The Missing Link: Technological Change, Dual VET, and Social Policy Preferences

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Introduction

How does technological change affect social policy preferences? This question has attracted significant interest in recent years (for a review see Gallego and Kurer 2022). The overarching hypothesis guiding this flourishing body of research rested on the intuition that individuals employed in occupations exposed to greater risk of automation would demand greater state intervention in the form of compensatory social policy (Thewissen and Rueda, 2019; Kurer and Häusermann, 2022; Gallego et al., 2022). Yet, empirical evidence in support of this hypothesis has been highly susceptible to choice of variables and research designs (Gallego et al., 2022; Weisstanner, 2023; Ahrens, 2024; Compton and Philips, 2024), leading to mixed results, which, as such, call for a re-assessment of the relationship between technological change and social policy preferences. This article does so by foregrounding the role of skill formation (cf. Busemeyer and Trampusch 2011). We focus in particular on the role played by dual vocational education and training (VET) both in *shaping* social policy preferences in the age of automation and in *moderating* the relationship between automation risk and demand for compensatory social policy.[1]

Our focus on skill formation is motivated by a major theoretical puzzle, namely the conspicuous absence of "skills" from recent debates on the relationship between technological change and social policy preferences.[2] This absence is surprising given that received wisdom from labor economics and comparative political economy (CPE) highlights, respectively, the crucial role of educational *levels* in determining workers' fortunes in the context of technological change (e.g. Autor, Levy and Murnane 2003; Goos, Manning and Salomons 2014) and the key role of different *types* of upper-secondary education systems—and in particular the extent to which they produce "specific" skills—in shaping demand for compensatory social policy (e.g. Iversen and Soskice 2001; Estevez-Abe, Iversen and Soskice 2001). Yet, skills and cross-national variation in education and training systems have been thus far surprisingly absent from the debate on individual preferences for social policy in the context of increasing automation risks, as also pointed out by recent review articles (Gallego and Kurer, 2022; Özkiziltan and Hassel, 2020).

This paper fills this gap both theoretically and empirically, by showing that skill formation constitutes a missing link in the relationship between automation risk and demand for compensatory social policy. In doing so, we propose a constructive dialogue between three streams of literature that—while sharing obvious affinities—have mostly developed separately from one another thus far: the labor economics literature that investigates the relationship between skills and technology; the political behavior literature on the connection

[1] Dual VET refers to training that takes place in both schools and firms (typically in the form of apprenticeships), resulting in certified and portable occupational skills. Firms and their intermediary associations participate in the financing and administration of training, which presupposes inter-firm cooperation (Busemeyer and Trampusch, 2011, 14-15).

[2] The lone exception is Weisstanner (2023) who suggests that the positive effect of routine-task intensity on social policy preferences is stronger in countries with lower enrollment in dual VET, but does not investigate the issue further.

between technological change and social policy preferences; and the Varieties of Capitalism (VoC) literature that focuses on the relationship between skill specificity and social policy preferences. Taken together, these streams of literature put skills, technology, and social policy preferences under the spotlight—but they only analyze them in pairs. We suggest instead that skills, technology, and social policy preferences should be placed under a unified theoretical framework.

More specifically, we argue that an educational background in dual VET influences social policy preferences in the age of automation as well as moderates the relationship between automation risk and demand for compensatory social policy. However, departing from the expectations of the influential VoC literature (Hall and Soskice, 2001), we develop a theoretical argument that predicts dual VET in the context of automation to make individuals less supportive of compensatory social policy. We outline three (non-mutually exclusive) theoretical mechanisms that underpin this relationship, which we refer to as (i) material self-interest, (ii) workplace socialization, and (iii) skill certification mechanisms. The material self-interest mechanism hinges on the fact that dual VET graduates enjoy above-average salary prospects, especially at the beginning of their career, which in turn decrease demand for compensatory social policy; the workplace socialization mechanism focuses on dual VET graduates' greater exposure to business discourse and motives as a significant part of their training takes place within firms, making them develop workfarist attitudes that consider government intervention (e.g. through unemployment protection) harmful for the economy; finally, the skill certification mechanism points at the encompassing and authoritative system that certifies skills acquired via dual VET, which we expect in turn to make dual VET graduates less worried about re-employment, should they become unemployed. We argue that these three mechanisms set dual VET apart from other forms of education and training and they jointly explain why dual VET graduates are surprisingly critical of compensatory social policy in the context of automation.

Empirically, we demonstrate that an educational background in dual VET is associated with lower levels of support for compensatory social policy (compared to respondents with comparable levels of educational achievement). Subsequently, we assess the three mechanisms through which this is hypothesized to happen. Finally, we demonstrate that an educational background in dual VET attenuates the positive effect of automation risk on support for compensatory social policy. Mobilizing cross-national survey data with country-level information on education and training as well as zooming into cases with large dual VET systems to tap into more fine-grained information on individuals' educational background, we find overall strong support for our argument across a range of statistical analyses and model specifications.

Our argument and findings have important implications for the existing literature. By exploring how skills affect demand for compensatory social policy in the age of automation, we advance the flourishing literature on the relationship between technological change and the welfare state. We also enrich the labor economics

literature on skills and technology by showing that *types* of education and training matter, alongside skill *levels*. The article also casts new light on an old debate, namely the relationship between skill specificity and social policy preferences.

The paper is organized as follows. The next section reviews the literature and highlights how the missing theorization of the role of education and training in the debate on technological change and social policy preferences is theoretically puzzling. Subsequently, we develop our theoretical argument, explaining in detail the three mechanisms through which we hypothesize dual VET weakens demand for compensatory social policy in the context of automation. After discussing the data and the statistical approach, we present the results of our empirical analysis. A final section concludes.

Literature Review: Skills as the Missing Link between Automation Risk and Social Policy Preferences

Skills, technology-induced automation, and social policy preferences feature prominently in the debate on the transition to the knowledge economy (cf. Thelen 2019, Hall 2020, Bonoli and Emmenegger 2022, Hassel and Palier 2021). However, these three elements are largely analyzed in pairs. The literature in labor economics has been preoccupied with the relationship between skills and automation but has shown little interest in demands for compensatory social policy. In contrast, much recent political behavior literature has focused on the relationship between automation risk and social policy preferences but has paid little attention to skills. Finally, the prominent VoC literature within CPE scholarship has highlighted the relationship between skills and social policy preferences. Yet, technology-induced automation has not featured prominently in this literature. As a result, few scholars have explored the three-pronged relationship between skills, automation risk, and social policy preferences, which we argue is a crucial, yet overlooked aspect of the transition to a knowledge economy. The remainder of this section first reviews the literature on automation risks, skills, and social policy preferences before spelling out the missing link between the three of them.

In labor economics, theories of skill-biased and routine-biased technological change (SBTC and RBTC) highlight the asymmetric effects that technology has on labor markets. Crucial reasons behind such asymmetry lie in the different relationships between occupations at various skills and task levels, on the one hand, and technology on the other (e.g. Autor, Levy and Murnane 2003, Goos, Manning and Salomons 2014). SBTC and RBTC theorize, respectively, a linear and U-shaped relationship between skills and technology. The former suggests that technology is complementary to jobs at high levels of skills, while it replaces jobs lower down the skill distribution. Such jobs are thus at the highest risk of automation. The latter concurs on

the complementary nature of technology and high skill levels (that are typically associated with non-routine cognitive tasks) and expects an effect of substitution in the middle of the skills distribution (where jobs characterized by routine tasks tend to concentrate). However, RBTC posits that occupations often found at the bottom of the skill distribution and characterized by interpersonal tasks are not easily replaceable by robots, algorithms, or other technological advancements.

Despite different expectations concerning the bottom of the skill distribution, both approaches point *de facto* in the same direction as far as the middle and top of the skill distribution are concerned. Knowledge economies are expected to "thrive" on high skill levels that fuel cognitively and analytically demanding occupations and that are complementary to technology. In contrast, they paint a rather bleak picture for the jobs in the middle of the skill distribution. The general take-home message from the labor economics literature that we highlight here is that skill levels matter in determining what jobs in the labor market face the highest automation risk. We shall return to this point later.

The relationship between technological change and social policy preferences has been another hotly debated topic in the last few years. A rapidly growing scholarship in political behavior has been interested in theorizing how (perceived and/or real) exposure to the risk of automation affects individual demand for social protection. Thus far, results have been mixed. Based on perceived automation risk, Kurer and Häusermann (2022) find that at-risk individuals demand traditional passive insurance against the risk of job loss. Similarly, based on routine-task intensity (RTI) at the occupational level, Thewissen and Rueda (2019) observe that individuals in routine occupations demand more redistribution to compensate for their greater risk of losing their jobs due to automation (see also Kurer and Häusermann 2022). Gallego et al. (2022), on the other hand, do not find strong support for the compensation hypothesis in the case of Spain. Rather than demanding more public spending on unemployment benefits, they find that workers at risk of automation would prefer policies that "slow down" the pace of technological change. Similarly, Ahrens (2024) and Compton and Philips (2024) find no clear relationship between labor market risks and social policy preferences.

Busemeyer and Tober (2023) focus on the interaction between the risk of automation, demand for social protection, and existing welfare state institutions. They find that both the perception of technology-related employment risks and RTI increase demand for generous unemployment benefits, although the relationship is moderated by the generosity of the already existing compensation schemes. Most notably, they find that welfare state institutions make a difference in shaping social policy preferences only for individuals at low perceived risk of automation, while those at high risk privilege compensatory social policies regardless of existing welfare institutions. Taken together, this fast-growing political behavior literature suggests a complex relationship between automation risk and demand for compensatory social policy. While the "risk increases

demand for social protection" framework is appealing for its parsimoniousness, the extent to which it accurately captures the determinants of preferences for compensatory social policy in the age of automation seems to be susceptible to data sources, specifications, and the exact policy manifestations that such preferences take.

Given the degree of ambiguity in findings thus far, we must conclude that there are missing links in the theorization of the relationship between automation risk and social policy preferences. From our vantage point, and especially given the importance of the skill-technology relationship as established by labor economists, an issue that stands out is the limited theoretical and empirical role assigned to education and training as potentially influencing the relationship between automation risk and demand for compensatory social policy. Empirical studies typically treat education as a control variable (e.g. years of education, thereby ignoring type of education) or they use an occupational-based (rather than education-based) measure of skill specificity as an alternative specification. But the role of education and skills is not systematically embedded in the theoretical apparatus underpinning this research (Thewissen and Rueda, 2019). Reviewing the state-of-the-art on the impact of automation on the labor market, Özkiziltan and Hassel (2020, 23) conclude that "a new research agenda should incorporate institutional factors, such as workers' voice and the role of existing training regimes (VET), with the differentiated effects on specific socio-economic groups and the best practices for workers to cope with labor market restructuring." Similarly, reviewing the implications of technological change in the workplace for political behavior, Gallego and Kurer (2022, 479) urge that "[d]ifferences in education and, particularly, vocational education and training regimes should have a more prominent role in this research agenda."

Approaching this debate from the perspective of social policy preference formation, the lack of explicit theorization of education and skill formation is all the more surprising given that the micro-foundations of one of the most prominent research agendas in contemporary CPE—the Varieties of Capitalism (VoC) framework—builds precisely on the relationship between (types of) skills and demand for social protection (Estevez-Abe, Iversen and Soskice, 2001; Hall and Soskice, 2001). Here the central tenet is again formulated along the lines of a "risk increases demand for social protection" relationship where, however, risk is not automation but rather skill specificity. The argument is famously formalized in Iversen and Soskice (2001) and holds in essence that there is a direct relationship between investment in specific skills, typically obtained through dual VET, and the risk that this investment carries due to the lower probability for specific-skilled individuals relative to individuals holding general skills to find an equally remunerating job in case of unemployment. Therefore, individuals who were to invest in highly specific skills—typically provided according to this view by dual VET systems (Estevez-Abe, Iversen and Soskice, 2001; Iversen and Stephens, 2008)—would also demand some form of insurance against this risk, most notably generous unemployment

benefits (Iversen and Soskice, 2001; Cusack, Iversen and Rehm, 2006; Lee, 2007).

This brief review of the literature presents us with a stark theoretical puzzle: (i) if type of skills (not just—or not even primarily—levels of education) is an important predictor of individual social policy preferences; (ii) if automation risk is an important factor shaping such preferences; and (iii) if automation risk is moderated by skill types, why do we lack systematic theorization and empirical scrutiny of the role that different skill types play in shaping preferences for social protection in the age of automation? One might plausibly answer that "we do not need one." This is because dual VET might be hypothesized—if all that has been discussed thus far holds true—as simply pushing in the same direction as automation. We refer to this as the "dual VET as *risk magnifier*" hypothesis, which would roughly run as follows: If technology-induced automation wipes out jobs in the middle of the skill distribution according to the prominent "hollowing out" thesis,[3] and if these jobs were already underpinned by "risky" investments in specific skills even before these new technologies were adopted at large, then we must conclude that automation risk and skill specificity reinforce each other and jointly contribute to increasing demand for insurance against these risks via increased social protection in the age of automation.

In the next section, we argue that there are reasons to advance an alternative argument centered around skill types—and in particular on the role of dual VET—in shaping the relationship between automation risk and preferences for compensatory social policy in the opposite direction compared to the risk magnifier hypothesis that received wisdom would steer us towards. We submit, in other words, that dual VET mitigates—rather than magnifies—support for compensatory social policy in the age of automation. Formulating this argument requires reconceptualizing dual VET by going beyond the specificity of the skills that they create and by focusing on other crucial dimensions of dual VET.

Theory: Reconceptualizing Skills in the Age of Automation

We identify three crucial characteristics of dual VET that allow us to posit that such an educational background (i) is associated with lower demand for generous social policies and (ii) moderates the relationship between automation risk and social policy preferences by dampening—not magnifying—support for compensatory social policy. We refer to this as the "dual VET as *risk mitigator*" hypothesis, which works through three non-mutually exclusive mechanisms. First, dual VET facilitates school-to-work transitions and allows individuals to command above-average salaries, especially at the beginning of their professional careers. Second, dual VET socializes young people mostly at the workplace rather than in schools, thus instilling

[3]Although this narrative is not undisputed, especially in European countries, see for example Haslberger (2021), Oesch and Piccitto (2019), and Fernández-Macías and Hurley (2017).

comparatively workfarist attitudes. Third, dual VET has a unique system that authoritatively certifies the skills acquired, which increases skill portability.

