



Recruiting mid-qualified workers in product-innovating firms: Which personality traits matter?

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ABSTRACT

Change in the work context is an important characteristic of product-innovating firms, and the innovation's profitability often depends on the workers' adaptive capability to cope with change. Personality traits shape the individual adaptive capability. Nevertheless, the current economic recruitment literature does not discuss personality trait-oriented recruitment in product-innovating firms. We investigate whether recruiters in product-innovating firms prefer mid-qualified job applicants with certain Big Five personality traits. We conduct a discrete choice experiment among 799 firms in Germany and use mixed logit models to estimate the heterogeneous personality preferences of recruiters by distinguishing between firms performing i) radical and ii) incremental product innovations. We find that recruiters prefer more emotionally stable workers regardless of the firm's innovation type. However, recruiters from firms engaging in radical innovations also prefer more conscientious applicants. Our findings have practical implications for firms, applicants and policy makers designing training curricula, because we show that recruiters from product-innovating firms consider personality trait-oriented recruitment not only for high-qualified workers but also for mid-qualified workers.

1. Introduction

Product innovations are a firm's key driver for economic success. However, innovations also change the nature of work, thereby requiring workers to adapt. Indeed, without a workers' capability to adapt to change, the profitability of an innovation is weakened (Leiponen, 2005; Smit, 2015; Do et al., 2016). The literature on organisational behaviour shows that certain personality traits help workers to cope with change (Neal et al., 2012) and constitute a valid predictor for adaptivity to changing work contexts (Allworth & Hesketh, 1999; Marcati et al., 2008; Lee, 2017; Runst & Thomä, 2022). Related research also shows that personality traits enable certain skills and are related to job performance, and that firms consider personality traits when hiring workers (Dunn et al., 1995; Moy & Lam, 2004; Wehner et al., 2022). However,

little is known about whether product-innovating firms consider worker personality when recruiting workers.

We add to the literature on economic research by answering the question: do recruiters from product-innovating firms prefer specific personality traits when recruiting mid-qualified workers?¹ We focus on product innovation because it is the most frequent form of innovation in German firms² and especially relevant for small and medium-sized firms, which is the most important segment of the German economy (Soellner, 2014). Because different innovation types may place different demands on workers, we distinguish between firms engaging in radical product innovation and firms engaging incremental product innovation (Ettlie, 1983; Dewar & Dutton, 1986; Edquist et al., 2001). Radical product innovation describes a fundamental and revolutionary change (e.g., the development of the first Apple mouse), while incremental

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¹ We refer to workers as mid-qualified workers who have completed their apprenticeship training within a vocational education and training (VET) system (e.g., in Germany, Austria, and Switzerland). This is a system in which both firms and educational institutions invest in marketable skills (Buttler et al., 1995).

² According to data from the Community Innovation Survey (CIS) of 2018, more than 55,000 firms implemented new products, while only 35,000 firms implemented new or improved methods for producing goods or providing services (own calculations based on Eurostat statistics) (Eurostat, 2018).

product innovations represent minor improvements in an existing product (e.g., improved versions of a car model) (Ettlie, 1983; Dewar & Dutton, 1986).

Moreover, related literature distinguishes between the generation and adoption of an innovation (Smit, 2015). We focus on the adoption of innovation because our target group of mid-qualified workers are (in most cases) not the source of an innovation, rather the adopters putting the innovation into practice (Thomä, 2017). This group of workers is crucial for the profitability of an innovation, because the output of an idea generation (i.e., new product) is only used when the workers engage with the new product (Leiponen, 2005; Smit, 2015).

We perform a discrete choice experiment among recruiters in 799 firms in Germany, presenting two hypothetical worker profiles to each recruiter. Each recruiter then decides, in seven consecutive rounds, on one of two hypothetical applicants. The worker profiles differ regarding their professional competencies, their Big Five personality traits (openness to experience, conscientiousness, extraversion, agreeableness, and emotional stability³) and the job applicant's requested wage. Moreover, we use a firm-level measurement of radical and incremental product innovation to analyse potential differences in the personality preferences of recruiters in product-innovating and non-product-innovating firms.

Our analysis contributes to the economic research literature by shedding light on the heterogeneity of recruitment preferences across product-innovating and non-product-innovating firms. The literature on recruitment shows that personality traits may be an important factor in the recruitment decisions of firms and that different work-organisational factors of a firm may lead to different preferences for workers' personality traits (Moy & Lam, 2004; Caliendo et al., 2022; Wehner et al., 2022). Moreover, the literature on the relation between worker skills and innovation shows that workers play an enabling role for the profitability of an innovation (Leiponen, 2005; Marcati et al., 2008). To the best of our knowledge, we are the first to explore differences in the recruitment preferences of firms engaging in radical or incremental product innovation.

The paper is organised as follows. Section 2 provides an overview of the relevant literature and discusses our hypotheses. Section 3 outlines the database and experimental design. Sections 4 and 5 describe the empirical strategy and present our results. Sections 6 and 7 discuss the results and set out the conclusions.

2. Theory

Firms develop, adjust and compete through innovations⁴ to the markets' standard (Abernathy & Clark, 1985; Grillitsch et al., 2019). They can do so by implementing new processes and/or new products (Edquist et al., 2001). The literature on innovation defines process innovation as "new ways of producing goods and services; it is a matter of how existing products are produced" and product innovation as "new – or better – products being produced and sold; it is a question of what is produced" (Edquist et al., 2001, pp.12–14). Previous researchers have identified both concepts as key factors for economic success (Dewar & Dutton, 1986; O'Connor, 2008). In this paper, we focus on firms engaging in product innovation, as this is the most common type of innovation (Eurostat, 2018).

Firms engaging in innovations provide a work environment characterised by constant change and unpredictability (Terreberry, 1968; Baard et al., 2014). The literature refers to workers as a crucial factor in the profitability of an innovation (Leiponen, 2005; Marcati et al., 2008).

Indeed, previous innovation literature on highly qualified workers often discusses science and engineering skills as an indicator for profitable innovations (Schneider et al., 2010). However, the literature on innovation shows that firms with mid-qualified workers who are flexible enough to adapt to change profit from the innovation (Smit, 2015). If workers lack the skill to adapt to change, firms do not benefit from an innovation as much. Thus, the skill of workers to adapt to change count as a competitive advantage (Shoss et al., 2012; McGuirk et al., 2015).

We refer to 'adaptivity' as the ability of a worker to adapt to change in the work context (Neal et al., 2012). In the following, we refer to change in the work context as implementations of "new combination" of e.g. products, services or work routines (Abdullah et al., 2016, p.178). While adaptivity is not a new concept, the increasing pace and forms of change to which workers have to adapt are new (Pulakos et al., 2000; Jundt et al., 2015; Demerouti et al., 2021).

2.1. Workers' personality and the ability to adapt to change

An explanation of workers' ability to adapt to new work contexts are the individual personality traits (Barrick et al., 2002). Previous research refers to an individual's personality as a general response-schema to environmental stimuli, which tend to be relatively stable over time (Marcati et al., 2008). This is because an individual's personality is an important factor in shaping and directing the motivation and – consequently – the actual behaviour to engage in a particular act (Barrick et al., 2002; Johnson et al., 2012; Gambetti & Giusberti, 2019). Moreover, certain personality traits can help workers to cope with change in the workplace (e.g., Marcati et al., 2008; Lee, 2017; Runst & Thomä, 2022). For example, Neal et al. (2012) investigates, among other things, the extent to which the form and direction of adaptive work role performances can be explained by personality traits. They find that the individual adaptivity positively correlates with conscientiousness and negatively correlates with neuroticism. We discuss these relationships in detail in the following subsections.

In sum, different workers deal differently with changes in the work context because of differences of personality traits (Hsieh et al., 2011; Abdullah et al., 2016). This is important for product-innovating firms as firms with workers adapting to change profit from the innovation (Smit, 2015). Therefore, we posit that recruiters from product-innovating firms recruit workers with personality traits that help them to cope with changing work and production demands.

H1: Recruiters from product-innovating firms recruit workers with personality traits that help them to cope with changing work and production demands.

In the following, we further explore this hypothesis by deducing sub-hypotheses based on the Big Five dimensions of personality (McCrae & John, 1992; Barrick et al., 2002; Borghans et al., 2008; Marcati et al., 2008; Almlund et al., 2011). The Big Five model describes the individual's personality by five main latent traits: openness, conscientiousness, extraversion, agreeableness, and emotional stability (Marcati et al., 2008). Recruiters can assess the Big Five personality traits in the recruitment process by deriving information from the cover letter and CV (Bretz et al., 1993; Brown & Campion, 1994) or a job interview (Funder & West, 1993). Related research argues that hiding negative personality traits is difficult (Caldwell & Burger, 1998). Especially, when recruiters assess an applicant over a longer period like in an assessment centre or a trial working day (Spector et al., 2000; Scroggins et al., 2009).

Specifically, we develop hypotheses about openness, conscientiousness, agreeableness and emotional stability from theory and the literature. For extraversion, there is no clear theoretical indication of potential mechanisms discussed in the literature, which is why we do not formulate a hypothesis.

³ For a more comprehensive view of this concept in empirical economics, see Borghans et al. (2008) and Almlund et al. (2011).

⁴ Innovation is defined as "an idea, practice, or material artifact perceived to be new by the relevant unit of adoption" (Zaltman et al., 1984 in Dewar and Dutton, 1986, p.1422).

2.1.2. Openness to experience

Workers who are more open to experience are broad-minded and curious (Barrick & Mount, 1991), as well as creative and eager to learn new things, which helps them to cope with new ways of doing things (Tett & Burnett, 2003). Hence, we assume that, the more open workers are, the more likely they are to adapt to a new work context, which could make them more strongly preferred by recruiters from product-innovating firms, with their ever-changing environments. Previous research is inconclusive on a relation between adaptivity and openness. Although, studies generally find a positive correlation (LePine et al., 2000), it is not always significant (Allworth & Hesketh, 1999; Pulakos et al., 2002; Neal et al., 2012). However, considering that the interplay between a worker who strives to learn new things and a work context that constantly offers new ways of doing things is positive (Tett & Burnett, 2003), we expect the following:

H1.1: Recruiters from product-innovating firms have a stronger preference for workers that are open to experiences relative to recruiters from firms that are not product-innovating.

