# Comparative political economy of technology adoption: a micro-analysis

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## Introduction

In our previous meeting, Suzanne Berger spoke about her experience touring a German manufacturing plant employing a robotic device that workers and management had nicknamed 'Green Hulk.' Green Hulk allowed one worker to accomplish tasks that had previously required two workers, but far from creating anxiety or downgrading working conditions, Suzanne Berger's interviewees pointed to the broader benefits that this new technology brought to their work. It made work less physically taxing, and displaced workers were moved to new tasks rather than laid off. The purpose of the anecdote was to raise a claim, fundamental to much of the comparative political economy literature, that broader institutions mediate both the use of particular types of technology - robotics, AI and so on - and the way workers understand the risks associated with technology.

Substantial comparative evidence argues that configurations of labor market, training, and financial institutions do matter for the way work is structured. This work suggests that the impact of technological adoption on job quality/quantity are at least partially endogenous to these institutions. Work on robotics in manufacturing (Dauth et al., 2017), retail (Watson, 2011) and the roll out of apps like Uber (Valdez, 2023; Thelen, 2018) all show that institutions mediate the employment and wage effects of technological change. This work rests on longstanding claims about positive institutional feedback loops: institutions shape different distributions of worker-employer power, or incentives for coordination at the firm level, which in turn shape how firms use technology and how workers perceive its risks, thus further conditioning their broader political support for maintaining these institutions.

These feedback loops, however, are not closed, either economically or politically. As Thelen (2014) shows, path-dependent but non-reproducing change often occurs: exogenous technological developments interact with existing institutions to create distinct paths of change. Given that technological adoption can both change institutions and is itself potentially endogenous to it, how can we understand institutional mediation systematically? The broader CIFAR working group on institutional determinants of technological adoption looks to examine these questions in more depth, in this memo, we examine one slice of this question, focusing on three linked 'micro-level' questions: are institutions associated with different perceptions of job quality in technology rich industries; do they mediate perceptions of individual technological risk; are they associated with different patterns of political

support for policies to address technological displacement?

Drawing on two existing surveys, our preliminary micro-analysis raises several interlinked puzzles about existing theoretical conceptualization of institutions. We argue that the relationship between institutions and job quality is less clear than theory would suggests; meso-level interactions at firms where many of the critical choices about technological adoption are made should not be overlooked; institutions are associated with varying risk perceptions, but these are sharper among non-exposed workers; and while political support for different policy packages varies across institutions, this affect is often coming from those less exposed to technological risk. These claims give rise to specific research puzzles that we will pursue in the future. In the final part of the memo, we suggest a research design that will enable us to collect data on how institutional settings (macro), firm organization and management (meso), and individual risk perceptions and preferences (micro) might be linked.

# Micro-macro linkages

Most theoretical work that posits a link between broad institutions - defined as the formal rules that underpin capitalist production and the provision of welfare (e.g. labor market protections, regulatory policies, collective bargaining and the welfare state) - and the way firms operate (e.g. classic work in Varieties of Capitalism (Hall and Soskice, 2001), as well as more recent work on growth models (Hassel and Palier, 2021; Baccaro and Pontusson, 2023) point to a range of testable micro-implications about the institutional mediation of technology. Figure 1 schematizes these arguments in broad brush.

The first, which Figure 1 schematizes through the lines marked "a", posits that institutions should shape the way firm adopt technology, and thus individual workers' experiences of it. The literature points to two linked sets of institutions that should matter here: employment protection and collective bargaining institutions. Where workers have longer-run protections, firms will be more limited in a) adapting to technological change by rapidly substituting capital for labor (although they may slow the pace of hiring) and b) where wages are high and compressed, firms have an incentive to adopt labor complementary technologies that allow high productivity work. The result is that firms in high-wage coordinated markets should invest in capital intensive modes of production that are complementary to skilled labor. Where collective bargaining also involves firm level co-determination, the presence of labor representatives on firm boards, should further lead to differences in how firms adopt technology.