It is important to note at the outset that the three mechanisms that we outline in the remainder of this section are expected to be just as relevant in the context of technological change as they would be in the absence of it. That is, an important corollary of our argument is that the three mechanisms that we identify imply that dual VET graduates are less supportive of compensatory social policy in general *and* that dual VET mitigates the demand for compensatory social policy in the face of automation risk. By implication, dual VET can be thought of as both a predictor of social policy preferences and a moderator in the relationship between automation risk and demand for compensatory social policy. Indeed, in the empirical analysis, we examine both the direct effect of dual VET and its role as moderator. Such a "double" focus is warranted because we seek to draw attention to and make theoretical sense of the hitherto neglected triangular relationship between skills, technological change, and social policy preferences. Moreover, we focus on the moderating role of dual VET on research design grounds. As discussed in outlining the "risk magnifier" hypothesis in the previous section, received wisdom from VoC associates dual VET with (industrial) occupations in the middle of the skill distribution (Culpepper and Thelen, 2008), which are in turn most amenable to automation according to the labor economics literature (Autor, Levy and Murnane, 2003; Acemoglu and Autor, 2011). Taken together, these prominent theories imply therefore that dual VET should make its graduates respond to technological change by *increasing* demand for compensatory social policy. Given that our argument predicts that the opposite holds true, focusing on the moderating role of dual VET in the context of technological change allows us to effectively stack the cards against our own argument and test it in a "least likely" setting.

Material Self-Interest

Empirical research has shown that dual VET is associated with low youth unemployment rates (Breen, 2005; Tomić, 2018; Zimmermann et al., 2013)(*blinded for review1*). Furthermore, dual VET-trained individuals have higher relative incomes, especially at the beginning of their career (compared to graduates of other educational tracks within their age cohort), due to the greater proximity of their qualifications to labor market needs, even as this advantage gradually decreases and flattens out over the life-course (Hanushek et al., 2017; Korber and Oesch, 2019; Chuan and Ibsen, 2022; Schulz, Solga and Pollak, 2023). It has also been noted that dual VET systems have kept adapting to the needs of the knowledge economy (Bonoli and Emmenegger, 2022).

We refer to this ability to promote smooth school-to-work transitions and comparatively high salaries

(at similar years of education) as the *material self-interest mechanism*. It builds at a theoretical level on recent work in political science (Gelepithis and Giani, 2022; Bullock, 2021; Marshall, 2016). The core channel through which education shapes social policy preferences according to this body of work is via the wages that workers command at different educational levels. Here the typical finding is that higher levels of education attract higher wages, which in turn decrease demand for compensatory social policy. This has been found to be the case for higher education, which Gelepithis and Giani (2022, 45) argue "to foster norms of cultural inclusion, while simultaneously eroding norms of economic solidarity." Similar findings apply to studies analyzing reforms increasing compulsory schooling age in Great Britain and the USA. Such reforms turned individuals who stayed longer in secondary school against generous compensatory social policy by virtue of the higher wages accrued to them as a result of additional years of schooling (Bullock, 2021; Marshall, 2016).

Following this line of reasoning, we hypothesize that dual VET dampens demand for compensatory social policy from individuals by granting them an economically advantageous position (compared to graduates of other educational pathways) in the form of higher employment rates and higher relative incomes, especially at the beginning of their careers. Differences in income levels should therefore mediate the negative relationship between dual VET background and demand for compensatory social policy.

Moreover, recent research suggests that dual VET is able to maintain its comparative advantage also in the context of technological change, because employer involvement ensures that training content is aligned with "the frontier" labor market needs, such as problem-solving skills in technology-rich environments (*blinded for review1*), while the "shared governance" between employers, unions, and governments contributes to the pursuit of occupational upgrading—rather than polarization—in the transition to the knowledge economy (Bonoli and Emmenegger, 2022). For instance, (*blinded for review3*) find that dual VET is associated with higher levels of non-routine cognitive jobs among young upper-secondary educated workers than non-dual VET systems and that this effect is larger at high levels of intensity of information and communications technology (ICT). Dual VET, in other words, is conducive to employment opportunities at the top end of the labor market also as advanced democracies transition into the knowledge economy. For this reason, we hypothesize that an educational background in dual VET also mitigates the effect of automation risk on support for compensatory social policy.

Workplace Socialization

The *workplace-socialization mechanism* focuses on the role of the education and workplace environment in shaping individuals' worldviews (Sears, 1975). Adults spend most of their waking time doing their job. These long hours spent at the workplace are likely to influence social policy preferences (Kitschelt and

Rehm, 2014, 1670). The same argument can be made about the period before people become economically active. In these years, individuals spend most of their time in education and training. Socialization theory argues that institutions such as education systems or workplaces serve as "inferential spaces" that shape how individuals come to think about cause-effect relationships and the desirability of certain policies (Mijs, 2018). Importantly, experiences made in secondary school and during the first years of employment have been found to be particularly influential because attitudes and beliefs developed at a relatively young age—the so-called "impressionable years" (Schuman and Scott, 1989)—tend to have lasting effects on policy preferences (Emmenegger, Marx and Schraff, 2017; Jennings and Niemi, 1974; Sears and Funk, 1999). The different experiences individuals make during their training years and the first years of employment are thus likely to shape their social policy preferences.

We expect dual VET to be different compared to any other form of education and training from a workplace socialization standpoint. Most notably, dual VET students conduct a significant proportion—often a majority—of their training within a company, not in a school. And as famously put by Van Maanen and Schein (1979, 209), "[w]ork organizations offer a person far more than merely a job," because in this way, individuals are also exposed to the strategic communication of employers, which influences perceptions and beliefs about economic problems and possible policy solutions (Heinrich, 2024). According to the OECD definition, combined school- and firm-based programs are considered examples of dual VET when "less than 75 percent of the curriculum is presented in the school environment or through distance education, [whereas] programs that are more than 90 percent work-based are excluded" (OECD, 2001, 401). Put differently, following the OECD definition of dual VET, which we also follow in this analysis, dual VET students spend between 25% and 90% of their time in a company. Most firm-based training is offered by small- and medium-sized companies.[4] Moreover, in dual VET, firms and their intermediary associations are typically involved in the definition of training content, which, we argue, provides another important lever to influence the socialization of dual VET students (Busemeyer and Trampusch, 2011, 14-15).

Technology-induced automation can be connoted negatively—as job destruction—or positively—as opening up new employment and profit opportunities. Similarly, compensatory social policy can be framed positively—as necessary insurance against automation risks—or negatively—as a burden on companies facing technological challenges. In both cases, we expect the latter to be the framing that young adults are more likely to encounter in dual VET systems relative to entirely school-based education systems, because such framing is a correlate of managerial and business discourse (Heinrich, 2024) and because firms play a

[4]All VET trainees spend at least a *significant* amount of time at the training firm, but we do not know any specifics about the amount of time spent and about the training firms themselves. Moreover, due to gender segregation in the labor market, women (men) are more likely to receive training from public (private) sector companies. However, our findings are robust to controlling for gender and sector of employment.

key role in training provision and content definition in dual VET (Busemeyer and Trampusch, 2011). We therefore expect dual VET graduates to feature more workfarist attitudes, where excessive government intervention (e.g. through unemployment protection) in the face of technological change is considered harmful disruption to the "natural" course of events. Recent research indeed lends strong support to the hypothesized relationship between VET and workfarist attitudes. For instance, Busemeyer and Guillaud (2023) show that individuals with no higher education background privilege a view of education as providing "marketable skills" (as opposed to "knowledge," which is emphasized by graduates of higher education institutions), which comes in turn with a strong preference for workfare policies and against compensatory social spending.[5] In short, we expect workfarist attitudes to mediate the negative relationship between dual VET background and demand for compensatory social policy. In addition, we expect workfarist attitudes to contribute to the mitigation of the relationship between automation risk and social policy preferences.

Skill Certification

Lastly, the *skill-certification mechanism* builds on the uniqueness of dual VET's authoritative certification of skills, inspired at a theoretical level by Streeck's (2011) encompassing critique of the aforementioned "asset theory of social policy preferences" (Iversen and Soskice, 2001) and the Varieties of Capitalism (VoC) literature more generally (Hall and Soskice, 2001). Streeck's critique is wide-ranging. For our purposes, we note two aspects. First, Streeck (2011, 23) argues that the skills produced by dual VET are in fact "broader" than the asset theory would predict, as they feature a consolidated curriculum in the first two years of an apprenticeship for "adjacent occupations" as well as an "academic part of vocational training" that "was upgraded to a point where a growing segment of youth were no longer able to meet the ever higher academic demands." In most dual VET systems, general skills are a key part of the mandatory training content (e.g. literacy and numeracy). For this reason, Schulz, Solga and Pollak (2023, 15) argue that "skill-use differentials between vocationally and tertiary-educated workers are rather small overall" and that these "observed differences in skill use remain rather stable across career stages." Similarly, Adda and Dustmann (2023, 458) demonstrate that vocationally-educated workers accumulate experience in cognitive-abstract tasks throughout their labor market careers, which helps sustain wage growth later in the life cycle.

Second, Streeck (2011, 5) argues that these (broad rather than "just specific") skills are authoritatively certified by governments, business, and unions consisting of a "system of occupations and occupational training profiles that, through publicly supervised examination and certification of acquired skills, allowed

[5] In companies, VET trainees might also get in contact with unions or work councils. However, companies are responsible for training provision and content definition, which suggests that their framing is more likely to prevail. Furthermore, union membership rates have reached multi-decade lows in many countries, indicating that they are less effective at getting their message across.

for, in principle, unlimited mobility of workers in nationwide sectoral labor markets" (see also Busemeyer 2009). The equation of dual VET with few general skills, a focus on routine manual tasks, and the absence of mobility between occupations, promulgated by the VoC literature, thus reflects an outdated conception of dual VET (see also Gathmann and Schönberg, 2010; Adda and Dustmann, 2023; Schulz, Solga and Pollak, 2023; Mayer, Grunow and Nitsche, 2010)(*blinded for review1*).

These features become particularly salient in the transition to the knowledge economy. Given employers' centrality in the definition of training content and the provision of training, dual VET is particularly responsive to labor market needs and constantly adapts to employers' demands, which, in the transition to the knowledge economy, means incorporating in the curricula the skills needed to cope with technological change (Emmenegger and Bonoli, 2022; Weiss, 2015)(*blinded for review1*). For this reason, VET educated workers have at their disposal portable (i.e. broad and authoritatively certified) skills that are perceived as being developed in close correspondence with labor market needs and with employers' buy-in. Therefore, we hypothesize that VET graduates perceive their skills to cushion rather than amplify the threat of automation, which should lower demand for compensatory social policy and contribute to mitigating the effect of automation risks on support for generous social policy.

Hypotheses

Table 1 summarizes our expectations and the observable implications. The conventional perspective holds that the risk deriving from skill specificity is associated with higher demand for compensatory social policy and adds on to the risk of automation (*risk magnifier hypothesis*). For this reason, a dual VET background should be associated with higher levels of support for compensatory social policy. For the same reason, a dual VET background should magnify the effect of automation risk on demand for compensatory social policy. In contrast to this conventional perspective, the *risk mitigator hypothesis* holds that a dual VET background decreases support for compensatory social policy in the age of automation. It does so through three non-mutually exclusive mechanisms: material self-interest, workplace socialization, and skill certification. In the empirical analysis, we will use mediation analysis to examine these three mechanisms. Finally, we argue that a dual VET background also mitigates—not magnifies—the effect of automation risk on demand for compensatory social policy. In the empirical analysis, we will use moderation analysis to examine this mitigation effect. However, first, we will discuss the research design and data that we use to put these hypotheses to an empirical test.

Table 1: Hypotheses

Risk magnifier hypothesis:	Dual VET background leads to higher demand for compensatory social policy and magnifies the effect of automation risk on demand for compensatory social policy.
Risk mitigator hypothesis:	Dual VET background leads to lower demand for compensatory social policy and mitigates the effect of automation risk on demand for compensatory social policy.
Mechanisms:	
(1) Material self-interest:	Dual VET graduates command a comparatively high income, especially at the beginning of their professional career. Income levels mediate the negative effect of dual VET background on demand for compensatory social policy.
(2) Workplace socialization:	Dual VET graduates have comparatively workfarist attitudes, which mediate the negative effect of dual VET background on demand for compensatory social policy.
(3) Skill certification:	Dual VET graduates are less concerned about their ability to find new employment, which mediates the negative effect of dual VET background on demand for compensatory social policy.

Data and Methods

Data

Our main data source is the 2016 wave of the European Social Survey (ESS). The ESS is a biennial survey of demographic and attitudinal characteristics of European populations, with changing special modules. The 2016 iteration includes a module on welfare attitudes and covers 23 countries.[6] Additionally, for the analysis of the skill certification mechanism, we rely on data from an original survey that we conducted in spring 2024 (hereafter "VET survey"). This survey covers seven countries (DK, EN, FR, DE, IT, PT, SE) and allows us to perform a mediation analysis, which was not possible with ESS data.[7] Given our substantive interest in attitudes towards compensatory social policy, we restrict our sample to working-age individuals. Our dependent variable reads as follows:

- "Is it the government's responsibility to ensure a reasonable standard of living for the unemployed?"
  (0 = not government's responsibility at all; 10 = entirely government's responsibility)

Scholars interested in the political responses to automation risk have looked at a variety of outcomes, including support for activation policies, early retirement schemes, or a universal basic income. We focus on unemployment support because an increase in demand for compensatory policy, and especially for unemployment support, has been the closest to a consistent finding in this literature (Kurer and Häusermann,

[6] AT, BE, CH, CZ, DE, EE, ES, FI, FR, GB, HU, IE, IL, IS, IT, LT, NL, NO, PL, PT, RU, SE, SI.
[7] For additional information on the VET survey, please consult the pre-analysis plan (*link blinded for review*).

2022; Busemeyer et al., 2023; Gallego and Kurer, 2022; Weisstanner, 2023)(*blinded for review2*). It is also conceptually most closely related to unemployment risk, as unemployment benefits are likely the most immediate concern of people who lose their job due to automation. Thus, we expect to find a negative effect of dual VET on demand for unemployment support, and a moderating effect of dual VET on the relationship between automation risk and demand for unemployment support.

Our main explanatory variables are individual VET status and occupational routine task intensity (RTI). We capture people's educational background with a 3-category variable distinguishing between non-tertiary vocational education ("VET non-tertiary"),[8] general non-tertiary education ("GE non-tertiary"), and a bachelor's degree or higher at a university or university of applied science ("university degree"). The coding procedure is described in detail in Appendix A. This approach yields two categories with comparable level of education (VET non-tertiary and GE non-tertiary), and third group of people with tertiary education. We also create a version of the variable where we collapse the two non-VET categories, but to ensure that we compare like with like, we use GE non-tertiary as our primary reference category.

Unfortunately, the cross-country ESS data do not allow us to distinguish between dual VET (combining school- and firm-based learning) and fully school-based VET. According to our theoretical argument, the risk-mitigating role and the material self-interest, workplace socialization, and skill certification effects should be visible mainly in the case of dual VET . To alleviate this limitation of the ESS data, we have collected country-level information on the shares of upper-secondary students who were enrolled in dual and school-based VET programs, respectively, in 2016 (from OECD.stat and country-specific sources, see (*blinded for review1*)). If the VET effect is indeed primarily driven by graduates of dual programs, this implies that there should be an interaction between the dual VET share and automation risk.

