

Findeisen, Sebastian; Dauth, Wolfgang; Schlenker, Oliver

Article

Organized labor versus robots? Co-determination in times of automation

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Institutions Across the World

Organized Labor Versus Robots?

Co-Determination in Times of Automation

Key Messages

- Works councils reduce job separations during automation events, especially when firms can easily replace incumbent workers
- Among workers who are most prone to automation, works councils prevent wage and earnings losses when firms adopt robots
- Works councils prevent earnings inequality through automation to rise by limiting earnings gains for non-production workers
- Plants with works councils accompany robot adoption with more training and experience higher productivity levels thereafter
- These results suggest that labor market institutions can benefit both incumbent workers and firms



Sebastian Findeisen is Professor of Economic Policy at the University of Konstanz and Principal Investigator at the Cluster of Excellence "The Politics of Inequality."

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Wolfgang Dauth is Head of the Research Department "Regional Labour Markets" at IAB Nuremberg and Professor of Regional Labor Economics at the University of Bamberg.

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Oliver Schlenker is Deputy Director of the Ludwig Erhard ifo Center for Social Market Economy and Institutional Economics and Senior Researcher at IAB Nuremberg.

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Technological progress is widely regarded as one of the main drivers of economic growth. Yet, economists have repeatedly emphasized that growth driven by innovation does not automatically benefit everyone equally (Ricardo 1821; Keynes 1930; Gordon 2016; Acemoğlu and Johnson 2023). Evidence from labor economics shows that digitalization and automation affect workers differently, depending on their individual skills and workplace characteristics (Autor, Levy and Murnane 2003; Acemoğlu and Autor 2011). For example, Acemoğlu and Restrepo (2022) demonstrate that rapid automation in the United States accounts for the largest share of wage declines among workers whose jobs mainly involve routine tasks. With today's rapid advances in AI and robotics, the question once again arises: how can society ensure that the economic gains from technological change are shared more evenly between firms and their employees?

Labor market institutions can play a crucial role in shaping who gains and who loses from technological change, as they influence the balance of bargaining power between workers and firms (Stansbury and Summers 2020). Dauth, Findeisen, Suedekum and Woessner (2021) provide a first piece of evidence of their importance by showing that, in Germany, the negative employment effects of robotization are concentrated in regions with low levels of unionization. Building on this insight, we investigate whether shop-floor worker representation, in the form of works councils, can shield incumbent workers from the negative consequences of automation.

Works councils are a cornerstone of industrial relations in Germany, covering around 40 percent of the workforce (Ellguth and Kohaut 2015). Their main role is to represent employees' interests by institutionalizing communication between workers and management, and by exercising legally enshrined rights to information, consultation, and co-determination (Freeman and Lazear 1995; Mohrenweiser 2022; Jäger, Noy and Schoefer 2022). Because they explicitly focus on safeguarding jobs and working conditions, they differ from unions, which are more oriented towards improvements such as negotiating wage increases. This emphasis on job protection makes works councils particularly relevant when firms introduce new automating technologies.

Matching Matters – Combining Plant-Level Information with Workers' Employment Biographies

For our analysis, we draw on an extensive plant-level data set – the Establishment Panel of the Institute for Employment Research (IAB), a representative annual survey covering around 15,000 establishments in Germany

(Bellmann et al. 2021). This survey contains rich data on workforce composition, training activities, hiring, and the amount, type, and purpose of investments. Additionally, it contains information on the presence of works councils and robot usage between 2015 and 2018 – from which we are able to infer when plants introduce robots for the first time.

We link this survey data with the administrative records of each plant's entire workforce. This data contains employment characteristics, including employment status, wage, occupation, region, and industry, as well as background characteristics such as age, education, and gender. Importantly, this combined dataset enables us to follow all workers who were exposed to robot adoption over time, even if they later left the plant, allowing us to capture the longer-term effects of automation on their careers.