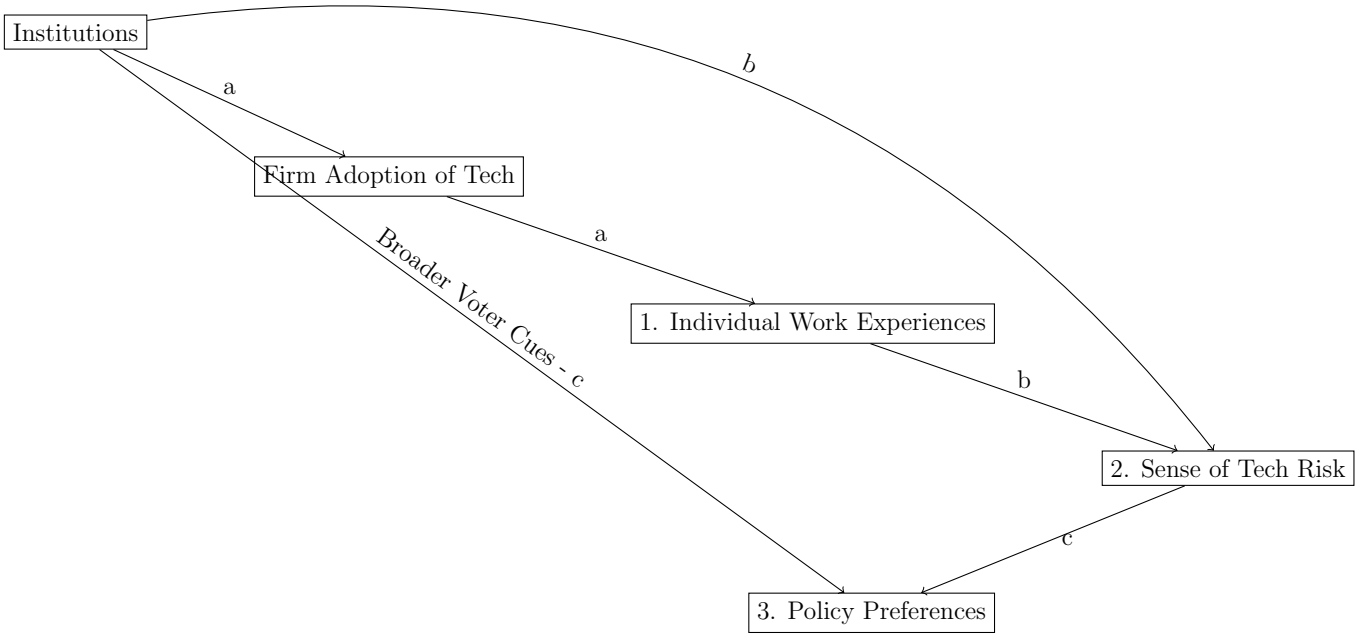
While this work argues that different types of firms should emerge across institutional environments, it also implies that in sectors with similar types of production (e.g. higher skilled manufacturing) we should observe differences in the way that firms deploy technology - and thus the way that individual workers experience it.

The second implication, schematized by the lines marked "b" suggest a direct and indirect effect of institutions on workers' understanding of technological risk. Institutions may moderate risk directly, as outlined in the preceding paragraph, by shaping individuals' experiences of technology at the firm level - for instance, increasing or decreasing their concerns about job loss, de-skilling, workload, or surveillance (and on the flip side, the benefits in

terms of job improvement). They may matter also indirectly, by providing insurance against the potential negative consequences of technological displacement (as well as dampen the positive consequences for workers most likely to 'win' out in terms of wages). Put differently, labor market and welfare institutions may compress or diffuse both perceptions of risks across groups of workers and shape the level of risk (Gingrich and Ansell, 2012).

The third implication, is that institutions should condition their own political reproduction. Work on both Varieties of Capitalism and Growth models, suggests there are reinforcing institutional effects. Again, there is a direct effect that works through experiences - workers that see institutions as promoting their own interests are likely to continue to support these same institutions. However, institutions do not just affect those working in a particular job, but can provide broader cues to the electorate about the nature economic growth and the way to promote it, which can create broader coalitions for more or less liberalizing institutional packages.

We argue that the evidence for these three processes, when we just look at relatively blunt indicators, is more mixed than institutional theory would suggest. Nonetheless, there is evidence of variation in experiences in experiences across institutional structures and some institutional mediation of risk. Understanding what role institutions play in shaping each of these steps - worker experiences, worker perceptions of risk, and public demand for policy - requires additional research.