To further strengthen our case, we conduct separate analyses on the so-called "DACH" countries (Germany, Austria, Switzerland), for which the ESS data allow us to construct an approximate mapping of the educational codes onto dual and school-based VET at the individual level (see Appendix A for details). Next to data availability, we examine these three countries because they all feature sizeable dual VET, school-based VET, and tertiary sectors, allowing us to examine differences in attitudes between graduates from these three educational sectors. With this approximate indicator of dual VET status at the individual level, we can show that dual VET is indeed distinct from school-based VET in its effect on social policy preferences.

Our other independent variable is routine task intensity (RTI) as a measure of objective automation risk. This reflects the prominent argument that workers in more routine-task-intensive occupations are at greater

[8] Advanced vocational qualifications (ISCED 5B) are included in this category, since they do not result in an academic degree, even though they are classified as short-cycle tertiary programs.

risk of unemployment and hence should demand more generous unemployment benefits. To operationalize automation risk, we calculate RTI scores using 2-digit ISCO-08 task content data from the European Working Conditions Survey (EWCS) following the procedure of Haslberger (2022). This measure is similar to the widely used RTI scores of Goos, Manning and Salomons (2014) but contains important improvements such as a better matching of concepts and empirical measures and the use of up-to-date European task data. Thus, for an analysis of ESS data it is superior to the Goos, Manning and Salomons (2014) measures.[9] It is important to note at the outset that, while VET status and RTI are significantly correlated, the relationship is modest in size (r = 0.19).

As control variables, we include important individual-level characteristics (gender, age, years of education, household income decile, union membership, unemployment, private sector employment, left-right ideology). All these variables have been found to be important predictors of support for redistribution and compensatory social policy in previous work (see e.g. Gingrich and Kuo 2022; Weisstanner 2023; Kurer and Häusermann 2022). In particular, controlling for years of education allows us to isolate the effect of education *type* from that of education *level*, and thus addresses some of the selection issues inherent to an observational study like ours. Similarly, by controlling for private sector employment, we account for potential heterogeneous effects of vocational training in the private and public sectors. At the country level, we control for the average unemployment rate in the survey year and the two preceding years (data from ILOSTAT) to account for national labor market performance and the dual VET share in the survey year (data from (*blinded for review1*).

Analytical Strategy

In the first part of our analysis, we are interested in the direct relationship between VET status and demand for compensatory social policy. Our baseline specification therefore is a multilevel model with random country intercepts that combines individual and country level data and takes the following form:

$$y_{ic} = \alpha_c + \beta_1 VET_{ic} + \hat{\beta}_2 X_{ic} + \hat{\beta}_3 X_c + e_{ic} \tag{1}$$

α_c is a random country intercept and $\beta_1 VET_{ic}$ is the indicator of an individual's VET status. $\hat{\beta}_4 X_{ic}$ is a vector of individual-level control variables (including RTI) and $\hat{\beta}_5 X_c$ a vector of country-level covariates, and finally e_{ic} is the residual error term. Our risk mitigator hypothesis posits that β_1 should be negative.

In the second part of the analysis, we argue that individuals who have received a vocational education—especially if it involved firm-based training—show a muted increase in their demand for social protection in

[9] Our results replicate if we use the Goos, Manning and Salomons (2014) measures (available upon request).

response to automation risk. To test this argument, we add an occupation-level measure of RTI ($\beta_2 RTI_{ic}$) and an interaction term between VET status and RTI ($\beta_3 VET_{ic} \times RTI_{ic}$), yielding the following equation:

$$y_{ic} = \alpha_c + \beta_1 VET_{ic} + \beta_2 RTI_{ic} + \beta_3 VET_{ic} \times RTI_{ic} + \hat{\beta}_4 X_{ic} + \hat{\beta}_5 X_c + e_{ic} \quad (2)$$

The risk mitigator hypothesis implies that the interaction coefficient β_3 should be negative. The main effect of VET status (β_1) should also be negative, while the coefficient on RTI (β_2) should be positive. In the analysis for the DACH countries, we estimate fixed effects models with clustered standard errors to account for the small number of clusters. Across all models, observations are weighted using the analytical survey weights provided by the ESS. To test our mechanisms, we rely on mediation analyses that we describe in detail below.

Results

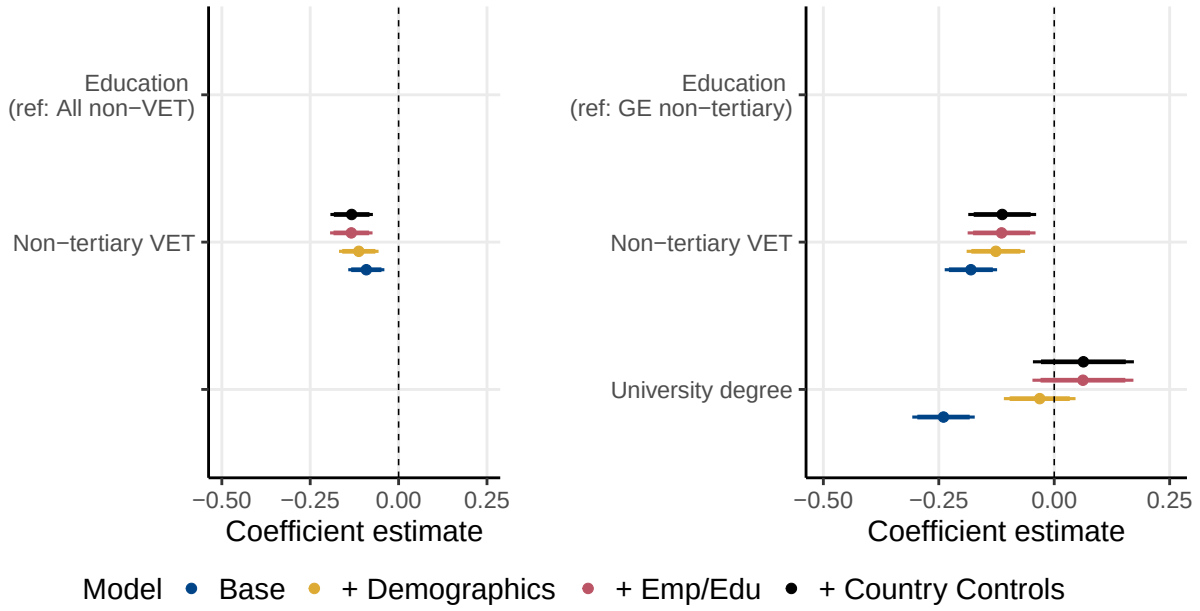
Our empirical analysis proceeds in three steps. First, we establish that having a VET background has a strong negative association with support for compensatory social policy. We also provide evidence that material self-interest and workplace socialization are important drivers of this relationship, while skill certification plays no major role. In a second step, we show that having a VET background severs the link between occupational routine-intensity and support for compensatory social policy, and present evidence that this is driven specifically by dual VET. Finally, to more forcefully argue this point, we zoom in on data from the DACH countries which allow us to distinguish whether individuals have a dual or a school-based VET background, and show that dual VET but not school-based VET attenuates the relationship between automation risk and support for compensatory social policy. For clarity, we make explicit when we refer to *dual* VET (combining school-based and firm-based training); where we refer to VET without further qualification, the data include school-based and dual VET.

VET is Linked to Lower Support for Compensatory Social Policy

We first show in Figure 1 that having a VET background is negatively related to support for unemployment benefits. In the panel on the left, we compare people who have a VET background to all those who do not, including those with higher education. The panel on the right shows that people with a VET background are distinct from both higher educated respondents with a university degree and respondents who have a similar highest level of education but with a general orientation. In both cases, respondents with a VET background stand out as significantly less supportive of compensatory social policy than people with different educational

backgrounds. We build our models by successively adding controls. The base model includes only the VET status indicator, the second model adds basic socio-demographic controls (age, sex, income), the third model adds controls related mainly to education and employment (years of education, RTI, employment status, private sector employment, union membership, political orientation), and the full model additionally accounts for country-level factors (dual VET share, unemployment rate). The full model is our default specification throughout the remainder of the paper. Regardless of the set of controls, the coefficient on VET status remains statistically significant and negative. This confirms the first part of our risk mitigator hypothesis: VET is linked to lower support for compensatory social policy.

Figure 1: VET background is associated with lower support for compensatory social policy



Note: Estimates from multilevel models with random country intercepts with 90% and 95% confidence intervals (thick and thin lines). Base: no controls. + Demographics: age, sex, household income. + Emp/Edu: years of education, RTI, employment status, private sector employment, union membership, political orientation. + Country Controls: dual VET share, unemployment rate. N = 34,053/27,840/22,969/22,969 (left panel) and 33,927/27,777/22,920/22,920 (right panel). For full results, see Table B1 and Table B2.

Interestingly, the right panel of Figure 1 shows that university-educated individuals are less supportive of compensatory social policy than people with general non-tertiary education in the unconditional model, but once we add the individual-level controls, this is reversed. No such reversal is observed for people with a VET background. The coefficients for the control variables can be studied in Table B1 and Table B2 in the appendix. Notably, RTI is positively associated with support for unemployment benefits, which aligns with previous literature that has found positive or null effects of automation risk on support for passive labor market policies (Gallego et al., 2022; Kurer and Häusermann, 2022; Busemeyer and Tober, 2023; Weisstan-

ner, 2023). Since individuals with a vocational education often work in routine-intensive occupations (the individual-level correlation in our data is r = 0.19), the negative effect of having a VET background suggests that VET systems may moderate the relationship between technological risk and support for compensatory social policy. Moreover, we find in line with other studies that additional years of secondary education reduce support for redistribution (Marshall, 2016; Bullock, 2021; Gelepithis and Giani, 2022). Thus, even conditional on the level of education, the type of education exerts an independent effect on support for unemployment benefits. This finding underscores our motivating observation that studies which ignore the role of types of education, and VET in particular, are in danger of missing an important link.

Potential Mechanisms

Our theoretical discussion identified three mechanisms through which dual VET might reduce demand for compensatory social policy, which we termed the material self-interest, workplace socialization, and skill certification mechanisms. We investigate these three—non-mutually exclusive—mechanisms using mediation analyses. We find strong evidence for the self-interest and workplace socialization mechanisms but not for the skill certification mechanism.

We perform the mediation analyses using a product of coefficients approach (Sobel, 1982; MacKinnon et al., 2002), calculating the direct effect of non-tertiary VET and the indirect effect of the mediator, and their relative contribution to the total effect on support for compensatory social policy. The procedure requires the estimation of two models: the mediator model

$$M = \alpha_0 + \alpha_1 T + \beta C + u \tag{3}$$

and the outcome model

$$Y = \gamma_0 + \gamma_1 T + \gamma_2 M + \delta C + v \tag{4}$$

where M represents the mediator, T the treatment (VET), and Y the outcome (support for unemployment benefits). The direct effect is γ_1 and the indirect effect is $\alpha_1 \times \gamma_2$. We calculate the standard errors of the indirect effects using the delta method. The total effect is the sum of the direct and indirect effects. The portion of the effect that is mediated is the ratio of the indirect effect over the total effect. Table 2 provides an overview of the mediator variables used to test the three mechanisms. We include the same control variables as in the full models in Figure 1 and use both the VET dummy and the 3-category variable. The figures below therefore show three sets of coefficient estimates, representing the effect of having a VET qualification

relative to any non-VET qualification, non-tertiary GE, or a university degree.

Table 2: Mediation analysis of mechanisms

Mechanism	**Mediator Variables**
Material self-interest	Household income decile (1 = bottom 10%; 10 = top 10%)
Workplace socialization	Workfarist attitudes: "To what extent [do] you agree or disagree that social benefits and services in [country] place too great a strain on the economy?" (1 = disagree strongly; 5 = agree strongly)
Skill certification	Difficulty of finding a new job: "How difficult or easy would it be for you to get a similar or better job with another employer if you had to leave your current job?" (0 = extremely difficult; 10 = extremely easy) Skill portability: "Do you know of any other employers who would have good use for what you have learned in your present job?" (0 = No/learned nothing in this job; 1 = Yes, one or two/some/many)

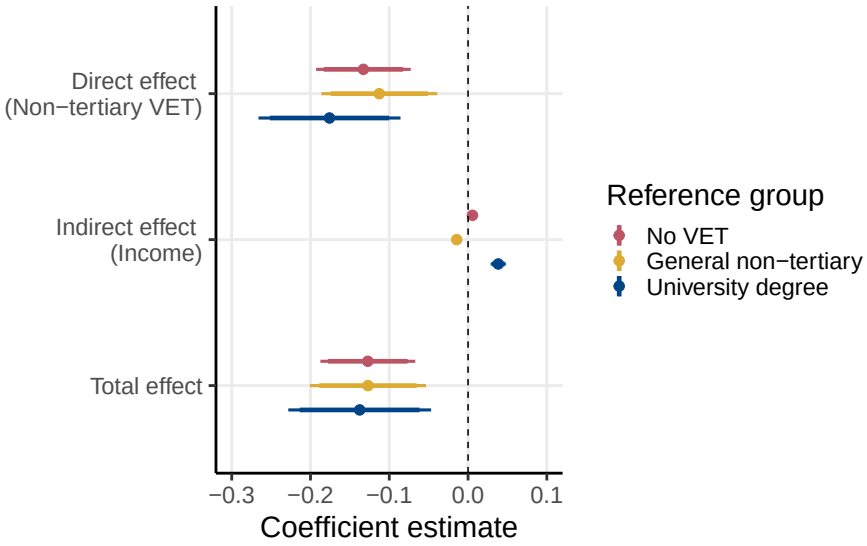
Material Self-Interest

Drawing on the literature on the education-wage-social-policy nexus, we argued that VET might reduce demand for compensatory social policy by enabling VET graduates to earn higher wages than individuals with a comparable level of education and fostering social policy preferences aligned with safeguarding their material self-interest. Our results support this argument: Differences in income levels mediate the negative relationship between a dual VET background and demand for compensatory social policy. Specifically, Figure 2 shows that income amplifies the effect of non-tertiary VET compared to non-tertiary GE, aligning with the total effect, while it counteracts the effect compared to individuals with a university degree, working in opposition to the total effect. For non-tertiary GE, the indirect effect accounts for approximately 11% of the total effect, indicating that income differences play a modest but important role in shaping the reduced support for compensatory social policy among VET-educated individuals relative to GE-educated individuals. In contrast, using university degree holders as the reference group, income acts as a suppressor, opposing the total effect and reducing it by 28%. This suggests that if VET graduates earned salaries comparable to university graduates, their opposition to compensatory social policy would be even stronger. Incidentally, this also hints at a possible role for socialization, which we investigate in the next section.

