Predictors of Participation in Continuing Vocational Education and Training funded by the Federal Employment Agency

Kaethe Schneider, Uliana Proskunina
Friedrich-Schiller University Jena

The predictors of continuing vocational education and training participation are broadly investigated. Nevertheless, only few studies consider its different segments, especially the one offered by the Federal Employment Agency. We contribute to this research gap with logistic regression models on the basis of the German Socio-Economic Panel. Our analysis proves that the outcome is best predicted by the job-based characteristics, followed by the firm-based ones. Simultaneously, we find its weak dependence on the psychographic characteristics. The article provides a comprehensive review of the theoretical foundations of the investigated phenomenon as well as contributes empirically to the German adult education research

1. Introduction

The increasing interest in recent decades in educational and social scientific research on participation in continuing vocational education (e.g. Becker, 2019; Becker & Schömann, 2015; Eisermann, Janik, & Kruppe, 2014; Hall & Krekel, 2008; Hubert & Wolf, 2007; Kaufmann & Widany, 2013; Offerhaus, Leschke & Schömann, 2010; Wilkens & Leber, 2003; Yendell, 2013) corresponds to the importance of continuing vocational education for society, educational policy and individual persons. Following Becker (2019), the ever shorter 'half-life' of initial formal education and training in the life-course, as well as the declining numbers of qualified entrants contributes to the demand for a qualified labor force that "can no longer be satisfied by the recruitment of subsequent cohorts of novices" (Becker, 2019, p. 2). Analyses revealing a general trend of rising training rates in the last few decades indicate the increased importance of continuing vocational education and training in the German labor market (e.g. Bilger & Strauß, 2019; Grund & Martin, 2012).

Participation in continuing vocational education was examined especially generally, theoretically and respectively empirically (e.g. Behringer, 1999; Grund & Martin, 2010; Hubert & Wolf, 2007; Offerhaus, Leschke, & Schömann, 2010; Wilkens & Leber, 2003; Yendell, 2013). There are only a few studies, such as, e.g., by Cloutier, Renaud, und Morin (2008), Düll and Bellmann, (1999), Grund and Martin (2010), Kaufmann and Widany (2013) and Renaud, Lakhdari and Morin (2004), who have examined participation in continuing vocational education differentially, in dependence on various continuing educational segments. Although differential studies have shed further light on what factors influence employees' participation in the different types of continuing vocational education and training, the studies leave some important questions unanswered, such as for example the question about the predictors of participation in continuing vocational education and training offered by the Federal Employment Agency. This question is addressed in this study.

In the relevant studies and statistics, various characteristics are employed in order to distinguish vocationally related continuing education from non-vocationally related types, as for example the purpose of the continuing education, the contents and the bearer (Rosenbladt, 2007). As a working definition for the concept of continuing vocational education we chose the aim-linked definition of the German Socio-Economic Panel (SOEP), a

representative data set of people living in Germany, because we make use of this data set for the empirical analysis. Following the SOEP, we define continuing vocational training and education (CVET) as “all further training measures that are designed to build on previous professional training or that are designed to pave the way for a change of profession, as is the case with occupational retraining” (TNS Infratest Sozialforschung, 2014, p. 57). Instead of using the SOEP term “further vocational training” we adopt the broader term “continuing vocational education and training”.

Recent studies have explained participation in continuing vocational education and training in general either at the organizational level on the basis of structural and job variables (e.g. firm characteristics, work practices) and employee demographics such as for example schooling, age or employment status (e.g. Clarke & Metalina, 2000; Düll & Bellmann, 1999; Frazis, Gittleman, & Joyce, 2000; Green, Machin, & Wilkinson, 1999; Grund & Martin, 2010) or from a psychological perspective referring chiefly to motivation (e.g. Renaud, Lakhdari & Morin, 2004; Tharenou, 2001). With regard to economic factors, continuing vocational education of employees is positively associated with factors of the work situation, such as firm size, firm branch and employment level (e.g. Düll & Bellmann, 1999; Grund & Martin, 2010). Socio-demographic factors that interact positively with participation in continuing vocational education are school leaving qualification, vocational training, vocational function, vocational status and employment status (e.g. Düll & Bellmann, 1999; Grund & Martin, 2010). Likewise, in comparison to persons over the age of fifty, younger employees display a higher probability of participating (e.g. Düll & Bellmann, 1999; Grund & Martin, 2010). During a 20-year observation period from 1989 to 2008, Grund and Martin (2010) show that job status and firm size are the most relevant characteristics for educational participation. From a psychological perspective, a study by Tharenou (2001, p. 617) shows for a longitudinal sample of 1705 Australians, that the motivation of employees in terms of expectation and wanting to learn contributes to predicting their participation in training and development, besides individual, job, and organizational factors.

Regarding differential studies, Renaud, Lakhdari und Morin (2004), for example, identified two groups of determinants, i.e. socio-demographic (age, gender, family responsibilities and education level) and employment-related (organizational tenure, hierarchical position and employment status) for participation in the segment of non-mandatory training offered by employers. Participants, mostly female, were employees of a large Canadian service organization. Results showed that age had a negative effect on participation, that women had a higher probability to participate, and that educational level was negatively related to participation, and that the probability of participation in non-mandatory training increased with the hierarchical position occupied. Using Canadian national data from the Workplace and Employee Survey (WES), Cloutin, Renaud and Morin (2008) show a differential effect of predictors for participation in voluntary vocational training for female and male managers. Voluntary vocational training “… refers to any type of structured learning, linked to the career, undertaken on the employee’s own time and which does not require the employer's approval…” (Cloutin, Renaud & Morin, 2008, p. 269). While for men, educational degree is significantly linked to the probability of participating in voluntary vocational training, for women age has a negative effect, schooling has a concave effect, and organizational tenure - a weak positive influence on the probability of participation in non-mandatory training.

For Germany, there is a newer differential study by Kaufmann and Widany (2013) to explain the in-firm, individual and mixed-financed continuing vocational education. In-firm continuing education is, according to the Adult Education Survey (AES), characterized in the

fact that participation occurs entirely or largely during paid working time or a paid release for educational purposes, and/or direct continuing educational costs are overtaken by an employer (Bilger & Strauß, 209, p. 18). Individual vocationally-related continuing education is present, according to the AES, when it is not in-firm and "chiefly for vocational reasons" (Bilger & Strauß, 2019, p. 18). This operationalization of in-firm and individual vocationally-related continuing education, found in the Adult Education Survey (AES), which differ depending on financing, is complemented by Kaufmann and Widany (2013) with the mixed-financed continuing vocational education segment. Investments not only from employees but also from employers flow into mixed-financed continuing education (Kaufmann & Widany, 2013, 34). The determinants of continuing vocational education of these three segments were analyzed by Kaufmann and Widany (2013) with the data from the National Educational Panel Study (NEPS) – Starting cohorts of adults 2009/10. As predictor clusters, Kaufmann and Widany (2013) chose the characteristics of socio-demography, personal attitude, activity and employment environment. The authors concluded that participation is clearly marked by external selective influences, even if the predictors show segment-specific random influences, which points to the relevance of a differential explanation of continuing vocational education. While the participation opportunities of employees in the firm continuing educational segment are determined above all by activity-related characteristics and characteristics of the immediate work environment, the participation structure of the mixed-financed segment seems to be more strongly influenced by work-related characteristics: for both segments the expectations of employers are relevant. In contrast, for the individual segment, personal attitude characteristics and characteristics of the social environment play a significant role (Kaufmann & Widany, 2013, p. 50).

In their study, Kaufmann & Widany (2013) identified besides the two segments specified in AES of continuing vocational education a further segment that is the mix-financed continuing vocational education segment. With our study we add another one to these segments, a further one, namely the segment of continuing vocational education offered by the Federal Employment Agency.

