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Article

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ORIGINAL ARTICLE

Open Access



Justice perceptions of occupational training subsidies: findings from a factorial survey

Richard V. Wolff^{1*} , Olaf Struck¹, Christopher Osiander², Monika Senghaas² and Gesine Stephan²

Abstract

Workers whose jobs are affected by structural change and digitization are required to continuously adapt their vocational skills to the requirements of the labor market. This adaptation is also essential for the competitiveness of their employer firms. The German legislature addressed this issue with investive measures for unemployment insurance, one of which is the Qualification Opportunities Act (Qualifizierungschancengesetz). Funds taken from unemployment insurance can now be used to provide financial help for employers in a more direct way and on a broader scale than before. It became possible that not only unemployed individuals but also workers in companies receive state assistance. This paper analyses the extent to which citizens accept such public support programs for further training and which principles of justice they apply when assessing a just amount of training subsidies. We conducted two factorial surveys. First, we investigated the justice assessments of training subsidies for different types of firms. The results showed that citizens are inclined to subsidize companies by receiving social security funds for further training of their employees. However, when doing so, the principle of needs-based justice should be complied with. Second, we analyze whether citizens think it is just or unjust to provide training subsidies to different workers, as we present them with changing characteristics of workers. The findings confirmed that in addition to the principle of need, views on performance justice, as well as economic considerations are relevant in assessments of whether training subsidies co-financed by unemployment insurance are just.

Keywords: Occupational training, Unemployment insurance, Justice assessments, Factorial survey, Multilevel and mixed effects model

JEL Classification: C99, D63, I38, J08, J24, J65

1 Introduction

Rapid technical progress and globalization have increased the need for flexible adjustments of the workforce in the labor market. Investment in human capital can enable workers and firms to adapt to changes in the economic environment and thus safeguard employment (Acemoglu and Restrepo 2017; Brynjolfsson and McAfee 2014; Struck 2006). Participation in training, however, is highly selective: workers in small and medium-sized enterprises (SMEs), older workers, and low-educated workers have

been shown to be generally underrepresented among those taking up occupational training (Bassanini et al. 2005). In particular, low-educated workers are often involved in undemanding routines with a high risk of substitution due to technical progress.

In view of this, the legislature in Germany enacted several changes at the beginning of 2019 (further extended in 2020) with the Qualification Opportunities Act (“Qualifizierungschancengesetz”).¹ The Act grants companies that want to adapt the qualifications of their workforce due to structural change access to reimbursement for further training from unemployment insurance funds.

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¹ Hereafter also referred to as “the Act”.

Accordingly, funds from contribution-based unemployment insurance are no longer used to exclusively support unemployed individuals.² This fits with the concept of a more preventive and investing social policy (Esping-Andersen et al. 2002; Morel et al. 2012).

With the regulations of the Act, the legislature has significantly expanded the group of those entitled to unemployment insurance funds. Against this backdrop, this article examines citizens' attitudes about these changes. Our research is situated within this framework toward a more expansive and proactively investing "labor insurance" as an expansion of unemployment insurance. Welfare institutions and their regulations for allocation and disbursement of resources depend on certain principles that influence if (the level of) support payments, such as subsidized training cost reimbursements, are deemed appropriate.³ It is important for the legitimacy of the welfare state that citizens accept social policy measures and regulations and regard them as just (Rothstein 1998; Roosma et al. 2013; Sachweh 2016). Major factors are principles of justice, which can affect the allocation according to effort and compensation, (basic) needs, or (social) productive efficiency (Leisering 2004). An "investive turn" (Evers 2008) has been documented for more than 10 years. This is a shift toward a more investive social policy, which is also expected to yield social gains (Esping-Andersen et al. 2002; Sachweh 2016, p. 309). The Act is a step in this direction, which has been long and extensively discussed in the political sphere (German Bundestag 2018)—but not among the general public. The legislature wants to support employees so that they can adapt to structural change. The means of this support is (partially) reimbursing the costs for occupational training and the wage costs during training. Consequently, there are two addressees in regard to justice assessment of the Act: employees and firms. On the one hand, employers can participate. For some of them, the need may not actually be real, which could then cause windfall gains for such employers. On the other hand, there are employees where the need can be more direct. Furthermore, respondents are able to perceive and evaluate differences between individuals and companies in terms of justification based on performance or efficiency. Therefore, we ask our respondents about both addressees to determine if they deem the legal regulations for allocating training cost reimbursements and the receipt of training cost reimbursements for certain workers—both simulated by our two vignettes—as just.

The article is structured as follows: The background of the new regulatory framework is presented in Sect. 2. The legal regulations are concordant with specific principles of justice and are partly included in the formulation of the hypotheses. These are presented in Sect. 3. We develop a number of hypotheses on the principles of justice that may drive citizens' assessments of the just amount of subsidies, e.g., related to needs-based justice or efficiency-based justice (Leisering 2004). Method and data are described in Sect. 4. Using a factorial survey, we ask participants how large training subsidies for different firms should be and how just or unjust training subsidies for different kinds of workers are perceived. By randomly varying either the features of firms or individuals described in two different vignettes, we aspire to causally determine the impact of these features on justice judgments. Section 5 contains the empirical results. In Sect. 6 some conclusions are presented.

2 Institutional background

In 2019, the Qualification Opportunities Act and in 2020, the Work for Tomorrow Act ("Arbeit-von-Morgen-Gesetz") greatly extended the funding opportunities for firms undertaking occupational training for their employees. Training subsidies for employed workers are granted dependent on firm size (Klaus et al. 2020). The program aims to support employees who perform occupational activities that can be replaced by modern technologies, are otherwise affected by structural change, or plan to work in an occupation with a shortage of skilled labor.

Basic job training measures to be funded include—among many others—software training courses or job-specific language classes. Funding can range between partial and complete absorption of job training costs. Funding is conditional on the following four criteria. First, the training has to provide knowledge that exceeds workplace-related short-term adaptations. Second, the most recently acquired occupational degree must have been obtained at least 4 years ago. Third, the job training measure has to be carried out by an accredited provider, either outside or inside the firm. Fourth, job training must comprise at least 160 h (from 2020 onwards: 120 h), with the maximum duration not exceeding 3 years.

Two types of financial support for qualification measures are available for firms under this legislation. First, the costs for the job training itself can be subsidized. Employers are required to bear a partial burden of the training costs in a "reasonable manner", which is specified according to the firm size. Firms pay direct job training costs according to firm size. Small firms with fewer than 10 employees can be compensated for the total costs of training. According to the Act, firms with 10–249

² Since 2007, vocational qualifications for low-skilled and older employees in German SMEs have also been subsidized through a special program, which has been used rarely (van den Berg et al. 2018; Klaus et al. 2020).

³ For the purposes of this paper now simply referred to as "training subsidies".

(250–2499) [2500 and more] employees are required to contribute at least 50% (75%) [85%] of the costs. Costs may also be reimbursed completely for low-skilled workers participating in retraining, if the job training benefits a worker aged 45 or older, or if a worker is severely handicapped. Second, the wages of participating workers can be (partly) covered by unemployment insurance. Small firms of less than 10 (10–249) [250 and more employees] may receive wage support of up to 75% (50%) [25%]. If the employee to receive job training lacks any vocational training, labor costs can be reimbursed completely. For low-qualified employees participating in retraining, the entire wage bill might be covered by unemployment insurance during training. Training has to address needs that go beyond short-term workplace adaptations, such as necessary adaptations due to exogenous structural change, as smaller companies have (on average) fewer resources at their disposal to respond to these challenges.