Another corollary of our argument is that the difference in material self-interest should be most pronounced among younger workers. This is because VET graduates start out with higher salaries than their peers, who then catch up during their labor market careers (e.g. Hanushek et al. 2017; Schulz, Solga and Pollak 2023). Borrowing from the literature on the scarring effects of unemployment (e.g. Emmenegger, Marx

and Schraff 2017), we expect that the early experience of gainful employment and paying taxes, while much of their age cohort still relies on parental or state support, may induce opposition to compensatory social policy, which only recedes slowly over time. Figure C3 in the appendix provides evidence in support of this conjecture. Among individuals under 35 years of age, having a vocational qualification nullifies the strongly positive and significant effect of RTI on unemployment support among people with general non-tertiary education. The interaction weakens slightly among prime-age workers aged 35-49 and disappears entirely in the group of older workers (50-65 years). Overall, our analysis suggests that the material self-interest of dual VET-educated workers—especially younger ones—is one of the mechanisms by which VET reduces support for compensatory social policy.

Figure 2: Income mediates the effect of VET



Note: Between -28% and 11% of the total effect of VET on support for unemployment benefits are mediated by income. N = 22,969 (Ref: No VET); N = 22,920 (Ref: General non-tertiary/University degree). For full results, see Table B3.

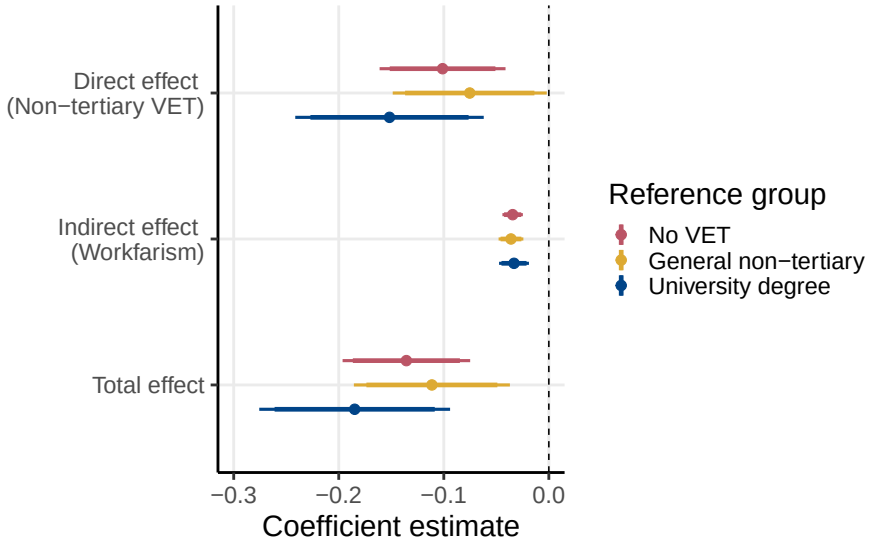
Workplace Socialization

The workplace socialization hypothesis holds that workplace training inculcates workfarist attitudes. Where students are socialized in the workplace, we reason, they are likely, in their "impressionable years" (Schuman and Scott, 1989), to be more exposed to discourses framing government intervention as burdensome and dependency on the government as objectionable than in general schooling. By shaping their ideological outlook, this should cause individuals with a dual VET background to oppose generous unemployment benefits. Thus, we posit that the effect of dual VET is partially mediated by attitudes towards state intervention in general. Empirically, our mediator is agreement with the statement that "social benefits and

services place too great a strain on the economy." This question captures views of the role of the state in general, rather than the specific policy problem of support for the unemployed, and can therefore serve as a proxy for workfarist attitudes.

Using the same mediation approach as above, in Figure 3 we find that having a VET background substantially increases agreement with the statement that benefits place too great a strain on the economy. Workfarism in turn is strongly negatively related to support for unemployment benefits. We estimate that between 18% and 32% of the total effect of VET are mediated by the workplace socialization mechanism, depending on the reference category. When non-tertiary GE serves as the reference category, the indirect effect through workfarism accounts for 32% of the total effect of VET. Relative to university-educated individuals, the indirect effect accounts for a still substantial 16% of the total effect, while for the catch-all reference group the percentage mediated is in between with 25%. Clearly, these are substantively meaningful mediation effects which indicate that socialization into more workfarist views plays an important role in shaping the relatively negative attitudes of VET-educated individuals towards compensatory social policy. This strongly suggests that workplace socialization is another substantively important mechanism through which (dual) VET reduces support for compensatory social policy.

Figure 3: Socialization mediates the effect of VET



Note: Between 18% and 32% of the total effect of VET on support for unemployment benefits are mediated by workfarist attitudes. N = 22,504 (Ref: No VET); N = 22,458 (Ref: General non-tertiary/University degree). For full results, see Table B4.

Skill Certification

The skill certification hypothesis holds that dual VET skills are highly portable due to authoritative certification, making holders of a dual VET qualification confident that they could quickly find a new job of similar quality if they should become unemployed. Hence, they are unlikely to personally benefit from generous unemployment benefits and therefore less supportive of compensatory social policy. To test this mechanism we estimate whether answers to the questions "Do you know of any other employers who would have good use for what you have learned in your present job?" and "How difficult or easy would it be for you to get a similar or better job with another employer if you had to leave your current job?" mediate the effect of VET on support for unemployment benefits. Since these questions were not asked in the 2016 wave of the ESS, we rely on data from our own survey of seven European countries, which we ran in the spring of 2024. We estimate mediation models similar to the ones above, with the same reference groups.[10]

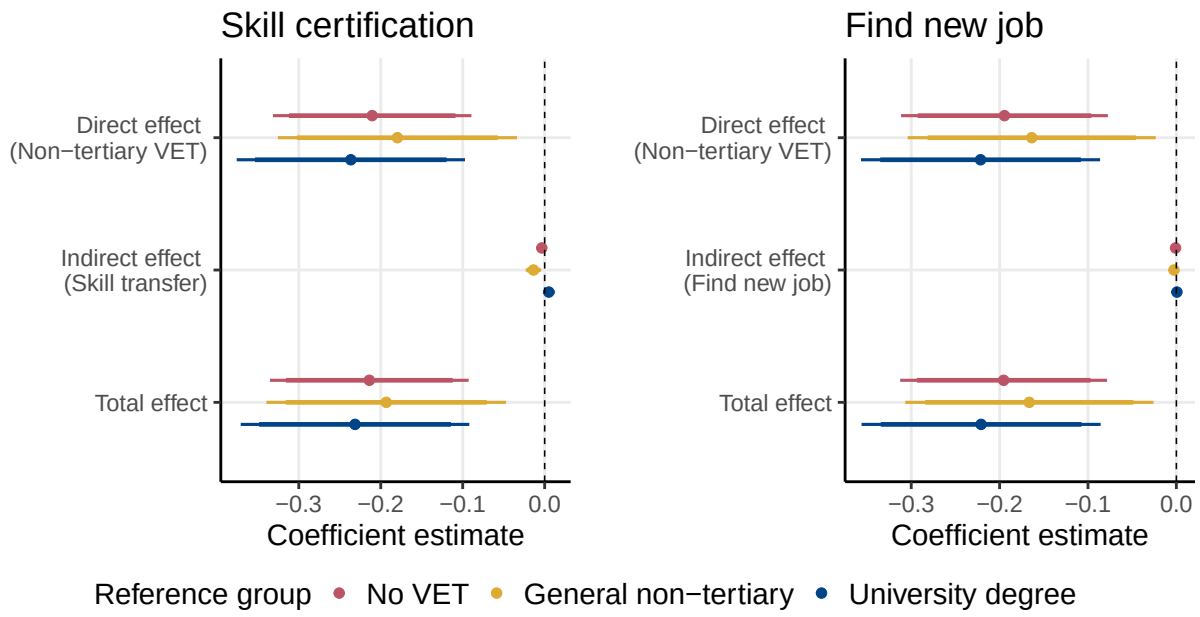
Our analyses do not support the skill certification mechanism. The left panel of Figure 4 shows that at most 7% of the total effect on support for unemployment benefits operates through people with a VET background being more confident in the transferability of their skills. When comparing people with a vocational background to those with a university degree, skill transferability even exerts an effect in the opposite direction, reducing the total effect by a minuscule 2%. This shows that skill transferability is not behind the lower support of VET-educated individuals for compensatory social policy. The right panel shows much the same picture for the question about the ease with which people expect to find a new job. The indirect effect is almost exactly zero, with at most 2% of the total effect operating through this channel. Our mediation analysis thus paints a consistent picture contradicting the skill certification hypothesis: we find no evidence that VET-trained individuals show lower support for unemployment benefits because they view their skills as highly portable.

VET Attenuates the Effect of Automation Risk, Driven by Dual VET

So far, we have established empirical support for the first element of our risk mitigator hypothesis—having a VET background leads to lower demand for compensatory social policy—and for two of the three hypothesized mechanisms. We now move to test the second part of the risk mitigator hypothesis which holds that (dual) VET attenuates the relationship between automation risk and support for unemployment benefits. To this end, we estimate a model interacting educational background and RTI. Figure 5 shows how the

[10]The VET survey did not ask about union membership or years of education and only collected 1-digit occupation codes. Thus, the models are largely identical to those using ESS data, but do not control for union membership or years of education and use occupation dummies instead of RTI scores. We replicate the analyses using data from the 2010 wave of the ESS, when the mediator questions were last asked, and find substantively identical results. We therefore only show the results using the more recent data; results using ESS 2010 data are available upon request.

Figure 4: Skill certification mechanism



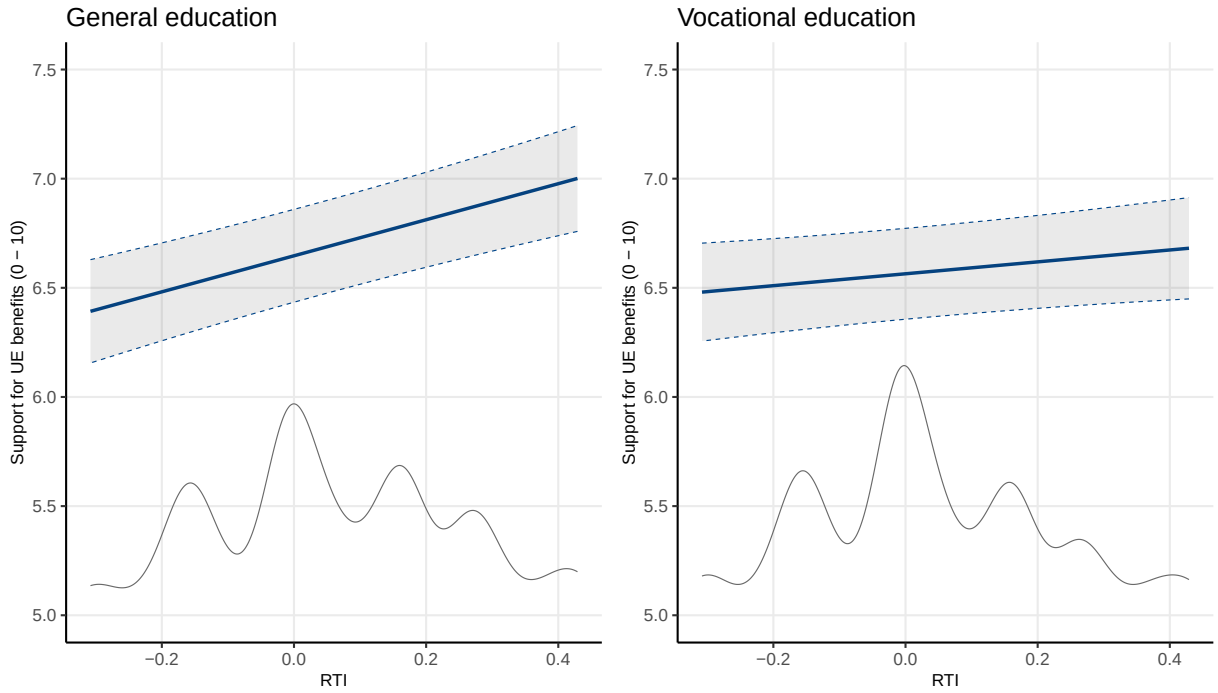
Note: Between -2% and 7% of the total effect of VET on support for unemployment benefits are mediated by skill certification and portability. N = 7,689 (left panel); N = 8,190 (right panel). For full results, see Table B5 and Table B6.

relationship between RTI and support for unemployment benefits differs between individuals with general non-tertiary education (left panel) and those with a VET background (right panel).[11] At the bottom of the panels, we also include kernel density plots of RTI which show that both groups tend to work in occupations with similar RTI. In individuals with a GE background, support for unemployment benefits increases significantly with routine-intensity, in line with the predominant narrative. The size of this increase is substantively meaningful, amounting to 27% of a standard deviation from the least to the most routine-intensive occupation. For VET-educated individuals, however, we find no significant relationship; support for unemployment benefits is essentially flat over the RTI distribution. Accordingly, the interaction coefficient is highly statistically significant ($p < 0.01$). This is also illustrated in Figure C1 in the appendix, which shows that at above-median levels of RTI, the marginal effect of VET status differs significantly between people with non-tertiary general and vocational education. Especially in routine-intensive occupations, individuals with general non-tertiary education therefore express on average significantly higher support for compensatory social policy than people with a VET background.

Since we cannot observe dual VET status at the individual level in all ESS countries, we substantiate our claim that dual VET is driving the relationship by interacting RTI with the dual VET share of enrollment

[11] In the interest of readability, we focus on the comparison between individuals with general and vocational non-tertiary education, that is, with similar levels of education, but a different program orientation. For the full model output including estimates for people with a university degree, please consult the tables in Appendix B.