# 1: Individual Work Experiences

First, do institutions shape the work experiences of employees in technologically dense sectors? To provide some descriptive information on this question, we turn to a longstanding survey of working conditions conducted by Eurofound. The Eurofound survey asks respondents (who are all employed and working age) about different aspects of their job, which

they build into series of indices: measuring the extent of skills and discretion in work, workers perceptions of advancement prospects, the physical intensity of work, and working time quality (see here). We restrict our analysis to the "old" EU-15 countries (excluding Eastern European states).

With these data, we examine descriptively whether individuals in similar types of jobs report different levels of quality across places. Because institutions may mediate the composition of employment in different industries - i.e. encourage different age, gender, experience profiles - we run a simple pooled model that regresses each of the job quality indices on gender, age, years of experience, establishment size, the education level of respondents, and dummies for employment in manufacturing occupations (ISCO 71-83) professional services (11-34), clerical and security (41-52) services, agriculture (61, 62), and routine work (91-93). We then look at national-occupation group deviations from the predicted level based on national employment composition - so we are developing a measure of how "good" or "bad" mean job quality is relative to the cross-national mean and net of compositional effect (the results are similar with the raw descriptive data).

The Eurofound survey does not have direct measures of technological use in employment. To provide a rough proxy, we look at the manufacturing sector (employees in ISCO codes 71-84) where there has been relatively widespread adoption of robotics and other technology over time. This approach is obviously extremely crude, given the wide variation within this broad occupational categorization, but provides a snap-shot descriptive measure of cross-national differences.

Figure 2 plots the national-occupation group deviations from the predicted level on the y-axis, and the degree of coordinated wage bargaining (Visser, 2015). The coordinated wage bargaining variable runs from 1-5, and captures the degree of centralizing and coverage in wage bargaining systems.

The top left panel shows the results for the "skills and discretion" index, which measures respondents' sense of autonomy and use of skills. We see that there is substantial variation across countries relative to the cross-sample mean of 0 - but it does not closely relate to the system of collective wage bargaining (other institutional measure yield similarly weak relationships). Among the countries with strong collective bargaining institutions, workers in the Nordic countries and the Netherlands report more discretion and use of skills, but Austrian, Belgian, and German workers report levels below those in France, the UK, and Ireland, despite substantially more labor involvement at both the national and firm level. When we turn to physical intensity on the top right - where higher numbers represent more reported physically intense work - we see similar variation. Within the more protected systems, the Nordic countries stand out as having lower intensity, but the Continentals are more varied. Similar patterns emerge when we turn to reported job prospects (bottom left) With earnings (bottom right), the results are more compressed, in part due the much higher rates of pay in Switzerland.

While not directly examining the effects of technology on experiences, in technology rich manufacturing jobs, we do see substantial variation. There is higher reported job quality in the Nordic countries - where workers do seem to use their skills more, jobs offer workers better prospects, and manufacturing jobs are less physically intensive - and lower reported quality in the Southern countries - but, contra work on collective bargaining and employment protection, the more liberal Anglo countries and France do not look that distinct from the

coordinated Continental countries on job quality in these sectors.