Our empirical strategy aims to quantify how automation events affect incumbent workers and how this effect is different in plants with and without works council and asks whether works councils can cushion these effects. The decision to install robots and the presence of a works council is highly non-random. Firms that automate – and those that have a works council – tend to be quite different from others, especially in terms of size (Mohrenweiser 2022). To ensure we are measuring the causal effect of worker representation during automation and not just picking up differences between large and small plants or other confounding factors, we use propensity score matching to construct a control group of comparable, never-treated workers in similar plants. For example, we might compare a 45-year-old machine operator in a medium-sized manufacturing plant that introduces robots with a 45-year-old machine operator in a similarly sized plant in the same industry that does not automate. We then apply an event-study approach, following the approach of Schmieder, von Wachter and Heining (2023) and Illing, Schmieder and Trenkle (2024), to trace how workers' employment trajectories evolve before and after automation. Finally, we focus only on incumbent workers – those already employed at a plant before the robots were introduced – to rule out the possibility that workers actively chose to move to firms with stronger job protection in anticipation of automation.

Works Councils Decrease Job Separations When Plants Adopt Robots

In our main analysis, we concentrate on routine production workers – such as machine operators and assemblers (Blossfeld occupation 2, see Blossfeld, 1987) – whose jobs involve a high share of tasks that can be potentially automated (Acemoğlu and Restrepo 2018) and are thus

most likely to be directly affected by robot adoption. While plants that introduce robots often expand overall employment (Koch, Manuylov and Smolka 2021; Hirvonen, Stenhammar and Tuhkuri 2023), previous research shows that workers in occupations with many automatable tasks frequently experience job losses (Bessen, Goos, Salomons and van den Berge 2023). Our approach therefore sheds light on how automation affects precisely the group of workers most exposed to technological displacement – and how labor market institutions potentially mitigate the effects.

Panel (A) in Figure 1 shows that the presence of a works council increases the probability that workers remain in their initial plant after robot adoption by about 4 percent. This overall effect hides important differences depending on local labor market conditions. When labor market tightness¹ is low – meaning firms can easily replace workers – works councils significantly increase worker retention.

In contrast, when labor markets are tight, the incentives of the workforce and the firm are more closely aligned as firms have strong incentives to retain their workforce. Thus, the additional effect of a works council becomes smaller.

In aggregate, we do not see that total employment levels evolve differently between robot-adopting plants with and without works councils. However, the higher retention rates in works council plants go hand in hand with lower hiring rates: on average roughly 50 percent fewer hires, or about 7.2 fewer workers, in the year before and during automation. This pattern suggests that while works councils help protect the plant’s workforce, they may at the same time reduce opportunities for new workers trying to enter these firms.

Works Councils Prevent Automation-Related Wage Cuts

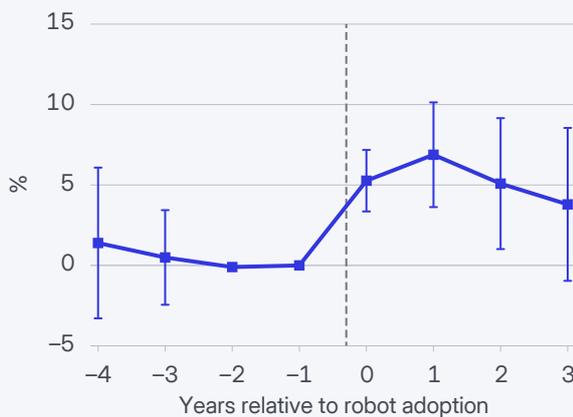
Overall, research finds that firm-level automation has only modest effects on wages (e.g., Acemoğlu, Lelarge and Restrepo 2020; Koch et al., 2021; Dixon, Hong and Wu 2021). The main exception are low-skilled workers, who

¹ Labor market tightness is defined as the ratio of vacancies to job seekers at the occupation-region level, weighted by plant employment shares (Bossler and Popp 2024).

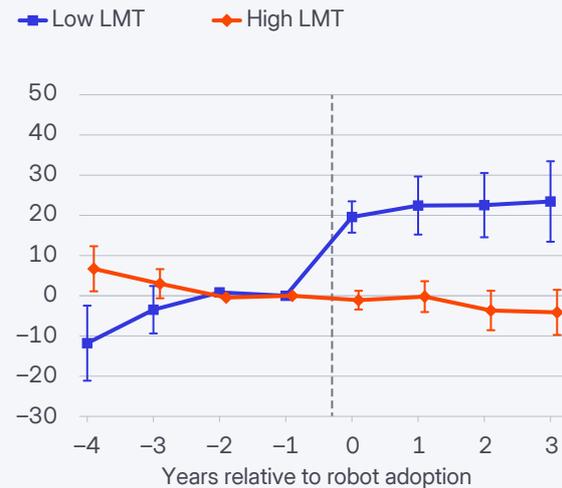
Figure 1

Retention Effect of Works Councils During Robotization

Panel A: Retention probability



Panel B: Retention probability (p33)