2.1.2. Conscientiousness

Conscientious workers are dependable and strive for achievement (Barrick & Mount, 1991). They work well with deadlines based on rules and strive for high-quality task completion (Tett & Burnett, 2003). We assume that conscientious workers are more likely to successfully cope with change because they force themselves to keep to high standards, and thus they can minutely focus on completing tasks even if the work context changes. The literature on adaptivity generally finds a positive relationship to conscientiousness, although some evidence is not very strong (Allworth & Hesketh, 1999). We expect that the personality trait of conscientiousness intensifies a worker's effort to meet altered expectations and hence to cope with change (Neal et al., 2012; Shoss et al., 2012). Thus, we expect the following:

H1.2: Recruiters from product-innovating firms have a stronger preference for recruiting conscientious workers relative to recruiters from firms that are not product-innovating.

2.1.3. Agreeableness

Agreeable workers are tolerant, considerate and cooperative (Barrick & Mount, 1991). They enjoy working in a team, helping others or contributing to the common good. Agreeableness should positively "influence the way that people interpret and respond to the actions of others" (Neal et al., 2012, p.5). For example, more agreeable workers are more likely to conform to group norms. However, previous literature reports no clear relation to adaptivity (Allworth & Hesketh, 1999; Neal et al., 2012). An explanation may be that more agreeable workers are more likely to prefer to support the status quo, instead of changing the way things are done (Neal et al., 2012). Thus, we expect the following:

H1.3: Recruiters from product-innovating firms do not have a stronger preference for recruiting agreeable workers relative to recruiters from firms that are not product-innovating.

2.1.4. Emotional stability (Neuroticism)

Emotionally stable workers are well-adjusted and secure, while the exact opposite, neuroticism, refers to facets like being depressed, angry, or anxious (Barrick & Mount, 1991). Emotionally stable workers react well-adjusted to situations where they have no control over the outcome (Tett & Burnett, 2003). Hence, we assume that more emotionally stable workers adapt relatively better to changes induced by innovation compared to less emotionally stable workers. The literature shows mixed evidence. Studies on adaptivity vary between a significant relation (Neal et al., 2012) and no relation (Allworth & Hesketh, 1999). However, emotionally stable workers handle times of uncertainty better, and workers in product-innovating firms often face changing work

situations (Tett & Burnett, 2003). Thus, we expect that workers who are secure in their behaviour will adjust more easily to change in the work context. On the contrary, neurotic workers should react negatively towards change, since this triggers anxiousness towards the unknown (i.e., non-routine work). Hence, we expect the following:

H1.4: Recruiters from product-innovating firms have a stronger preference for recruiting emotionally stable workers relative to recruiters from firms that are not product-innovating.

2.2. Workers' personality and the degree of adaptivity

New products alter the nature of work and require workers to learn new work steps (Pulakos et al., 2000). The mandatory change effort is related to the degree of newness of an innovation. Indeed, the literature on innovation distinguishes between radical and incremental innovation (Ettlie, 1983; Dewar & Dutton, 1986; Meelen et al., 2017). Radical innovation describes a fundamental and revolutionary change of an existing unit containing a high degree of new knowledge, while incremental innovation represents minor improvements with a low degree of new knowledge (Dewar & Dutton, 1986; Forés & Camisón, 2016). Moreover, the two innovation types differ in terms of mode of innovation (Apanasovich, 2016) and implementation strategies (Ettlie et al., 1984). Indeed, radical innovation is more demanding of people involved in the change process relative to incremental innovation (Ettlie et al., 1984). Radical innovation requires more unique strategies, while incremental innovation draws on traditional strategies (Ettlie et al., 1984; Do et al., 2016). Thus, the innovation types require a different degree of adaptivity.

Given that workers differ in their ability to adapt to change, certain personalities cope more easily with radical and/or incremental innovations. Thus, we expect that the effects of radical and incremental innovation on recruiters' personality preferences also differ. The literature on innovation does not discuss potential differences or directions in the relation of the Big Five personality traits and innovation types. Therefore, the second hypothesis is an empirical question.

H2: The preference of recruiters from product-innovating firms for personality traits that help the workers to cope with changing work and production demands is stronger the case in firms that innovate radically than in firms that innovate incrementally.

3. Data and experimental design

The discrete choice experiment and related survey questions⁵ are integrated into the BIBB Cost-Benefit Survey (BIBB-CBS) 2017/2018 (Schönfeld et al., 2020). The BIBB-CBS is a firm-level survey that focuses on apprenticeship training, continuing training and the recruitment of workers. It is conducted every five years. The Institute for Applied Social Sciences (infas) in Bonn organises the fieldwork using a computer-assisted personal interviewing method (CAPI). The sample of firms is drawn from the register of firms of the Federal Employment Agency. The register includes all firms in Germany employing at least one worker subject to social security payments. As such, the survey sample is representative of all German firms. We randomly select a subset of the surveyed firms, whose representatives then take part in the discrete choice experiment.

The external validity of our results crucially depends on the respondents' actual involvement in the recruitment process and level of recruitment experience (Hainmueller et al., 2015). Thus, we narrow down our sample to firm' owners, CEOs or heads of HR departments who claim to be regularly involved in the firms' recruitment processes.

⁵ Questions on firms' innovation behaviour and respondents' role and experience in recruitment.

Table 1
Descriptive Statistics.

Variable Names	N	Mean	SD	MIN	MAX
Innovation Type					
New Products (Ref. No New Product)	799	0.54	0.50	0	1
Improved Products (Ref. No Improved Products)	799	0.56	0.50	0	1
Respondents' Position					
Owner (Ref. No Owner)	799	0.47	0.50	0	1
Respondents' Characteristics					
Male (Ref. Female)	799	0.64	0.48	0	1
Tenure (in Years)	799	15.53	11.01	1	50
Academic Degree (Ref. No Academic Degree)	799	0.44	0.50	0	1
Firms' Characteristics					
West Germany (Ref. East Germany)	799	0.86	0.34	0	1
Number of Employees	799	71.30	213.39	1	3435
Service Sector (Ref. Industry Sector)	799	0.69	0.46	0	1
Public Sector (Ref. No Public Sector)	799	0.07	0.26	0	1

Source: BIBB-CBS 2017/2018, own calculations.

Note: Descriptive statistics of the working sample.

Moreover, we limit our sample to respondents with decision-making power,⁶ i.e., respondents that take recruitment decisions either by themselves or together with other decision-makers in the firm. Additionally, we exclude respondents that do not answer the question about launching new or significantly improved innovations in the three years before the survey (i.e., we exclude firms with missing values). In Table A.1, we compare our working sample with the full BIBB-CBS 2017/2018 sample. The two samples differ from each other in some characteristics, wherefore we perform a robustness test (see Section 5.3).

Of the 983 respondents, 885 participate in the discrete choice experiment (90 %), while 98 respondents decline to participate (10 %). Of the 885 respondents, 799 provide valid answers on the firms' introduction of innovations (90 %) and 86 respondents decline to answer (10 %).⁷ Of the 799 respondents, 677 answer all 7 choices and 122 answer 6 or fewer choices. Thus, we have 10,472 worker profiles from 5236 decisions made by 799 respondents. Table 1 provides a descriptive overview of the working sample, including information on the recruiters' and firms' characteristics. 54 % of the respondents' state that the firm had introduced at least one new product, and 56 % of the respondents report the introduction of at least one improved product. 47 % of the respondents in the sampled firms are the owner, and 64 % of the respondents are male. The average firm tenure is 15 years, and 44 % of the respondents have an academic degree. 86 % of the firms are in the west of Germany, and the firms have, on average, 71 employees. 69 % of the firms are in service sector and 7 % are in a public sector.

In addition, Table 2 provides a descriptive overview of means of respondents' and firms' characteristics in comparison to the firms' innovation type. The observable characteristics are rather similar.

Moreover, Fig. 1 shows a distinction of the working sample into firms' engagement in innovation types. Precisely, 44 % of the firms engage in both types of innovation ($n = 355$). Among the firms with at least one type of innovation, 9% engage in only radical product innovation ($n = 74$) and 11% engage in only incremental product innovation ($n = 89$). Of the working sample, 35 % of the firms engage in neither radical nor incremental product innovation ($n = 281$). We explain the measurement and coding of our variables on firms' innovation types in Section 3.3.

⁶ We asked respondents to Please indicate the extent to which you participate in the decision-making and whether and which workers are recruited. The answer options were: I decide on my own, I decide together with others, I support or advise the decision-makers, I am not involved in the decision, refused and don't know.

⁷ We further discuss the measurement of innovation in Section 3.3.

Table 2
Descriptive Statistics on the Firms' Innovation Types.

	Full Working Sample	Sample of Firms engaging in Radical Product Innovation	Sample of Firms engaging in Incremental Product Innovation
Variable Names	Means	Means	Means
Respondents' Position			
Owner (Ref. No Owner)	0.47	0.45	0.44
Respondents' Characteristics			
Male (Ref. Female)	0.64	0.61	0.63
Tenure (in Years)	15.53	15.00	15.14
Academic Degree (Ref. No Academic Degree)	0.44	0.46	0.46
Firms' Characteristics			
West Germany (Ref. East Germany)	0.86	0.88	0.88
Number of Employees	71.30	76.93	82.78
Public Sector (Ref. No Public Sector)	0.07	0.06	0.07
Service Sector (Ref. Industry Sector)	0.69	0.69	0.71
N	799	429	444
% of N	100 %	54 %	56 %

Source: BIBB-CBS 2017/2018, own calculations.

Note: Descriptive statistics of the means of respondents' and firms' characteristics of the full working sample in comparison to the firms' engaging in radical or incremental product innovation.

3.1. Discrete choice experiment

We use a discrete choice experiment to assess causal relationships in firms' recruitment decisions. As shown in Fig. 2, respondents can choose the most preferable choice option from a set of choices (alternative options for actions). By systematically varying the alternative attributes, it is possible to determine the significance of the stated choices on the decision (Auspurg & Liebe, 2011).