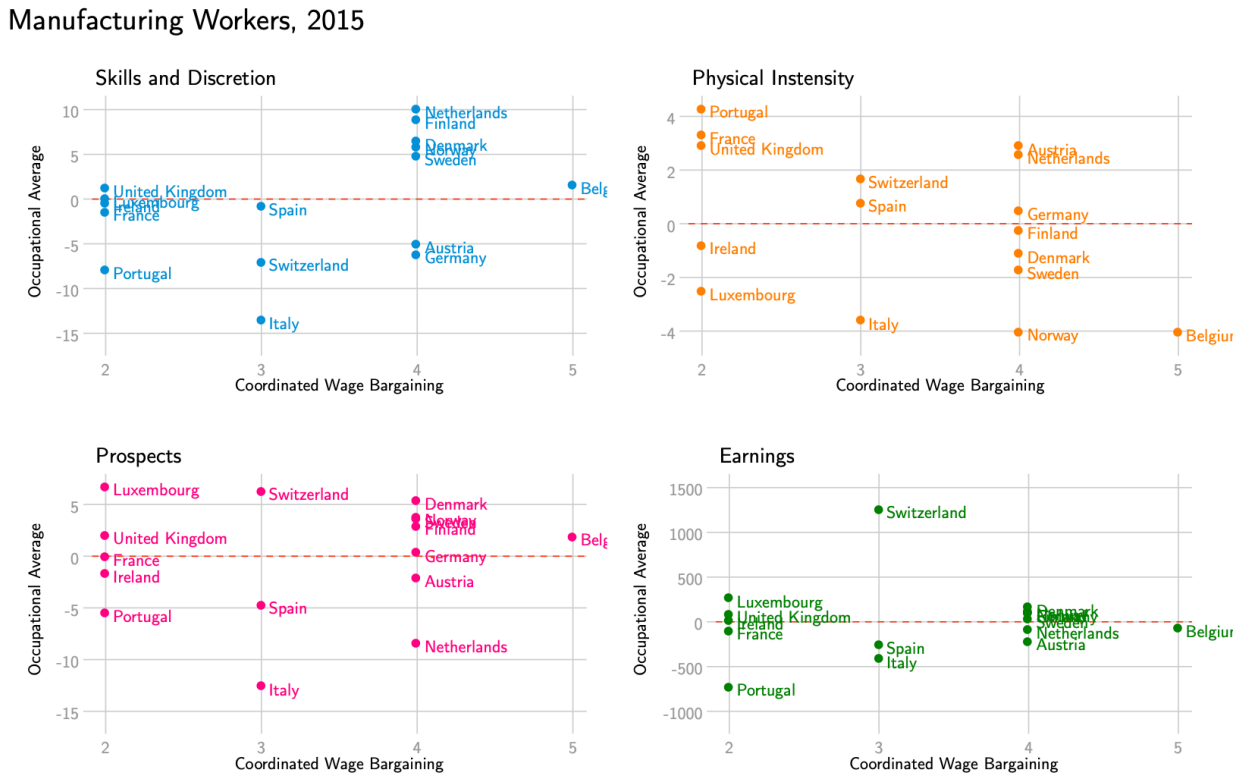



Figure 1: National mean values for manufacturing workers, netting out compositional effects, plotted relative to national levels of coordinated wage bargaining

This descriptive exercise raises three possibilities. First, that institutions matter less in practice than in theory. However, given the variation both within and across countries, this interpretation seems questionable. Second, that institutions matter, but we need to conceptualize which institutions matter - in particular, what sets the Nordic countries apart - more carefully. Third, we need measures of job quality and technology that are more precise and capture the macro-meso-micro interactions more directly.

# 2: Experiences to Perceptions

Second, *how* do institutions shape the way individuals understand technological risk (and rewards)? Insecure individuals exist in all countries. But those with objectively similar levels of exposure to technology face different work experiences and different broader institutional contexts (Gallego et al., 2022). The reasoning presented in Figure 1 would suggest that workers facing higher objective levels of occupational risks in context with more risk mediating institutions will experience lower subjective risk.

To see if these objective differences relate to subjective perceptions in theoretically expected ways, we turn to the OECD Risks that Matter 2020 survey. This survey asks a

range of questions about perceived technological risks. For the 13 countries that appear in the Eurofound survey and RTM, we link workers in the five broad categories listed above (manufacturing, professionals, clerks and security, agriculture and laborers) to the group job quality scores in the Eurofound survey as well as the broader institutional context. Because the UK and Ireland are not in the RTM, we assign the US and Canada the average of the UK and Irish scores on job quality, so that we have some liberal economies in our sample.

We then look at whether group based perceptions of technology differ systematically across contexts with different job quality aggregates (to test the direct effect on experiences on preferences) and welfare institutions (to test the indirect of institutions of preferences). We measure the latter through unemployment replacement rates (Scruggs, Jahn and Kuitto, 2014). Once again, this approach is very crude. The aim is not to carefully test institutional associations but to eye-ball differences in ways that might lead us to a more careful design.