Notes: These figures show the effect of the presence of a works council on workers’ probability of remaining employed at the initial plant following robot adoption. All estimates are based on a triple-differences specification with additional controls (plant size and age). In Panel (B), workers are split by their plant-specific labor market tightness (LMT) in the year prior to adoption (cutoff: 33rd percentile). Vertical bars indicate 90 percent confidence intervals based on robust standard errors clustered at the matching-pair level, following Abadie and Spiess (2022). The sample includes individuals aged 25–60 at the year of adoption, employed at least two years prior to adoption, and working in routine production occupations (Blossfeld occupation 2, see Blossfeld, 1987). To ensure comparability, workers in robot adopting plants are matched to similar workers in non-adopting plants based on pre-treatment characteristics (e.g. job experience, gender, age, and occupation) and plant characteristics (e.g. size, productivity, and industry). Source: IAB Establishment Panel and IAB Integrated Employment Biographies.

tend to experience relative wage declines following automation (Barth, Roed, Schöne and Umblijs 2020; Adachi 2021; Acemoğlu, Koster and Ozgen 2023). Although works councils do not have formal wage-bargaining rights, they can still influence pay indirectly – for instance, by monitoring and negotiating how workers are classified into pay grades. In doing so, they may be able to prevent workers from being reclassified into lower pay grades and thus facing wage cuts (Mohrenweiser 2022). In the context of automation, we therefore test whether works councils protect earnings and prevent wage cuts, particularly for low-skilled workers performing routine-intensive tasks.

We find that works councils have a positive effect on the wages and earnings of routine production workers. Panel (A) in Figure 2 shows that three years after robot adoption, wages in plants with a works council are on average about 3 percent higher than in comparable plants without. A similar pattern emerges for earnings: as shown in Panel (B), the earnings gap between incumbent routine production workers in plants with works councils and those in plants without shop-floor representation gradually widens, reaching roughly 10 percent three years after automation.

The positive effect of works councils does not come from unusually large wage or earnings gains in plants with works councils, but rather from a sharp and persistent decline in wages – and thus earnings – in plants without. In other words, works councils appear to shield routine production workers from falling wages through automation. However, at the same time, they limit wage and earnings growth for non-production workers. Because routine production workers on average earn less than non-production workers prior to automation, this means that works councils help prevent within-establishment wage inequality from rising in times of automation – though partly at the expense of workers with non-routine, manual task profiles.

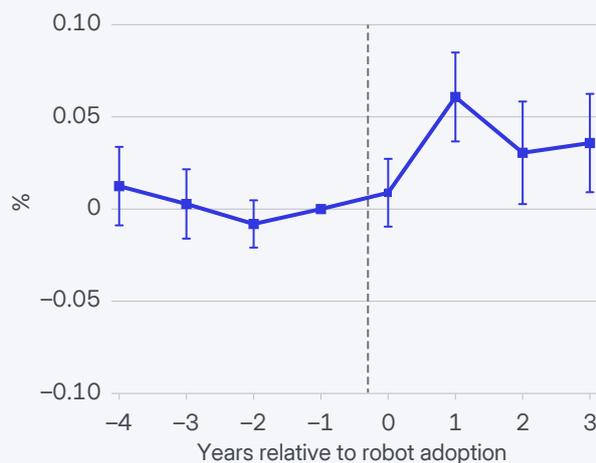
More Training During Robotization = More Productivity Thereafter?

By aggregating workforce preferences and communicating them to the management, works councils can help firms to assess how strongly employees support or oppose proposed organizational changes and adjust their training offers accordingly. Consistent with this, previous studies find that firms with worker representation generally