The measures of active labor market policy, such as for example training measures, and integration subsidies are paid in Germany from a common budget. According to the Social Law Code (Sozialgesetzbuch (SGB) Volume 3 (III) 13.3.20139), continuing vocational education is a service of active labor furthering beside instruments like, e.g., counseling and placement, activation and vocational integration, choice of vocation and vocational training. In the case of continuing vocational education, employees can be furthered in consultation with the Federal Employment Agency with an authorized educational bearer through the assumption of continuing educational costs according to SGB III, "the continuing education is necessary to vocationally integrate them when unemployed, to ward off threatening unemployment or because due to lack of vocational qualification the need for continuing education is recognized" (§ 81 Para. 1 Sentence 1 SGB III). In the legal sphere of SGB III, in 2013 about 75,000 persons participated in continuing vocational education (Federal Employment Agency – Bundesagentur für Arbeit, 2014).

Our objective is to identify the predictors of participation in the segment of continuing vocational education and training offered by the Federal Employment Agency in Germany. This project uses personal data in German Survey data and multivariate estimation to examine in an exploratory way the effects of structural and job-related variables, employee demographics and individual characteristics on participation in Federal Employment Agency funded continuing vocational education and training.

Based on the extensive question catalogue that contains socio-demographic, structural and job-related variables and the question of the continuing vocational education and training offered by the Federal Employment Agency, the German Socio-Economic Panel (SOEP) is suitable for this exploratory study. The German Socio-Economic Panel (SOEP) is a longitudinal survey of approximately 11,000 private households in the Federal Republic of Germany from 1984 to 2018 and the new eastern German states (former GDR) from 1990 to 2018.

Before we empirically test the theoretical concept for the explanation of continuing vocational education, we first explain the theoretical foundations.

2. Theoretical Framework

Studies conducted on participation in training were in general from two distinct theoretical streams. The first one is from an economic paradigm and includes theories such as human capital and labor market segmentation theories, the second stream is of psychological provenience and consists of theories such as action and motivation theories. In a review of the theoretical perspectives, Nienhueser (1996, p. 47) criticizes that the interaction between an employer and an employee was largely left out of behavioral science, motivational and psychological studies. Following Nienhueser, we see the necessity to interlock both theoretical perspectives with each other in order to take into consideration in model construction the interaction between employees and respectively in our case clients of the Federal Employment Agency, referred to below as *Client FEA*, and the Federal Employment Agency, referred to below as the *FEA.*

We choose for the theoretical development the procedure of "Model construction as a foundational strategy" following Nienhueser (1996, p. 53). With this strategy, drawing on Nienhueser (1996), a model object is constructed that is tied to a theoretical model with general theoretical nomothetic statements (Nienhueser, 1996). "A model object is a simplified list of the characteristics of a real object or state of affairs. A theoretical model is to the contrary more than just a schematic representation. It forms much more a specific theory of the facts portrayed from the model object and contains statements from general theories that are related to the model object elements and their real counterparts" (Nienhueser, 1996, p. 53). As a result of the foundational strategy there arises a theoretical Basis Model, in which beside general non-contradictory and mutually linked statements we also find statements on specific contextual conditions (Nienhueser, 1996, p. 54; p. 76).

Before the background of an explanatory problem, we determine the model object (Nienhueser, 1996). What is to be explained is participation in Continuing Vocational Education and Training funded by the Federal Employment Agency.

The actors are the Client FEA and the FEA. The initiator of the action to attend continuing education is the Client FEA, the initiator of the authorization of participation and of financial support for continuing vocational education is the FEA. The Client FEA, the action of the Continuing Vocational Education and Training, the FEA, and the action of authorizing and financing the continuing education form the model object.

In order to explain in the second step the empirical phenomenon of the different states of the model objects with the aid of general statements (Nienhueser, 1996, p. 56), we draw on tested theories that relate to the problem or model.

Theory element 1: Rubicon model of action phases

The motivational-psychological Rubicon model of action phases according to Heinz Heckhausen and Peter Gollwitzer (1987) models the course of action in the form of successive phases: the pre-decision, pre-action, action, and post-action phases. The pre-decision, also called the assessment phase, has the function of constructing the aim, while in the pre-action phase plans are made for how the aim can be realized. In the following action phase, the person begins the action and carries it out. This phase is followed by the post-action phase, in which with the achievement or respectively non-achievement of the aim, the intention is de-activated and the action is evaluated with regard to success or failure and further subsequent improvements.

Theory element 2: Expectancy-Value Theories

Expectancy-Value theories are theories of decision and action. Each action is understood as the result of a rational decision process. The actor chooses the aim among the ones available for choice that for him has the highest assumed utility, and that among the action options available for the realization of the aim has the highest expected utility in regard to the realization of the strived-for aim. With the choice between two actions, the person thus prefers the one with which the production of achievable value (incentive) with the probability to realize it (expectancy), are maximal (Heckhausen & Heckhausen, 1989).

Theory element 3: Social Exchange Theories

Actors and things are the central elements of exchange theory, according to James Coleman (1994), a representative of rational choice theories. Following Coleman (1994, p. 28), the conceptual base for a social system of actions of individual actors consists of two kinds of elements. ”The elements are actors and things over which they have control and in which they have some interest” (Coleman, 1994, p. 28). Actors are the initiators of actions. Coleman (1994) distinguishes actors according to individual and corporate actors, as e.g., the FEA.

If actors are not fully in control of things in which they have some interest they need to engage in transactions with other actors. This interaction is characterized by interdependence, here by behavioral interdependence (Friedman, 1977), as individual behavior is dependent on the future action of the other. “A minimal basis for a social system of action is two actors, each having control over resources of interest to the other. It is each one’s interest in resources under the other’s control that leads the two, as purposive actors, to engage in actions that involve each other” (Coleman 1994, p. 29).

Theory element 4: Theory models of segmented labor markets

Linked with labor market segmentation is the model according to which a labor market can be subdivided into sub-markets (Sengenberger, 1978). The segmented labor markets are “seen as a result of the effective employment of economic and political forces and interests in the labor market process” (Sengenberger, 1978, p. 16). The sub-labor markets differ with regard to specific criteria of employment relationships, such as, e.g., with regard to chances of entry and leaving, qualification demands, (intra-)company mobility, labor conditions and employer-employee relations. Subdividing sub-labor markets according to these characteristics leads to the distinction, e.g., of markets for unspecific, subject-specific and company-specific qualifications, of primary and secondary markets, and of markets for stable and unstable jobs (Sengenberger, 1978, p. 16).

If we return to the structure of a primary and secondary labor market according to Peter Doeringer and Michael Piore (1971), then according to this theory of dual segmentation, the employment risks function as distinguishing criteria. The primary labor market, characterized by relatively stable jobs, good working conditions, high demands for qualification, relatively high incomes, and chances for upward mobility. In contrast to this is the secondary labor market, which is located above all in the production domain, with more unstable labor relationships, poorer working conditions, lower qualifications and lower salaries.

3. Theoretical considerations and hypotheses

The elements of the model object are brought together below with the aid of theory elements, in order to specify them and to generate theoretically founded hypotheses on participation in continuing vocational education and training funded by the FEA.

The core theory for explaining CVET funded by the FEA is Coleman's *social exchange theory*. Although the minimal basis for a social system refers to individual actors, we refer it to the social system of action between an individual, the Client FEA, and a corporate actor, the FEA. We assume, following Coleman (199, p. 29), that each actor has the goal to maximize the realized interest. The Client FEA further qualifies herself vocationally, the FEA, approves and finances the continuing education. Based on exchange theory, the actors, Client FEA and FEA, are in "behavioral interdependence" (Friedman, 1977): Client FEA is interested in physical capital, the services of the FEA, that are under the control of the FEA. There is no legal right to the furthering of continuing vocational education by the Federal Employment Office. It is much more a voluntary service that authorities have discretion to grant. The FEA decides on the furthering of continuing vocational education on the basis of criteria of suitability and the personal relations of those entitled to furthering, the local availability of labor market services, as well as labor market conditions. At the same time, the FEA is interested in the human capital of the Client FEA, which is controlled by him. Thus, each one's interest in resources is under the control of the other, which leads to the transaction.