In summary, the framework established in Germany applies the following key criteria: substitutability of jobs, training duration, firm size, employee age, and employee qualification. These criteria are reflected in regulations, which are primarily directed toward supporting companies and employees who are in need (Kluegel et al. 1999, p. 255; Gilliland 1993; Miller 2020), provided the company itself is not responsible for causing this need (Konow 2001; Mikula 2002, p. 268).

These criteria and their accompanying principles of justice are investigated in our factorial survey. The theoretical background and the hypotheses that frame the survey are presented below.

3 Theoretical background and hypotheses

Welfare state regulations impact individual life conditions and structure social relationships. Citizens are directly affected by the design of measures and regulations: as recipients of transfer payments and as addressees of social services, as well as contributors and taxpayers to finance the welfare state. It is therefore important for the legitimacy of welfare states that citizens accept measures and regulations decided on a political level (van Oorschot et al. 2017). The acceptance of welfare programs and institutions is based on citizens' principles about what constitutes a just relationship between effort and reward, as well as a certain living standard, which society grants its citizens in return for their contribution to society (Bowles und Gintis 2000; Kaufmann 1997a; Mau 2004; Roosma et al. 2013; Sachweh 2016).

To maintain a consensus on the condition of the welfare state or its integrating functions (Kaufmann 1997b), sociopolitical norms and institutionally defined allocation and dispensation mechanisms ought to reflect principles of distribution that are perceived

as just. These principles can be aligned with the need of individual or collective actors to a greater or lesser degree (Kluegel et al. 1999, p. 255; Gilliland 1993). This is connected to the principle of responsibility for results that can or cannot be influenced (Konow 1996, 2001; Mikula 2002). However, principles of distribution can also be oriented toward the principle of contribution to a greater or lesser degree (Adams 1965; Young 1993), i.e., according to previously or currently being performed acts of the individual or collective (Greenberg 1990).

Moreover, it has been pointed out that justice assessments need to consider future effects of allocation conditions (Vobruba 1996). This finding is taken into account by “productivistic justice” (ibid. 969; cf. also Leisering 1999, p. 11). First, this means that citizens attempt to estimate a (socially) effective use of funds and consider this in their judgments. Second, this may also mean that citizens, in principle, take a favorable position toward an investive social policy (Sachweh et al. 2009, p. 618), which includes the Qualification Opportunities Act. The prevention of unemployment and its associated costs may also save money in the mid-term (Hans et al. 2017).

In the following, we discuss, the potential justice assessments citizens make when determining the just amount of subsidies for further training of different types of *firms*. For this case in particular, we expect that citizens are mindful of neediness and a company's capacity to act on its own behalf. It is also possible that a decision is made on the grounds of effective usage of contributions to unemployment insurance. Undue profits for companies might arise, as companies receive benefits from unemployment insurance for job-related training that they might have carried out anyway (Kruppe et al. 2020, p. 8).

Since this information is hidden, other signals, such as factors that influence the market position or size—SMEs invest much less in training than large firms (Allaart et al. 2009)—have been selected as indicators. A company's capacity to act, the factor of self-responsibility and hereupon-derived neediness, can influence citizens' justice perceptions regarding the allocations of funds from unemployment insurance. The Act distinguishes subsidy levels according to company size but does not consider further indicators of the market position.

H1 Citizens provide higher training subsidies for companies that are economically weaker (H1a) or smaller in size (H1b) compared to companies that are economically strong or large in size.

In principle, the legislature wants to provide help for employees, who are negatively affected by

technologically induced structural change. We expect that citizens acknowledge such need. It is presumed that training subsidies for companies are higher if employees are affected by structural change with higher probability.

H2 Citizens provide higher training subsidies for companies, if funded occupations are strongly exposed to technological progress.

Furthermore, we consider the extent to which training subsidies are perceived as just for different types of *employees*. This also allows a comparison to the more or less singular focus on unemployed individuals before the Act. We expect that for employees, the criteria for the principle of need are also considered.

H3 Training subsidies for further training have a higher probability of being regarded as just for individuals who have characteristics that signal low labor market prospects (e. g., advanced age or occupations at risk of being replaced by technological progress in the future) than for individuals who are in a more favorable position on the labor market.

Very long courses that may take two years and go beyond further training, such as vocational retraining, could be regarded as inefficient. That is because they are often disconnected from current activities and qualifications, where more targeted and shorter further training would allow distribution of resources toward more recipients. Funding for very long vocational trainings is not possible under the guidelines of the Qualification Opportunities Act that supports companies and employees but is possible under unemployment insurance for unemployed individuals. Both derive their resources from the same source, so we formulate the following hypothesis:

H4 Training subsidies for further training have a higher probability of being regarded as just for shorter courses than for courses with very long duration (2 years).

The principle of justice underlying social insurance schemes in Germany is the principle of equity, which aligns contributions and benefits. From this point of view, those who contributed longer should also be provided more benefits from insurance funds.

H5 Training subsidies for further training have a higher probability of being regarded as just for employees with stable work histories and therefore regular social security contributions compared to individuals with irregular work histories.

However, the principle of need may also be addressed, as employees with unstable work histories could be more reliant on proactive, internal further training, due to their generally lesser chances on the labor market, which may reduce or even reverse the effect of H5.

In Germany, both unemployed and employed individuals can access training subsidies from unemployment insurance. On the one hand, also among our respondents, the employees themselves pay for social security insurance. The vast majority of our respondents and German citizens in general are under this obligation. It is possible that an expansion of beneficiaries among their own group is accepted and seen as a more appropriate compensation for previously provided individual contributions. On the other hand, unemployed individuals are probably seen as needier than employees, not least because unemployed individuals' benefits are also based on their past payments for unemployment insurance. Last, a focus on neediness is aligned with a more economical and effective usage of limited resources.

H6 Training subsidies for further training have a higher probability of being regarded as just for unemployed individuals than for employed workers.

4 Methods and data

The empirical findings are based on a factorial survey; such surveys have been proven suitable to investigate a wide range of questions, such as social norms (Auspurg and Hinz 2015; Rossi and Anderson 1982). We construct several fictitious situations (vignettes) and ask the respondents to assess these situations. The situations randomly combine different characteristics along several dimensions. Three major advantages of this approach are that (a) respondents have to judge realistic situations; (b) with the necessary caution, the causal effects of different characteristics on assessments may be identified; and (c) the approach is relatively robust regarding biased answering behavior, such as social desirability bias.

We use two different sets of vignettes. The first relates to the firm dimension (H1 to H2), and the second focuses on the worker dimension (H3 to H6). The vignette design creates longitudinal data with the occasion dimension for each scenario, similar to panel data with the time dimension. For the two sets of vignettes, the respective vignette variables are selected uniformly at random from every possible vignette set of the vignette universe and assigned to each survey participant. The four different vignettes within each set represent a different occasion to evaluate, so the judgment of each scenario is influenced by a multitude of factors, whose intensity can vary between and within subjects. This is important, as it requires a

Table 1 Dimensions of the firm-related vignettes

Dimension	Characteristics	Number of attributes
Economic situation of the company	Economically strong Economically weak	2
Company size	30 300 3000 30,000	4
Number of funded employees	2 15	2
Degree of potential job automation in current occupation for funded employees	Not mentioned Already 25% of activities replaceable Already 75% of activities replaceable	3
Duration of funding	4 weeks 6 months	2

The vignette universe consists of 96 ($2 \times 4 \times 2 \times 3 \times 2$) combinations total, all of which are plausible (full factorial design)

multilevel approach and will be addressed at the end of this section.