Evaluating causal relationships in firms' recruitment decisions using regular survey data presents two main challenges. Firstly, the attributes of the recruited and rejected applicant are not observed simultaneously. Secondly, because of the non-exogenous nature of applicants' attributes, it is difficult to generate data suitable for causal inference (Eriksson & Kristensen, 2014). Opposed to survey questions, we use a discrete choice experiment, which allows us to observe both recruited and rejected applicant, with the applicants' attributes varying exogenously. Previous literature shows that stated preferences, when experimentally elicited, are close to revealed preferences if respondents are highly committed to their decision (Hainmueller et al., 2015). Thus, we limit our working sample to respondents who are involved in the recruitment process and are familiar with making recruitment decisions (e.g., firm' owners, CEOs or heads of HR departments; see Section 3). Nevertheless, because the survey questions on a firms' innovative activities are not assessed within the discrete choice experiment, we are unable to make strong arguments about causality of the relationship between recruitment decisions and a firms' innovative activities. We do, however, perform robustness tests taking firms' observable and unobservable differences into account (see Section 5.3). We test for unobservable differences which may impact a firms' decision to engage in innovation with recruiter/firm fixed effects. The results are robust in terms of the relative importance of the attributes.

Our discrete choice experiment is conducted among recruiters in a random sub-sample of firms from a larger firm-level survey. The

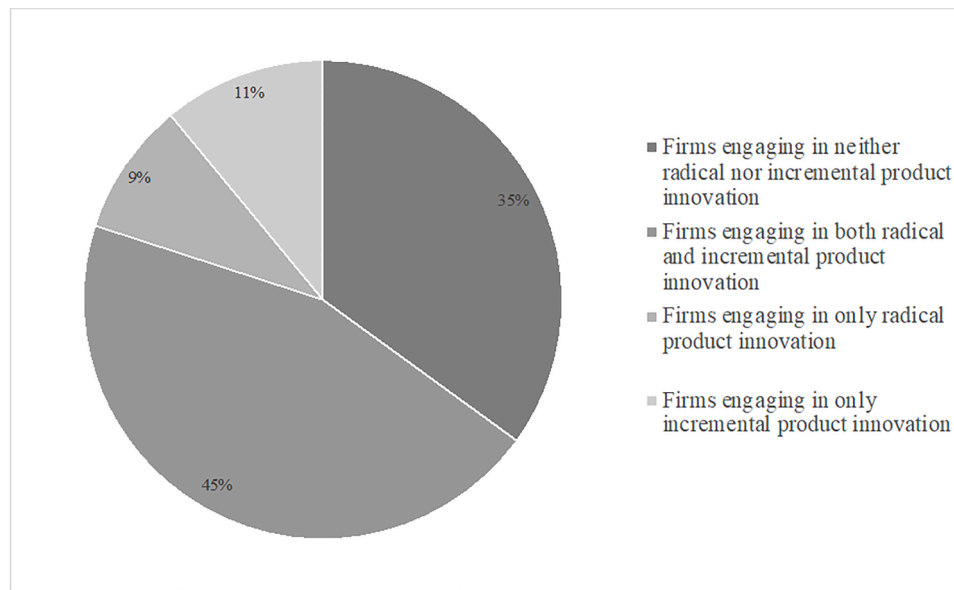


Fig. 1. Firms' Engagement in Product Innovation.

Source: BIBB-CBS 2017/2018, own calculations. Note: Figure on the distinction of the working sample into firms' engagement in product innovation.

recruiters choose between two hypothetical job applicants. In total, we repeat this exercise seven times per respondent, using different applicant profiles each time. We describe each job applicant based on seven attributes: professional competence, personality traits (openness to experience, conscientiousness, extraversion, agreeableness, emotional stability) and the job applicant's requested wage. The introductory text of the discrete choice experiment informs the recruiter that the hypothetical applicants participates in a two-staged selection process that provide information on the applicants attribute values (Humburg & van der Velden, 2015). The first stage includes the screening of a cover letter and a CV. The second stage involves an interview and a trial working day. Our experiment is at the end of second stage of the selection process, where the recruiter makes a recruitment decision about the two remaining applicants.

3.2. Job applicants' attributes and attribute values

Table 3 shows the profile information of the job applicants, which differ in the following aspects: professional competence, personality traits, and the job applicant's requested wage.

The professional competence of an applicant is either average or above average.⁸ We operationalise the personality traits corresponding to the Big Five concept of personality⁹ (see Table 4). The attribute values that are used to measure the Big Five traits rely on the German Socio-Economic Panel (SOEP) (Richter et al., 2013, p. 44–46), the Big Five Inventory (BFI) (John et al., 1991) and the Ten-Item Personality Inventory (TIPI) (Gosling et al., 2003). We use two opposing items per personality trait.

Finally, we differentiate between a gross wage requested by the job applicant that equals the average wage for the occupation in that firm and a gross wage that deviates from it by -15% , -10% , -5% , $+5\%$, $+10\%$ or $+15\%$.¹⁰

⁸ Because we framed the experiment in a way such that the applicants had already been pre-selected based on their CV, we refrained from modelling applicants with low professional competence.

⁹ For detailed information on the concept of the Big Five, see Borghans et al. (2008) and Matthews et al. (2009).

¹⁰ We used percentages instead of monetary deviations, since the wage varies widely in the market.

3.3. Measurement of innovation

Within the BIBB-CBS 2017/2018, we measure a firms' innovation type in terms of new or improved launched products (Schönfeld et al., 2020). This approach to measuring innovation is linked to the definitions and guidelines outlined in the Oslo Manual (2005). Respondents answer the following question: 'How many new or significantly improved products and services has your firm implemented in the past three years/in the past year?'.¹¹

Respondents report the number of innovations. In our paper, the (a) 'new products and services' represent radical innovations, while the (b) significantly 'improved products and services' are incremental innovations (Dewar & Dutton, 1986). For our analysis, we create dummy variables for each type of innovation,¹² distinguishing between firms that had no innovation in the past three years (0) and firms that either had at least one new or significantly improved product innovation (1). In Table 1, we show the frequencies of firms with new (radical) and significantly improved (incremental) product innovation.

Further answering options were 'refuse to answer' and 'don't know'. The missing information on innovation could be non-random due to observable or unobservable factors. However, this information is mainly not provided because respondents simply did not know if product innovation happened in the firm in prior years, possibly due to their function in the firm. Of 86 respondents who did not answer the question on the firms' introduction of innovation, 83 respondents answered 'don't know' (97%) and 3 answered 'refuse to answer' (3%). By controlling for the function of respondents in our regression, we aim to tackle this potential problem.¹³

4. Empirical strategy

We analyse the recruitment choices with a mixed logit model (Revelt & Train, 1998; Greene, 2003; Hensher & Greene, 2003). This model "assumes that the probability of choosing a profile from a set of

¹¹ Depending on the founding year of the company.

¹² A dummy for radical innovation and a dummy for incremental innovation.

¹³ The econometric model section draws upon previous work by Wehner et al. (2022), who use the same base discrete choice experiment but apply it to a different context.

Following is a question on the recruitment of skilled workers. Please imagine this situation, regardless of whether your firm is currently looking for professionals or not:

Your firm has an urgent need to fill a full-time position in the profession (Prog.; Show selected profession). After you review the application documents, only two people remain for you to choose from, and you will definitely hire one of them.

- Both are 28 years old, with German as their mother tongue.
- Both have a good vocational training diploma and five years of relevant professional experience in the firm where they did their apprenticeship training.
- All other unspecified decisions criteria for recruitment – e.g., gender or additional qualifications – are the same for both applicants.

Based on the personal interview and a trial workday, you have received an impression of their professional competencies, as well as their personalities. This information is presented below. Please indicate if you would hire skilled worker 1 or 2.

Please enter the appropriate number 1 or 2 and then click return.

1. Profile Job Applicant 1	2. Profile Job Applicant 2
...has average professional competence	...has above-average professional competence
...shows active imagination and solves tasks in an original way	...shows little imagination and solves tasks in a conventional way
...completes tasks thoroughly and efficiently	...completes tasks carelessly and in a disorganized way
...seems to be reserved and quiet when dealing with others	...seems to be communicative and sociable when dealing with others
...seems to be considerate and kind to others	...seems to be sometimes somewhat rude to others
...seems to be tense and nervous	...seems to be relaxed and handles stress well
...receives a wage that equals the firm's average skilled labor wage	...receives a wage that is 5% above the firm's average skilled labor wage

Fig. 2. Example of the Discrete Choice Experiment on Recruitment Decision.
Source: BIBB-CBS 2017/2018. Note: Example of the discrete choice experiment.

alternatives is a function of the attribute levels that characterize the alternatives and a random error term that adjusts for individual-specific variations in preferences" (Hauber et al., 2016, p.308).

A related model often used to analyse vignette data is the conditional logit model, which does have two major limitations, which make it less appropriate for our study (McFadden, 1973; Hauber et al., 2016). The first limitation is that conditional logit models ignore potential scaling heterogeneity (Greene & Hensher, 2010). The conditional logit model assumes the ratio of estimated preference weights and thus the variance to be constant (Hauber et al., 2016). This assumption ignores potential systematic variations and can lead to biased estimates of preference weights (Whitty et al., 2014; Hauber et al., 2016). Secondly, the

conditional logit model fails to account for preference heterogeneity (Hauber et al., 2016). Here, the unobserved coefficient vector β is assumed to be the same for all recruiters N (McFadden, 1973). Thus, the model ignores unobserved systematic differences in the preferences of the respondents, which again can lead to biased estimates of preference weights (Hauber et al., 2016). Moreover, while the conditional logit model estimates some coefficients, including the mean preference weights, the mixed logit model estimates a mean effect and a standard deviation of effects across the sample (Hauber et al., 2016). Hence, the conditional logit model only estimates a set of choice probabilities capturing the mean preference weights of the attribute, while the mixed logit model estimates both a mean effect and a standard deviation of

Table 3
Overview of Applicants' Attributes and Values in the Discrete Choice Experiment.

Attribute	Attribute Value
Professional Competence	The applicant... (1) ... has average professional competence (2) ... has above-average professional competence
Big Five – Openness	(1) ...shows little imagination and solves tasks in a conventional way (2) ... shows active imagination and solves tasks in an original way
Big Five – Conscientiousness	(1) ...completes tasks carelessly and in an unorganised way (2) ... completes tasks thoroughly and efficiently
Big Five – Extraversion	(1) ... seems to be reserved and quiet when dealing with others (2) ... seems to be communicative and sociable when dealing with others
Big Five – Agreeableness	(1) ... seems to be cold and sometimes somewhat rude to others (2) ... seems to be considerate and kind to others
Big Five – Emotional Stability	(1) ... seems to be tense and nervous (2) ... seems to be relaxed and to handle stress well
Gross Wage	(1) ... receives a wage that is 15 % above the company's average wage (2) ... receives a wage that is 10 % above the company's average wage (3) ... receives a wage that is 5 % above the company's average wage (4) ... receives a wage that equals the company's average wage (5) ... receives a wage that is 5 % below the company's average wage (6) ... receives a wage that is 10 % below the company's average wage (7) ... receives a wage that is 15 % below the company's average wage

Source: BIBB-CBS 2017/2018.