In the interaction, the FEA estimates whether, e.g., unemployment can be ended without continuing education, whether other labor market political instruments are more likely to succeed, and whether Client FEA can with sufficient probability be integrated into the labor market using the strived-for educational aim. In the frame of the *Rubicon model of action phases,* the evaluation is a pre-decision process. In the evaluation phases the psychic processes have the function of aim construction, which can be pictured using expectancy-value models.

The motivation, the action, here to authorize and finance continuing education, is explained, according to *expectancy-value theories*, by the subjective expectation to achieve certain consequences with the behavior and the (subjective or objective) value of the behavioral consequence. With regard to expectancy, action-result expectations are distinguished from result-consequence expectations and situation-outcome expectations (Heckhausen & Heckhausen, 1989). The action-result expectation represents the cognition, insofar as a person believes that through own action she can bring about a desired action result. The result-consequence *expectation* is the assumption that the achieved action result will also have positively evaluated consequences, and how close the contingency is between result and consequence. The situation-result expectation is the assumption about the extent to which the situation leads to the result without action. The value of "subjective value" is divided into the following components, "intrinsic value", as the value of the action or

pleasure in the action, “attainment value”, as identification with the result, for example, with the achievement or competence, “utility value”, as utility value, for example, as utility for short and long-term aims and “cost”.

According to expectancy-value theories, the Client FEA and the FEA interact respectively depending on specific needs, motives and aims with the situation and before the background of this interaction-event develop expectancy-value cognitions. The situation that is a component of the expectancy-value model represents the connection to circumstances or conditions. The situation is determined by circumstances, such as for example the labor market, which can according to the *Theory of dual Segmentation* be considered a proxy for employment risks. The situation is also formed through the respectively other action partners.

In Illustration 1, a general model is presented to explain continuing vocational education and training funded by the FEA. This model was conceived based on the Rubicon model of action phases, expectancy-value theory, as well as on the manner of representing these two theories in agreement with Nienhueser’s model (1996) to explain personal strategies in companies.

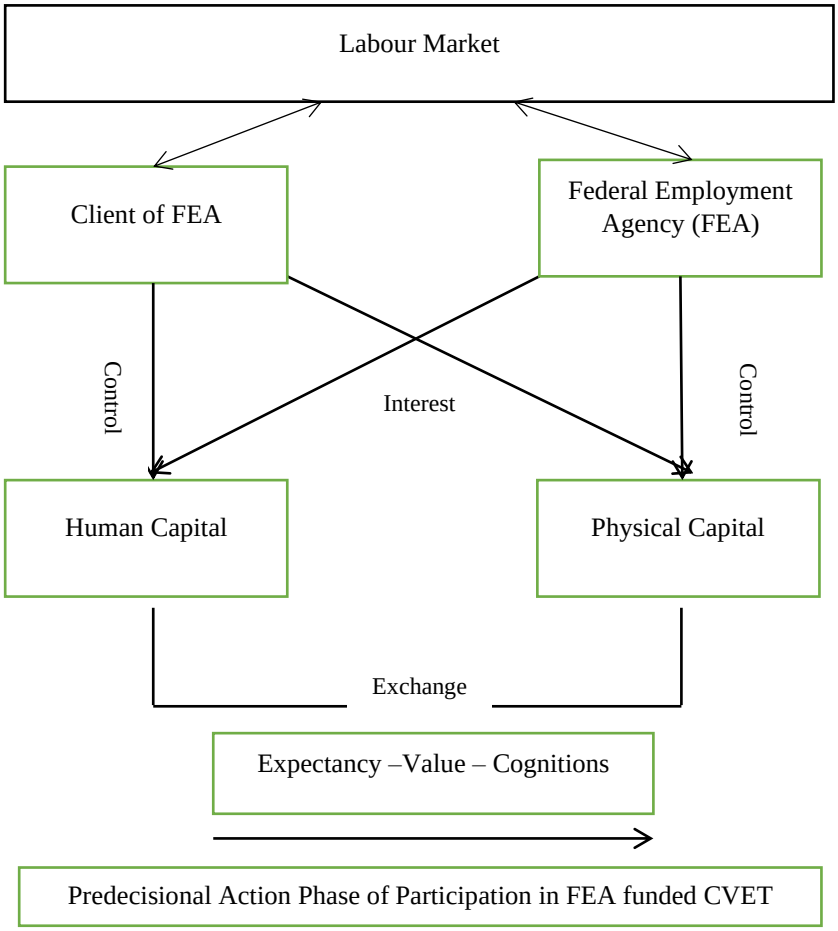

Figure 1: Model for the explanation of CVET funded by the FEA (cf. Nienhueser, 1996, p. 66)

Starting from the model, we generate hypotheses to explain participation through the FEA in CVET. With the help of this model, we now identify the conditions under which we can expect that the probability of participating in continuing further education will be higher or lower.

In the case of the FEA the utility in human capital is seen as preventing unemployment. But in physical capital, as e.g. the financing of continuing education, the monetary services, as for example the financing of continuing education, the monetary services of the Federal Employment Agency and increased attractiveness for the labor market. Table 1 shows how on the one side the FEA's motivation to authorize and finance continuing vocational education, and on the other side, that of the Client FEA to participate in continuing education, can be respectively explained. It becomes clear that the expectancy-value cognitions of the interaction partners in an exchange here can vary. The actors' decision for continuing vocational education is tied to the expectation to benefit thereby.

Table 1. Expectancy-Value Cognitions within the prediction phase of Client FEA and the FEA

	FEA	**Client FEA**
Action-Result Expectation	Successful participation of the Client FEA in continuing education	Increased competence
Result-Consequences expectations	• Increased Competence • Avoiding feared unemployment or respectively vocational integration	• Physical capital • Avoiding feared unemployment or respectively vocational integration
Situation-Result expectations	-	
Costs	Monetary costs	• Human resources • Personal Time
Intrinsic value		
Attainment value	Human capital	Physical Capital
Utility value	Balance of supply and demand in the labor market	Avoiding feared unemployment or respectively vocational integration

The probability of threatening unemployment is for employees on fixed-term employment contracts greater in comparison to employees with permanent employment contracts. The function of CVET, funded by the FEA, is to avoid unemployment or respectively to vocationally integrate the Client FEA. It is assumed that the FEA and the Client FEA have higher result/consequences expectations for CVET in the case of fixed-term employment contracts. Utility values with regard to the balance of supply and demand in the labor market, as well as attainment values in regard to improved human capital of the Client FEA promote the action of continuing education financing. We conclude:

Hypothesis 1 (Employment relation)
Persons with fixed-term employment contracts have higher probabilities of training participation than persons with permanent employment contracts.

Likewise the probability to become unemployed is higher in cases of marginal, irregular part-time employment than with regular employment. It is assumed that the FEA and the Client FEA have higher result-consequences expectations for a continuing vocational education with marginal irregular part-time employment. The utility values of the balance of

supply and demand in the labor market, as well as attainment values of improved Human Capital of the Client FEA promote the action of financing continuing education. This leads to:

Hypothesis 2 (Employment status)
Persons who are in marginal, irregular part-time employment have higher probabilities of training participation than persons in regular employment.

According to expectancy-value theories, the Client FEA forms with her needs, motivations, etc. in interaction with the situation an expectancy-value cognition. A lower intrinsic value of the Client FEA in regard to learning action reduces the probability of initiatives of the Client FEA to apply for continuing vocational education. This leads to our

Hypothesis 3 (Attitude toward lifelong learning)
Persons who have a negative attitude toward lifelong learning have lower probabilities of training participation than persons with a positive attitude.

The dissatisfaction of Client FEA interacts with needs and furthers the utility value of continuing vocational education for the realization of needs. We, therefore, conclude:

Hypothesis 4 (Satisfaction with different life spheres)
Persons who have low satisfaction with different life spheres, especially household and respectively personal income, have higher probabilities of training participation than persons with high satisfaction rates in these spheres.

In the case of childcare and helping care-needy persons, the initiative of the Client FEA to apply for continuing vocational education will be reduced due to lower action-result expectancy caused by limited time budgets. This leads to:

Hypothesis 5 (Typical weekday schedule)
Persons who must care of children and/or care-needing relatives, have lower probabilities of training participation than persons who don't have such responsibilities.