Figure 5: Vocational education nullifies the effect of RTI on support for unemployment benefits

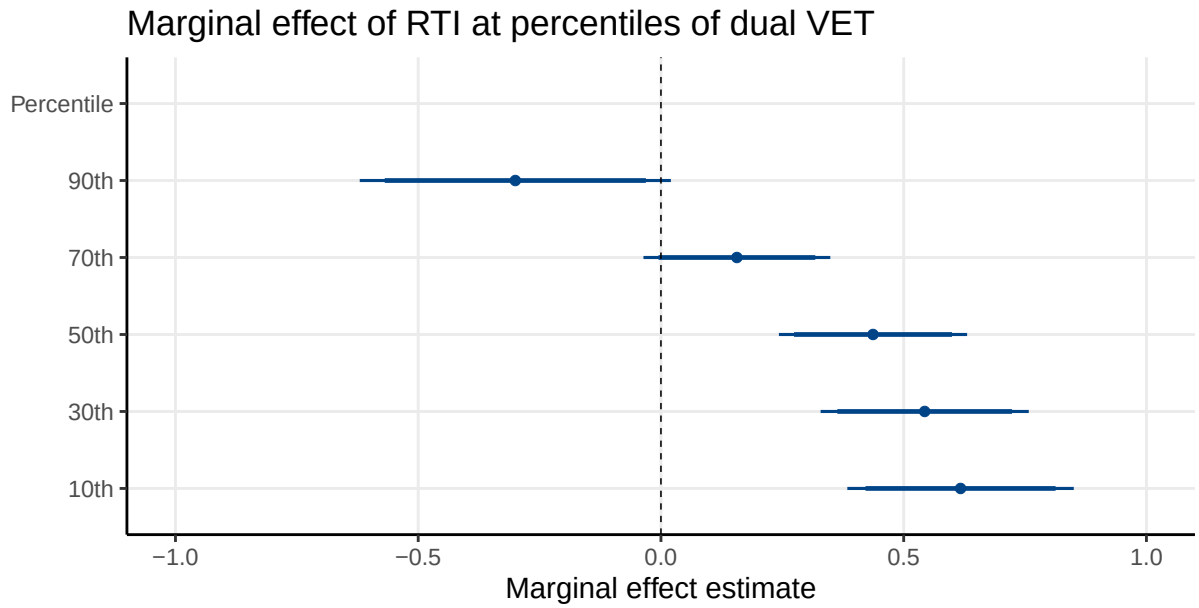


Note: Predicted support for unemployment benefits across the distribution of RTI, by educational background, with 95% confidence bands. Density of RTI at the bottom. N = 22,920. For full results, see Table B7.

at the upper secondary level. In Figure 6, we plot the marginal effect of RTI at different percentiles of the dual VET share of upper secondary enrollment. In line with our argument, we find that RTI is significantly positively associated with support for compensatory social policy where enrollment in dual VET is low, but the relationship becomes statistically insignificant around the 70^{th} percentile and even turns negative at higher shares of dual VET enrollment. This finding strongly indicates that the individual-level attenuation effect that we documented in Figure 5 is primarily due to individuals who have a *dual* VET background.

In firm support of the risk mitigator hypothesis, we find evidence for the view that VET skills constitute a missing link between automation risk and individuals' social policy preferences. Crucially for the debate about the policy implications of technology-induced automation, we show that the link between RTI and demand for compensatory social policy is absent in people with a VET background. Moreover, we find that this is driven by countries where dual VET predominates. However, individual-level information about the orientation of VET qualifications is needed to conclusively establish this relationship. We turn to this in the next section.

Figure 6: Where the dual VET share is high, there is no relationship between RTI and support for unemployment benefits



Note: Marginal effect of RTI on support for compensatory social policy for different levels of the dual VET share, with 90% and 95% confidence intervals (thick and thin lines). N = 22,920. For full results, see Table B7.

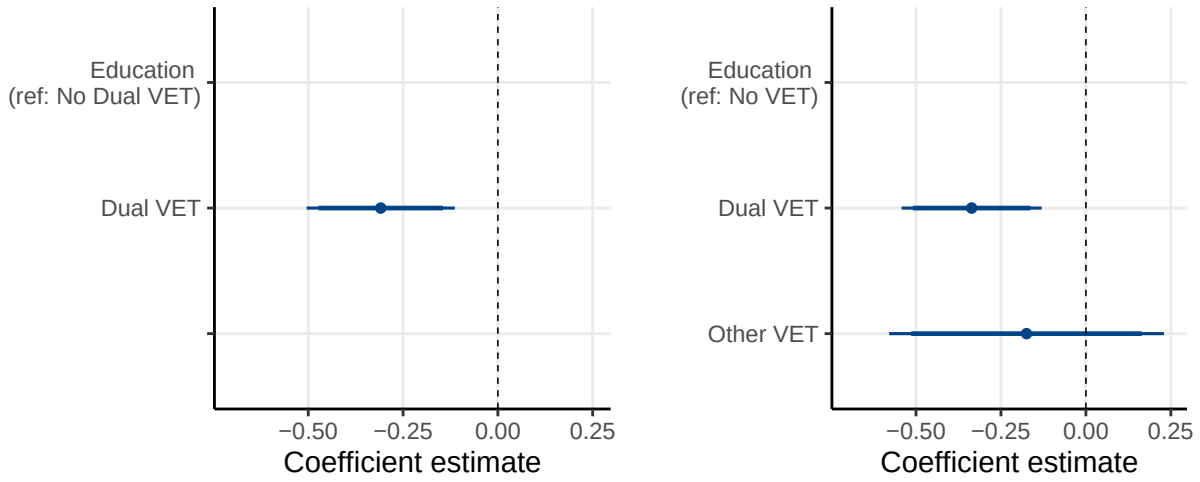
The Effect of Dual VET Status in the DACH Countries

In the analyses so far, we have been limited by the fact that the harmonized education data in the ESS do not allow us to distinguish between school-based and dual VET at the individual level. However, some countries have national coding schemes that allow us to determine with reasonable accuracy whether individuals have a dual VET background. We therefore use the case of the DACH countries (Germany, Austria, Switzerland), where both school-based and workplace-based VET are common, to further investigate whether the pattern we detected is really driven by dual VET.[12] Mirroring our earlier approach, we create two indicators: a dummy that takes the value "1" for people who have a *dual* VET background and "0" otherwise, and a categorical indicator to capture whether individuals have obtained a dual ("dual VET") or a school-based VET qualification ("other VET"), or have no VET background at all ("no VET"). Due to the small number of countries, we estimate fixed effects models with clustered standard errors in the following analyses.

We first replicate the models from Figure 1. We see in the left panel of Figure 7, which uses "no dual VET" as the reference category, that the dual VET effect in the DACH countries is approximately two times the size of the overall VET effect in the left panel of Figure 1. In the panel on the right, we disaggregate the data further to show that individuals with a dual VET background differ from those with school-based VET.

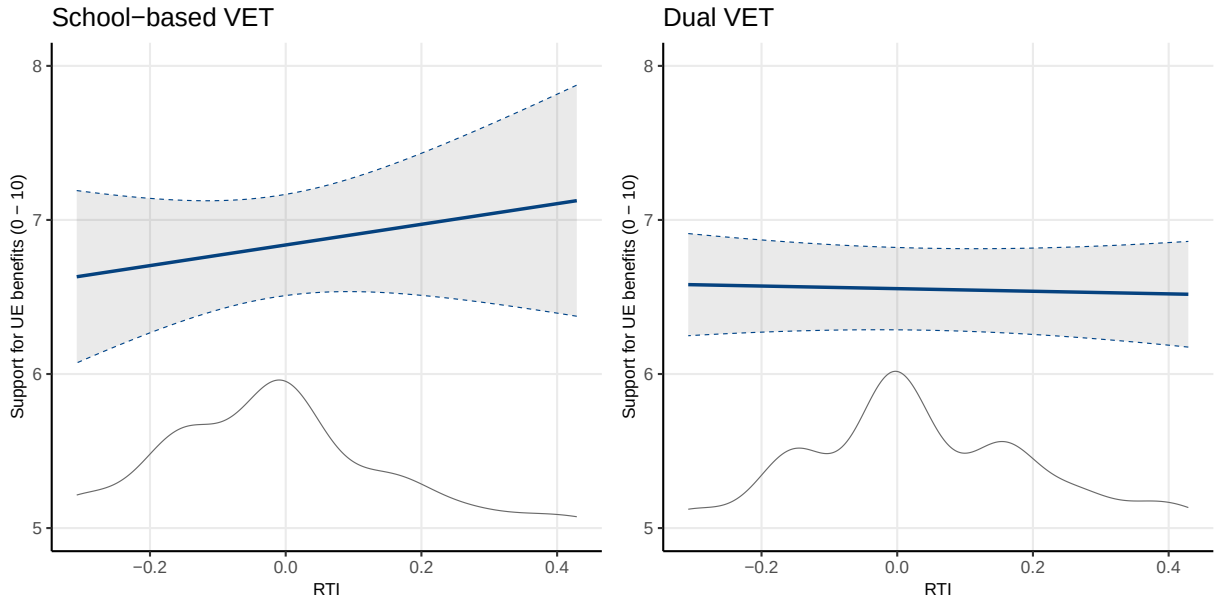
[12]Details about the coding scheme can be found in Appendix A, where we also discuss some ambiguous cases.

Figure 7: The effect of dual VET in the DACH countries



Note: Model estimates with 90% and 95% confidence intervals (thick and thin lines). The models include the full set of individual-level controls, as well as country fixed-effects and clustered standard errors. N = 3,733 (left panel) and 3,735 (right panel). For full results, see Table B8.

Figure 8: Only dual VET severs the link between RTI and support for compensatory social policy in the DACH countries



Note: Predicted support for unemployment benefits across the distribution of RTI, by type of VET background, with 95% confidence bands. Density of RTI at the bottom. N = 3,735. For full results, see Table B8.

We find that, while people with school-based VET are not statistically significantly different from DACH residents without a VET background in their support for compensatory social policy, the effect for dual VET graduates is negative, large, and highly significant. These results clearly highlight the difference between dual VET and not just non-VET tracks, but also school-based VET. Although the difference between dual VET and school-based VET is not itself statistically significant (largely owing to the limited sample size of the school-based VET group), it is apparent that dual VET in the DACH countries is qualitatively different from school-based VET. Moreover, in contrast to the 23-country sample, in the DACH models the coefficient on RTI is not significantly different from zero. This result reinforces our earlier finding that in countries with high dual VET enrollment, there is no relationship between automation risk and support for compensatory social policy (see Figure 6).

To test whether the second element of the risk mitigator hypothesis also holds in the DACH countries, we replicate the model from Figure 5, this time comparing school-based VET and dual VET. The left panel of Figure 8 shows a positive relationship between RTI and support for unemployment benefits in people with a school-based VET qualification. The estimated effect size is in the same range as in the general education group in the left panel of Figure 5. However, the effect of RTI on people with school-based VET is less precisely estimated due to the small sample size of that group. By contrast, the right panel shows that in people with a dual VET background, there is a precisely estimated null relationship between RTI and support for unemployment benefits. This provides crucial individual-level evidence that *dual VET*, and not school-based VET, mitigates automation risk, as we hypothesized. Figure C2 in the appendix illustrates that the marginal effect of dual VET status compared to school-based VET is negative across the entire distribution of RTI, but only statistically significant at the 5% level between approximately the 50^{th} and 80^{th} percentile (significant at 10% approximately above the 45^{th} percentile). The evidence from the DACH countries thus falls short of a "smoking gun"—although this seems to be due to the imprecise estimation in the small school-based VET group—but it adds to the weight of the evidence, which in its totality strongly suggests that a dual VET background has a distinct negative association with support for compensatory social policy and moderates the impact of automation risk on social policy preferences.

Discussion and Conclusions

In this paper, we sought to advance the literature on the political consequences of technological change by analyzing the role of dual VET (i) in accounting for social policy preferences in the age of automation and (ii) in moderating the effect of technological change on demand for social protection. More specifically, we developed a theoretical argument centered on the impact of dual VET in three steps. First, we hypothe-

sized that a dual VET background dampens demand for compensatory social policy. Second, we identified three non-mutually exclusive theoretical mechanisms that mediate this relationship, namely (i) material self-interest, (ii) workplace socialization, and (iii) skill certification. Finally, we argued that a dual VET background mitigates the relationship between automation risk and demand for social protection.

Empirically, we mobilized cross-country data from the ESS with a detailed analysis of the Austrian, German, and Swiss ESS modules to ascertain the impact of dual VET on preferences for generous unemployment benefits and their moderating effect on the relationship between automation risks and support for compensatory social policy. In strong support of our "risk mitigator" hypothesis, we found that individuals with a VET background are less supportive of compensatory social policy, that this effect is mediated by the material self-interest and workplace-socialization mechanisms (but not the skill-certification mechanism), and that the relationship between risk of automation and demand for compensatory social policy drops significantly among workers with a VET background in high dual VET countries. Ancillary evidence from the "DACH" countries exploited more fine-grained information on individuals' educational background to lend additional support to the expectation that dual VET reduces demand for compensatory social policy. Given that the three mechanisms are not mutually exclusive, we interpret the results as overall providing strong support to our theoretical propositions. In other words, in the age of automation, dual VET reduces support for compensatory social policy (i) by turning dual VET graduates against public spending on social policy to protect their above-average salaries and (ii) by socializing them in a workfarist environment that comes with a negative view of government intervention. Our paper, therefore, provides theoretical and empirical insights to fully integrate the role of education and training in the study of the political consequences of technological change.

Our findings challenge the "asset theory of social policy preferences," which posits a positive relationship between skill specificity and support for compensatory social policy (Iversen and Soskice, 2001; Estevez-Abe, Iversen and Soskice, 2001). This literature has portrayed dual VET skills as "specific" and therefore inherently "risky" due to low portability, fostering support for non-market mechanisms (e.g. unemployment protection) that provide insurance against the risk carried by investing in specific skills. While this argument has been already subject to critiques on both theoretical and empirical grounds (Streeck, 2011; Emmenegger, 2009; Busemeyer, 2009), it has come to characterize contemporary CPE research as a core element of the micro-foundations of one of its most successful research paradigms, namely VoC (Hall and Soskice, 2001). The context of technological change provides a critical case to reassess the asset theory, because dual VET has been traditionally associated with mid-skilled occupations that are particularly threatened by automation. According to the asset theory, therefore, we should expect dual VET to further increase demand for compensatory social policy given that such workers are now subject to a double risk: alongside the traditional

risk of holding specific skills, they are also employed in occupations that might be replaced by technology. We referred to this as the "risk magnifier" hypothesis.

Yet, we find strong evidence suggesting that the opposite holds true. Dual VET decreases support for compensatory social policy, as predicted by our alternative, "risk mitigator" hypothesis. This finding has two important implications. First, existing literature puts *de facto* exclusive emphasis on the provision of (specific) skills as the defining feature of dual VET. This narrow focus, however, might overshadow other features of dual VET that are of no less importance, as illustrated by strong evidence in support of our material self-interest and workplace-socialization mechanisms that have been shown to shape the social policy preferences of dual VET graduates. Second, and relatedly, the strong evidence in favor of the "risk mitigator" hypothesis questions the assumption of a causal relationship between dual VET and generous welfare states, suggesting that these two variables might stand in a relationship best characterized by co-evolution rather than complementarity (Boyer, 2005).

As extant research has produced thus far mixed results on the effects of automation risks on social policy preferences, our study highlighted *skills* as an important missing link in the debate. It showed that the *design* of education and training systems may be just as important as the *level* of skills that individuals attain. Depending on system design, individuals go through vastly different educational experiences and labor market transitions, with profound implications for their social policy preferences. Recent calls to better integrate the role of education and training systems in the literature on social policy preferences in the age of automation (cf. Gallego and Kurer, 2022; Özkiziltan and Hassel, 2020) seem to us, therefore, to point in the direction of a crucial issue. And we think of our article as the first major attempt to respond to such calls.