Note: Example of the vignette attributes and attribute values.

Table 4
Overview of Applicants' Attributes and Items in the Discrete Choice Experiment.

Attributes	Attribute Item
Big Five – Openness	The applicant... 1. ... shows little imagination (BFI, SOEP, [reverse]) and solves tasks in a conventional way (TIPI). 2. ... shows active imagination (BFI, SOEP) and solves tasks in an original way (BFI, SOEP).
Big Five – Conscientiousness	1. ... completes tasks carelessly (BFI) and in an unorganised way (BFI). 2. ... completes tasks thoroughly (BFI, SOEP) and efficiently (BFI, SOEP)
Big Five – Extraversion	1. ... seems to be reserved (BFI, SOEP) and quiet (BFI) when dealing with others. 2. ... seems to be communicative (SOEP) and sociable (BFI, SOEP) when dealing with others.
Big Five – Agreeableness	1. ... seems to be cold (BFI) and sometimes somewhat rude to others (SOEP, BFI). 2. ... seems to be considerate (SOEP) and kind to others (SOEP, BFI).
Big Five – Emotional Stability	1. ... seems to be tense (BFI) and nervous (SOEP, BFI). 2. ... seems to be relaxed (SOEP, BFI) and to handle stress well (SOEP, BFI).

Note: the abbreviations refer to the German Socio-Economic Panel (SOEP) (Richter et al., 2013, p. 44–46), the Big Five Inventory (BFI) (John et al., 1991) and the Ten-Item Personality Inventory (TIPI) (Gosling et al., 2003).

effects across the sample (Hauber et al., 2016). This means that the mixed logit model assumes differences in the preference weights across the sample and thus differences among the respondents' preferences. Unlike the conditional logit model, the mixed logit model varies the choice probabilities (Cameron & Trivedi, 2010; Hauber et al., 2016; Shi & Yin, 2018).

We analyse the data with the mixed logit model as follows (Revelt & Train, 1998; Greene, 2003; Hensher & Greene, 2003). The recruiters ($n = 1, \dots, N$) choose the J job applicants in T choice sets. The recruiters' n utility in choosing a job applicant j out of choice set t is:

$$U_{njt} = \beta_n X_{njt} + \varepsilon_{njt}$$

β_n is an unobserved coefficient vector for each recruiter n . We assume that the vector is normally distributed with $f(\beta|\Theta)$. Here, Θ refers to the mean and the covariance of β . X_{njt} is a vector of observed explanatory variables that are the job applicants' attribute values and the measurement of a firms' innovation type interacted with the attribute values. ε_{njt} is an unobserved, independent and identically distributed (IID) random vector (McFadden, 1973) over recruiters N , job applicants J and choice sets T . Thus, the probability that choice $j = 1$ is:

$$\text{Prob}\left(\frac{U_{n1t}}{U_{n2t}} > 1\right)$$

In our preferred regression, we approximate the log-likelihood function with 2000 Halton draws (Lancsar et al., 2017), which is the

threshold beyond which coefficients do not change significantly anymore.¹⁴

To simulate the maximum likelihood, we estimate the random variables for the mean coefficient β_i and the standard deviation σ . We calculate individual clustered standard errors since the assumption of independent observations is not met. As a result, estimators may be biased, and standard errors may be constructed too narrowly.

5. Results

5.1. Preferences for applicants' competence and personality traits

Table 5 shows the coefficients of the respective experiment attributes using conditional and mixed logit regression models. Indeed, both regression models show that the personality traits of workers are relevant for recruiters' preferences in recruiting. According to Table 5, the standard deviations for most personality traits are significant, which indicates that the coefficients of the recruiters' preferences for attribute values do vary a lot. This means that accounting for the preference heterogeneity is important for the precision of our estimates. Thus, we

¹⁴ We performed robustness analyses in which we varied the number of draws. The results of the interaction effects between personal attributes and radical/incremental innovation are mostly robust over various numbers of Halton draws (see Table S.1 and Table S.2 in the supplementary materials).

Table 5

Base Regression Model (Comparison of Conditional and Mixed Logit Model).

	Conditional Logit	Mixed Logit	SD of Mixed Logit
Personal Attributes			
Above-Average Competence (Ref. Average Competence)	0.217*** (0.039)	0.303*** (0.054)	0.500*** (0.107)
More Open to Experience (Ref. Less Open to Experience)	0.439*** (0.040)	0.621*** (0.058)	0.495*** (0.107)
More Conscientiousness (Ref. Less Conscientiousness)	1.067*** (0.048)	1.506*** (0.087)	0.837*** (0.085)
More Extraversion (Ref. Less Extraversion)	0.113*** (0.035)	0.166*** (0.048)	0.112 (0.172)
More Agreeableness (Ref. Less Agreeableness)	1.104*** (0.048)	1.573*** (0.088)	1.072*** (0.089)
More Emotional Stability (Ref. Less Emotional Stability)	0.535*** (0.042)	0.745*** (0.064)	0.637*** (0.097)
Wage requested by Applicant: Ref. Average Wage			
15 % Above Average	−0.555*** (0.089)	−0.727*** (0.123)	
10 % Above Average	−0.319*** (0.094)	−0.346*** (0.128)	
5 % Above Average	−0.162* (0.084)	−0.200* (0.116)	
5 % Below Average	−0.222*** (0.083)	−0.229** (0.113)	
10 % Below Average	−0.174* (0.095)	−0.196 (0.127)	
15 % Below Average	−0.271*** (0.096)	−0.367*** (0.130)	
Observations	10,472	10,472	
N	799	799	
log-likelihood	−2492	−2394	

Source: BIBB-CBS 2017/2018, own calculations.

Note: mixed logit model with clustered standard errors. Standard errors in parentheses. Estimation based on 2000 Halton draws. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

focus on interpreting the findings based on the mixed logit regression model.

Fig. 3 shows the marginal effects for a recruiter's preference for an applicant' professional competence and personality traits. The marginal effects are significant for all six applicant attributes compared to the reference group. For instance, an applicant who is more conscientious has a higher probability of being hired compared to an applicant who is less conscientious. More precisely, our results in Fig. 3 show that the probability of being hired increases the strongest for agreeableness by 20 percentage points and for conscientiousness by 18 percentage points. The hiring probability for emotional stability increases by eight percentage points, for openness to experiences by seven percentage points and for professional competence by three percentage points. The lowest difference in hiring probability records extraversion with an increase by two percentage points.

In addition to the marginal effects, we present the predicted probabilities within the experiment setting. As shown in Table 6, the results show that the predicted hiring probabilities are as follows: 43 % for average competent applicants versus 46 % for above-average competent applicants, 42 % for less openness to experience versus 49 % for more openness to experience, 36 % for less conscientiousness versus 54 % for more conscientiousness, 44 % for less extraversion versus 46 % for more extraversion, 37 % for less agreeableness versus 56 % for more agreeableness, and 41 % for less emotional stability versus 49 % for more emotional stability.

Moreover, our results in Table 5, where the wage attributes are included as wage request dummies, indicate that recruiter's preference to recruit an applicant is significantly less when the wage request is either above or below the average wage. This result is partly in line with previous literature (e.g., Humburg & van der Velden, 2015). Notably, the preference for the average wage is even more pronounced in our study. One factor that likely contributes to this higher preference for the average wage is that collective agreements, particularly common for skilled workers in Germany, constrain firms from offering wages lower than those agreed upon. Because of this preference structure, we are not

able to analyse firms' willingness to pay for different personality traits, as this requires a linear preference structure (e.g., preferring a low wage over a high wage). Thus, we do not further discuss wage attributes in the following.

Our results show that a recruiter's preference to recruit an applicant with higher competence or strong distinct personality traits is significantly higher compared to an applicant with average competence or less distinct personality traits. This is in line with previous literature, which show that firms sometimes do take personality trait-oriented recruitment into account (e.g., Moy & Lam, 2004), with results based on the same experimental data but different samples (Wehner et al., 2022). However, the base results are merely a starting point for analysing the main research question in this paper, i.e., whether these preferences for personality are altered by the existence of innovative activities in the firm. To analyse these, we interact the attributes in the discrete choice experiment with our variables measuring radical and incremental product innovation in the firm of the decision maker.

5.2. Heterogeneity in personality preferences for product-innovating firms

Hypothesis 1 predicts that recruiters from product-innovating firms recruit workers with personality traits that help them to cope with changing work and production demands. We answer this after discussing the four Sub-hypotheses related to this first overarching hypothesis.

Sub-hypothesis 1.1 predicts a positive relation between openness to experience and the recruiting probability. As shown in Table 7, the interaction effects with radical and incremental innovation provide no evidence for this theoretically plausible relation. Thus, the results do not support Sub-hypothesis 1.1.