To measure attitudes towards technology, we sum responses to 5 questions, all recoded to run from more concern about technology (4) to less concern (1). Each asks how likely the following outcomes will be: job replaced by a computer/robot, job replaced by a platform worker, lose job because not good enough with technology. We then examine questions about the gains technology, which we again recode so that higher numbers indicate more concern above technology: technology will make job compatible with private life (recoded), technology will make job less physically demanding (recoded), technology will make job less boring (recoded).

Figure 3 shows the results descriptively, plotting group mean of technology attitudes on the y-axis, and the Eurofound "Skills and Discretion" scores on the x-axis (imputed for US and Canada). Figure 3 shows, with regard to job loss concerns, that country average differences within groups are relatively limited (the same is true with the replacement rates measure, not shown).Professionals are *more* worried about job loss than manufacturing workers, but are more positive to the work quality aspects of technology. These gaps are biggest in the US and Canada, where all groups are more worried about technology but especially professionals, but the country means in other contexts are less clearly linked to institutional experiences. Manufacturing workers, by contrast, are not that distinct across place. Within the manufacturing group (top right), US, Italian, and Greek workers are more concerned about technology than those in other countries, despite quite different institutions.

When these differences are examined more carefully with a multivariate model, country differences are not generally significant, nor are the directly measured institutional (replacement rate) or experience (Eurofound) data.

Again, these weak institutional differences may be interpreted in multiple ways. First, perhaps institutions do not matter for how people experience risk. Second, institutions may matter, but we need clearer measures both of risk perceptions and institutional experiences. The link between subjective and objective measures of risk is highly debated. In order to test this more systematically, we need more carefully defined measures of both objective risk - occupational exposure to technology at a much more fine grained measure of occupation - and then measures of individual workplace dynamics (management structure, protections and so on). Third, however, we think that these weak national differences may raise different questions about how people connect their experiences of firms and broader institutions to perceptions of outcomes.