As we seek to chart a new line of research that assigns a greater role to education and training systems, we suggest at least two avenues for future research to further expand on our findings. First, our individual-level information drawn from cross-national ESS data does not distinguish between firm-based and school-based VET. We dealt with this issue by combining national-level data on the size of the dual VET system with an individual-level VET dummy. Moreover, we used data from the Austrian, German, and Swiss ESS modules that do allow to distinguish between dual and fully school-based VET at the individual level. However, it would be worthwhile exploring this relationship further via surveys that in the future will hopefully collect cross-national individual-level data on the type of VET background. Second, while we go beyond much existing research in our attempt to open up the black box and tease out the mechanisms that drive our main finding, the ESS data do not allow us to make strong causal claims. This paper should therefore serve as a starting point for further efforts to pinpoint exactly how dual VET (or other aspects of education and skill formation systems) shape the relationship between technology and social policy preferences. Detailed

single-country studies as well as experimental research will help to properly establish causal mechanisms. We hope that our paper will motivate further research into this issue.

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Appendix: For Online Publication

Contents

A Coding of Education Variables

The ESS allows researchers to come up with their own purpose-built educational variables based on the 3-digit variable *EDULVLB*. The first digit represents the 8 ISCED-11 levels. "The second digit reflects programme orientation (1: general and 2: vocational) at ISCED levels 2 to 5 programmes (programmes below the degree level)" (European Social Survey, 2016, 3). Since we treat both 'lower tier' and 'higher tier' higher education programs as such (that is, we do not consider universities of applied science as part of the VET system), the second digit is irrelevant for our purposes at ISCED levels 6 and above. The third digit, indicating program destination, is also irrelevant for our study. Based on these codes, we devise several variables for our analyses.

edu3 is a categorical variable which distinguishes between general education up to short-cycle tertiary education ("General non-tertiary"), vocational education up to short-cycle tertiary education at vocational colleges ("Non-tertiary VET"), and a bachelor's degree or higher at higher education institutions ("University degree"). It is our main variable as it allows us to compare vocationally educated respondents to people with a similar level of education (sub-degree) but a different program orientation, as well as to people with a higher level of education (university degree). We also use two simplified variables: The *vocational* dummy, which takes the value "1" for programs that are coded as "Non-tertiary VET" in *edu3* and "0" otherwise, and the *degree* dummy, which takes the value "1" for programs that are coded as "University degree" in *edu3* and "0" otherwise. The precise allocation can be seen in the color-coded Table A1. Table A2 shows the prevalence of vocational education by country, with familiar patterns of variation. The German-speaking countries have high VET shares, as do some Eastern European countries such as the Czech Republic, Hungary, and Slovenia. Southern Europe and the Anglo countries, on the other hand, mostly have low VET shares, as do Israel and Norway.

Note that we group short-cycle tertiary education (ISCED 5) with the "Non-tertiary VET" and "General non-tertiary" categories, since according to the UNESCO Institute for Statistics (2012, 48), they are typically "practically based, occupationally-specific and prepare students to enter the labour market." By contrast, programs at the bachelor's or equivalent level (ISCED 6) are typically "theoretically-based but may include practical components and are informed by state of the art research and/or best professional practice" (UNESCO Institute for Statistics, 2012, 51). Thus, their practical — as opposed to theoretical — orientation makes short-cycle tertiary programs qualitatively different from university education, even though they are strictly speaking classified as a form of tertiary education. Substantively, we believe that this is the appropriate way to handle short-cycle tertiary education, but in any case, our main results are robust to treating ISCED level 5 as part of degree-level education.

Table A1: Education codes in the ESS

Code	Label
0	Not completed ISCED level 1
113	ISCED 1, completed primary education
129	Vocational ISCED 2C < 2 years, no access ISCED 3
212	General/pre-vocational ISCED 2A/2B, access ISCED 3 vocational
213	General ISCED 2A, access ISCED 3A general/all 3
221	Vocational ISCED 2C >= 2 years, no access ISCED 3
222	Vocational ISCED 2A/2B, access ISCED 3 vocational
223	Vocational ISCED 2, access ISCED 3 general/all
229	Vocational ISCED 3C < 2 years, no access ISCED 5
311	General ISCED 3 >= 2 years, no access ISCED 5
312	General ISCED 3A/3B, access ISCED 5B/lower tier 5A
313	General ISCED 3A, access upper tier ISCED 5A/all 5
321	Vocational ISCED 3C >= 2 years, no access ISCED 5
322	Vocational ISCED 3A/3B, access 5B/lower tier 5A
323	Vocational ISCED 3A, access upper tier ISCED 5A/all 5
412	General ISCED 4A/4B, access ISCED 5B/lower tier 5A
413	General ISCED 4A, access upper tier ISCED 5A/all 5
421	ISCED 4 programs without access ISCED 5
422	Vocational ISCED 4A/4B, access ISCED 5B/lower tier 5A
423	Vocational ISCED 4A, access upper tier ISCED 5A/all 5
510	ISCED 5A short, intermediate/academic/general tertiary below
520	ISCED 5B short, advanced vocational qualifications
610	ISCED 5A medium, bachelor/equivalent from lower tier tertiary
620	ISCED 5A medium, bachelor/equivalent from upper/single tier
710	ISCED 5A long, master/equivalent from lower tier tertiary
720	ISCED 5A long, master/equivalent from upper/single tier tertiary
800	ISCED 6, doctoral degree
5555	Other

Note: Cyan: vocational = 0; degree = 0; edu3 = 1
Yellow: vocational = 1; degree = 0; edu3 = 2
Lime: vocational = 0; degree = 1; edu3 = 3.

For Germany, Switzerland, and Austria, it is furthermore possible to approximately distinguish between workplace-based and school-based VET. Since all three countries have predominantly workplace-based VET but also a non-negligible share of school-based VET, this allows us to directly highlight the difference between the two approaches to VET. The distinction must remain an approximation since some codes in the ESS data are not detailed enough and for some occupations the organization of training differs between sub-national units. Yet, this is the best approximation of individual dual VET status that is possible with ESS education data. We apply the OECD definition which considers *combined school- and work-based programs* those in which "less than 75 per cent of the curriculum is presented in the school environment or through distance education. Programs that are more than 90 per cent work-based are excluded" (OECD, 2001, p.401). The resulting coding can be seen in Tables A3, A4, and A5. On this basis, we create a categorical variable *dual_vet3*, which distinguishes between "no VET", "dual VET", and "other VET", and a dummy variable

Table A2: Educational attainment by country

Country	General non-tertiary	Non-tertiary VET	University degree	NA
AT	411 (21.4%)	1257 (65.3%)	256 (13.3%)	6
BE	529 (32.3%)	524 (32.0%)	585 (35.7%)	14
CH	328 (22.4%)	835 (57.0%)	303 (20.7%)	7
CZ	645 (29.6%)	1245 (57.1%)	290 (13.3%)	0
DE	424 (15.6%)	1577 (58.0%)	716 (26.4%)	17
EE	674 (34.9%)	715 (37.0%)	544 (28.1%)	1
ES	980 (57.3%)	321 (18.8%)	410 (24.0%)	2
FI	473 (26.4%)	765 (42.7%)	552 (30.8%)	4
FR	775 (40.0%)	818 (42.2%)	345 (17.8%)	2
GB	657 (35.8%)	669 (36.5%)	507 (27.7%)	47
HU	534 (33.9%)	834 (53.0%)	205 (13.0%)	5
IE	951 (37.8%)	901 (35.8%)	663 (26.4%)	11
IL	1071 (44.6%)	540 (22.5%)	789 (32.9%)	10
IS	269 (32.7%)	271 (33.0%)	282 (34.3%)	9
IT	1295 (55.3%)	769 (32.9%)	276 (11.8%)	26
LT	571 (28.1%)	893 (44.0%)	566 (27.9%)	4
NL	627 (40.2%)	465 (29.8%)	468 (30.0%)	6
NO	540 (36.5%)	359 (24.3%)	581 (39.3%)	6
PL	462 (29.0%)	765 (48.1%)	365 (22.9%)	5
PT	745 (64.4%)	143 (12.4%)	268 (23.2%)	11
RU	489 (21.2%)	1037 (45.0%)	779 (33.8%)	0
SE	465 (31.1%)	633 (42.3%)	398 (26.6%)	10
SI	360 (30.2%)	605 (50.7%)	229 (19.2%)	4

dual_vet which takes the value "1" for people who completed a program classified as dual VET and "0" otherwise. We now discuss our country-specific decisions.

The German dual VET system is internationally regarded as a model and has inspired VET reforms aiming to emulate the system (Bonoli and Emmenegger, 2022). In Germany (Table A3), the ESS answer categories allow for a fairly clear distinction between workplace-based and school-based VET.[13] However, due to the federal structure of the education system, there are some fuzzy cases. For example, in most — but not all — states, training to become a kindergarten teacher combines two years of school-based education with a year of practical training, and is therefore considered dual VET. Similar differences exist for care occupations.[14] Fachschulen in most cases offer a school-based extension of previous dual training, for example in the trades. Due to their close link to the dual system and the practical orientation of the courses, as well as the fact that a majority of students continue working while enrolled, they are best regarded as belonging to the dual VET system. Categories 11 and 12 ("Laufbahnprüfung für den gehobenen Dienst" and "2. Staatsexamen") are coded as "no VET", since the vast majority of respondents in these categories also

[13]The German ESS questionnaire differs slightly from other countries in that respondents are asked three separate education questions: their highest general secondary qualification, their highest vocational qualification, and their highest general tertiary qualification, if applicable. Table A3 considers only the question about respondents' highest vocational qualification. If we assign all respondents who also have a completed general tertiary degree to the "no VET" category, we obtain slightly weaker results.

[14]See here for occupations in the health sector and here for pedagogical occupations.

have a university degree.

In Austria (Table A4), the coding is fairly straightforward. The category "Lehrabschluss" refers to apprenticeships which are overwhelmingly workplace-based, while a handful of other categories form a sizeable group of school-based vocational training schemes. It should be noted that category 11 is considered school-based in Austria, since to obtain a qualification as a master craftsman, it is sufficient to pass an exam, regardless of any further formal training after the initial vocational qualification. Compared to Germany and Switzerland, the Austrian VET system has a larger school-based component and experienced a particularly acute crisis in the 1990s and 2000s (Seitzl and Unterweger, 2022). This means that we would expect Austrians to view dual VET more critically than their German or Swiss counterparts.

Finally, Switzerland (Table A5) enrols a larger share of students at upper secondary level and maintains a stronger focus on workplace-based training than Austria and even Germany (REF). Unfortunately, not all ESS variable levels allow a clear assignment to a mode of VET and we are required to make judgment calls. For example, category 11 includes elementary vocational qualifications such as "Berufliche Grundbildung", "Anlehre", and "Kurzlehre", which are lesser forms of dual training, but also "Handelsschule" and "Allgemeinbildende Schule", which are school-based. Since the latter have historically been more common than the former, we code the whole category as school-based VET. Higher vocational training at ISCED level 5 (mostly "höhere Fachschulen") is coded as dual VET in Switzerland since students usually work 70% - 90% while attending a course (Di Maio and Trampusch, 2022). Overall, the coding for Switzerland likely contains more noise than for Germany and Austria. Nevertheless, given the prominence of the dual VET system in Switzerland, we think it important to include the case. Since even an approximate distinction between school-based and work-based VET at the individual level is not feasible for many countries in the ESS, we additionally collected data on country-level enrolment in dual VET at the upper secondary level in 2010 and 2016 from the OECD Education at a Glance reports and country-specific sources, based on (blinded for review1). Thus, we have a battery of measures that substantiate our argument that the VET effect on social policy preferences is driven predominantly by dual VET.

Table A3: Education codes and shares in Germany

Code	Label	Share (%)
0	Kein beruflicher Ausbildungsabschluss	26.93
1	Betriebliche Anlernzeit mit Abschlusszeugnis; Teilfacharbeiterabschluss	1.26
2	Berufsgrundbildungsjahr, Berufsfachschule (Grundkenntnisse), med. Hilfsberufe	0.88
3	2- bis 3-jähriger Ausbildung an Schule d. Gesundheitswesens (z.B. Pflege)	4.38
4	Berufsqual. Abschluss Berufsfachschule/ Kolleg (schul. Berufsausbildung)	3.19
5	Abschluss einer Ausbildung zum Erzieher/zur Erzieherin	1.51
6	Gewerbliche Lehre/duale Ausbildung in Industrie, Handwerk oder Landwirtschaft	25.28
7	Abgeschlossene kaufmännische Lehre/duale Ausbildung (Kaufmannsgehilfenbrief)	17.15
8	Laufbahnprüfung für den mittleren Dienst	1.40
9	Abschluss einer 2. Berufsausbildung (berufliche Zweitausbildung)	1.44
10	Meister-/Techniker-/gleichwertiger Fachschulabschluss; VWA; Fachakademie (BY)	10.24
11	Laufbahnprüfung für den gehobenen Dienst	1.40
12	2. Staatsexamen	4.45
7777	Refusal	0.25
8888	Don't know	0.25

Note: Based on ESS variable *eduade3*. Cyan: school-based VET; yellow: dual VET; lime: no VET; orange: varied coding.

Table A4: Education codes and shares in Austria

Code	Label	Share (%)
1	Kein Abschluss	0.10
2	Volksschulabschluss	1.29
3	Abschluss der Hauptschule, Neuen Mittelschule oder Volksschuloberstufe (8. Schulstufe)	7.86
4	Abschluss der Polytechnischen Schule bzw.einer einjährigen mittleren Schule (9. Schulstufe)	4.93
5	Abschluss der AHS-Unterstufe (8. Schulstufe an einem Gymnasium)	1.19
6	Lehrabschluss	42.09
7	Abschluss einer Berufsbildenden mittleren Schule (min. 2-jährig, z.B. Handelsschule, Fachschule)	11.34
8	AHS-Matura (Gymnasium, inkl. Sonderform oder Studienberechtigungsprüfung)	6.57
9	Diplom in Gesundheits- und Krankenpflege oder im medizinisch-technischen Fachdienst	2.54
10	BHS-Matura (HAK, HTL, HLW, BAKIP, inkl. Sonderformen und Berufsreifeprüfung)	6.87
11	Kolleg-Diplom, Meister-Prüfung (Werkmeister, Bauhandwerker), Abschluss eines Universitätslehrgangs	1.84
12	Diplom an pädagogischer Akademie, medizinischer Akademie, Sozialakademie	2.44
13	Bachelor/Bakkalaureat an einer Fachhochschule oder pädagogischen Hochschule	1.34
14	Bachelor/Bakkalaureat an einer Universität	1.84
15	Diplomstudienabschluss/Master an einer Fachhochschule	1.59
16	Diplomstudienabschluss/Master an einer Universität (inkl. Doktorat als Erstabschluss)	4.38
17	Postgraduale Universitätslehrgänge (aufbauend auf Diplomstudienabschluss, z.B. MBA)	0.20
18	Abschluss mit Doktorat (aufbauend auf Diplomstudienabschluss: Dr., PhD)	1.29
5555	Other	0.15
7777	Don't know	0.15

Note: Based on ESS variable *edlveat*. Cyan: school-based VET; yellow: dual VET; lime: no VET.