With regard to the labor market, drawing on the theory of dual segmentation, it holds that smaller firms in manufacturing sectors are more likely to locate in secondary labor markets that are exposed to greater labor market risks, as for example unemployment. In contrast, the service sector, as for example banks and insurance companies, is above average in regard to operational continuing education and qualification requirements. It is assumed that the FEA and the Client FEA have higher result-consequences expectations for continuing vocational education from the FEA. Clients of smaller firms and the manufacturing sector have lower result-consequences expectations for the Client FEA from the service sector. Utility values of the balance of supply and demand in the labor market as well as attainment values of improved human capital of the Client FEA promote the action of continuing educational financing. This leads us to the next three hypotheses:

Hypothesis 6 (Industry)
Persons who work in the manufacturing sector have higher probabilities of training participation than persons who do not.

Hypothesis 7 (Industry)
Persons who are active in the service sector have lower probabilities of training participation than persons who are not.

Hypothesis 8 (Firm size)
Persons who work for larger firms have lower probabilities of training participation than persons who do not.

With regard to the labor market, it holds drawing on the theory of dual segmentation that qualification requirements, such as educational level and required job training, are marked with higher probability in the primary labor market than in the secondary labor market, which likewise is affected by greater labor market risks, as for example workers' unemployment. On the basis of these labor market structures it is probable, that the FEA and the Client FEA have higher result-consequences expectancy for CVET for Client FEA with lower qualifications in regard to continuing education. This leads us to the next two hypotheses:

Hypothesis 9 (Educational qualification)
Persons who have a lower level of educational qualification have higher probabilities of training participation than persons with a higher level.

Hypothesis 10 (Required training for job)
Persons whose jobs have a lower level of required formal education and required on-the-job-training, have higher probabilities of training participation than those of persons with a higher level.

The considered determinants for CVET funded by the FEA can be roughly classified to the four domains of socio-demographic characteristics, psychographic characteristics, job-based characteristics and firm-based characteristics. On the basis of exchange theory, we emphasize the significance of two central variable groups for CVET required by the FEA in the explanatory model: Job- and firm-based characteristics. Individuals as actors have a relation of power inequality to corporate actors, thus to the socially educated (cf. Coleman, 1994). Because they have fewer resources, individuals have fewer action options than corporate actors (cf. Coleman, 1991). Psychographic characteristics, such as satisfaction with different life spheres, attitude towards lifelong learning and typical weekday schedule, are relevant to the individual actor, the Client FEA. Since the meta-decision for or against continuing vocational education on the macro-level is affected by the corporate actor (Käpplinger, 2016, p. 7), we assume that the psychographic and the expectancy-value cognitions of the Client FEA are of a secondary order. We therefore conclude:

Hypothesis 11
Job- and firm-based characteristics explain to a higher share of variation of participating in FEA funded continuing vocational education than psychographic and socio-demographic characteristics.

Table 2 gives a short summary of our hypotheses based on theoretical considerations. The directions of action in bold type face symbolize stronger effects of the independent variables on continuing vocational education in comparison to the ones in regular type face.

Table 2. Summary of hypotheses

Socio-demographic characteristics	
• Age	
• Gender	
• Region	
• Educational degree	(-)
Psychographic characteristics	
• Satisfaction with different life spheres	(-)
• Attitude towards lifelong learning	(+)
• Typical weekday schedule [Time]	(-)
Job-based characteristics	
• Required training for the job	**(-)**
• Employment relation: fixed-term contract	**(+)**
• Employment relation: no contract	**(+)**
• Employment status: marginal irregular part-time employment	**(+)**
Firm-based characteristics	
• Industry: Manufacturing	**(+)**
• Industry: Service sector	**(-)**
• Firm size	**(-)**

4. Method

There are numerous collections of statistics in Germany, such as e.g. database Micro-census (Datenbasis Mikrozensus), Adult Education Survey (AES), the Education Report (Bildungsbericht), the Continuing Vocational Training Survey (CVTS) and the Socio-Economic Panel (Sozio-ökonomisches Panel: SOEP), that portray participation in continuing vocational education quantitatively. The date base of our study is the Socio-Economic Panel (SOEP), an annual follow-up survey of private households by the German Institute for Economic Research (Deutsches Institut für Wirtschaftsforschung (DIW)), which has been carried on since 1984 in Western Germany and since 1990 as well in the new states, formerly East Germany. This dataset has been chosen due to the available combination of economic and socio-demographic measurements with those of psychology. Besides a section of standard questions, the questionnaires also contain annually changing modules on specific focus topics, among others the topic of continuing education and also that of continuing vocational education furthered by the Federal Employment Agency.

4.1 Measurement of variables

We include a vast number of variables for the sample members' characteristics in our logit estimates.

Socio-demographic characteristics:

- Age: biological age. Scale: number of years; ≥18
- Gender: biological sex. Scale: male/female
- Region: generated variable on the current household residence. Scale: West Germany/East Germany

- Educational degree: generated variable upon degrees and diplomas attained in both general schooling and in vocational/university education as of the highest degree obtained according to "International Standard Classification of Education (ISCED)" Scale:
  - General elementary education
  - Middle vocational education
  - Vocational education and Abitur
  - Higher vocational education
  - Higher education
  - Does not apply (unclassifiable or absent information)

Psychographic characteristics:

- Satisfaction with different life spheres. How satisfied are you with your:
  - Health
  - Sleep
  - Work
  - Housework
  - Household income
  - Personal income
  - Dwelling
  - Leisure
  - Available childcare
  - Family life

  Scale: 0 (Completely dissatisfied) to 10 (Completely satisfied)
- Attitude towards lifelong learning. To what extent do you agree with the following statement: In the present-day working world, it is crucial to add to, brush up on, or expand your skills through further training. Scale: 1 (Completely disagree) to 7 (Completely agree)
- Typical weekday schedule. What is a typical weekday like for you? How many hours per normal workday do you spend on the following activities?
  - Job, apprenticeship, second job (including travel time to and from work)
  - Errands (shopping, trips to government agencies, etc.)
  - Housework (washing, cooking, cleaning)
  - Childcare
  - Care and support for persons in need of care
  - Education or further training (also school, university)
  - Physical activities (sports, fitness, gymnastics)
  - Other leisure activities and hobbies

  Scale: number of hours; ≥0

Job-based characteristics:

- Required training for job: generated variable on required job training for all employed persons. The variable is generated using questions on required formal education and required on-the-job-training. Scale:
  - No training
  - Introduction to job
  - On-the-job training
  - Courses

  - Vocational training
  - Technical college since 1999
  - University since 1999
  - Does not apply (unclassifiable or absent information)

Because of the possibility of multiple responses for the questions on required training and on-the-job training, it is more reasonable to use a single generated variable as the highest required training for the position. Otherwise, we have a situation when for complex jobs all the listed kinds of training are needed.

- Employment relation: type of employment contract. Scale:
  - Permanent employment contract
  - Fixed-term employment contract
  - Does not apply (unclassifiable or absent information)
- Employment status: generated variable on the current employment status. Scale:
  - Full-time employment
  - Regular part-time employment
  - Vocational training
  - Marginal, irregular part-time employment
  - Not employed

Firm-based characteristics:

- Industry: generated variable on the industry of economic activity for all employed persons on the basis of the Statistical Classification of Economic Activities in the European Community (NACE). Scale:
  - Manufacturing
  - Construction
  - Trade
  - Transport
  - Bank, Insurance
  - Services
  - Other sectors (Agriculture, Energy, Mining)
  - Does not apply (unclassifiable or absent information)
- Firm size: generated variable on the core size category of the company for all employed persons. Scale:
  - Lt 5
  - Ge 5 Lt 10
  - Ge 11 Lt 20
  - Ge 20 Lt 100
  - Ge 100 Lt 200
  - Ge 200 Lt 2000
  - Ge 2000
  - Self-employed without coworkers
  - Does not apply (unclassifiable or absent information)

4.2 Sample construction

Our sample consists of people who participated at least once in continuing vocational education and training in 2013 and gave a valid answer *for the bearer of one subjectively estimated* most important course. We use this term to refer to all continuing vocational

education and training measures that are designed to build on previous professional training or that are designed to pave the way for a change of profession, as is the case with occupational retraining. The total amount of time spent on continuing vocational education and training may range from a few hours to several months. The idea to pursue further training may have come from a respondent, an employer, or training could be funded by a government agency such as the Federal Employment Agency.