Sub-hypothesis 1.2 predicts a positive relation between conscientiousness and the recruiters' recruiting preferences. The interaction effects with radical innovation show quite strong evidence of this relation, while the interaction effects with incremental innovation display no evidence of a relation (see Table 7). To better understand the relative impact of our results, we calculate predicted probabilities for applicants

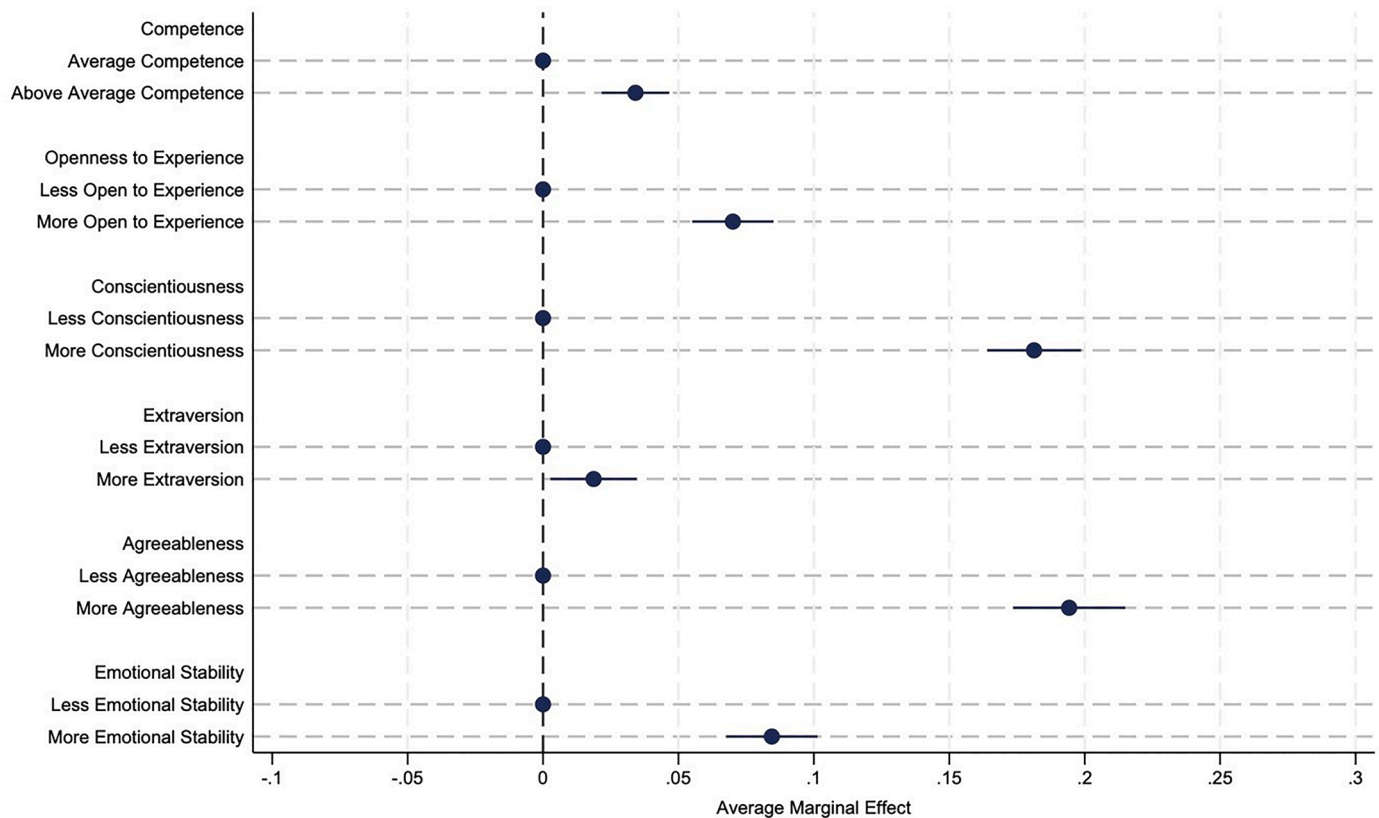


Fig. 3. Marginal Effects of Personal Attributes.

Source: BIBB-CBS 2017/2018, own calculations. Note: The marginal effects are based on the mixed logit model specification presented in Table 5. The confidence intervals are shown at a 95 % level.

Table 6
Predicted Probabilities of Personal Attributes.

	Predicted Probabilities of Personal Attributes
Average Competence	0.427 (0.006)
Above-Average Competence	0.461 (0.005)
Less Open to Experience	0.415 (0.006)
More Open to Experience	0.485 (0.006)
Less Conscientiousness	0.360 (0.006)
More Conscientiousness	0.542 (0.006)
Less Extraversion	0.437 (0.005)
More Extraversion	0.456 (0.006)
Less Agreeableness	0.367 (0.007)
More Agreeableness	0.561 (0.006)
Less Emotional Stability	0.406 (0.005)
More Emotional Stability	0.490 (0.006)
Observations	10,472
N	799

Source: BIBB-CBS 2017/2018, own calculations.

Note: Predicted probabilities based on the mixed logit model with clustered standard errors. Standard errors in parentheses. Estimation based on 2000 Halton draws and 50 bootstrap replications.

Table 7
Interaction Effects with Radical and Incremental Product Innovation.

	Radical Product Innovation	Incremental Product Innovation
More Open to Experience	0.130 (0.108)	-0.052 (0.109)
More Conscientiousness	0.266** (0.128)	0.005 (0.129)
More Extraversion	0.028 (0.094)	0.018 (0.094)
More Agreeableness	0.212 (0.130)	0.206 (0.130)
More Emotional Stability	0.203* (0.113)	0.192* (0.112)
Observations	10,472	10,472
N	799	799
Log-likelihood	-2390	-2391

Source: BIBB-CBS 2017/2018, own calculations.

Note: mixed logit model with clustered standard errors. Standard errors in parentheses. Estimation based on 2000 Halton draws. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. This table is an extraction of Table A.2.

with different personality traits in product-innovating firms relative to firms that are not product-innovating (see Figs. 4 and 5).¹⁵ The results indicate that the hiring probability for more conscientious workers increases from 52 % for firms not engaging in radical innovation to 56 %

¹⁵ In Fig. 4 and 5, the confidence intervals overlap. However, because we test for the differences between the two means and not the variability of each individual estimate. The confidence intervals do not indicate the significance of the effects. For a more comprehensive view on the significance of the difference between two means, see Schenker & Gentleman (2001) and Knol et al. (2011).

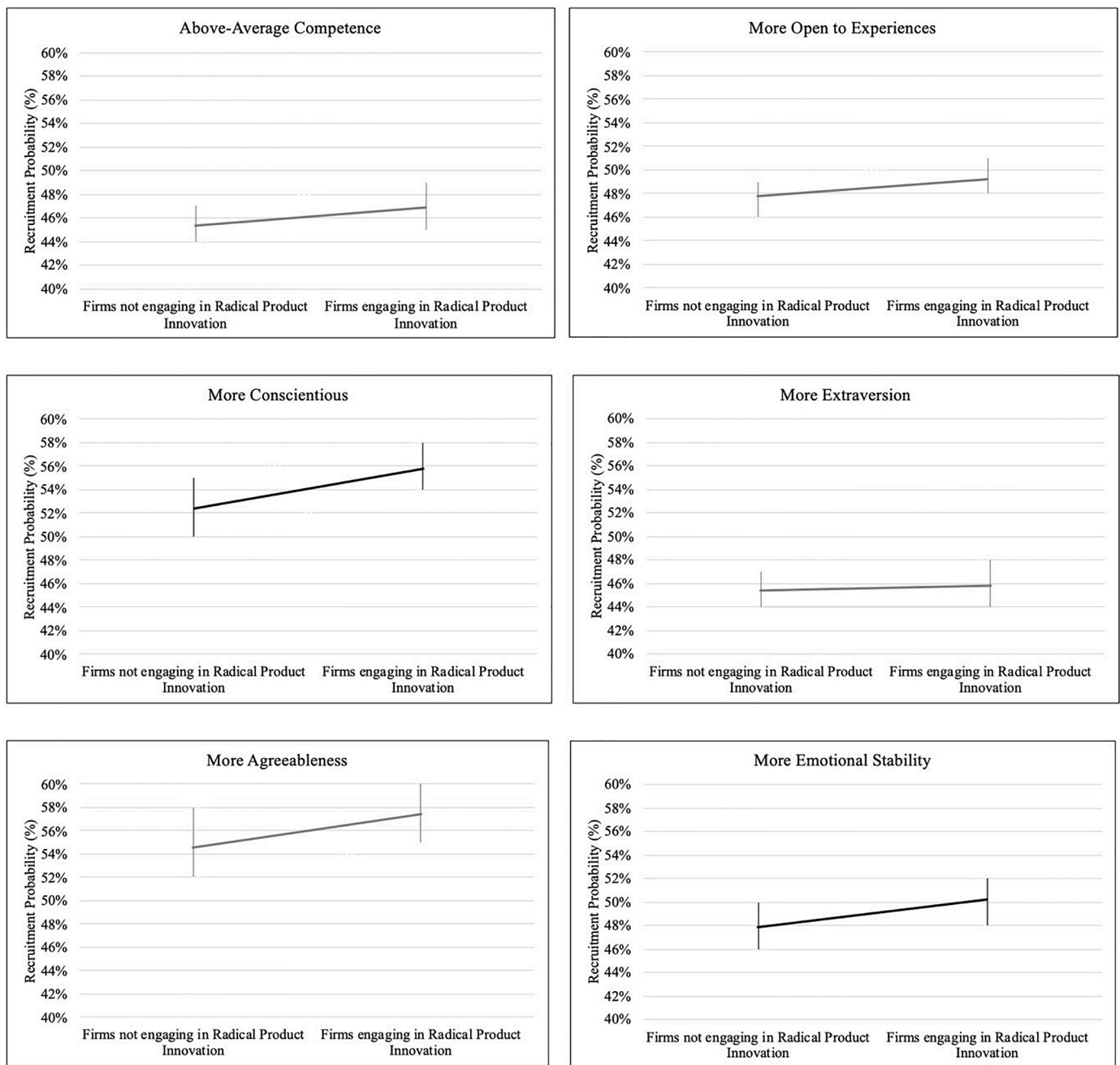


Fig. 4. Predicted Probabilities of the Interaction Effects between Personal Attributes and Radical Product Innovation.

Source: BIBB-CBS 2017/2018, own calculations. Note: The predicted probabilities are based on the mixed logit model specification presented in Table A.2. Table S.3 in the supplementary materials shows the predicted probabilities. The significant interaction terms are marked in black; the insignificant ones in grey. The confidence intervals are shown at a 95 % level.

for firms engaging in radical innovation. Thus, because we do not find an interaction with incremental innovation, the results partly support Sub-hypothesis 1.2.

Sub-hypothesis 1.3 predicts no stronger preference for recruiting agreeable workers relative to recruiters from firms that are not product-innovating. We do not find an interaction with radical nor with incremental innovation. Thus, the results corroborate Sub-hypothesis 1.3.

Sub-hypothesis 1.4 predicts a relation between emotional stability and the recruiters' desire to recruit. The interaction variables indicate a significant (at 10 %) coefficient for both firms engaging in radical innovation and firms engaging in incremental innovation (see Table 7). As shown in Figs. 4 and 5, the results of the predicted probabilities show a difference of 48 % for firms not engaging in radical product innovation

to 50 % for firms engaging in radical product innovation and a difference of 48 % for firms not engaging in incremental product innovation to 50 % to firms engaging in incremental product innovation. Thus, the results indicate that the hiring probability for emotionally stable workers in product-innovating firms is relatively high and thereby, support Sub-hypothesis 1.4.