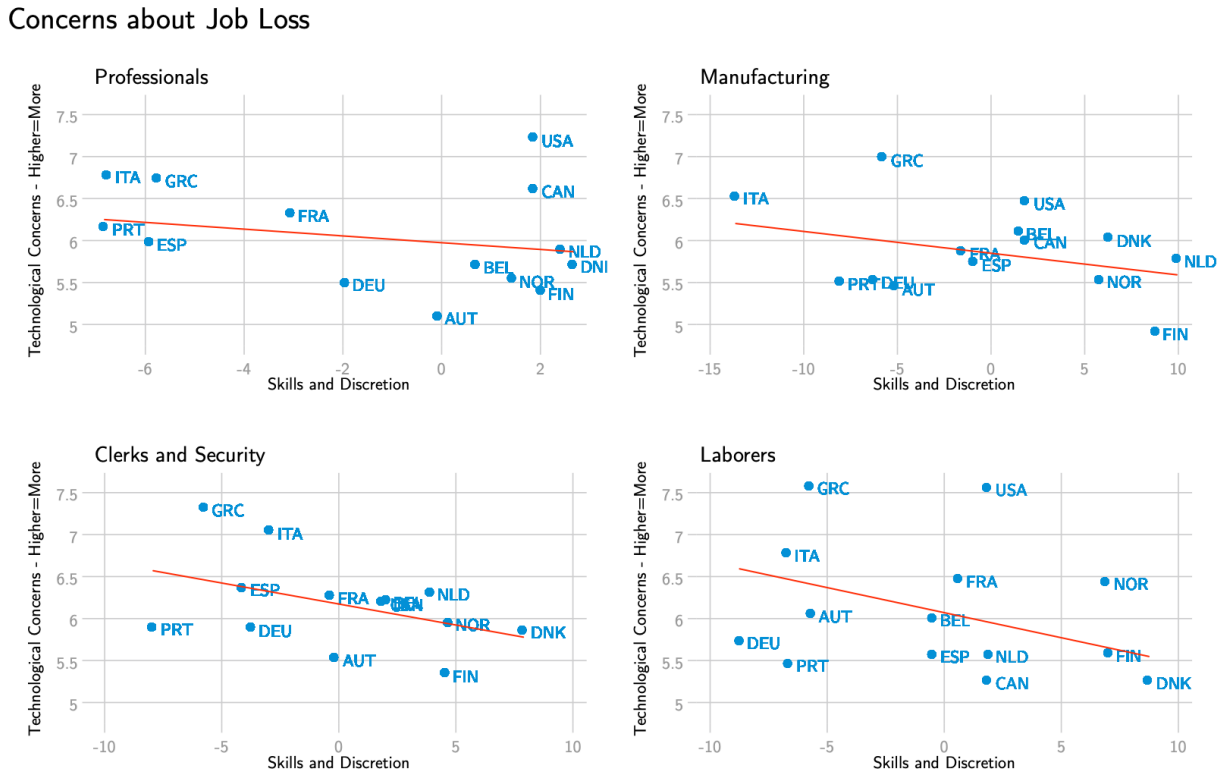



Figure 2: National mean values for workers on "technology" job loss index, plotted against national group averages on the "Skills and Discretion" index in Eurofound

# 3: Non-experiential mechanisms

Coalitions around institutions may be narrow - involving those directly affected - or broad - building on larger electoral support from those in other sectors. Work in the growth models and other literature, suggests a broader public 'buy in' to particular economic strategies. However, work in public attitudes towards technology points to some areas of tension between the policy preferences of voters and institutional configurations.

Busemeyer and Tober (2023), drawing on the above mentioned RTM survey, examine the policy preferences of respondents with regard to technological shocks. They make two key claims: respondents in more extensive welfare states do have lower perceptions of technological risk, but these differences are often driven by those without direct exposure to technological risk. When it comes to preferences over policy, the biggest gaps in preferences across countries are among the *lower* exposure groups.

We look at a range of policy options that respondents can pick in the RTM survey in Figure 5, with higher numbers demonstrating more support. In Figure 6, we recreate the strategy of Busemeyer and Tober (2023), looking at support under conditions of tradeoff - respondents have 100 points that they must allocate among priorities - education, retraining, public services, UBI, and employer subsidies. Here we see, in line with Busemeyer and Tober (2023) and the broader work of Häusermann et al. (2022) that those who are less worried


Figure 3: National mean values for workers on "technology" gains index, plotted against national group averages on the "Skills and Discretion" index in Eurofound

about technology (and the educated middle classes more generally) are more favorable to education, particularly in Nordic countries, whereas those who are more concerned are almost always predicted to support more compensatory measures (on all policies) with less variation across institutional context (these analyses control for age, gender and education).

These configurations raise a third puzzle: why are risk shaping institutions associated with more variation among those with lower levels of self reported risk? Indeed, these patterns suggest that institutions are associated with different informational or normative cues for lower risk voters, but we know little about these processes.

A third possible research agenda looks at how individuals understand the risks that *others* face, and the appropriate responses. They also raise the possibility of a self-undermining dynamic - those in the most expansive systems want more market conforming education policies - possibility suggesting a tension in institutional reproduction.

# Proposed research design(s)

We propose to field an original survey that collects observational and experimental data in three countries (Germany, the UK, Sweden), sampling individuals who are in the labor force. The goal of the design is to allow us to (1) empirically investigate if a link between