Those are 80% (4,311 out of 5,405) of the training participants' sample 2013 and 16% (4,311 out of 27,465 SOEP respondents) of the target population sample. For the determinants of training, we imply the differentiation between those who participated in training funded by the FEA in contrast to all other initiatives. This constitutes 13% (570 out of 4,311) of all respondents who gave a valid answer for the question upon training initiative. The major part of training initiatives comes from other sources, which constitute the remaining 87% (3,741 out of 4,311). In particular, obligatory and voluntary employer-provided training – 33% each (1,416 out of 4,311 and 1,432 out of 4,311 respectively) and own training initiative – 21% (893 out of 4,311).

People who participated in training funded by the FEA constitute 11% of all training participants in 2013 (570 out of 5,405) and 2% (570 out of 27,465 SOEP respondents) of the representative sample of the German population. The sample descriptive statistics for the variables of interest are shown in the tables 3 and 4 below.

Table 3. Descriptive statistics for nominal and ordinal dependent variables

	FEA		Other initiatives		Sample	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
Gender						
Male	292	51.23	1,759	47.02	2,260	52.42
Female	278	48.77	1,982	52.98	2,051	47.58
Region						
West Germany	441	77.37	2,912	77.84	3,353	77.78
East Germany	129	22.63	829	22.16	958	22.22
Educational degree						
General elementary education	32	5.61	148	3.96	180	4.18
Middle vocational education	167	29.30	1,357	36.27	1,524	35.35
Vocational education and Abitur	45	7.89	382	10.21	427	9.90
Higher vocational education	62	10.88	304	8.13	366	8.49
Higher education	239	41.93	1,473	39.37	1,712	39.71
Does not apply	25	4.39	77	2.06	102	2.37
Required training for job						
No training required	31	5.44	55	1.47	86	1.99
Introduction to job	25	4.39	90	2.41	115	2.67
On-the-job training	27	4.74	68	1.82	95	2.20
Courses	42	7.37	108	2.89	150	3.48
Vocational training	181	31.75	1,701	45.47	1,882	43.66
Technical college since 1999	61	10.70	543	14.51	604	14.01
University since 1999	136	23.86	850	22.72	986	22.87
Does not apply	67	11.75	326	8.71	393	9.12
Employment relation						

Permanent employment contract	44	7.72	3,098	82.81	3,142	72.88
Fixed-term employment contract	34	5.96	392	10.48	426	9.88
Does not apply	492	86.32	251	6.71	743	17.23
Employment status						
Full-time employment	343	60.18	2,429	64.93	2,772	64.30
Regular part-time employment	81	14.21	962	25.72	1043	24.19
Vocational training	25	4.39	92	2.46	117	2.71
Marginal, irregular part-time employment	50	8.77	100	2.67	150	3.48
Not employed	71	12.45	158	4.22	229	5.31
Industry						
Manufacturing	27	4.74	362	9.68	389	9.02
Construction	49	8.60	340	9.09	389	9.02
Trade	35	6.14	226	6.04	261	6.05
Transport	30	5.26	164	4.38	194	4.50
Bank, Insurance	29	5.09	157	4.20	186	4.31
Services	279	48.95	2,065	55.20	2,344	54.37
Other sectors	28	4.91	80	2.14	108	2.51
Does not apply	93	16.32	347	9.28	440	10.21
Firm size						
Lt 5	129	22.63	98	2.62	227	5.27
Ge 5 Lt 10	65	11.40	202	5.40	267	6.19
Ge 11 Lt 20	30	5.26	251	6.71	281	6.52
Ge 20 Lt 100	33	5.79	649	17.35	682	15.82
Ge 100 Lt 200	33	5.79	321	8.58	354	8.21
Ge 200 Lt 2000	34	5.96	827	22.11	861	19.97
Ge 2000	26	4.56	1,225	32.75	1251	29.02
Self-employed without coworkers	160	28.07	34	0.91	194	4.50
Does not apply	60	10.53	134	3.48	194	4.50
Total	**570**		**3,741**		**4,311**	

Source: SOEP Data 2014, own calculations

Table 4. Descriptive statistics for metric dependent variables

	FEA				Other initiatives				Sample			
	Mean	**Std. Dev.**	**Min.**	**Max.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Age	46.24	11.26	18	76	43.53	10.58	18	79	43.89	10.71	18	79
Satisfaction with health	7.04	2.09	0	10	7.13	1.91	0	10	7.11	1.94	0	10
Satisfaction with sleep	6.90	2.40	0	10	6.98	2.10	0	10	6.97	2.14	0	10
Satisfaction with work	6.82	2.96	0	10	7.06	2.28	0	10	7.03	2.38	0	10
Satisfaction with housework	5.55	3.21	0	10	5.70	3.02	0	10	5.68	3.04	0	10
Satisfaction with household income	6.74	2.50	0	10	7.16	2.05	0	10	7.10	2.12	0	10
Satisfaction with personal income	6.25	2.75	0	10	6.91	2.17	0	10	6.82	2.27	0	10
Satisfaction with	7.78	1.99	0	10	7.96	1.75	0	10	7.93	1.78	0	10

dwelling												
Satisfaction with leisure	6.65	2.31	0	10	6.70	2.12	0	10	6.70	2.14	0	10
Satisfaction with available childcare	2.18	3.62	0	10	2.41	3.72	0	10	2.38	3.70	0	10
Satisfaction with family life	7.78	2.01	0	10	7.85	1.85	0	10	7.84	1.87	0	10
Attitude towards lifelong learning	6.46	1.15	0	7	6.42	1.1	0	7	6.43	1.13	0	7
Time for job/ apprenticeship/second job	7.15	3.81	0	15	8.16	2.92	0	16	8.03	3.07	0	16
Time for errands	0.88	0.68	0	5	0.85	0.60	0	6	0.86	0.61	0	6
Time for housework	1.30	1.10	0	8	1.29	1.02	0	10	1.29	1.04	0	10
Time for childcare	1.99	3.59	0	24	1.76	3.15	0	24	1.79	3.21	0	24
Time for care for persons in need	0.14	1.14	0	24	0.11	0.89	0	24	0.11	0.93	0	24
Time for education or further training	0.67	1.46	0	10	0.40	1.10	0	15	0.43	1.15	0	15
Time for physical activities	0.64	0.71	0	5	0.63	0.71	0	8	0.63	0.71	0	8
Time for other leisure activities	1.39	1.31	0	11	1.33	1.22	0	17	1.33	1.23	0	17

Source: SOEP Data 2014, own calculations

The descriptive statistics make clear the differences and commonalities among participants of the FEA funded CVET and those of the other segments of CVET. In the comparison, three differences become apparent in regard to share frequency of the employment relation, employment status and firm size.

Clearly fewer participants in the FEA funded CVET than participants of other continuing vocational educational segments have a permanent employment contract (7.8% vs. 83%), and 86% of the participants of FEA funded education and training have no employment contract in contrast to the participants of the other segments (6.8%).

Regarding employment relations, clearly fewer participants in FEA funded CVET in comparison to participants of continuing vocational education not furthered by the FEA (14% vs. 26%) have a regular part-time employment. A greater difference also exists between the reference groups or respectively unemployment (12% vs. 4%).

For firm size, it appears that participants in FEA funded CVET are self-employed without co-workers (28% vs. 1%) or in firms with fewer than 5 employees (23% vs. 3%) with a higher probability (with a greater probability self-employed without coworkers), while the participants of the other segments are active with a higher probability in firms with more than 200 employees (55% vs. 11%).