We briefly introduce the topic and later use different outcome variables for firm-related and worker-related vignettes. According to the Act, firms receive subsidies depending on their characteristics. Therefore, we ask the respondents how high a percentage of the subsidies should be for the specific cases given in the vignette scenarios regarding companies. However, specific groups of employees are also beneficiaries. The legislature aims to support workers who are strongly affected by, for instance, structural change and digitization. Consequently, we also ask respondents to evaluate whether they deem it just that a certain person be considered for funding of further training.

First, we begin our survey with a general introduction as presented below to make all respondents familiar with the topic (German version in [Appendix](#): Text A1):

“Employers and employees who are subject to social security contributions are required to pay contributions to unemployment insurance. These funds can also be used to pay for further training in companies so that employees can better adapt to new challenges at the workplace.”

Second, we introduce the topic of the firm vignette (underlining included) and then ask respondents to make a judgment about the preferred percentage of training subsidies (German version in [Appendix](#): Text A2):

“In the following, 4 different situations are described, in which companies apply for funding of further training at the employment agency.

Please decide how much the company should receive in a certain situation for further training of its employees.

It can happen that the situations only differ slightly from each other. For these cases, too, your judgment is important for us. It is not about “right” or “wrong”, we are interested in your assessment.”

Table 1 provides an overview of the dimensions of the *firm-related* vignettes. These are the economic situation of the company, company size, number of employees taking part in training, possible degree of job automation, and training duration.

The firm-related scenarios (bold letters for variable parameters) are presented in this text:

“An economically **strong (weak)** company with **30 (300; 3000; 30,000)** employees applies at the employment agency for support for the occupational training of **two (15)** employees. The training lasts for **1 month (6 months)**. These employees work in professions in which **75% (25%; sentence not displayed)** of activities can already be replaced by computers and computer-controlled machines.”

After each of the four different scenarios, respondents were asked to indicate which percentage of wages during training and training costs should be reimbursed by unemployment insurance as a subsidy. Answers were provided in 10% steps, ranging from zero to 100%.

Third, we introduced the topic of the worker vignette (underlining included) and then asked respondents to judge how just or unjust they deem training subsidies (German version in [Appendix](#): Text A3):

“In the following, 4 different situations are described, in which unemployed or employed people come up wanting further training.

Please decide how just or unjust you find it, that the respective person receives financing for further training

Table 2 Dimensions of the worker-related vignettes

Dimension	Characteristics	Number of attributes
Sex	Male	2
	Female	
Age in years	34	3
	46	
	58	
Job status	Unemployed	2
	Employed	
Job risk of automation	Activities not replaceable in future	2
	Already 75% of activities replaceable	
Job contribution to social insurance	Continuous	2
	Intermittent and partial	
Job training duration	4 weeks	3
	6 months	
	2 years	

The vignette universe consists of 144 ($2 \times 3 \times 2 \times 2 \times 3$) combinations total, all of which are plausible (full factorial design)

from unemployment insurance funds. Likewise, it can happen that the situations only differ slightly from each other. Again, it is not about “right” or “wrong”, we are interested in your assessment.”

Table 2 provides an overview of the second type of vignette, where respondents assessed whether funding for a described individual *worker* was just. The dimensions analyzed are gender, age, risk of job loss due to automation, previous contributions to unemployment insurance, and the duration of training.

Worker-related scenarios (bold letters for variable parameters) are presented in this text:

“A **34 (46; 58)**-year-old **employed (unemployed) man (woman)** works in a profession in which **75% of activities can be replaced by computers or computer-controlled machines (which cannot be replaced by computers in the future)**. After finishing vocational training, **he (she)** was **continuously employed and contributed (intermittently employed and partially contributed)** to unemployment insurance. For this person, unemployment insurance finances occupational training with a duration of **4 weeks (6 months; 2 years)**.”

Respondents were asked how just, from their point of view, it is that the employment agency pays for this occupational training, using funds from the unemployment insurance?⁴

⁴ Strictly analytical something can only be either just or unjust and nothing in between. However, in empirical reality and in colloquial language this distinction is not so clear-cut, so respondents may still want to select a more nuanced position. Consequently, we allowed four different outcomes (ranging from unjust and quite unjust to quite just and just). Afterward, the two sides were combined into the dichotomy of unjust/just.

Having finished our depiction of vignettes, let us now turn to the description of our pool of respondents. The survey sample of approximately 35,000 people was sampled uniformly at random from the Integrated Employment Biographies (IEB V13.01.00-181010). The IEB covers all registered spells of employment subject to social security contributions (including marginal employment), unemployment, unemployment benefit receipt, job search and participation in active labor market programs in Germany. The sample was restricted to citizens 18 years old or older at the time of data collection and to individuals of German nationality (Osiander et al. 2020). Data access further required individuals to have had an IEB spell during 2017 and at least one employment spell during the period 2013–2017 to be included in the sample.

Using this sample, between 11/2019 and 1/2020 24,934 people were contacted via e-mail and 9551 people via post and asked to take part in an online survey. These invitations included information about the research project and data protection issues; a reference to the project homepage offered additional information. The e-mails contained an individualized link to the survey, while the letter included a QR code as well as a short link along with an individual password. Almost 50% of participants chose to answer the survey on their smartphones or tablets, while the other half chose to use a laptop or desktop PC. Overall, 1712 individuals started the survey, and after accounting for missing answers to the questions, including refusal to merge their answers with the administrative records on their labor market biographies in the IEB, a balanced panel with 1010 persons remained.

In consideration of established guidelines (AAPOR 2016), we calculate the net response ratios conservatively. Approximately 3.8% of people who were contacted (2.7% for invitations via e-mail and 6.7% for invitations via post) on valid addresses fully answered the survey. This is in line with expectations for such contact channels. The sample of our participants is not representative of the German labor force. However, we were able to conduct selectivity analyses for the combined samples of e-mail and post. Almost 50% of respondents in the gross sample are female, 20% live in Eastern Germany (including Berlin), 75% have completed vocational training or university and 60% are qualified skilled workers. Our selectivity analysis compares the gross sample to the final sample of respondents. People from Eastern Germany (including Berlin) and people who are 65 years and above are underrepresented, while people 50–64 are overrepresented. Moreover, people with higher formal qualifications, longer duration of both employment and previous unemployment receipt are also overrepresented in our final sample (Osiander et al. 2020).

All participants received two sets of four vignette scenarios. Furthermore, we collect information on: gender, age, qualification, political preferences and classified net monthly household income. We also include questions about (a) the respondent's attitude toward unemployed individuals and (b) how respondents handle new technologies at the workplace. The respondent characteristics can control for selective distortions in the sample, such as age, income, political views and for behavior patterns, such as self-interested behavior. Depending on the circumstances, someone is primarily a beneficiary or a payer in the unemployment insurance system. Factors such as regional work opportunities, position in the labor market and technical knowledge can play a role, and people may choose the option they believe to benefit from the most. A summary of all variables and their operationalization is available in Appendix Table 5.

Each participant judged four vignettes related to the company level and four vignettes related to the employee level. These four evaluations are very likely not independent of each other, given that they are from the same person.