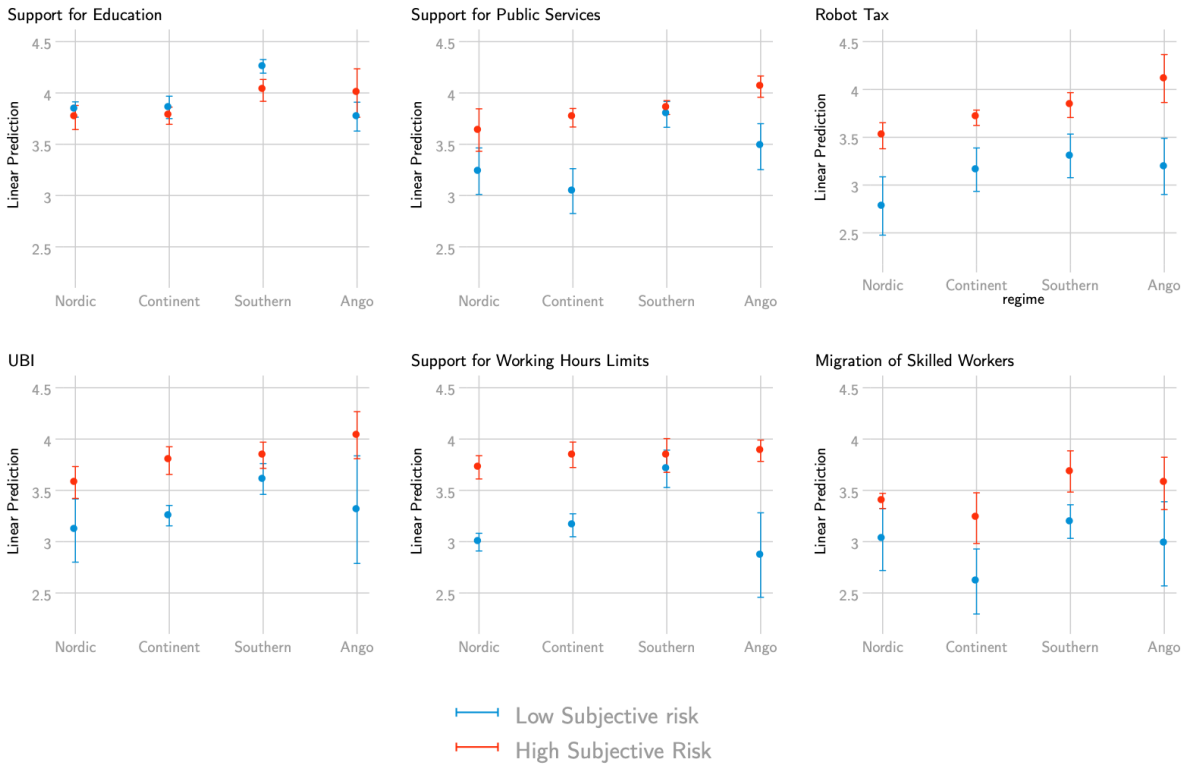



Figure 4: Predicted support for different policy interventions to address risks of digitization (4=strong support) for workers with high and low subjective perceptions of risk.

institutions, firm-level arrangements, and worker experience and risk perception exists and (2) causally identify workplace regimes and policies that might improve workers' acceptance of technological change and sense of job security.

In the observational portion of the survey, we ask questions pertaining to work organization (e.g., worker participation in decision making, choices about the use or pace of technology adoption, the extent to which labor-replacing technologies are already in use), individual and job characteristics (e.g., occupation, educational attainment), perceptions of technological risks and job quality, and political behavior. These respondents reside in three countries that feature a variety of labor market institutions (e.g., labor legislation, unemployment benefits). This proposed survey will enable us to answer additional questions about macro-, meso-, and micro-level linkages that we are unable to with existing surveys.

Following these questions about individuals' real-life experiences, we turn to a conjoint experiment that allows us to explore how features of workplace governance and responses to technological change affect buy-in from workers. We describe an overall trend of technological change in the workplace and ask respondents to consider pairs of job offers (this approach is similar to that of Mazumder and Yan (2020) in asking about features of jobs using a conjoint design). These job offers describe features of the workplace and workplace policies. Factors include worker consultation on firm decision-making and technological adoption, in-house training opportunities, compensation for laid-off workers, within-company mobility, early-