5. Analysis

The variable to be explained is participation in CVET funded by the FEA. We employ logistic regression, in order to research the dependence of the variable “participation in continuing vocational education and training funded by the FEA” on the named independent variables, that can show a desired measurement level. As well if we proceed theory-led, we employ

exploratory procedures of model formation, because for the socio-demographic variables we have generated no theory-based assumptions. Among other goals, with the chosen procedures we seek to estimate the order of importance for variables, though situation specific (Lewis, 2007). To validate the results in-sample, we apply two following procedures.

Procedure 1: Backward selection/elimination

The explanatory variables are step-by-step backwards contingently introduced into the model. The complete model is to be regarded with all predictor variables and calculated with the coefficient of determination pseudo R^2. Then successively those variables are removed that lead to the least backward decline of the coefficient of determination. The execution terminates when this coefficient is significantly reduced with the removal of a variable.

Procedure 2: Forward selection

The explanatory variables are by blocks and within blocks step-by-step forwards contingently included into the model.

Block 1: *Socio-demographic characteristics*
Block 2: *Psychographic characteristics*
Block 3*: Job-based characteristics*
Block 4: *Firm-based characteristics*

Those variables of a predictor block will be removed that make no significant contribution to the explanation of the respectively to be explained variables (Backward selection/elimination). After entering each block, the coefficient of determination is to be calculated; likewise, this is to be calculated for the final model.

To minimize the impact of the methodology shortcomings, we have reduced the number of predictors to those that are strongly theory-derived and used a proper sample size (Lewis, 2007; Smith, 2018). In the result tables we present the influences of the empirically relevant variables with the effect coefficients and their standard errors. The estimates of the regression coefficients can be evaluated as the global measure for the strength of influence of the independent variables on the probability of occurrence. For better readability, significant values are emphasized in the result tables.

6. Empirical Results

Table 5 shows logistic regression coefficients for the model with all predictors and the backward selection/elimination approach. Since we developed the regression model based on well-founded theoretical considerations, we also chose logistic regression coefficients acquired with the “inclusion” method. The models for all predictors and respectively for the backward selection/elimination approach show very high model accuracy: the pseudo R^2 is 0.64, respectively 0.65. The model explained 64% or respectively 65% of the variation in participating in FEA funded CVET.

Table 5. Determinants of participation in CVET funded by the Federal employment agency: logistic regression coefficients

	Modell with all predictors	Backward selection[1, 2]
Constant	-0.48 (7.00)	-0.87 (0.50)
Age	0.01 (0.00)	Excluded
Gender: Male	0.23 (0.20)	**0.40* (0.18)**
Region: West Germany	-0.22 (0.20)	Excluded
Educational degree. Baseline category: General elementary education		
Middle vocational education	**-0.82** (0.32)**	Excluded
Vocational education and Abitur	**-1.05** (0.41)**	Excluded
Higher vocational education	**-1.29** (0.44)**	Excluded
Higher education	**-0.83* (0.36)**	Excluded
Does not apply	-0.19 (0.49)	Excluded
Satisfaction with health	-0.01 (0.05)	Excluded
Satisfaction with sleep	0.01 (0.04)	Excluded
Satisfaction with work	0.05 (0.04)	Excluded
Satisfaction with housework	0.03 (0.03)	Excluded
Satisfaction with household income	-0.05 (0.05)	Excluded
Satisfaction with personal income	-0.01 (0.05)	Excluded
Satisfaction with dwelling	**-0.12** (0.05)**	**-0.10** (0.04)**
Satisfaction with leisure	0.05 (0.04)	Excluded
Satisfaction with available childcare	0.01 (0.03)	Excluded
Satisfaction with family life	0.02 (0.05)	Excluded
Attitude towards lifelong learning	-0.03 (0.07)	Excluded
Time for job/apprenticeship/second job	0.01 (0.04)	Excluded
Time for errands	0.07 (0.13)	Excluded
Time for housework	-0.10 (0.09)	Excluded
Time for childcare	-0.01 (0.03)	Excluded
Time for care for persons in need	-0.01 (0.08)	Excluded
Time for education or further training	-0.04 (0.05)	Excluded
Time for physical activities	-0.15 (0.11)	Excluded
Time for other leisure activities	0.03 (0.05)	Excluded
Required training for job. Baseline category: No training required		
Introduction to job	0.40 (6.96)	Excluded
On-the-job training	0.60 (6.96)	Excluded
Courses	-0.81 (6.96)	Excluded
Vocational training	-0.17 (6.95)	Excluded
Technical college since 1999	-0.57 (6.95)	Excluded
University since 1999	-0.10 (6.95)	Excluded
Does not apply	0.40 (7.11)	Excluded
Employment relation. Baseline category: Permanent employment contract		
Fixed-term employment contract	**2.14*** (0.27)**	**2.13*** (0.26)**
Does not apply	**4.93*** (0.25)**	**4.76*** (0.24)**
Employment status. Baseline category: Full-time employment		
Regular part-time employment	0.20 (0.29)	0.19 (0.25)

Vocational training	**-1.61** (0.58)**	**-1.19* (0.54)**
Marginal, irregular part-time employment	-0.68 (0.49)	-0.57 (0.41)
Not employed	-1.65 (0.87)	**-1.81** (0.76)**
Industry. Baseline category: Manufacturing		
Construction	-0.50 (0.43)	-0.51 (0.43)
Trade	-0.86 (0.48)	-0.69 (0.47)
Transport	-1.27 (0.67)	-1.06 (0.64)
Bank, Insurance	0.26 (0.51)	0.16 (0.51)
Services	**-1.17*** (0.34)**	**-1.19*** (0.33)**
Other sectors	-0.11 (0.60)	-0.17 (0.59)
Does not apply	-1.30 (1.51)	-0.80 (0.47)
Firm size. Baseline category: Lt 5		
Ge 5 Lt 10	**-0.80* (0.33)**	**-0.76* (0.32)**
Ge 11 Lt 20	**-1.46*** (0.36)**	**-1.43*** (0.35)**
Ge 20 Lt 100	**-2.11*** (0.33)**	**-2.03*** (0.32)**
Ge 100 Lt 200	**-4.00*** (0.68)**	**-3.84*** (0.66)**
Ge 200 Lt 2000	**-2.67*** (0.37)**	**-2.70*** (0.35)**
Ge 2000	**-2.93*** (0.34)**	**-2.97*** (0.33)**
Self-employed without coworkers	**2.26*** (0.62)**	**2.11*** (0.62)**
Does not apply	**-1.64* (0.80)**	**-1.56* (0.78)**
Pseudo R2	***0.65***	***0.64***

Notes: *** p≤0.001, **p≤0.01, *p≤0.05

[1] 0.05 is set as a significance level for exclusion from the model

[2] **Excluded variables** (ascending order of contribution to the full model): Time for care for persons in need, Satisfaction with personal income, Satisfaction with health, Satisfaction with sleep, Time for job/apprenticeship/second job, Satisfaction with available childcare, Attitude towards lifelong learning, Satisfaction with family life, Time for errands, Time for childcare, Time for other leisure activities, Required training for job, Time for education or further training, Region, Time for housework, Satisfaction with housework, Satisfaction with household income, Satisfaction with work, Time for physical activities, Satisfaction with leisure, Age, Educational degree

Source: SOEP Data 2014, own calculations

Model with all predictors. Employees with fixed-term contracts (in comparison to those with permanent ones) and self-employed without co-workers (in comparison to firms with 5 employed persons) are more likely to take part in FEA funded vocational education training. Possessors of middle level vocational education, vocational education and Abitur, higher vocational education and higher education degrees (in comparison to those with general elementary education), persons satisfied with dwelling, employees in vocational training (in comparison to full-time ones), employees in the service sector (in comparison to those in manufacturing) as well as employees of firm sizes for 5 to 10, 11 to 20, 20 to 100, 100 to 200, 200 to 2000 and more than 2000 employed persons (in comparison to firms with up to 5 employed persons) are less likely to take part in FEA funded CVET.

