−0.6980	−0.6864
	(0.870)	(0.872)	(0.877)	(0.860)
var (country RE)	0.0002***	0.0002***	0.0002***	0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)
var (country-year RE)	0.0002***	0.0002***	0.0002***	0.0001***
		(0.000)	(0.000)	(0.000)
	(0.000)			
var (residual)	0.0537***	0.0537***	0.0537***	0.0537***
	(0.000)	(0.000)	(0.000)	(0.000)
Countries	33	33	33	33
Country-years	66	66	66	66
Observations	66 301	66 301	66 301	66 301

Notes: Standard errors in parentheses. All models additionally control for age, gender, education, marital status, logged GDP per capita, linear year trend, % left-seats, total social expenditure, health spending, disability spending, unemployment rate.
*$P < 0.10$, **$P < 0.05$, ***$P < 0.01$.

Table A9 Classification of welfare regimes

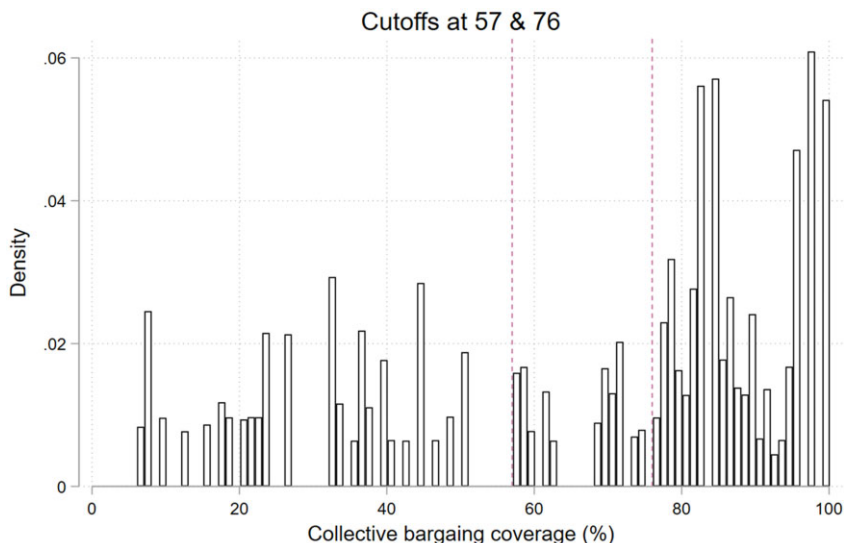| Sample countries	Included in original Bambra and Eikemo (2009)?
Scandinavian	
Finland	Yes
Norway	Yes
Sweden	Yes
Denmark	Yes
Iceland	No
Bismarckian	
Austria	Yes
Belgium	Yes
France	Yes
Germany	Yes
Luxembourg	Yes
The Netherlands	Yes
Switzerland	Yes
Anglosaxon	
Ireland	Yes
Great Britain	Yes
Canada	No
Southern Europe	
Greece	Yes
Italy	Yes
Portugal	Yes
Spain	Yes
Cyprus	No
Malta	No
Turkey	No
Eastern Europe	
Czech Republic	Yes
Hungary	Yes
Poland	Yes
Slovenia	Yes
Slovakia	No
Bulgaria	No
Croatia	No
Latvia	No
Lithuania	No
Estonia	No
Romania	Yes

Figure A3 Histogram of adjusted coverage (country level), 1981–2008 ICTWSS.

Table A10 Sensitivity tests on cut-offs for coverage as a three-level categorical variable, interactions with labour force status

Variables	(1) Preferred model: 57 and 76	(2) Terciles: 58 and 85	(3) Alternative gaps in distribution: 30 and 65
Labour status ref: Employed	ref.	ref.	ref.
Unemployed	0.0789***	0.0781***	0.0905***
	(0.006)	(0.006)	(0.008)
Inactive	0.1050***	0.1022***	0.1331***
	(0.004)	(0.004)	(0.006)
Union density	−0.0003	−0.0003	−0.0002
	(0.000)	(0.000)	(0.000)
Low coverage: 6.1–56	ref.		
Med coverage: 57–75	−0.0003		
	(0.010)		
High coverage: 76–100	0.0008		
	(0.009)		
Med coverage: 57–75 # unemployed	−0.0119		
	(0.012)		
Med coverage: 57–75 # inactive	−0.0226***		
	(0.007)		
High coverage: 76–100 # unemployed	−0.0377***		
	(0.008)		
High coverage: 76–100 # inactive	−0.0353***		
	(0.005)		