We come back to our overarching Hypothesis 1, which is partly supported by the results of our four Sub-hypotheses as Sub-hypothesis 1.4 is fully supported, Sub-hypotheses 1.3 and 1.2 are partly supported and Sub-hypothesis 1.1 is not supported.

Hypothesis 2 predicts a stronger preference for personality traits that help the workers to cope with changing work and production demand in radically product-innovating firms compared to incrementally product-

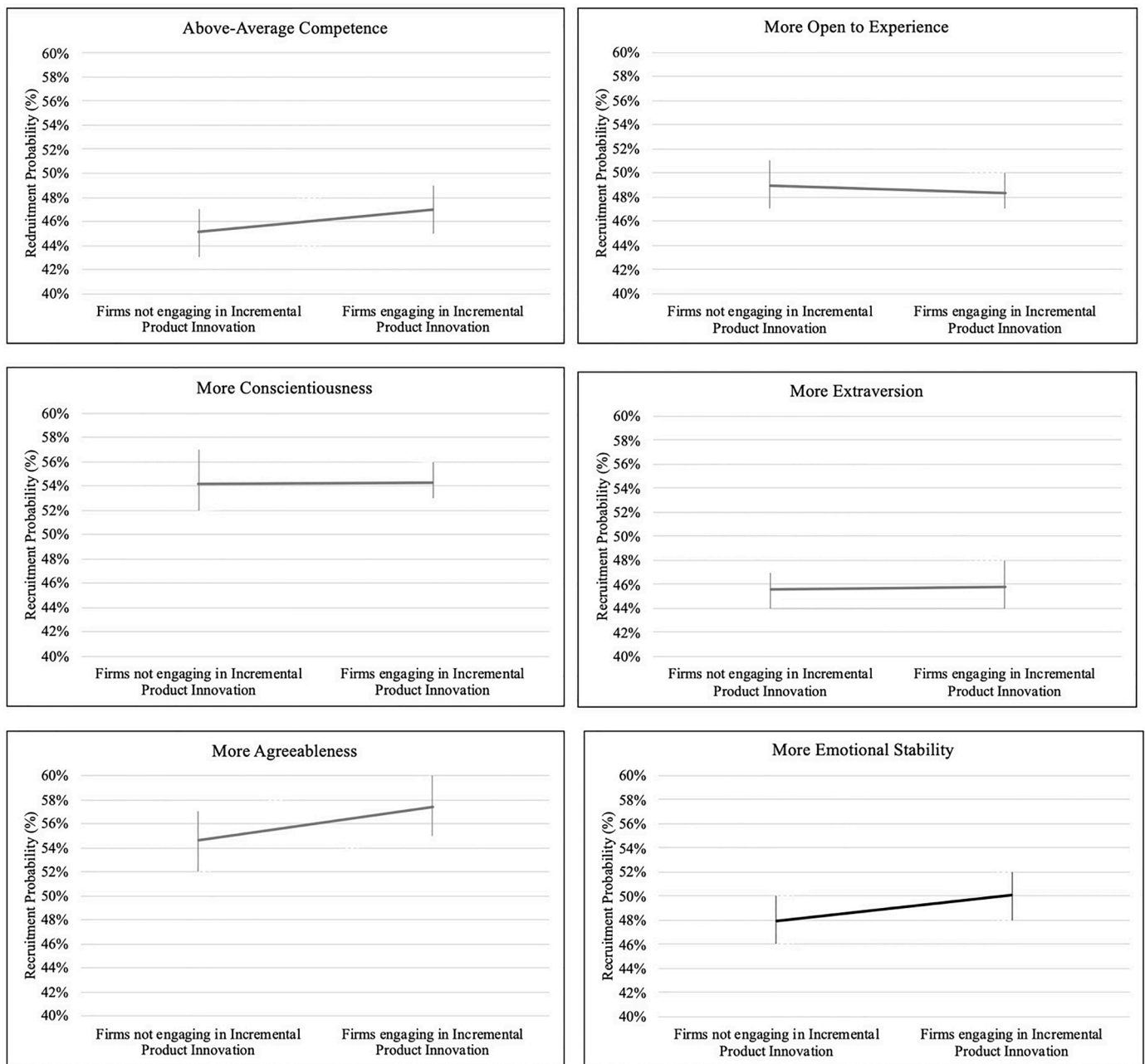


Fig. 5. Predicted Probabilities of the Interaction Effects between Personal Attributes and Incremental Product Innovation.

Source: BIBB-CBS 2017/2018, own calculations. Note: The predicted probabilities are based on the mixed logit model specification presented in Table A.2. Table S.4 in the supplementary materials shows the predicted probabilities. The significant interaction terms are marked in black; the insignificant ones in grey. The confidence intervals are shown at a 95 % level.

innovating firms. Table 7 shows that radically product-innovating firms prefer more conscientious and emotional stable workers while incrementally product-innovating firms prefer emotionally stable workers. Thus, the results support Hypothesis 2.

5.3. Robustness

We test the robustness of our results in the following three ways. First, we test the robustness of the main results in Table 7 by adding interaction between the attribute values and important control variables described in Table 1 (i.e., Lu & White, 2014). These control variables include recruiter' and firm' characteristics. Concerning the recruiter' characteristics, we add the recruiters' position (owner/no owner), tenure (above/below median), educational background (academic

degree/no academic degree), and gender (male/female). Regarding the firm' characteristics, we add the firm size (small/large), location (West/East Germany), economic sector (public/private), occupational sector (service/ industry). We perform the regression with the interaction effects with radical and incremental innovation and add the controlling interaction effects (see Tables A.3 and A.4). The estimation results of these regressions are similar to our main results (see Table 7).

Second, to test the robustness of our results of the base model of the mixed logit regression model, we estimate three alternative model specifications that account for potential recruiter and firm effects. To control for recruiter and firm effects, we add interaction terms between the applicants' attributes and observable recruiter' and firm' characteristics to our mixed logit model. Moreover, we estimate linear probability and logit models including recruiter/firm fixed effects. Fig. 6

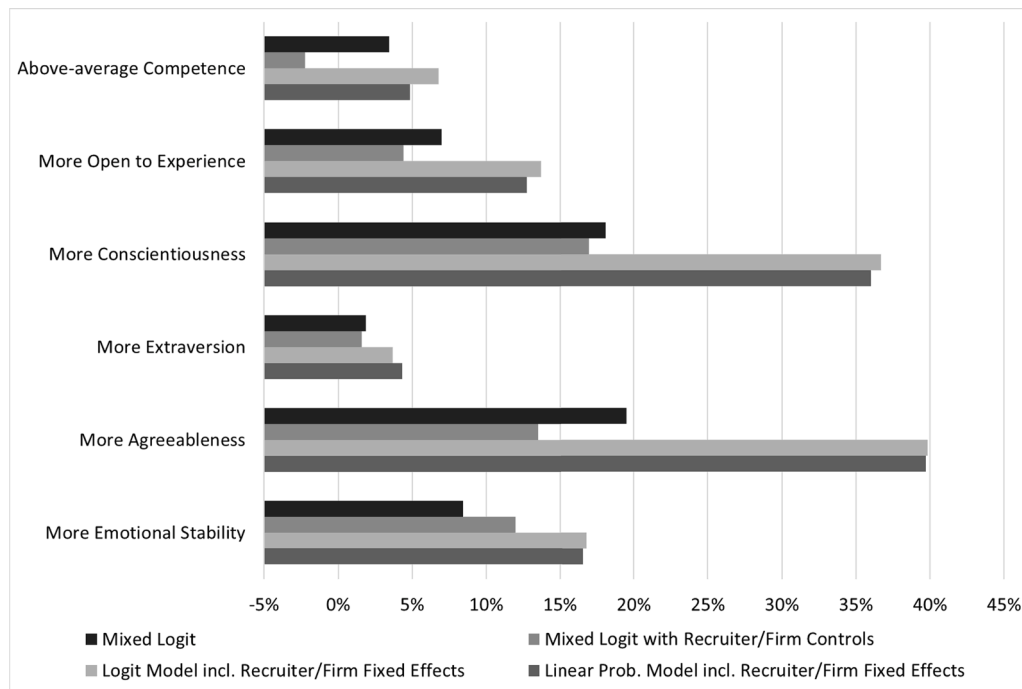


Fig. 6. Comparison of Marginal Effects for Recruiters' Preferences for Applicants' Competence and Personality.

Source: BIBB-CBS 2017/2018, own' calculations. Note: The marginal effects are based on the estimation results presented in Table S.5 in the Supplementary Material. The percentages (%) represent percentage points. The coefficients for above-average competence and extraversion are insignificant in the mixed-logit model with controls (see Supplementary Material Table S.5, Column 2).

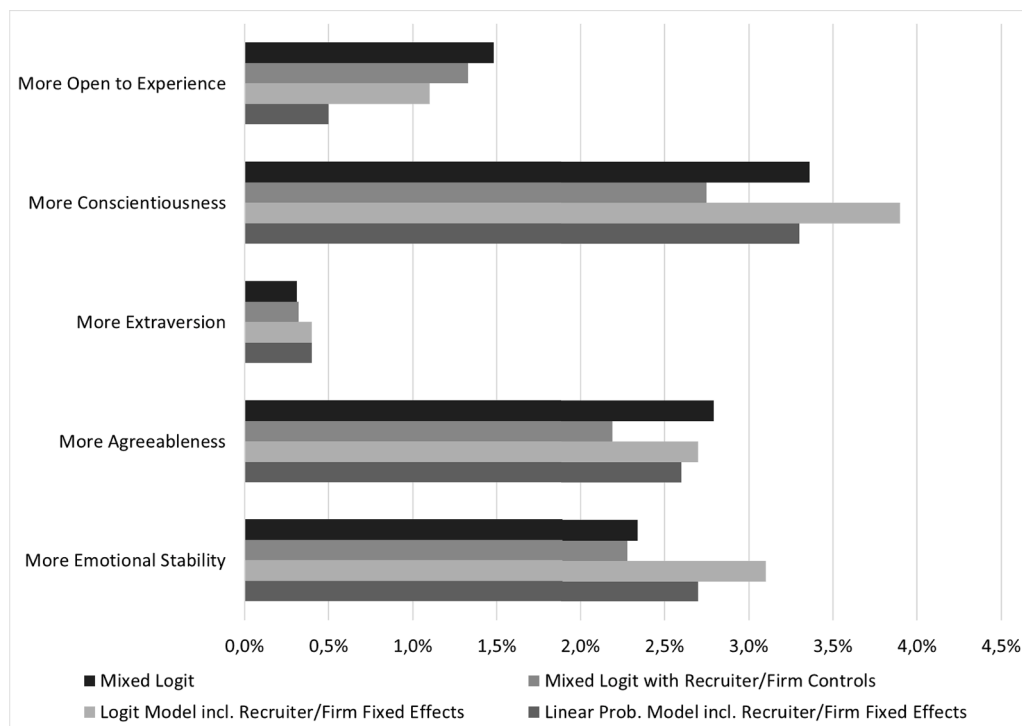


Fig. 7. Comparison of Average Marginal Effects for Heterogeneity in Recruiters' Personality Preferences by Radical Product Innovation.