Model backward selection. Male employees (in comparison to female ones), employees with fixed-term contracts (in comparison to those with permanent ones), self-employed without co-workers (in comparison to firms with 5 employed persons) have a higher probability to take part in FEA funded CVET. Persons satisfied with dwelling, employees in vocational training (in comparison to full-time ones), and being unemployed, as well as employees in the service sector (in comparison to those of manufacturing), employees of firm sizes for 5 to 10, 11 to 20, 20 to 100, 100 to 200, 200 to 2000 and more than 2000 employed persons (in comparison to firms with up to 5 employed persons) are less likely to participate in FEA funded CVET.

Compared to the baseline category of permanent employment contract (employment relation), not only membership in the group of employees with a fixed-term contract, but also membership in the group of those who have no contract, proves to be significantly positive, whereby the lack of a contract has a clearly stronger influence on participation. In regard to the reference category "Lt 5" firm size appears to have the strongest positive effect for membership in the group of self-employed without co-workers, while the results obtained for firm size present a concave function: employees of firms with 100 to 200 employees are less likely to take FEA funded CVET than those with fewer or more employees.

Table 6. Determinants of participation in CVET funded by the Federal employment agency: model estimation and ranking predictors (Adequacy)

Single predictor included in the model	Log likelihood	LR Chi^2	Pseudo R^2
Model with all predictors included	*-606.06*	*2155.50****	*0.64*
Employment relation	-825.27	1717.09***	0.51
Firm size	-936.16	1495.31***	0.44
Employment status	-1620.58	126.46***	0.04
Industry	-1653.77	60.08***	0.02
Satisfaction with dwelling	-1681.38	4.87*	0.01
Gender	-1682.06	3.51	0.01

Note: *** p≤0.001, **p≤0.01, *p≤0.05
Source: SOEP Data 2014, own calculations

The characteristics of the employment relation as well as those of firm size contribute according to estimates essentially to the explanation of participation in CVET funded by the FEA. The variables "employment status", "industry", "satisfaction with dwelling" and "gender" show to the contrast a comparatively minor effect.
Table 7 presents respectively the logistic regression coefficients for the forward selection and the bi-directional elimination, the forward selection for variables' block-wise addition and backward elimination for re-estimation within variables' blocks. Pseudo R^2 as a measure of estimate accuracy amounts for forward selection to 0.65. For backward elimination, the model criteria of accuracy show the model criteria of accuracy and –parameter, that are given for each of the three steps, the highest model accuracy for "job-based characteristics" (Pseudo R^2 = 0.57). By keeping a further block of "firm-based characteristics" besides that of "job-based characteristics", the explanation of variance is improved. (Pseudo R^2=0.64) and achieves the highest value for the co-efficient of determination. The variation of participation is to 64% explained by the bi-directional model.

Table 7. Determinants of training initiative by the Federal employment agency: bi-directional elimination of predictors for logistic regression (Coefficients)

	Forward selection: block-wise addition[1]	Backward elimination[2, 3, 4]		
		Step 1: Job-based characteristics	Step 2: Job-based + Firm-based characteristics	Step 3: Job-based + Firm-based + Socio-demographic characteristics
Constant	-1.00 (7.60)	-2.97 (3.28)	**-1.36*** (0.38)**	-0.74 (0.49)
Required training for job. Baseline category: No training required				
Introduction to job	0.52 (7.58)	-0.67 (3.31)		
On-the-job training	0.71 (7.58)	-0.38 (3.31)		

Courses	-0.61 (7.58)	-1.14 (3.30)	Excluded	Excluded
Vocational training	-0.05 (7.58)	-1.12 (3.28)		
Technical college since 1999	-0.44 (7.58)	-2.25 (3.29)		
University since 1999	0.03 (7.58)	-1.46 (3.28)		
Does not apply	0.63 (7.73)	-1.08 (3.30)		
Employment relation. Baseline category: Permanent employment contract				
Fixed-term employment contract	**2.15*** (0.27)**	**1.85*** (0.25)**	**2.17*** (0.26)**	**2.15*** (0.26)**
Does not apply	**4.82*** (0.25)**	**5.94*** (0.21)**	**4.76*** (0.23)**	**4.78*** (0.24)**
Employment status. Baseline category: Full-time employment				
Regular part-time employment	0.19 (0.25)	0.01 (0.21)	-0.01 (0.23)	0.18 (0.25)
Vocational training	**-1.49** (0.57)**	-0.75 (0.51)	**-1.18* (0.54)**	**-1.61** (0.56)**
Marginal, irregular part-time employment	-0.73 (0.43)	-0.19 (0.33)	-0.67 (0.40)	-0.68 (0.41)
Not employed	**-1.81* (0.77)**	**-2.68*** (0.39)**	**-1.97*** (0.74)**	**-1.88* (0.77)**
Industry. Baseline category: Manufacturing				
Construction	-0.47 (0.43)		-0.47 (0.43)	-0.55 (0.42)
Trade	-0.84 (0.47)		-0.75 (0.46)	-0.74 (0.46)
Transport	-1.26 (0.68)		-0.98 (0.63)	-1.14 (0.65)
Bank, Insurance	0.19 (0.51)		0.11 (0.51)	0.17 (0.51)
Services	**-1.17*** (0.34)**		**-1.30*** (0.33)**	**-1.21*** (0.33)**
Other sectors	-0.07 (0.59)		-0.14 (0.59)	-0.10 (0.58)
Does not apply	-1.46 (1.55)		-0.82 (0.48)	-0.88 (0.48)
Firm size. Baseline category: Lt 5				
Ge 5 Lt 10	**-0.80* (0.33)**		**-0.74* (0.32)**	**-0.77* (0.32)**
Ge 11 Lt 20	**-1.45*** (0.36)**		**-1.43*** (0.35)**	**-1.45*** (0.35)**
Ge 20 Lt 100	**-2.09*** (0.32)**		**-1.98*** (0.32)**	**-2.05*** (0.32)**
Ge 100 Lt 200	**-3.99*** (0.68)**		**-3.76*** (0.66)**	**-3.95*** (0.67)**
Ge 200 Lt 2000	**-2.66*** (0.36)**		**-2.65*** (0.35)**	**-2.72*** (0.35)**
Ge 2000	**-2.94*** (0.33)**		**-2.91*** (0.32)**	**-3.02*** (0.32)**
Self-employed without coworkers	**2.20*** (0.61)**		**2.09*** (0.62)**	**2.11*** (0.61)**
Does not apply	**-1.65* (0.78)**		-1.41 (0.76)	**-1.54* (0.78)**
Age	0.01 (0.00)			Excluded
Gender: Male	**0.38* (0.18)**			**0.38* (0.18)**
Region: West Germany	-0.27 (0.19)			Excluded
Educational degree. Baseline category: General elementary education				
Middle vocational education	**-0.84** (0.31)**			**-0.76* (0.30)**
Vocational education and Abitur	**-1.03** (0.40)**			**-0.99* (0.39)**
Higher vocational education	**-1.33** (0.43)**			**-1.29*** (0.42)**
Higher education	**-0.95** (0.34)**			**-0.87** (0.31)**
Does not apply	-0.35 (0.47)			-0.42 (0.47)
Pseudo R2	***0.65***	***0.57***	***0.64***	***0.64***

Notes: *** p≤0.001, **p≤0.01, *p≤0.05

[1] 0.05 is set as a significance level for inclusion into the model

[2] 0.05 is set as a significance level for exclusion from the model

[3] Stepwise addition of blocks is in a descending order of contribution to the full model

[4] Block "Psychographic characteristics" does not match a significance level of 0.05[1] and, therefore, excluded from the model

Source: SOEP Data 2014, own calculations

Model forward selection. Employees with fixed-term contracts (in comparison to those with permanent ones), self-employed persons without co-workers (in comparison to firms with 5 employed persons) and male employees (in comparison to female ones) participate in FEA funded CVET with higher probability.

Holders of middle level vocational education, vocational education and Abitur, higher vocational education and higher education degrees (in comparison to those with general elementary education), employees in vocational training and unemployed persons (in comparison to full-time ones), employees in the service sector (in comparison to those in manufacturing), as well as employees of firm sizes for 5 to 10, 11 to 20, 20 to 100, 100 to 200, 200 to 2000 and more than 2000 employed persons (in comparison to firms with up to 5 employed persons) have a lower probability to take part in FEA funded CVET.