Table A5: Education codes and shares in Switzerland

Code	Label	Share (%)
1	Nicht abgeschlossene Primarschule	0.39
2	Primarschule	2.89
3	Sekundarschule, Realschule, Oberschule	10.95
4	10. Schuljahr, Vorlehre, Haushaltsjahr, Berufsvorbereitungsklasse, Brückenangebote	2.30
5	Fachmittelschulen (3 Jahre, FMS-Ausweis, Fachmaturität), Diplommittelschulen (DMS), Handelsschule	2.89
6	Gymnasiale Maturität, Gymnasium	3.08
7	Gymnasiale Maturität für Erwachsene oder Berufslehre nach gymnasialer Maturität	0.33
8	Lehrerseminar, Schule für Unterrichtsberufe (für Vor- und Primarschule)	2.03
9	Berufsmaturität	1.64
10	Berufsmaturität für Erwachsene	0.72
11	Berufliche Grundbildung (Eidg. Berufsattest) Anlehre in Betrieb und Schule, Kurzlehre (2 Jahre), Handelsschule (1 Jahr), Allgemeinbildende Schule (1-2 Jahre)	4.13
12	Berufslehre 3-4 Jahre (Eidg. Fähigkeitszeugnis) in Lehrbetriebe oder in Berufsfachschule	33.97
13	Zweite Berufslehre oder Berufslehre als Zweitausbildung	1.90
14	Meisterdiplom, Eidg. Fachausweis und weitere Fachprüfungen	2.95
15	Diplom oder Nachdiplom einer höheren Fachschule, z.B. in den Bereichen Technik, Verwaltung, Gesundheit, Sozialarbeit, Kunst und Gestaltung	4.07
16	Diplom oder Nachdiplom einer der folgenden höheren Fachschulen: Ingenieurschule (HTL); Höhere Wirtschafts- und Verwaltungsschule (HWV); Höhere Fachschule für Gestaltung (HFG); Höhere Hauswirtschaftliche Fachschule (HHF); Hotelfachschule Lausanne (Abschlüsse der Jahre 1998, 1999 und 2000)	4.46
17	Fachhochschulen (FH), Pädagogische Hochschule (PH), Bachelor	5.18
18	Fachhochschulen (FH), Pädagogische Hochschulen (PH), Master, Diplom, Nachdiplom	4.07
19	Universitäre Hochschulen, Abgeschlossenes Grundstudium, Halblizenziat	0.39
20	Universitäre Hochschulen, Eidgenössische Technische Hochschule (ETH), Bachelor, Lizenziat das 3-4 Jahre erfordert	2.30
21	Universitäre Hochschulen, Eidgenössische Technische Hochschulen (ETH), Lizenziat das mehr als 4 Jahre erfordert	1.38
22	Universitäre Hochschulen, Eidgenössische Technische Hochschulen (ETH), Master, Diplom, Nachdiplom	5.11
23	Doctorat, PhD	2.36
5555	Other	0.20
7777	Refusal	0.07
8888	Don't know	0.26

Note: Based on ESS variable *edlvdch*. Cyan: school-based VET; yellow: dual VET; lime: no VET.

B Full Model Outputs

Table B1: Output to Figure 1 (left panel)

	(1)	(2)	(3)	(4)
VET dummy	−0.091***	−0.113***	−0.134***	−0.133***
	(0.026)	(0.029)	(0.031)	(0.031)
Female		0.052+	0.044	0.044
		(0.027)	(0.030)	(0.030)
Age		0.006***	0.007***	0.007***
		(0.001)	(0.001)	(0.001)
Income		−0.084***	−0.059***	−0.059***
		(0.005)	(0.006)	(0.006)
RTI			0.283**	0.281**
			(0.092)	(0.092)
Education (years)			−0.007	−0.008
			(0.005)	(0.005)
Union member			0.189***	0.190***
			(0.042)	(0.042)
Left-right scale			−0.151***	−0.151***
			(0.007)	(0.007)
Unemployed			0.463***	0.462***
			(0.056)	(0.056)
Private sector work			−0.132***	−0.132***
			(0.035)	(0.035)
UE rate				0.037
				(0.029)
Dual VET share				−0.011
				(0.008)
Intercept	6.724***	6.951***	7.599***	7.444***
	(0.122)	(0.130)	(0.156)	(0.328)
N	34 053	27 840	22 969	22 969
AIC	182 091.2	148 532.2	120 103.6	120 115.4
BIC	182 124.9	148 589.9	120 208.2	120 236.0

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Multilevel models with random country intercepts.

Table B2: Output to Figure 1 (right panel)

	(1)	(2)	(3)	(4)
Non-tertiary VET	−0.180***	−0.126***	−0.114**	−0.113**
	(0.029)	(0.032)	(0.037)	(0.038)
University degree	−0.240***	−0.031	0.062	0.063
	(0.034)	(0.040)	(0.056)	(0.056)
Female		0.051+	0.043	0.043
		(0.027)	(0.030)	(0.030)
Age		0.006***	0.007***	0.007***
		(0.001)	(0.001)	(0.001)
Income		−0.083***	−0.060***	−0.060***
		(0.005)	(0.006)	(0.006)
RTI			0.293**	0.292**
			(0.093)	(0.093)
Education (years)			−0.012*	−0.012*
			(0.006)	(0.006)
Union member			0.190***	0.191***
			(0.042)	(0.042)
Left-right scale			−0.151***	−0.151***
			(0.007)	(0.007)
Unemployed			0.462***	0.460***
			(0.056)	(0.056)
Private sector work			−0.130***	−0.130***
			(0.035)	(0.035)
UE rate				0.037
				(0.029)
Dual VET share				−0.011
				(0.008)
Intercept	6.817***	6.959***	7.640***	7.483***
	(0.122)	(0.130)	(0.159)	(0.330)
N	33 927	27 777	22 920	22 920
AIC	181 431.9	148 231.4	119 878.0	119 889.7
BIC	181 474.0	148 297.3	119 990.6	120 018.3

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Multilevel models with random country intercepts. The reference category for *Non-tertiary VET* and *University degree* is general non-tertiary education.

Table B3: Output to Figure 2

	Ref: No VET		Ref: GE non-tertiary		Ref: Uni degree	
	Mediation	Outcome	Mediation	Outcome	Mediation	Outcome
Income	(DV)	−0.059***	(DV)	−0.060***	(DV)	−0.060***
		(0.006)		(0.006)		(0.006)
VET dummy	−0.094**	−0.133***				
	(0.034)	(0.031)				
Non-tertiary VET			0.240***	−0.113**		
(ref.: GE non-tertiary)			(0.041)	(0.038)		
University degree			0.879***	0.063		
(ref.: GE non-tertiary)			(0.061)	(0.056)		
Non-tertiary VET					−0.639***	−0.176***
(ref.: Uni degree)					(0.050)	(0.046)
General non-tertiary					−0.879***	−0.063
(ref.: Uni degree)					(0.061)	(0.056)
RTI	−2.710***	0.281**	−2.446***	0.292**	−2.446***	0.292**
	(0.100)	(0.092)	(0.101)	(0.093)	(0.101)	(0.093)
Female	−0.456***	0.044	−0.452***	0.043	−0.452***	0.043
	(0.033)	(0.030)	(0.033)	(0.030)	(0.033)	(0.030)
Age	−0.006***	0.007***	−0.007***	0.007***	−0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Union member	0.625***	0.190***	0.595***	0.191***	0.595***	0.191***
	(0.047)	(0.042)	(0.046)	(0.042)	(0.046)	(0.042)
Left-right scale	0.063***	−0.151***	0.062***	−0.151***	0.062***	−0.151***
	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.007)
Education (years)	0.173***	−0.008	0.115***	−0.012*	0.115***	−0.012*
	(0.005)	(0.005)	(0.007)	(0.006)	(0.007)	(0.006)
Unemployed	−1.968***	0.462***	−1.953***	0.460***	−1.953***	0.460***
	(0.061)	(0.056)	(0.061)	(0.056)	(0.061)	(0.056)
Private sector work	0.311***	−0.132***	0.322***	−0.130***	0.322***	−0.130***
	(0.038)	(0.035)	(0.038)	(0.035)	(0.038)	(0.035)
UE rate	−0.003	0.037	−0.002	0.037	−0.002	0.037
	(0.039)	(0.029)	(0.038)	(0.029)	(0.038)	(0.029)
Dual VET share	0.003	−0.011	0.002	−0.011	0.002	−0.011
	(0.010)	(0.008)	(0.010)	(0.008)	(0.010)	(0.008)
Intercept	3.421***	7.444***	3.900***	7.483***	4.780***	7.547***
	(0.431)	(0.328)	(0.419)	(0.330)	(0.428)	(0.340)
N.	22 969	22 969	22 920	22 920	22 920	22 920
AIC	124 624.3	120 115.4	124 157.5	119 889.7	124 157.5	119 889.7
BIC	124 736.9	120 236.0	124 278.1	120 018.3	124 278.1	120 018.3

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Three model groups based on the reference category for the education variable as stated at the top of the table. For each group, the mediation model (with income as the DV) and the outcome model (with UE support as the DV) are included. The indirect effect is calculated by multiplying the coefficient on the education variable in the mediation model with the coefficient on the mediator variable in the outcome model.

Table B4: Output to Figure 3

	Ref: No VET		Ref: GE non-tertiary		Ref: Uni degree	
	Mediation	Outcome	Mediation	Outcome	Mediation	Outcome
Workfarism	(DV)	−0.333***	(DV)	−0.334***	(DV)	−0.334***
		(0.014)		(0.014)		(0.014)
VET dummy	0.104***	−0.101***				
	(0.014)	(0.031)				
Non-tertiary VET			0.108***	−0.075*		
(ref.: GE non-tertiary)			(0.017)	(0.037)		
University degree			0.009	0.076		
(ref.: GE non-tertiary)			(0.026)	(0.055)		
Non-tertiary VET					0.099***	−0.152***
(ref.: Uni degree)					(0.021)	(0.046)
General non-tertiary					−0.009	−0.076
(ref.: Uni degree)					(0.026)	(0.055)
RTI	0.230***	0.369***	0.226***	0.381***	0.226***	0.381***
	(0.043)	(0.092)	(0.043)	(0.093)	(0.043)	(0.093)
Female	0.024+	0.069*	0.026+	0.068*	0.026+	0.068*
	(0.014)	(0.030)	(0.014)	(0.030)	(0.014)	(0.030)
Age	0.000	0.007***	0.000	0.007***	0.000	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Income	0.012***	−0.055***	0.012***	−0.055***	0.012***	−0.055***
	(0.003)	(0.006)	(0.003)	(0.006)	(0.003)	(0.006)
Union member	−0.052**	0.173***	−0.054**	0.173***	−0.054**	0.173***
	(0.020)	(0.042)	(0.020)	(0.042)	(0.020)	(0.042)
Left-right scale	0.090***	−0.123***	0.090***	−0.123***	0.090***	−0.123***
	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)
Education (years)	−0.016***	−0.012*	−0.017***	−0.017**	−0.017***	−0.017**
	(0.002)	(0.005)	(0.003)	(0.006)	(0.003)	(0.006)
Unemployed	−0.149***	0.467***	−0.147***	0.465***	−0.147***	0.465***
	(0.026)	(0.057)	(0.026)	(0.057)	(0.026)	(0.057)
Private sector work	0.037*	−0.116***	0.039*	−0.113**	0.039*	−0.113**
	(0.016)	(0.035)	(0.016)	(0.035)	(0.016)	(0.035)
UE rate	0.038*	0.051+	0.038*	0.051+	0.038*	0.051+
	(0.015)	(0.027)	(0.015)	(0.027)	(0.015)	(0.027)
Dual VET share	0.005	−0.009	0.005	−0.009	0.005	−0.009
	(0.004)	(0.007)	(0.004)	(0.007)	(0.004)	(0.007)
Intercept	2.255***	8.157***	2.254***	8.205***	2.263***	8.282***
	(0.169)	(0.311)	(0.169)	(0.312)	(0.173)	(0.323)
N	22 504	22 504	22 458	22 458	22 458	22 458
AIC	82 741.0	117 080.4	82 588.1	116 865.7	82 588.1	116 865.7
BIC	82 861.4	117 208.8	82 716.5	117 002.0	82 716.5	117 002.0

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Three model groups based on the reference category for the education variable as stated at the top of the table. For each group, the mediation model (with workfarism as the dependent variable) and the outcome model (with UE support as the DV) are included. The indirect effect is calculated by multiplying the coefficient on the education variable in the mediation model with the coefficient on the mediator variable in the outcome model.

Table B5: Output to Figure 4 (left panel)

	Ref: No VET		Ref: GE non-tertiary		Ref: Uni degree	
	Mediation	Outcome	Mediation	Outcome	Mediation	Outcome
Skill transferability		−0.372***		−0.376***		−0.376***
		(0.087)		(0.087)		(0.087)
VET dummy	0.009	−0.210***				
	(0.008)	(0.062)				
Non-tertiary VET			0.036***	−0.180*		
(ref.: GE non-tertiary)			(0.010)	(0.074)		
University degree			0.050***	0.057		
(ref.: GE non-tertiary)			(0.010)	(0.077)		
Non-tertiary VET					−0.014	−0.236***
(ref.: Uni degree)					(0.009)	(0.071)
General non-tertiary					−0.050***	−0.057
(ref.: Uni degree)					(0.010)	(0.077)
Female	−0.006	−0.159**	−0.009	−0.161**	−0.009	−0.161**
	(0.007)	(0.056)	(0.007)	(0.057)	(0.007)	(0.057)
Age	−0.002***	−0.010***	−0.002***	−0.010***	−0.002***	−0.010***
	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)	(0.002)
Income	0.011***	−0.012	0.010***	−0.013	0.010***	−0.013
	(0.001)	(0.008)	(0.001)	(0.009)	(0.001)	(0.009)
Left-right scale	−0.003	−0.195***	−0.003	−0.194***	−0.003	−0.194***
	(0.002)	(0.018)	(0.002)	(0.018)	(0.002)	(0.018)
Unemployed	−0.042**	0.729***	−0.038*	0.734***	−0.038*	0.734***
	(0.016)	(0.119)	(0.016)	(0.119)	(0.016)	(0.119)
Private sector work	0.012	−0.076	0.011	−0.077	0.011	−0.077
	(0.008)	(0.057)	(0.008)	(0.057)	(0.008)	(0.057)
Dual VET share	0.000	−0.003	0.000	−0.003	0.000	−0.003
	(0.001)	(0.010)	(0.001)	(0.010)	(0.001)	(0.010)
UE rate	−0.001	0.016	−0.001	0.015	−0.001	0.015
	(0.013)	(0.124)	(0.012)	(0.124)	(0.012)	(0.124)
Occupation dummies	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	0.948***	8.783***	0.914***	8.747***	0.963***	8.804***
	(0.096)	(0.926)	(0.092)	(0.924)	(0.092)	(0.923)
N	7689	7689	7689	7689	7689	7689
AIC	4032.7	35 155.4	4017.5	35 160.1	4017.5	35 160.1
BIC	4178.6	35 308.2	4170.4	35 319.9	4170.4	35 319.9

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Three model groups based on the reference category for the education variable as stated at the top of the table. For each group, the mediation model and the outcome model are included. The indirect effect is calculated by multiplying the coefficient on the education variable in the mediation model with the coefficient on the mediator variable in the outcome model. Dual VET shares for 2020 and UE rates for 2023. Occupation dummies instead of RTI scores. Years of education not available.