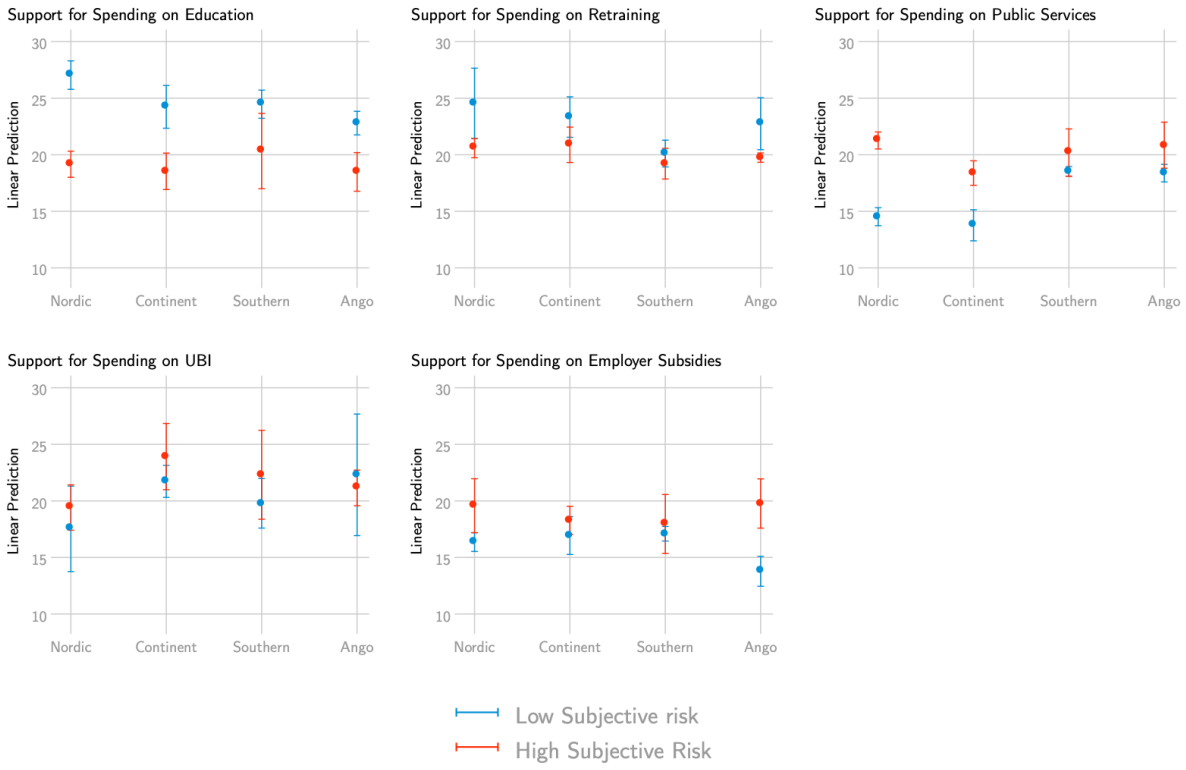



Figure 5: Predicted support for constrained spending from those with high and low subjective perceptions of risk.

retirement opportunities, and salary. The salary factor increases realism of the set-up and also serves as a check on sample quality (holding other factors constant, respondents should prefer higher salary). As a part of this design, we will additionally consider moderator variables such as: country's institutions, employment contract type, subjective unemployment risks, household income, and education. This design helps us to understand a) what features of job quality workers prioritize and b) macro-meso-micro linkages.

Third, we will add a vignette design that asks respondents about the risks created electric vehicle (EV) technology. EV technology is potentially highly disruptive of the European auto industry - as it requires different skills and levels of labor than internal combustion engines - yet non-action in moving to EVs is risky due to changes in the auto market and the rise of Chinese competitors like BYD. The future of the internal combustion engine and auto-manufacturing is highly debated in Europe, and levels of familiarity with the underlying issues is widespread. Our vignette design would vary exposure to prompt that remind respondents about 'pre-distributive' institutions (wage bargaining, vocational training and redistributive institutions (unemployment insurance). We would then examine respondents' perceptions of the risks of moving to greater EV for workers in the sector and the economy as a whole. The aim would be to test whether institutions moderate, for a broader group of respondents, perceptions of high disruptive economic change.

Our survey would thus gather a broader range of observational data both on workplace

experiences of technology adoption, individual risk perceptions, and other-regarding risk perceptions. It would provide an experimental test of workplace preferences in the face of technology (which can be compared to the functioning of actual institutions) and moderating effect of institutional cues on over all risk perception.

# Conclusion

Looking at the micro-level is *not* the only - or even the best - way to examine the effects of institution on outcomes. It is also important to look at more meso-level interactions - firms, unions - where many of the critical choices about technological adoption are made. However, the goal of the micro-level analysis would be to provide some initial tests of institutional effects on technological adoption that can be measured directly, and potentially experimentally manipulated, in ways that broader institutional outcomes cannot.

We are very open to all suggestions on the research questions, theoretical framework, and design proposals.

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