Source: BIBB-CBS 2017/2018, own' calculations. Note: The average marginal effects are based on the specifications presented in Table S.6 in the Supplementary Material. The percentages (%) represent percentage points. The coefficients for the interactions between conscientiousness as well as emotional stability and radical product innovation are insignificant when calculating a linear probability model including recruiter/firm fixed effects (see Supplementary Material Table S.6, Column 3).

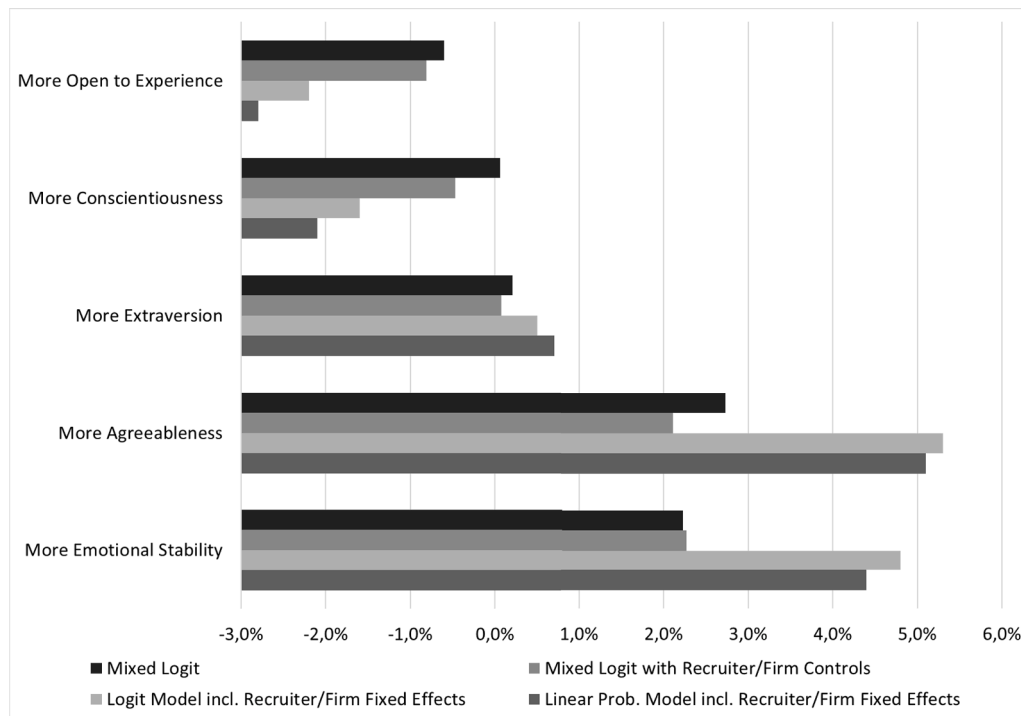


Fig. 8. Comparison of Average Marginal Effects for Heterogeneity in Recruiters' Personality Preferences by Incremental Product Innovation.

Source: BIBB-CBS 2017/2018, own calculations. Note: The average marginal effects are based on the specifications presented in Table S.7 in the Supplementary Material. The percentages (%) represent percentage points.

presents the marginal effects of the base model discussed in Section 5.1 and the three additional model specifications. It shows that the marginal effects of the personality traits for being recruited stay mostly robust in terms of their relative importance when we re-estimate the results with the alternative models. Except for the coefficients for professional competence and extraversion in the mixed logit model with controls for recruiter and firm characteristics, which decrease in size and become insignificant (see Table S.5 in the Supplementary Material, Column 2).

Third, similar to the previous point, we test the robustness of the estimates on the heterogeneity of recruiters' personality preferences for product innovating firms, as discussed in Section 5.2. Figs. 7 and 8 compare the average marginal effects of the four models for the interactions between personal attributes and radical/incremental product innovation types. Both figures show that the sizes of the average marginal effects remain largely robust in terms of their relative importance. Except for the coefficients for the interaction effects between conscientiousness and emotional stability with radical product innovation in the linear probability model, which become insignificant (see Table S.6 in the Supplementary Material, Column 3).

Overall, our robustness analyses show that the findings of the main results are robust in terms of the relative importance of the attributes across model specifications. However, we remain with the mixed logit model as our preferred estimation method because the other two alternative models have two main disadvantages that cause unrealistic assumptions about recruiters' preferences. First, they assume that the error term in the recruiters' utility function is independent and identically distributed (IID). This assumption overlooks the possibility that recruiters' unobserved characteristics may correlate both across alternatives in each choice situation and across different choice situations (Henscher & Greene, 2003). Second, these models assume the independence of irrelevant alternatives (IIA), leading to an overestimation of the joint probability of choosing close substitutes (Layton, 2000, pp. 23–24).

6. Discussion

Our analyses allow for two general conclusions. First, recruiters from product-innovating firms prefer workers with certain, but not all, personality traits that help them to cope with changing work and production demands. This conclusion bases on the results of the four Sub-hypotheses, which are as follows.

First, our results indicate that recruiters from product-innovating firms do not have a higher preference for workers with openness to experience compared to recruiters from non-product-innovating firms. This result could occur because workers who are open to experience do not comply with the expectations of others and thus are seen as a hindrance for the implementation of innovations (Neal et al., 2012). Indeed, our focus group are mid-qualified workers who (in most cases) put the innovation into practice instead of initiating the change. Thus, this personality trait may be seen as a hindrance at this stage of the innovation process.

Second, conscientiousness strongly relates to firms engaging in radical innovation and does not relate to firms engaging in incremental innovation. This discrepancy may be the result of a different adaptivity effort by the worker. Radical innovations require unique implementation strategies, requiring the workers to be relatively more involved in the implementation process (Ettlie et al., 1984). More conscientious workers may be triggered by the unique implementation strategies as they intensify their efforts to meet expectations, demand deadlines in accordance with the rules, and strive for more high-quality task completion relative to less conscientious workers (Tett & Burnett, 2003; Neal et al., 2012). On the other hand, incremental innovation uses traditional strategies, which the workers are familiar with (Ettlie et al., 1984). This finding supports the hypothesis that the implementation strategies of radical innovation require more adaptable effort relative to incremental innovations (Ettlie et al., 1984; Do et al., 2016).

Third, in our study, agreeableness is not related to recruitment preferences, neither in radically nor in incrementally product-innovating firms (see Section 5.3.). The findings are in line with

previous literature on worker adaptivity indicating no relation between agreeableness and adaptivity (i.e., Allworth & Hesketh, 1999). More agreeable workers rather prefer to support the status quo, instead of changing the way things are done (Neal et al., 2012).

Fourth, emotional stability increases the probability of being selected, both in radically and in incrementally product-innovating firms. This finding supports the idea that workers who are emotionally stable adjust more easily to change in the work context. The literature on adaptive performance is, however, inconclusive about the theoretically expected relation between emotional stability and adaptivity (i.e., Allworth & Hesketh, 1999). The discrepancy in results from other studies may be the result of different focus groups. For example, Allworth and Hesketh (1999) do not exclusively investigate the relation between emotional stability and adaptive performance but also the separation of adaptive performance from task and contextual performance within the hotel industry. Thus, differences in the results may be explained by varying interactions, groups of interest, and focus of research. Nevertheless, our study suggests that, for workers in Germany, emotional stability positively affects the hiring chance in both radically and incrementally product-innovating firms.

Thus, our first conclusion is that recruiters from radically product-innovating firms prefer conscientious and emotionally stable workers, while recruiters from incrementally product-innovating firms prefer emotionally stable workers.

Our second conclusion is that the recruiters' preferences for personality traits that help workers adapt to a changing work context are stronger in radically product-innovating firms compared to incrementally product-innovating firms (see Table 7). This finding supports our assumption that the required degree of adaptivity for a worker differs for the two product innovation types and thus, recruiters' personality preferences differ, too. We, hereby, provide an answer to an empirical question.

7. Conclusion

With this study, we aim to explore whether recruiters of product-innovating firms prefer certain personality traits. We analyse the results from a discrete choice experiment and find that recruiters prefer more emotionally stable workers regardless of the firm's innovation type, whereas recruiters from firms engaging in radical innovations also prefer more conscientious applicants.

Before discussing the implications of our findings, we need to discuss a few limitations. Firstly, a general caveat for discrete choice experiments is that they investigate hypothetical decisions (Auspurg & Liebe, 2011). The possible lack of external validity may lead to biased answers due to social acceptability or strategic decision-making (Liebe, 2007). However, our experimental design is as close as we can get to real-life decision making, as the respondents are real-life recruiters who are forced to choose between two applicant profiles (Hainmueller et al., 2015). Moreover, the indirect valuation method of the choice sets is considered to be more immune to such effects than direct valuation methods (Louiére & Hensher, 2000; Auspurg & Liebe, 2011).

A second caveat concerns situational factors according to the trait

activation theory (Tett & Burnett, 2003). This theory suggests that situational factors influence the expression of personality traits at work, which means that the same trait may be expressed differently in different jobs or work contexts (Neal et al., 2012). For example, agreeableness and extraversion are especially beneficial in jobs with an interpersonal focus (Tett & Burnett, 2003). The literature on personality trait effects further suggests that the direction of personality traits depends on the work context. For example, conscientiousness is negatively related to creativity when individuals work under close supervision and have unsupportive co-workers (Feist, 1998; George & Zhou, 2001). However, our experimental design takes this caveat into account, as the respondents are real-life recruiters who know the occupation and future tasks the firm is hiring for. Thus, the respondents know the situational factors.