Table B6: Output to Figure 4 (right panel)

	Ref: No VET		Ref: GE non-tertiary		Ref: Uni degree	
	Mediation	Outcome	Mediation	Outcome	Mediation	Outcome
Find new job		−0.016		−0.017		−0.017
		(0.011)		(0.011)		(0.011)
VET dummy	0.056	−0.195**				
	(0.062)	(0.060)				
Non-tertiary VET			0.163*	−0.164*		
(ref.: GE non-tertiary)			(0.074)	(0.072)		
3University degree			0.200**	0.058		
(ref.: GE non-tertiary)			(0.077)	(0.074)		
General non-tertiary					−0.200**	−0.058
(ref.: Uni degree)					(0.077)	(0.074)
Non-tertiary VET					−0.037	−0.222**
(ref.: Uni degree)					(0.072)	(0.069)
Female	−0.117*	−0.145**	−0.126*	−0.147**	−0.126*	−0.147**
	(0.057)	(0.055)	(0.057)	(0.055)	(0.057)	(0.055)
Age	−0.026***	−0.008***	−0.026***	−0.008***	−0.026***	−0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Income	0.098***	−0.016*	0.094***	−0.017*	0.094***	−0.017*
	(0.008)	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)
Left-right scale	0.162***	−0.179***	0.164***	−0.179***	0.164***	−0.179***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Unemployed	−1.042***	0.632***	−1.027***	0.636***	−1.027***	0.636***
	(0.117)	(0.113)	(0.117)	(0.113)	(0.117)	(0.113)
Private sector work	−0.219***	−0.083	−0.222***	−0.083	−0.222***	−0.083
	(0.057)	(0.055)	(0.057)	(0.055)	(0.057)	(0.055)
Dual VET share	−0.015	−0.003	−0.015	−0.003	−0.015	−0.003
	(0.011)	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)
UE rate	−0.174	0.026	−0.177	0.025	−0.177	0.025
	(0.129)	(0.120)	(0.126)	(0.120)	(0.126)	(0.120)
Occupation dummies	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	8.638***	8.352***	8.501***	8.314***	8.701***	8.372***
	(0.959)	(0.895)	(0.937)	(0.894)	(0.936)	(0.893)
N	8190	8190	8190	8190	8190	8190
AIC	38 057.8	37 455.6	38 056.3	37 460.3	38 056.3	37 460.3
BIC	38 205.0	37 609.8	38 210.6	37 621.6	38 210.6	37 621.6

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Three model groups based on the reference category for the education variable as stated at the top of the table. For each group, the mediation model and the outcome model are included. The indirect effect is calculated by multiplying the coefficient on the education variable in the mediation model with the coefficient on the mediator variable in the outcome model. Dual VET shares for 2020 and UE rates for 2023. Occupation dummies instead of RTI scores. Years of education not available.

Table B7: Output to Figure 5 and Figure 6

	Figure 5	Figure 6
Non-tertiary VET	−0.082*	−0.112**
	(0.038)	(0.037)
University degree	−0.050	0.059
	(0.061)	(0.056)
RTI	0.826***	0.617***
	(0.153)	(0.119)
Non-tertiary VET × RTI	−0.553**	
	(0.196)	
University degree × RTI	−1.576***	
	(0.261)	
Dual VET share	−0.011	−0.011
	(0.008)	(0.008)
Dual VET share × RTI		−0.023***
		(0.005)
Female	0.047	0.044
	(0.030)	(0.030)
Age	0.007***	0.007***
	(0.001)	(0.001)
Education (years)	−0.010+	−0.012+
	(0.006)	(0.006)
Income	−0.060***	−0.061***
	(0.006)	(0.006)
Union member	0.185***	0.192***
	(0.042)	(0.042)
Left-right scale	−0.150***	−0.150***
	(0.007)	(0.007)
Unemployed	0.459***	0.459***
	(0.056)	(0.056)
Private sector work	−0.113**	−0.128***
	(0.035)	(0.035)
UE rate	0.036	0.037
	(0.029)	(0.029)
Intercept	7.430***	7.484***
	(0.330)	(0.329)
N	22 920	22 920
AIC	119 859.7	119 881.0
BIC	120 004.4	120 017.7

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Multilevel models with random country intercepts. The reference category for *Non-tertiary VET* and *University degree* is general non-tertiary education.

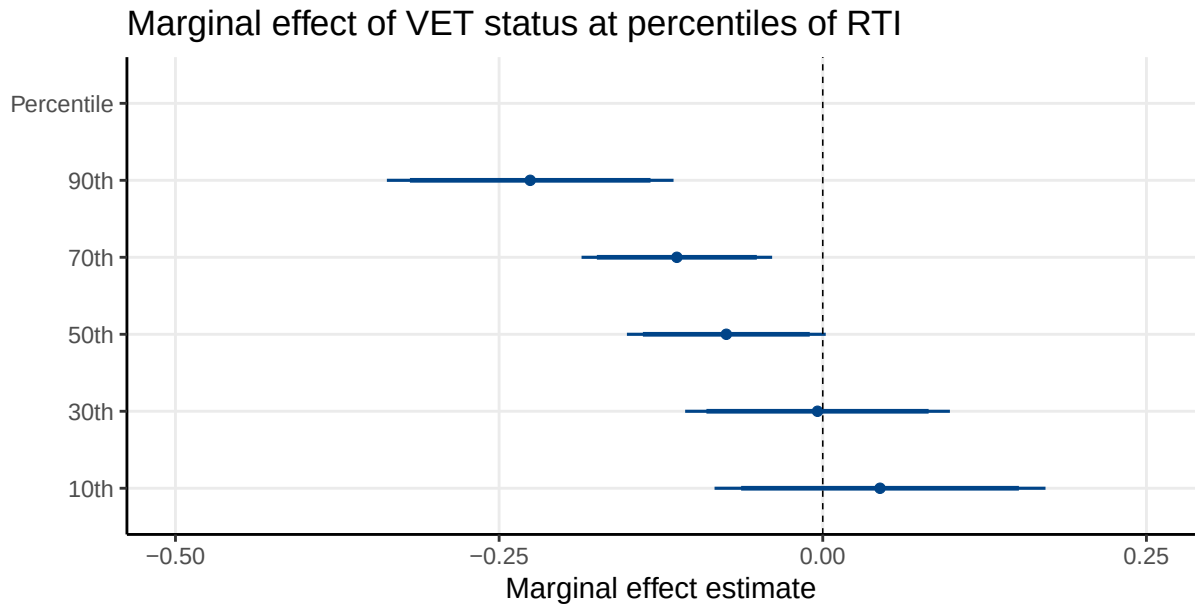
Table B8: Output to DACH analyses

	Figure 7 (left)	Figure 7 (right)	Figure 8
Dual VET dummy	−0.342**		
	(0.113)		
Dual VET		−0.351**	−0.357**
		(0.118)	(0.119)
Other VET		−0.064	−0.074
		(0.240)	(0.241)
RTI	0.259	0.261	0.692
	(0.305)	(0.305)	(0.508)
Dual VET × RTI			−0.777
			(0.594)
Other VET × RTI			−0.022
			(1.261)
Female	−0.366***	−0.364***	−0.373***
	(0.099)	(0.099)	(0.099)
Age	0.000	0.000	0.001
	(0.004)	(0.004)	(0.004)
Education (years)	0.036*	0.035*	0.041*
	(0.016)	(0.016)	(0.016)
Income	−0.079***	−0.079***	−0.080***
	(0.019)	(0.019)	(0.019)
Union member	0.060	0.063	0.067
	(0.129)	(0.128)	(0.129)
Left-right scale	−0.152***	−0.151***	−0.151***
	(0.029)	(0.029)	(0.029)
Unemployed	0.412+	0.413+	0.404+
	(0.224)	(0.224)	(0.224)
Private sector work	−0.308**	−0.310**	−0.315**
	(0.109)	(0.109)	(0.110)
Intercept	7.881***	7.904***	7.844***
	(0.344)	(0.353)	(0.351)
N	3733	3735	3735
R2 Adj.	0.058	0.058	0.058
AIC	17 781.4	17 791.8	17 792.0
BIC	17 868.6	17 885.1	17 897.9

Note: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Models include country fixed-effects and clustered standard errors. The reference category for *Dual VET dummy* is *No dual VET*. The reference category for *Dual VET* and *Other VET* is *No VET*.

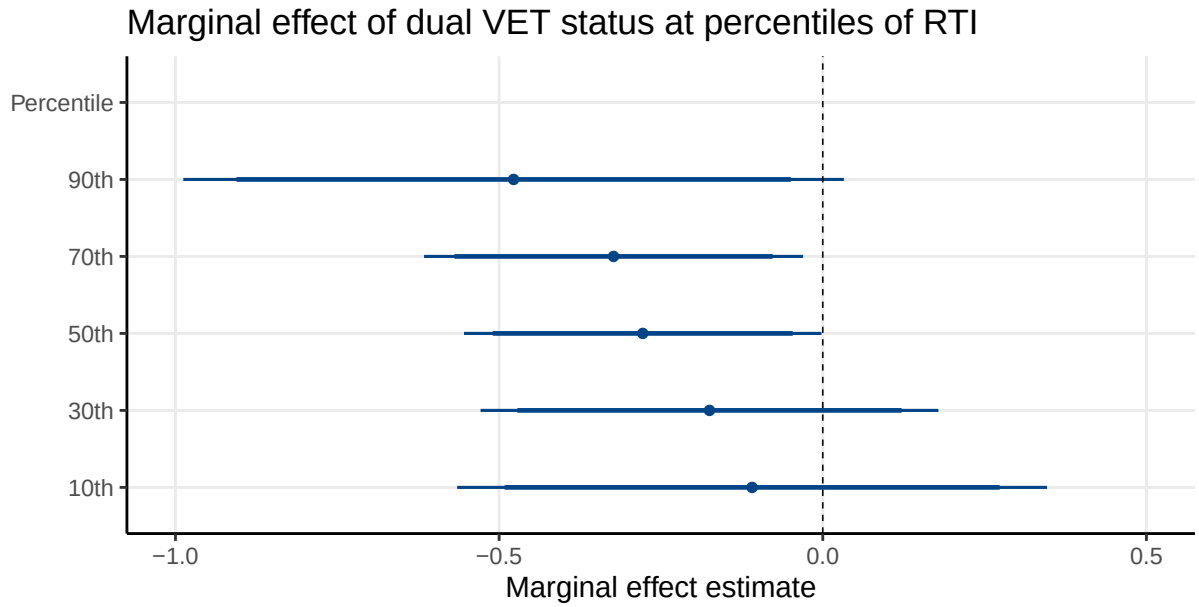
C Supplementary Analyses

Figure C1: People with VET background are less supportive of UE benefits than those with GE non-tertiary, especially at high levels of RTI



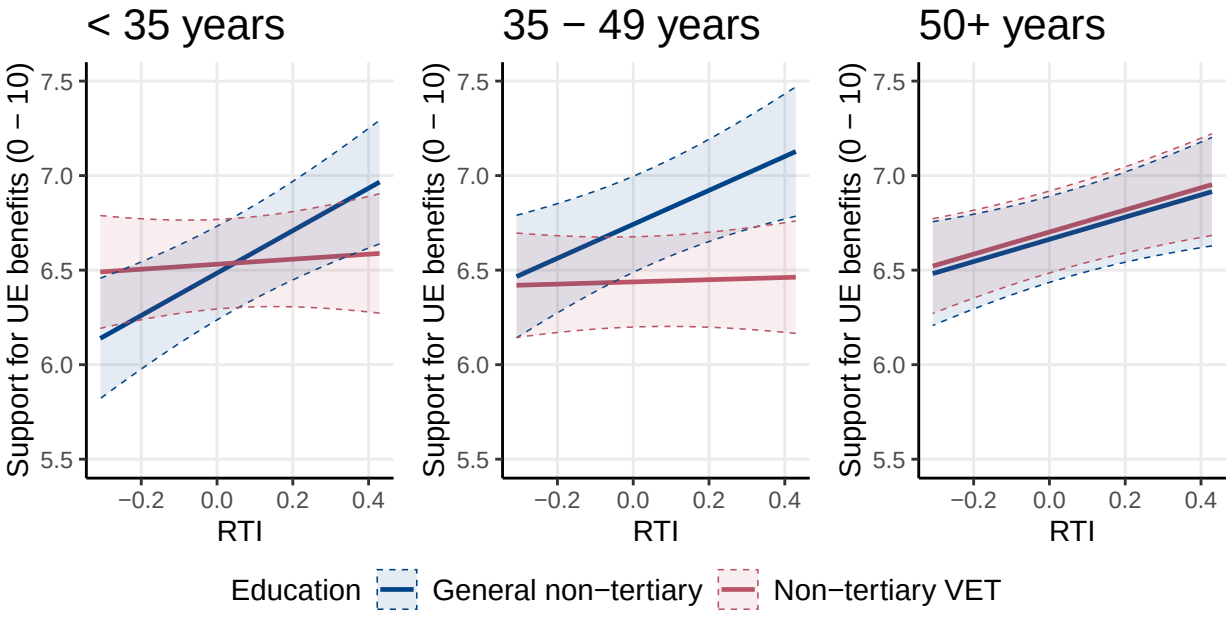
Note: The figure shows the marginal effect of VET on support for compensatory social policy compared to GE non-tertiary for different levels of RTI. N = 22,920. For full results, see Table B7.

Figure C2: People with dual VET background in DACH countries are less supportive of UE benefits than those with school-based VET, especially at medium-high levels of RTI



Note: The figure shows the marginal effect of dual VET on support for compensatory social policy compared to school-based VET at different levels of RTI. N = 3,735. For full results, see Table B8.

Figure C3: The difference between GE and VET in the effect of RTI is most pronounced among younger workers



Note: Predicted support (with 95% confidence bands) for unemployment benefits at different levels of RTI, by educational background, for different age cohorts. N = 6,382 (< 35 years old); N = 7,689 (35 - 49 years old); N = 8,849 (50 - 65 years old).