For both the firm vignette (size of training subsidies perceived as just) and the worker vignette (training subsidy is perceived as just), this is accounted for by estimating multilevel models such as fixed effects models, but also mixed effects models using random intercepts and slopes at the individual level. The fixed aspect means that only the within-variation of the vignette variables enters the model, while mixed models can fit all coefficients. In our mixed model, both vignette variables and individual characteristic variables, plus a selection of random slopes (also called random coefficients), are fitted at the individual level. In general, mixed models can deliver more reliable results than standard linear panel regression with random effects. Therefore, we account for the multilevel structure in the first vignette with a linear mixed model. Mixed models combine the advantages of both fixed effects and random effects (Bell et al. 2019) but are therefore more complex. Mixed effects with random effects coefficients for only intercept and residual are identical to random effects models. Additional slopes can be regarded as an extension of the random effects model and are the hallmark of mixed models. Analogous to the general assumption that the random intercept model follows a normal distribution, random slopes follow a multivariate normal distribution. Such random slopes can capture and model even more variance than the mere inclusion of a random intercept can. Therefore, unless parallel slopes can be assumed, mixed models should be considered a first choice before fitting a simple random effects model. This proved particularly important for the logit models used for the second vignette, but the linear models of the

first vignette can also benefit from this. We know that mixed effects with random intercept and random slopes can be important because the cluster-robust variance-covariance estimator (Eicker–Huber–White procedure) accounts only for between-person heteroscedasticity but not for variance differences originating within clusters. In our case, only the vignettes vary within the cluster that each participant represents.

For the firm vignette, the linear mixed regression model includes random slopes for the attributes “company size”, “degree of job automation” and “duration of funding” (cf. Table 1) to account for within-person standard deviation differences with random slopes. To motivate the mixed model, we check three criteria: relevant effects and noteworthy p-values of the correlation coefficients, the results of a likelihood ratio test, and improved information criteria (AIC/BIC). We model both the standard deviation for random slopes and the correlation between random slopes, including the correlation of random slopes with the random intercept. We choose conservative unstructured standard deviations because we cannot assume a certain standard deviation pattern. First, we confirm that all standard deviation coefficients are relevant in size and statistically significant ($p < 0.001$). For the correlation terms, all selected random slope variables are relevant in size and statistically significant ($p < 0.001$) as they correlate with the constant, so these variables are all regarded as important for inclusion in the model. Second, a likelihood ratio test ($p < 0.001$) corroborates this selection of random slopes when compared to the same model but without random slopes. Third, the chosen random slopes collectively improve both information criteria, AIC and BIC (cf. Table 3), to avoid overfitting. Due to extensive testing, we can confirm that no other possible combination of random slopes increases the model fit further. Please take note that the pseudo- R^2 of Snijders/Bosker does not take into account random slopes, which is why its results in Model 2 and Model 3 are identical. This measure is used here to point out a general increase in explained variance between Model 1b and Model 2 at level 1, which is our vignette level, and at level 2, which is the level of individual characteristics (Snijders and Bosker 1999). In summary, the selected linear mixed effects panel model has advantages over a standard random effects model, as it further reduces heteroscedasticity (Bell et al. 2019).

For the worker vignette with binary coding of just or unjust, a logit mixed model with random slopes delivers different and more reliable results than a standard panel logit with random effects could. Once again, we choose to address the multilevel structure by applying mixed effects, now with a logit mixed model. We fit conditional logit fixed and mixed logit models by

Table 3 Firm vignette: size of training subsidies perceived as just (in 10% intervals)

	Model 1a	Model 1b	Model 2	Model 3
Fixed effects coefficients				
1. Vignette features	FE	Mixed + RI	Mixed + RI	Mixed + RI/RS
Company size (ref: 30)				
300 employees	−4.163*** (0.897)	−4.028*** (0.887)	−3.993*** (0.888)	−3.644*** (0.853)
3000 employees	−9.782*** (0.956)	−9.567*** (0.937)	−9.563*** (0.937)	−9.689*** (0.885)
30,000 employees	−15.144*** (0.973)	−15.016*** (0.957)	−15.019*** (0.956)	−14.484*** (0.938)
Strong company (else: weak)	−16.924*** (0.703)	−16.869*** (0.697)	−16.929*** (0.696)	−16.766*** (0.683)
Training for 15 people (else: two)	−0.928 (0.668)	−0.791 (0.659)	−0.735 (0.660)	−0.934 (0.632)
Job at risk of automation (ref: nothing)				
Already 25% replaceable	−0.569 (0.914)	−0.433 (0.881)	−0.401 (0.879)	0.092 (0.857)
Already 75% replaceable	−2.588** (0.948)	−2.551** (0.924)	−2.562** (0.922)	−1.857* (0.893)
Funding for 6 months (else: four weeks)	−0.792 (0.724)	−0.679 (0.690)	−0.609 (0.688)	−0.911 (0.619)
2. Personal characteristics				
Male (else: female)			−6.214*** (1.560)	−5.958*** (1.543)
Age of respondent (ref: 50–64)				
Age 18–34			5.439* (2.030)	5.559* (2.002)
Age 35–49			1.222 (1.793)	1.523 (1.774)
Age 65–78			−0.249 (4.030)	0.124 (4.027)
German region (ref: 'Eastern States')				
German Southern States			−2.720 (2.389)	−3.288 (2.393)
German Northern States			−4.793 (2.416)	−5.635* (2.425)
German City States			0.448 (3.279)	−0.854 (3.257)
Education (ref: A-levels/vocat. training)				
No education			6.380 (6.896)	5.986 (6.567)
(Technical) College			−3.657* (1.576)	−3.719* (1.561)
Net hh-income/month (ref: 2000–2999)				
Less than 1000 Euro			−0.993 (4.460)	−0.932 (4.364)
1000–1499 Euro			1.018 (3.347)	0.514 (3.248)
1500–1999 Euro			6.178* (2.919)	5.475 (2.944)
3000–3999 Euro			1.023 (2.358)	0.183 (2.345)
4000–4999 Euro			−1.496 (2.615)	−1.830 (2.605)
5000 Euro or more			2.638 (2.712)	2.261 (2.681)
Income not specified			−1.390 (3.153)	−2.239 (3.139)
Party affiliation (ref: 'Greens')				
CDU (Christian Democratic Union)			−1.834 (2.836)	−0.760 (2.813)
CSU (Christian Social Union)			−6.275 (4.633)	−5.731 (4.682)
SPD (Social Democratic Party)			−0.005 (2.594)	0.251 (2.593)
AfD (Alternative for Germany)			−0.812 (4.767)	−0.416 (4.758)
FDP (Free Democratic Party)			−9.216* (3.373)	−8.543* (3.322)
Die Linke (The Left)			−1.059 (3.051)	−1.901 (2.994)
Other party (not in parliament)			2.353 (4.574)	2.289 (4.620)
Not specified			2.027 (2.029)	2.264 (2.002)
Unemployment benefit (else: no)			0.921 (1.708)	0.734 (1.697)
Unemployed responsibility (else: no)			1.890 (2.545)	2.412 (2.520)
Difficulty with new work tech (ref: no)				
Difficulty with new tech			3.969 (2.489)	3.861 (2.436)
Not applicable (no work)			0.264 (2.170)	0.325 (2.166)
Constant		62.778*** (1.262)	66.889*** (3.693)	67.326*** (3.681)

Table 3 (continued)

	Model 1a	Model 1b	Model 2	Model 3
Random effects (RE) coefficients				
Sd (constant)		22.670*** (0.524)	21.774*** (0.509)	26.984*** (0.776)
Sd (residual)		17.873*** (0.327)	17.873*** (0.327)	12.703*** (0.502)
Sd (strong company)				14.899*** (0.937)
Sd (25% replaceable)				13.116*** (1.503)
Sd (75% replaceable)				13.170*** (1.487)
Sd (subsidize 15)				10.051*** (1.416)
Corr (strong company, 25% replaceable)				0.179 (0.108)
Corr (strong company, 75% replaceable)				0.014 (0.101)
Corr (strong company, subsidize 15)				0.122 (0.092)
Corr (strong company, constant)				−0.431*** (0.047)
Corr (25% replaceable, 75% replaceable)				0.189 (0.145)
Corr (25% replaceable, subsidize 15)				−0.086 (0.124)
Corr (25% replaceable, constant)				−0.263*** (0.070)
Corr (75% replaceable, subsidize 15)				0.253 (0.143)
Corr (75% replaceable, constant)				−0.224*** (0.067)
Corr (subsidize 15, constant)				−0.390*** (0.061)
Model fit criteria				
Information criteria: (1) AIC; (2) BIC	(1) 1040; (2) 1083	(1) 36,810; (2) 36,879	(1) 36,796; (2) 37,042	(1) 36,545; (2) 36,879
R ² : McFadden; Lvl. 1&2 Snijders/Bosker	0.203 (MF)	0.106; 0.013 (S/B)	0.148; 0.080 (S/B)	0.148; 0.080 (S/B)