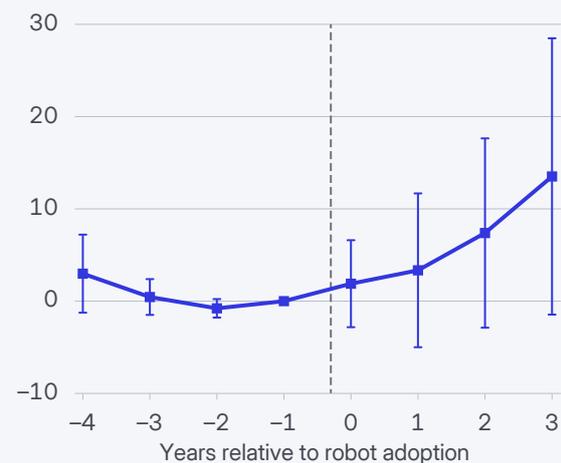
Figure 2

Wage and Earnings Effects of Works Councils During Robotization

Panel A: Log wage



Panel B: Relative earnings



Notes: These figures show the effect of the presence of a works council on workers' wages (Panel A) relative earnings (Panel B) following robot adoption in plants. Wages refer to the mean log gross daily wage and imputed for wages above the contribution ceiling for the pension insurance following Card et al. (2013). Earnings are relativized to the year prior adoption. All estimates are based on a triple-differences specification with additional controls (plant size and age). Vertical bars indicate 90 percent confidence intervals based on robust standard errors clustered at the matching-pair level, following Abadie and Spiess (2022). The sample includes individuals aged 25–60 at the year of adoption, employed at least two years prior to adoption, and working in routine production occupations (Blossfeld occupation 2, see Blossfeld, 1987). To ensure comparability, workers in robot adopting plants are matched to similar workers in non-adopting plants based on pre-treatment characteristics (e.g. job experience, gender, age, and occupation) and plant characteristics (e.g. size, productivity, and industry).

Source: IAB Establishment Panel and IAB Integrated Employment Biographies.

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provide more training (Stegmaier 2012; Mohrenweiser 2022). In our data, we see a sharp increase in the share of workers receiving training during automation events: the gap between plants with and without works councils widens to almost 15 percentage points before returning to previous levels. When we distinguish between low- and high-skilled workers, we find that the relative increase in training is largest for low-skilled workers, i.e. those most directly working with robots. This pattern likely reflects not only firms' greater willingness to supply training but also workers' higher willingness to participate, as increased job security makes investments into firm-specific skills more worthwhile (Freeman and Lazear 1995).

Finally, we turn to the firm perspective and ask whether works councils also affect productivity and investment behavior. Because works councils aim to ensure that employees receive a "fair share" of a firm's profits, their goal is not just to redistribute but also to grow the overall "pie" – in other words, to raise productivity and profitability (Freeman and Lazear 1995). Consistent with this idea and earlier findings (Addison, Schnabel and Wagner 2001; Mueller and Neuschaeffer 2021), plants with works councils in our sample are already about 10 percent more productive before robot adoption, although this initial difference is not statistically significant. After automation, however, the productivity gap widens dramatically – to around 30 percent – a difference that is both statistically and economically significant. Importantly, we find no evidence that works councils influence the purpose or timing of robot adoption: we do not observe systematic differences in whether robots are used for process or product improvements, in the likelihood of adoption, in the amount invested, or in robot density (robots per worker). This suggests that the higher post-automation productivity levels in works council plants are unlikely to be driven by differences in adoption strategy but by how firms and workers adapt to the new technology.

Policy Implications

Our results show that works councils play a key role in shielding workers in automation prone jobs from displacement and wage cuts. At the same time, they limit wage and earnings growth for non-production workers, thereby compressing the wage distribution. Three insights follow. First, the impact of automation varies across task profiles, and so does the moderating role of labor market institutions. Second, because routine production workers earn less than non-production workers before automation, works councils help reduce the increase in within-establishment wage and earnings inequality arising from automation. Third, looking only at average effects would hide this het-

erogeneity, as the positive and negative earnings effects largely offset each other.

On the firm side, we find suggestive evidence that works councils foster cooperative adjustment: plants with works councils retain and retrain more workers and become substantially more productive after automation. Importantly, these productivity gains are not driven by differences in robot adoption strategies but by how firms and workers adapt to new technologies.

Together, these findings highlight a policy trade-off. Strengthening worker representation can increase protection for vulnerable workers and limit rising inequality, but it may also reduce hiring and dampen wage growth for other groups. Policymakers should therefore consider measures that protect incumbents without closing the door for new entrants, ensuring both equity and dynamism in labor markets undergoing technological change. Moreover, future studies need to examine more closely who the winners and losers of labor market institutions are in the context of technological change, enabling policymakers to better design targeted measures. •

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