Our paper has practical implications for firms and applicants, as well as for policy makers involved in the design of training curricula. Our findings provide guidance for future training decisions based on skills demanded by the market. Product and service innovations are crucial for firms' success and persistence. Nevertheless, to generate the highest profitability of an innovation, workers' adaptivity to change is important (Smit, 2015; Do et al., 2016). Our results suggest that recruiters from product-innovating firms recruit accordingly. We show that personality trait-oriented recruitment is not only important when recruiting workers who invent the innovation (Leiponen, 2005), but also when recruiting mid-qualified workers who put the innovation into practice (Thomä, 2017). Thus, workers with personality traits that differ from those required by firms will have a disadvantage in the labour market. This also has implications for the development of non-cognitive skills over educational careers. Research on firms' (changing) demand for non-cognitive skills could improve the information base for designing curricula in schooling and training systems.

CRedit authorship contribution statement

Luisa Minssen: Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Conceptualization. **Mark Levels:** Writing – review & editing, Supervision, Methodology, Investigation, Conceptualization. **Harald Pfeifer:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Caroline Wehner:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.socce.2024.102267](https://doi.org/10.1016/j.socce.2024.102267).

Appendix

Table A.1

Comparison of Working Sample and Full Sample.

Working Sample					Full Sample					T-Test
N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX	P -VALUE
Innovation Type										
New Products (Ref. No New Products)										
799	0.54	0.50	0	1	3585	0.53	0.50	0	1	0.64
Improved Products (Ref. No Improved Products)										
799	0.56	0.50	0	1	3526	0.54	0.50	0	1	0.29
Respondents' Position										
Owner (Ref. No Owner)										
799	0.47	0.50	0	1	4045	0.35	0.48	0	1	0.00
Respondents' Attributes										
Male (Ref. Female)										
799	0.64	0.48	0	1	4045	0.57	0.50	0	1	0.00
Tenure (in Years)										
799	15.53	11.01	1	50	3756	14.76	10.82	0	55	0.05
Academic Degree (Ref. No Academic Degree)										
799	0.44	0.50	0	1	4045	0.40	0.49	0	1	0.02
Firms' Characteristics										
West Germany (Ref. East Germany)										
799	0.86	0.34	0	1	4045	0.87	0.33	0	1	0.37
Number of Employees										
799	71.30	213.39	1	3435	4045	233.71	2202.87	0	76,900	0.00
Public Sector (Ref. No Public Sector)										
799	0.07	0.26	0	1	4045	0.10	0.30	0	1	0.00
Service Sector (Ref. Industry Sector)										
799	0.69	0.46	0	1	4045	0.70	0.46	0	1	0.66

Source: BIBB-CBS 2017/2018, own calculation.

Table A.2

Table A.2

Recruitment Decision and Innovation Type.

	Radical Product Innovation	Incremental Product Innovation
MEAN		
Personal Attributes		
Above-Average Competence	0.233***	0.205**
(Ref. Average Competence)	(0.078)	(0.084)
More Open to Experience	0.555***	0.652***
(Ref. Less Open to Experience)	(0.080)	(0.085)
More Conscientiousness	1.374***	1.504***
(Ref. Less Conscientiousness)	(0.106)	(0.112)
More Extraversion	0.153**	0.156**
(Ref. Less Extraversion)	(0.066)	(0.068)
More Agreeableness	1.465***	1.455***
(Ref. Less Agreeableness)	(0.110)	(0.112)
More Emotional Stability	0.643***	0.638***
(Ref. Less Emotional Stability)	(0.084)	(0.087)
Interactions between Personal Attributes and Product Innovation Type		
(For each Innovation Type, see Column Title)		
Above-Average Competence	0.142	0.170
x Innovation Type	(0.106)	(0.107)
More Open to Experience	0.130	−0.052
x Innovation Type	(0.108)	(0.109)
More Conscientiousness	0.266**	0.005
x Innovation Type	(0.128)	(0.129)
More Extraversion	0.028	0.018
x Innovation Type	(0.094)	(0.094)
More Agreeableness	0.212	0.206
x Innovation Type	(0.130)	(0.130)
More Emotional Stability	0.203*	0.192*
x Innovation Type	(0.113)	(0.112)
Wage requested by Applicant: Ref. Average Wage		
15 % Above Average	−0.724***	−0.731***
	(0.122)	(0.122)
10 % Above Average	−0.347***	−0.349***
	(0.128)	(0.128)
5 % Above Average	−0.201*	−0.210*
	(0.116)	(0.116)

(continued on next page)

Table A.2 (continued)

	Radical Product Innovation	Incremental Product Innovation
5 % Below Average	−0.228** (0.113)	−0.235** (0.113)
10 % Below Average	−0.196 (0.127)	−0.203 (0.127)
15 % Below Average	−0.364*** (0.130)	−0.368*** (0.129)
SD		
More Average Competence	0.501*** (0.107)	0.489*** (0.109)
More Open to Experience	0.495*** (0.107)	0.495*** (0.107)
More Conscientiousness	0.834*** (0.086)	0.829*** (0.085)
More Extraversion	0.110 (0.183)	0.113 (0.176)
More Agreeableness	1.072*** (0.089)	1.062*** (0.088)
More Emotional Stability	0.629*** (0.098)	0.630*** (0.098)
Observations; N	10,472; 799	10,472; 799
Log-likelihood	−2390	−2391

Source: BIBB-CBS 2017/2018, own calculations.

Note: mixed logit model with clustered standard errors. Standard errors in parentheses. Estimation based on 2000 Halton draws.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

This table is the full version of Table 7.

Table A.3

Robustness Test of Radical Innovation with Control Variables.

Personal Attributes x Radical Product Innovation					
Competence	Openness to Experience	Conscientiousness	Extraversion	Agreeableness	Emotional Stability
Model M1: Interaction Coefficients based on Original Model (see Table A.2)					
0.142 (0.106)	0.130 (0.108)	0.266** (0.128)	0.028 (0.094)	0.212 (0.130)	0.203* (0.113)
Model M2: Interaction Coefficients after Controlling for the Interaction between an Applicants' Attributes and a Single Control Variable:					
Owner (Ref. No Owner)					
0.130 (0.107)	0.124 (0.108)	0.248* (0.128)	0.027 (0.094)	0.196 (0.129)	0.195* (0.113)
Tenure (in Years)					
0.143 (0.106)	0.133 (0.108)	0.254* (0.127)	0.033 (0.094)	0.206 (0.129)	0.200* (0.113)
Academic Degree (Ref. No Academic Degree)					
0.140 (0.106)	0.133 (0.108)	0.260** (0.128)	0.028 (0.094)	0.202 (0.129)	0.206* (0.113)
Male (Ref. Female)					
0.150 (0.106)	0.134 (0.108)	0.260** (0.128)	0.035 (0.095)	0.194 (0.130)	0.194* (0.114)
Number of Employees					
0.127 (0.106)	0.120 (0.108)	0.248* (0.128)	0.017 (0.094)	0.190 (0.129)	0.195* (0.112)
West Germany (Ref. East Germany)					
0.124 (0.107)	0.116 (0.108)	0.254** (0.129)	0.027 (0.095)	0.202 (0.129)	0.200* (0.113)
Public Sector (Ref. No Public Sector)					
0.147 (0.106)	0.127 (0.108)	0.263** (0.128)	0.022 (0.094)	0.230* (0.129)	0.205* (0.112)
Service Sector (Ref. Industry Sector)					
0.147 (0.106)	0.126 (0.108)	0.265** (0.127)	0.024 (0.094)	0.205 (0.128)	0.205* (0.113)
Model M3: Interaction Coefficients after Controlling for the Interaction between an Applicants' Attributes and all Control Variables					
0.137 (0.107)	0.117 (0.109)	0.220* (0.128)	0.029 (0.095)	0.170 (0.127)	0.198* (0.114)

Source: BIBB-CBS 2017/2018, own calculations.

Note: mixed logit model with clustered standard errors. Standard errors in parentheses. Estimation based on 2000 Halton draws. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4
Robustness Test of Incremental Innovation with Control Variables.

Personal Attributes x Incremental Product Innovation					
Competence	Openness to Experience	Conscientiousness	Extraversion	Agreeableness	Emotional Stability
Model M1: Interaction Coefficients based on Original Model (see Table A.2)					
0.170 (0.107)	−0.052 (0.109)	0.005 (0.129)	0.018 (0.094)	0.206 (0.130)	0.192* (0.112)
Model M2: Interaction Coefficients after Controlling for the Interaction between an Applicants' Attributes and a Single Control Variable:					
Owner (Ref. No Owner)					
0.157 (0.107)	−0.062 (0.110)	−0.011 (0.128)	0.020 (0.094)	0.191 (0.130)	0.184 (0.113)
Tenure (in Years)					
0.175 (0.107)	−0.057 (0.109)	−0.006 (0.128)	0.019 (0.094)	0.199 (0.129)	0.187* (0.112)
Academic Degree (Ref. No Academic Degree)					
0.172 (0.107)	−0.046 (0.109)	0.006 (0.129)	0.017 (0.094)	0.205 (0.130)	0.195* (0.112)
Male (Ref. Female)					
0.173 (0.107)	−0.052 (0.109)	0.008 (0.129)	0.015 (0.094)	0.208 (0.130)	0.192* (0.113)
Number of Employees					
0.154 (0.107)	−0.063 (0.109)	−0.008 (0.128)	0.017 (0.094)	0.182 (0.130)	0.195* (0.112)
West Germany (Ref. East Germany)					
0.151 (0.108)	−0.061 (0.109)	−0.012 (0.130)	0.019 (0.094)	0.189 (0.129)	0.186* (0.113)
Public Sector (Ref. No Public Sector)					
0.171 (0.107)	−0.046 (0.109)	0.008 (0.129)	0.011 (0.093)	0.219* (0.129)	0.198* (0.112)
Service Sector (Ref. Industry Sector)					
0.163 (0.108)	−0.061 (0.110)	−0.006 (0.129)	0.015 (0.094)	0.184 (0.129)	0.202* (0.113)
Model M3: Interaction Coefficients after Controlling for the Interaction between an Applicants' Attributes and all Control Variables					
0.144 (0.107)	−0.072 (0.109)	−0.072 (0.127)	0.007 (0.093)	0.164 (0.127)	0.196* (0.112)

Source: BIBB-CBS 2017/2018, own calculations.
Note: Mixed logit model with clustered standard errors. Standard errors in parentheses. Estimations are based on 2000 Halton draws. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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