4040 vignette answers for 1010 persons

FE fixed effects, RI random intercept, RS random slopes

*p < 0.050; **p < 0.005; ***p < 0.001; robust standard errors in parentheses

maximizing the log pseudolikelihood (cf. Appendix Table 6) and in postestimation predict robust average marginal effects (cf. Table 4). Table 6 indicates both secular improvement with a decreasing AIC and an increase in McKelvey–Zavoinas' pseudo-R² from approximately 20% to approximately 80% as a measure of variation explained by the model. This pseudo-R² is also recommended as most suitable for logit models (Langer 2017). In Model 1a, we include only the vignette variables for a logit conditional fixed effect for comparison with the following mixed models. In Model 1b, the same vignette variables are used to fit individual coefficient variances as random intercepts. In Model 2, we then add personal characteristics. For reference, the results of Model 1b and Model 2 are identical to those fitting a standard logit random effects regression, which does not consider slopes. In the final Model 3, we add individual random slopes to model the variance structure. For this, we choose to model the attributes “job status”, “job risk of automation” and “job contribution to social insurance” (cf.

Table 2) to model within-person variance differences with random slopes.⁵ We do this because of three factors: the relevance of the variance coefficients and the noteworthy p-values for the covariance coefficients, the results of a likelihood ratio test, and the improved information criteria. We begin by modeling the variances for random slopes and the covariances between random slopes, including the covariances of random slopes with the random intercept. We choose conservative unstructured covariances because we cannot assume a certain covariance pattern. First, we notice that the results for the chosen random slopes show considerable values for the individual variance coefficients. The covariance coefficients also have noteworthy effects, with (almost all) p-values smaller than 0.05, and are therefore regarded as relevant for inclusion in our model. Second, further validation of the chosen random slope model is given by the results of a likelihood ratio test (p < 0.001) with selected random slopes compared to a model without random slopes. Third, all chosen random slopes collectively improve both information criteria, AIC and BIC (cf. Table 6). This means that the model is not overfitted. No other possible combination of random slopes improves the model fit further, which reassures us that it is not

⁵ Due to convention, variance and covariance is used for random coefficients here, but after applying a transformation to normalize the estimate, which does not affect p-values, the results would be analogous to standard deviation and correlation of the linear mixed model.

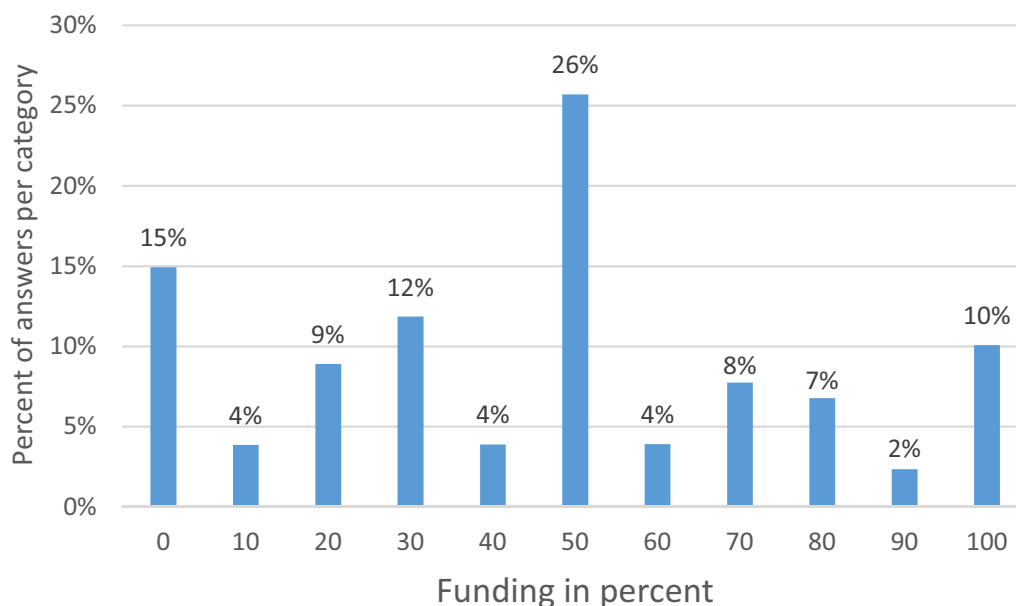
Table 4 Worker vignette: training subsidy is perceived as just—Avg. marginal effect

Avg. predicted marginal effect	Model 1a	Model 1b	Model 2	Model 3
1. Vignette features	Logit fixed	Logit mixed + RI	logit mixed + RI	logit mixed + RI/RS
Male (else: female)	−0.058* (0.027)	−0.025** (0.011)	−0.027* (0.011)	−0.025* (0.010)
Age (ref: 34 years old)				
46 years old	0.074* (0.031)	0.040*** (0.012)	0.042*** (0.012)	0.035*** (0.012)
58 years old	−0.034 (0.032)	−0.020 (0.014)	−0.021 (0.014)	−0.028* (0.013)
Unemployed (else: no)	0.140*** (0.027)	0.078*** (0.012)	0.081*** (0.012)	0.086*** (0.011)
Funding time (ref: 4 weeks)				
Funding for 6 months	−0.034 (0.034)	−0.027* (0.013)	−0.026* (0.013)	−0.027* (0.013)
Funding for 2 years	−0.193*** (0.032)	−0.092*** (0.013)	−0.090*** (0.013)	−0.091*** (0.012)
Job 75% replaceable (else: no)	0.150*** (0.029)	0.069*** (0.013)	0.067*** (0.013)	0.070*** (0.013)
Continuous job (else: no)	0.267*** (0.026)	0.119*** (0.012)	0.122*** (0.012)	0.117*** (0.012)
2. Personal characteristics				
Male (else: female)			0.039* (0.016)	0.042* (0.016)
Age (ref: 50–64)				
Age 18–34			0.015 (0.020)	0.027 (0.019)
Age 35–49			0.011 (0.018)	0.010 (0.017)
Age 65–78			−0.030 (0.046)	−0.041 (0.046)
Region (ref: 'Eastern States')				
German Southern States			−0.005 (0.024)	−0.005 (0.024)
German Northern States			−0.005 (0.024)	−0.007 (0.023)
German City States			0.026 (0.032)	0.017 (0.032)
Education (ref: A-levels and vocational training)				
No education			−0.049 (0.068)	−0.068 (0.068)
(Technical) College			0.023 (0.016)	0.024 (0.016)
Monthly net household Euro income (ref: 2000–3000)				
Less than 1000 Euro			0.002 (0.042)	0.009 (0.040)
1000–1499 Euro			0.034 (0.034)	0.030 (0.034)
1500–1999 Euro			0.016 (0.026)	0.020 (0.025)
3000–3999 Euro			−0.019 (0.022)	−0.016 (0.022)
4000–4999 Euro			−0.032 (0.025)	−0.024 (0.024)
5000 Euro or more			−0.074* (0.027)	−0.060* (0.026)
Income not specified			−0.031 (0.034)	−0.028 (0.033)
Parties (ref: 'Greens')				
CDU (Christian Democratic Union)			−0.060* (0.031)	−0.065* (0.031)
CSU (Christian Social Union)			−0.050 (0.049)	−0.055 (0.048)
SPD (Social Democratic Party)			0.031 (0.025)	0.020 (0.025)
AfD (Alternative for Germany)			−0.045 (0.049)	−0.066 (0.050)
FDP (Free Democratic Party)			−0.135*** (0.042)	−0.132*** (0.039)
Die Linke (The Left)			0.012 (0.031)	−0.004 (0.032)
Other party (not in Parliament)			0.085* (0.031)	0.071* (0.031)
Not specified			−0.004 (0.019)	−0.01 (0.019)
Unemployment benefit (else: no)			0.069** (0.022)	0.075*** (0.020)
Unemployed responsible for situation (else: no)			0.035* (0.016)	0.042* (0.016)
Difficulty with new work technologies (ref: no)				
Difficulty with new tech			0.023 (0.023)	0.018 (0.022)
Not applicable (no work)			0.025 (0.022)	0.027 (0.021)