Table A10 *Continued*

Variables	(1) Preferred model: 57 and 76	(2) Terciles: 58 and 85	(3) Alternative gaps in distribution: 30 and 65
Low coverage: 6.1–57		ref.	
Med coverage: 58–84		0.0023	
		(0.009)	
High coverage: 85–100		0.0037	
		(0.010)	
Med coverage: 58–84 # unemployed		−0.0283***	
		(0.009)	
Med coverage: 58–84 # inactive		−0.0215***	
		(0.006)	
High coverage: 85–100 # unemployed		−0.0351***	
		(0.009)	
High coverage: 85–100 # inactive		−0.0358***	
		(0.005)	
Low coverage: 6.1–29			ref.
Med coverage: 30–64			−0.0083
			(0.010)
High coverage: 65–100			−0.0054
			(0.012)
Med coverage: 30–64 # unemployed			−0.0215**
			(0.011)
Med coverage: 30–64 # inactive			−0.0543***
			(0.007)
High coverage: 65–100 # unemployed			−0.0468***
			(0.010)
High coverage: 65–100 # inactive			−0.0604***
			(0.007)
Constant	−0.3601	−0.3583	−0.3703
	(0.933)	(0.927)	(0.874)
var (country RE)	0.0002***	0.0002***	0.0002***
	(0.000)	(0.000)	(0.000)
var (country-year RE)	0.0002***	0.0002***	0.0002***
	(0.000)	(0.000)	(0.000)
var (residual)	0.0537***	0.0537***	0.0537***
	(0.000)	(0.000)	(0.000)
Countries	33	33	33
Country-years	66	66	66
Observations	66 301	66 301	66 301

Notes: Standard errors in parentheses. Models control for age, gender, education, marital status, % left-seats, total social expenditure, health spending, disability spending, unemployment rate.
*$P < 0.10$, **$P < 0.05$, ***$P < 0.01$.

Table A11 Marginal effects of categorical coverage on probability of reporting poor health, by labour force status, EVS 1981–2018

Variables	Estimate	Standard error	P-value	95% CI lower bound	95% CI upper bound
Unemployed vs. employed inequality					
Low vs. medium coverage	−0.01184	0.01156	0.30562	−0.01081	0.03449
Low vs. high coverage	−0.03658	0.00747	0.00000	0.02193	0.05124
Medium vs. high coverage	−0.02475	0.01114	0.02637	0.00291	0.04658
Inactive vs. employed inequality					
Low vs. medium coverage	−0.02256	0.00738	0.00224	0.00809	0.03702
Low vs. high coverage	−0.03702	0.00484	0.00000	0.02754	0.0465
Medium vs. high coverage	−0.01446	0.00689	0.03591	0.00095	0.02798

Table A12 Effect of +2SD coverage (38–94%) on poor health for employed persons

Variables	Estimate	Standard error	P-value	95% CI lower bound	95% CI upper bound
Full-time vs. part-time					
Part-time	−0.003	0.007	0.731	−0.017	0.012
Full-time	−0.005	0.006	0.400	−0.016	0.006
Inequalities: Full-time vs. part-time	0.002	0.006	0.690	−0.013	0.009
By occupation					
White-collar	−0.002	0.006	0.667	−0.013	0.009
Skilled blue-collar	−0.006	0.007	0.328	−0.019	0.006
Unskilled blue-collar	−0.013	0.007	0.057	−0.025	0.000
White-collar vs. skilled-blue	−0.004	0.005	0.382	−0.013	0.005
Inequalities: White-collar vs. unskilled-blue	−0.010	0.005	0.029	−0.019	−0.001
Inequalities: Skilled-blue vs. unskilled-blue	−0.006	0.006	0.277	−0.017	0.005
Unionized vs. not unionized					
Unionized	−0.004	0.006	0.473	−0.015	0.007
Not unionized	−0.007	0.007	0.313	−0.022	0.007
Inequalities: Unionized vs. not unionized	−0.003	0.005	0.519	−0.014	0.007
By decision-making power in job					
High power	0.008	0.006	0.211	−0.004	0.020
Medium power	0.000	0.006	0.939	−0.011	0.011
Low power	−0.007	0.006	0.250	−0.018	0.005
Inequalities: High vs. low power	−0.015	0.004	0.001	0.006	0.023