4040 vignette answers; 1010 persons

RI random intercept, RS random slopes

*p < 0.050; **p < 0.005; ***p < 0.001; robust standard errors in parentheses



Notes: 4,040 vignettes, 1,010 persons.

Fig. 1 Distribution of funding percentages to subsidize firm costs of further training.

necessary to include additional random slopes, as differences in variances can already be captured by the chosen final model. This is also supported by doubling the model fit criterion of pseudo- R^2 (FE + RE) from approximately 40% to approximately 80% when comparing Model 2 to Model 3 (cf. Table 6).

In conclusion, a standard panel logit model with random effects would not be appropriate here. Such a model would seriously violate the model assumptions of homoscedasticity and deliver anti-conservative results that introduce a bias on standard errors and point estimates (Bell et al. 2019), so we prefer the final mixed model with the aforementioned random slopes to mitigate this problem.

5 Empirical findings

In the first step, we analyze the extent to which features of the *firm* have an impact on the perceived just amount of training subsidies. The average amount of funding across all vignettes is approximately 45%. As outlined above, the design of our study ultimately does not allow us to draw conclusions regarding the general support of training subsidies in the population. A descriptive analysis shows that in 85% of the scenarios, the respondents would financially support training subsidies at least to some degree (see Fig. 1). Due to our factorial survey design, we can cautiously draw a causal interpretation

(Wasserstein et al. 2019) of the effects of firm characteristics on justice assessments. Table 3 presents the results from Model 1a with fixed effects and Model 1b with mixed effects and random intercept. Both cover only the vignette dimensions. Model 2 also controls for respondent characteristics. Finally, Model 3 is the same as Model 2 but with random slopes. The following discussion refers to Model 3. Note that we focus our interpretation on point estimates (random coefficients are not to be interpreted for this purpose)—rounded to the next $\frac{1}{2}$ % or half percentage point—for coefficients with low p-values of <5%, <0.5% and <0.1%, as indicated by one, two or three asterisks; standard errors can be found in the respective tables to reflect this. The p-values with one asterisk between <5% and 0.5% should be seen as merely suggestive, while those <0.5% may be considered significant, and those <0.1% may be considered even more so (Benjamin et al. 2018).

First, survey respondents grant substantially higher subsidies to economically weak firms than to economically strong firms ($\approx +17$ percentage points). Furthermore, the subsidy share increases with firm size—each tenfold increase in the number of employees reduces the assigned subsidy (≈ -5.0 percentage points each step), particularly for very large firms (≈ -14.5 percentage points). As predicted by H1a and H1b, participants

thus account for the basic justice principle of need when assigning the just amount of training subsidies. However, the degree of differentiation according to firm size is smaller than that granted in current legislation in Germany.⁶

We find, however, no support for H2 that individuals assign more support to firms where trained workers are employed in occupations threatened by technological change. Survey participants assign even less funding if the firm trains workers whose jobs are strongly exposed to potential job automation (≈ -2 percentage points) compared to the reference scenario where no information on the risk of automation was given. It is possible that the participants consider such work sites a “lost cause” and would rather not waste resources on the company itself.

Regarding respondents characteristics, men generally attribute less funding to the firm (≈ -6 percentage points), adults younger than 35 attribute more funding compared to the reference group of 50–64-year-old respondents ($\approx +5.5$ percentage points) and respondents from German “Northern States” give less (≈ -5.5 percentage points) than respondents from the East. The effect of monthly net classified household income is not relevant, while college education has a small negative effect on the level of support (≈ -3.5 percentage points). Furthermore, individuals who identify themselves as voters of the Free Democratic Party (FDP) grant much less support to firms (≈ -8.5 percentage points), in line with the small government approach of the party.

In the second step, we analyze the importance of the characteristics of trained workers, who also stand to gain from the Act. As beneficiaries, they are thus included in the assessment of training subsidies in another vignette design. The dependent variable is a binary variable indicating whether funding is perceived as just or unjust. Approximately 20% of singular vignette answers regarded funding as unjust and 80% as just. In the following, we will use the average marginal effects of Table 4 Model 3 for further interpretation.

H3 posited that training subsidies are more likely to be perceived as just for individuals in need, in particular for persons whose occupations are exposed to automation and older workers. Indeed, the respondents judge training subsidies to be just more often ($\approx +7\%$) if the recipient of the subsidy has been working in an occupation where tasks could already be substituted to a high degree (75%) by computers. This result is in line with H3.

Regarding age, the results show that compared to a 34-year-old person, a middle-aged person (age 46) is

slightly more likely to be perceived as a just recipient of funding for further training ($\approx +3.5\%$), while this is less likely for an older individual of age 58 ($\approx -3\%$). It is plausible that younger workers, due to their usually more up-to-date training and long-term prospects for amortization of their own investment in training, are perceived as less needy. For older persons, respondents may assume that they are close to retirement and that investments in training will thus not pay off. Furthermore, the respondents might presume that older learners have diminished learning capabilities. Concerning age, H3 is only partly confirmed, as respondents also seem to take the principle of efficiency into account.

With respect to training duration, respondents perceive funding for training over six months ($\approx -3\%$) or two years ($\approx -9\%$) as less just than a shorter training of 4 weeks. While 4 weeks are already slightly preferred to 6 months, the difference is quite small and not relevant for the analysis, which focuses on long courses. According to H4, such long courses will be deemed too long. Our results are in line with H4, so efficiency considerations may also play a role in justness assessments of training subsidies.

H5 presumed that training subsidies for workers with continuous contributions to social insurance would more likely be regarded as just than subsidies to workers with unstable work histories. Here, we indeed find a comparatively strong effect ($\approx +12\%$). This supports H5, which is based on the principle of equity, while needs-based justice may only play a minor role here.

Finally, an important feature of training subsidies is whether the support is directed to unemployed individuals or employed workers. The estimates show that training subsidies for the occupational training of unemployed individuals are regarded as more just ($\approx +8.5\%$). According to H6 we expected that training subsidies for further training are more likely to be perceived as just for unemployed individuals than for the employed. While the respondents may consider principles of both need and equity,⁷ need seems to be the dominant principle in this context. The results provide support for H6, as unemployed individuals are clearly preferred. Nevertheless, training subsidies for employees are also judged to be fair by the vast majority of vignette answers. This is in line with the legislation, as employees also have access to training paid for by the same fund that thus far has prioritized unemployed individuals.

⁶ The Act grants 25 percentage points less as firm size increases from 30 to 300 and another 10 percentage points less for training costs as firm size increases from 300 to 3000—compared to our 5.0 percentage points each step.

⁷ To test what determines dominant principles further, interaction effects were calculated, but they provided no further insights. Multiple tests for interaction effects between vignettes and certain personal characteristics related to the vignettes (e. g., age of respondent and age in vignette; sex of respondent and sex in vignette) were carried out, but none had strong effects, improved information criteria or were statistically significant/relevant enough to warrant inclusion in the model.

Regarding respondent characteristics, we find a few effects on justice considerations. Men ($\approx +4\%$) are more inclined to show support. Respondents with a high net household income are more reluctant to consider assistance to be just ($\approx -6.0\%$). For political leanings, strong effects were found for a political preference for the Christian Democratic Union (CDU $\approx -6.5\%$), for the Free Democratic Party (FDP $\approx -13\%$) and for other parties not currently in parliament ($\approx +7\%$) when compared to the reference of supporting the Green party. Respondents who ever received unemployment benefits through unemployment insurance show greater support ($\approx +7.5\%$). Finally, if the respondent agrees with the statement in respondent characteristics that unemployed individuals themselves are responsible for their situation, then this slightly increases the acceptance ($\approx +4\%$) to provide training subsidies in the worker vignette.

6 Discussion of key findings

Against the background of new funding options as part of unemployment insurance regarding further training for currently employed workers in Germany, this article analyzes the determinants of justice perceptions of such support measures. The state provides the opportunities for firms to apply for a (partial) reimbursement of wage costs during training, as well as training costs. The analysis shows that citizens generally accept the training subsidies for occupational further training in the Qualification Opportunities Act. Our factorial surveys also uncover the principles of justice underlying the assessment of training subsidies for firms and for workers.

First, an important technical point is that the mixed effects models highlight the need to incorporate (appropriate) random slopes, which can yield a considerable boost in explained variance to strengthen the study results. Future theoretical research could determine, if the size of this boost is dependent on the number of vignette variables, vignettes per respondent or other factors.

Second, focusing on the firm dimension, we show that that the approach of German legislation to reimburse a larger share of training costs for small firms is mirrored by the assessments of training subsidies by the respondents. However, respondents differentiate their assessments by firm size less than the recent legislation in Germany does. Respondents would grant more support to economically weak and small firms, which are more in need than stronger and larger firms are. We find, however, no indication that funding should increase with training duration and with an increased degree of job automation to which funded workers are exposed.

Third, focusing on the worker dimension, we find support for the basic justice principle of need and principle

of equity but also indications that the respondents appreciate an economical use of funds. Public training support for workers is more often assessed as just, if the workers are currently unemployed or if their occupation is strongly exposed to potential automation, in line with the principle of need. Furthermore, workers are preferred to exhibit stable work histories and thus steady contributions to unemployment insurance, in line with the principle of equity. The productive use of resources is specified by favoring people of middle age and lack of support for long training durations, in line with economical use of funds.

Fourth, when comparing both dimensions, exposure to technological change is only statistically significant for the worker vignette, but not for the firm vignette. While both vignettes are different in other ways as well, it can be speculated that supporting workers with training subsidies is more tenable. That may be, because workers can directly and more easily benefit by switching to a more suitable line of work and even industry—something firms cannot easily do.

In light of principles of justice to evaluate the new funding possibilities of unemployment insurance, our results show that respondents largely exhibit congruence with neediness and thus not with the principle of equity. However, productivistic justice principles and orientation toward the efficient application of social insurance resources can also come to the fore

Appendix

Text A1: Original German version of general introduction

Sozialversicherungspflichtig Beschäftigte und Arbeitgeber zahlen in Deutschland Beiträge zur Arbeitslosenversicherung.

Von diesem Geld können auch Beschäftigte in Unternehmen Weiterbildungskurse bezahlt bekommen, damit Mitarbeiterinnen und Mitarbeiter sich besser an neue Herausforderungen am Arbeitsplatz anpassen können.

Text A2: Original German version of the firm vignette and its introduction

Im Folgenden werden vier verschiedene Situationen beschrieben, in denen Unternehmen eine Förderung von Weiterbildungen bei der Arbeitsagentur beantragen.

Bitte entscheiden Sie, wie viel das Unternehmen in einer bestimmten Situation für die Weiterbildung seiner Beschäftigten bekommen sollte. Es kann vorkommen, dass sich die Situationen nur geringfügig voneinander unterscheiden. Auch in diesen Fällen ist uns Ihr Urteil

darüber wichtig. Es geht nicht um “richtig” oder “falsch”, wir sind an Ihrer Einschätzung interessiert.

Firm vignette

Ein wirtschaftlich solides (schwaches) Unternehmen mit 30 Beschäftigten (300; 3.000; 30.000 Beschäftigten) beantragt bei der Arbeitsagentur die Förderung einer Weiterbildungsmaßnahme für zwei Beschäftigte (15 Beschäftigte). Die Weiterbildung soll einen Monat (6 Monate) dauern. Diese Beschäftigten arbeiten in Berufen, in denen bereits heute 75 Prozent (25 Prozent; *Satz nicht erwähnt*) ihrer Tätigkeiten durch Computer oder computergesteuerte Maschinen ersetzbar sind.

Wieviel Prozent der Kosten für den Lohn und die Weiterbildung des Mitarbeiters soll die Arbeitsagentur dem Unternehmen erstatten?

Text A3: Original German version of the worker vignette and its introduction

Im Folgenden werden vier andere Situationen beschrieben, in denen Arbeitslose oder Beschäftigte vorkommen, die sich weiterbilden möchten.

Bitte entscheiden Sie, wie gerecht oder ungerecht Sie es finden, dass die jeweilige Person eine Weiterbildung

aus Mitteln der Arbeitslosenversicherung finanziert bekommt.

Es kann auch hier vorkommen, dass sich die Situationen nur geringfügig voneinander unterscheiden. Es geht wieder nicht um “richtig” oder “falsch”, wir sind an Ihrer Einschätzung interessiert.

Worker vignette

Ein/e 34-jährige/r (46-jährige/r;58-jährige/r) erwerbstätige/r (arbeitslose/r) Mann (Frau) arbeitet in einem Beruf, dessen Inhalte schon heute zu 75% durch Computer oder Roboter ersetzbar sind (der auch zukünftig nicht durch Computer ersetzt wird). Er (Sie) war seit der Ausbildung dauerhaft beschäftigt und hat Beiträge (unregelmäßig beschäftigt und hat phasenweise Beiträge) in die Arbeitslosenversicherung eingezahlt. Die Person bekommt eine vierwöchige (sechsmonatige, zweijährige) Weiterbildung aus Mitteln der Arbeitslosenversicherung finanziert.

Wie gerecht ist es aus Ihrer Sicht, dass die Arbeitsagentur die Weiterbildung aus Mitteln der Arbeitslosenversicherung bezahlt?

See Tables 5, 6.

Table 5 Sample composition for respondent characteristics

Variables for all items in a category add up to 100% (excl. rounding error)	Percent (%)
Male	53.9
Female	46.1
Age 18–34 (18 is minimum)	22.3
Age 35–49	28.7
Age 50–64	44.1
Age 65+ (78 is the realized survey maximum)	5.0
‘Eastern States’: Brandenburg, Mecklenburg-West Pomerania, Saxony, Saxony-Anhalt, Thuringia	15.2
‘Southern States’: Baden-Württemberg, Bavaria, Rhineland-Palatinate, Saarland	38.7
‘Northern States’: Hesse, North Rhine-Westphalia, Schleswig-Holstein, Lower Saxony	36.8
‘City States’: Berlin, Bremen, Hamburg	9.2
No education	1.8
A-levels and/or vocational training	54.8
(Technical) College	43.5
Monthly net household income of less than 1000 Euro	4.4
Monthly net household income between 1000 and 1499 Euro	6.6
Monthly net household income between 1500 and 1999 Euro	9.2
Monthly net household income between 2000 and 2999 Euro	22.2
Monthly net household income between 3000 and 3999 Euro	20.7
Monthly net household income between 4000 and 4999 Euro	15.0
Monthly net household income more than 5000 euro	15.1
Monthly net household income not specified	6.7
CDU (Christian Democratic Union)	10.6
CSU (Christian Social Union)	3.2

Table 5 (continued)

Variables for all items in a category add up to 100% (excl. rounding error)	Percent (%)
SPD (Social Democratic Party)	9.7
AfD (Alternative for Germany)	3.6
FDP (Free Democratic Party)	4.9
Die Linke (The Left)	7.7
Bündnis 90/Die Grünen ('Greens')	25.4
Other party not represented in parliament	3.8
Political factor not specified (no party affiliation, apolitical, no political affiliation)	31.2
Ever in life registered for unemployment benefits	61.8
Not ever in life registered for unemployment benefits	38.2
Agree with statement: ultimately, unemployed individuals are responsible for their situation	9.1
Agree with statement: ultimately, unemployed individuals are not responsible for their situation	90.9
Agree with statement: I will have difficulty handling new technology at work	11.2
Agree with statement: I will not have difficulty handling new technology at work	69.6
Statement not applicable due to not working	19.2
1010 persons	

Table 6 Worker vignette: training subsidy is perceived as just—odds ratio

Fixed effects (FE) odds ratio	Model 1a	Model 1b	Model 2	Model 3
1. Vignette features	Logit conditional FE	Logit mixed + RI	Logit mixed + RI	Logit mixed + RI/RS
Male (else: female)	0.757 (0.097)	0.779 (0.085)	0.764* (0.084)	0.637* (0.120)
Age (ref: 34 years old)				
46 years old	1.431* (0.219)	1.514*** (0.198)	1.556*** (0.204)	1.943** (0.440)
58 years old	0.850 (0.127)	0.827 (0.109)	0.823 (0.108)	0.614* (0.138)
Unemployed (else: no)	1.938*** (0.246)	2.168*** (0.253)	2.228*** (0.258)	4.747*** (1.543)
Funding time (ref: 4 weeks)				
Funding for 6 months	0.850 (0.137)	0.748* (0.108)	0.756* (0.108)	0.590* (0.149)
Funding for 2 years	0.405*** (0.062)	0.410*** (0.054)	0.418*** (0.055)	0.198*** (0.053)
Job to 75% replaceable (else: no)	2.036*** (0.282)	1.985*** (0.254)	1.941*** (0.245)	2.341* (0.874)
Continuous job (else: no)	3.407*** (0.432)	3.226*** (0.409)	3.321*** (0.422)	10.486*** (4.703)
2. Personal characteristics				
Male (else: female)			1.472* (0.227)	2.142* (0.623)
Age (ref: 50–64)				
Age 18–34			1.165 (0.234)	1.636 (0.596)
Age 35–49			1.115 (0.197)	1.198 (0.377)
Age 65–78			0.757 (0.312)	0.505 (0.370)
Region (ref: Eastern States)				
German Southern States			0.954 (0.223)	0.907 (0.403)
German Northern States			0.956 (0.223)	0.880 (0.371)
German City States			1.309 (0.448)	1.373 (0.826)
Education (ref: A-levels & vocational training)				
No education			0.644 (0.369)	0.336 (0.344)
(Technical) College			1.262 (0.202)	1.546 (0.461)
Monthly net household Euro income (ref: 2000–3000)				
Less than 1,000 Euro			1.020 (0.457)	1.201 (0.932)

Table 6 (continued)

Fixed effects (FE) odds ratio	Model 1a	Model 1b	Model 2	Model 3
1000–1499 Euro			1.476 (0.598)	1.841 (1.325)
1500–1999 Euro			1.194 (0.340)	1.493 (0.745)
3000–3999 Euro			0.826 (0.186)	0.744 (0.298)
4000–4999 Euro			0.731 (0.181)	0.647 (0.284)
5000 Euro or more			0.504* (0.127)	0.358* (0.163)
Income not specified			0.734 (0.241)	0.607 (0.357)
Party affiliation (ref: 'Greens')				
CDU (Christian Democratic Union)			0.573* (0.158)	0.327* (0.169)
CSU (Christian Social Union)			0.629 (0.271)	0.385 (0.304)
SPD (Social Democratic Party)			1.400 (0.388)	1.487 (0.750)
AfD (Alternative for Germany)			0.655 (0.288)	0.323 (0.260)
FDP (Free Democratic Party)			0.322*** (0.103)	0.124*** (0.073)
Die Linke (The Left)			1.133 (0.374)	0.924 (0.548)
Other party (not in parliament)			2.945* (1.422)	5.133 (4.398)
Not specified			0.956 (0.186)	0.824 (0.295)
Unemployment benefit (else: no)			2.152* (0.618)	4.770** (2.468)
Unemployed responsible (else: no)			1.403* (0.222)	2.102* (0.621)
Difficulty with new work technologies (ref: no)				
Difficulty with new tech			1.264 (0.296)	1.386 (0.569)
Not applicable (no work)			1.287 (0.294)	1.658 (0.664)
Constant (not odds ratio)		2.235*** (0.183)	1.786*** (0.357)	3.483*** (0.706)
Random effects (RE) coefficient				
Var (constant)		2.886*** (0.386)	2.423*** (0.333)	13,860*** (3.989)
Var (unemployed 'UE')				5.266* (2.198)
Var (job replaceable)				14.123*** (3.658)
Var (continuous job)				11.619*** (3.301)
Cov (constant, unemployed)				-2.721 (1.998)
Cov (constant, job replaceable)				-4.646* (2.261)
Cov (constant, continuous job)				-3.912* (1.952)
Cov (UE, job replaceable)				-4.002* (1.496)
Cov (UE, continuous job)				4.770*** (1.427)
Cov (job replaceable, Cont. job)				-5.459** (1.752)
Model fit criteria				
Information criteria: AIC; BIC	AIC:1040; BIC:1083	AIC:3369; BIC:3432	AIC:3342; BIC:3582	AIC:3207; BIC:3504
R ² (FE) MF; McKelvey and Zavoina	0.203 (McFadden)	0.202 (MK&Z)	0.284 (MK&Z)	0.5691 (MK&Z)
R ² (FE + RE) McKelvey and Zavoina	N/A	0.406 (MK&Z)	0.423 (MK&Z)	0.7807 (MK&Z)
Intraclass correlation (ICC)	N/A	0.395		

Odds ratios exclude constant and random effects coefficients; robust standard errors in parentheses; secular AIC decrease in mixed

1692 (logit conditional FE) or 4040 (logit mixed) vignette answers for 1010 persons

*p < 0.050; **p < 0.005; ***p < 0.001

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Author contributions

The cited authors contributed insights in all parts of the paper. All authors read and approved the final manuscript.

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Availability of data and materials

As the data underlying our analysis are not completely proprietary, access to the data is restricted. The data we use are social data. They contain sensitive information and are subject to confidentiality regulations. Obtaining access

to the data through the research data center of the Institute for Employment Research (IAB) requires a contract with IAB. We will support researchers interested in replicating the results with the required formalities to receive data access.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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