Model bi-directional elimination. Male employees (in comparison to female ones), employees with fixed-term contracts (in comparison to those with permanent ones) self-employed persons without co-workers (in comparison to firms with 5 employed persons) are more likely to take part in this kind of training.

Possessors of middle level vocational education, vocational education and Abitur, higher vocational education and higher education degrees (in comparison to those with general elementary education), employees in vocational training and unemployed persons (in comparison to full-time ones), employees in the service sector (in comparison to those in manufacturing), as well as employees of firm sizes for 5 to 10, 11 to 20, 20 to 100, 100 to 200, 200 to 2000 and more than 2000 employed persons (in comparison to firms with up to 5 employees) are less likely to take part in the FEA funded CVET.

Results for the educational degree show a concave function: Holders of higher vocational education degrees are less likely to participate in FEA funded CVET than those with lower or higher degrees. As in the backward selection model, we also observe the concave function for firm size.

The summary of findings including approaches 1 and 2 is presented in Table 8.

Table 8. Determinants of training initiative by the Federal employment agency: models' summary for approaches 1 and 2

Significant predictors[1]	**All predictors**	**Backward selection**	**Forward selection**	**Bidirectional elimination**
Employment relation. Baseline category: Permanent employment contract				
Fixed-term employment contract	+	+	+	+
Does not apply	+	+	+	+
Firm size				
Ge 5 Lt 10	-	-	-	-
Ge 11 Lt 20	-	-	-	-
Ge 20 Lt 100	-	-	-	-
Ge 100 Lt 200	-	-	-	-
Ge 200 Lt 2000	-	-	-	-
Ge 2000	-	-	-	-
Self-employed without coworkers	+	+	+	+
Does not apply	-	-	-	-
Employment status. Baseline category: Full-time employment				
Vocational training	-	-	-	-
Not employed	0	-	-	-
Educational degree. Baseline category: General elementary education				
Middle vocational education	-	Excluded	-	-
Vocational education and Abitur	-	Excluded	-	-

Higher vocational education	-	Excluded	-	-
Higher education	-	Excluded	-	-
Industry				
Services	-	-	-	-
Satisfaction with dwelling	-	-	Excluded	Excluded
Gender: Male	0	+	+	+
Pseudo R2	***0.65***	***0.64***	***0.65***	***0.64***

Notes: [1] Predictors ranked by the Adequacy method
+ Significant positive impact
- Significant negative impact
0 No significant impact
Source: Tables 5-7 of the paper

Our model shows for all procedures very good model accuracy (Pseudo R^2 for all models is 0.64, or respectively 0.65). The high pseudo R^2 values for the respective models indicate that our model applied very well to the sample data, as it explained nearly 65% of the probability of participating in CVET funded by FEA. Among other reasons, this is caused by the data-driven model construction and is discussed as a common problem of the methodological solution of this kind (Smith, 2018). The assumption of the significance of two central variable groups, job-based und firm-based characteristics for continuing vocational education supported by the FEA could be confirmed. Characteristics of the employment relation and firm size contribute in all models essentially to the explanation of participation. The high pseudo R^2 values show that the effect on participation can be very well explained through model assumptions, because contributions over 40 % are very seldom reached. It will become clear that not only the goodness of fit, but also the signs of the coefficients, with the exception of the variables of educational degrees, male sex, satisfaction with dwelling and the status of being unemployed, agree in all models.

7. Discussion and Conclusions

The objective of the current study was to investigate relationships between socio-demographic, psychographic, job-based and firm-based characteristics and participation in FEA funded CVET. Our results showed that job-based characteristics, followed by firm-based characteristics, exhibit the strongest influence on the outcome. Results indicated that most of our hypotheses are supported by the results of the binary logit estimate, and some of our hypotheses which were not supported lead to surprising results.

For the educational degree, we hypothesized a negative relationship with participation. Results for the educational degree show a concave function with holders of higher vocational education degrees being less probable to participate in FEA funded CVET than those with lower or higher degrees. Future research that needs to address this interesting function can contribute to a differentiation of the human capital theory.

With regard to psychographic characteristics, our hypotheses could not be confirmed, only satisfaction with dwelling was weakly negatively associated in two models with participation. Further research is needed to deepen and elaborate the interactions between further psychographic characteristics and expectancy-value cognitions.

Our results provided support to hypotheses related to employment relation and employment status of job-based characteristics. However, for the required employment training, the hypothesized negative relationship with participation could not be confirmed. This result might be due to our operationalization of required training for employment, as it combines required formal education and on-the-job training.

Regarding firm-based characteristics, the results supported our hypothesis. They showed that the service branch is negatively related to participation in FEA funded CVET, treating manufacturing sector as a reference category. The latter did not exhibit further significant differences in comparison to other sectors.

As predicted, firm size significantly interacts with participation, however, and results present a concave function, with employees of firms with 100 to 200 employees being less likely to take part in FEA funded CVET than those with fewer or more co-employees. Future research is needed to explain the surprising concave function that might elaborate the labor segmentation theory. Being self-employed without co-workers exhibits positive effect on the outcome.

Surprisingly, in three of our models, being unemployed is negatively associated with participation in FEA funded CVET, although a core function of FEA funded CVT is reintegration. Future research is needed to try to replicate this result from a longitudinal perspective and explain the relationship. Alternatively, the research with the help of the governmental statistics, especially those of FEA, could validate the current findings with regard to economic and socio-demographic characteristics.

With our study we could add to the present body of models explaining the segments of CVET a model that explains the variance of FEA funded CVET to a high degree.

8. Limitations

Our study is limited by data restrictions, as the SOEP does not provide detailed information about motivation of participants in survey wave 31. This question deserves an answer, as Tharenou (2001) could show, besides motivation from expectation, motivation to learn directly explains participation in CVET. Further research should investigate other psychographic determinants besides motivation that are relevant in the context of FEA funded CVET, but because of data limitations could not be included in our analysis.

With this study we have illustrated a temporal cross-section that does not allow us to draw conclusions for other years. Future research needs to address these limitations by developing a longitudinal research design. Further data restrictions include the “middle class bias” which is present in the German Socio-Economic Panel. For instance, overrepresentation of people with a higher education degree which has the direct relation to our target variable of continuing vocational education and training participation might affect the results.

Besides, the limitations of the stepwise regression procedures apply here. Our findings are to be interpreted as predominantly explorative and transferred on other samples with major caution. Research with further subsets of variables, especially those of psychographics, as well as cross-validation will contribute to the establishment of the most optimal one.

A further limitation is the theoretical paradigm. We base our study on a model of the acting person who is characterized by rationality. This means that people choose suitable means for their aims. This model of man is not sufficiently complex, if we, for example, consider that with utility aspects of continuing educational expectations are seldom realized (cf. among others, Ebner, & Ehlert, 2018), and psychological research shows that the personality is not characterized only by a planning, analytical system, but also by a system of intuitive behavioral steering, for example. Future research is needed, before the background of an image of man that does justice to the various personality systems, to develop a good explanatory model with a transparent number of explanatory variables.

References

Behringer, F. (1999). Beteiligung an beruflicher Weiterbildung. Humankapitaltheoretische und handlungstheoretische Erklärung und empirische Evidenz. Opladen: Leske + Budrich.

Behringer, F., Kampmann, J., & Käpplinger, B. (2009). Theoretische Erklärungsansätze zur betrieblichen Weiterbildungsbeteiligung. In F. Behringer, B. Käpplinger, & G. Pätzold (Hrsg.), Betriebliche Weiterbildung – der Continuing Vocational Training Survey (CVTS) im Spiegel nationaler und europäischer Perspektiven (S. 35–52). Stuttgart: Franz Steiner.

Bilger, F. & Strauß, A. (2019). Weiterbildungsverhalten in Deutschland 2018. Ergebnisse des Adult Education Survey. – AES Trendbericht (Hg. Bundesministerium für Bildung und Forschung) (S. 4-51). Bielefeld.

Bundesagentur für Arbeit (2014). Fortschrittlich. Zukunftsorientiert. Für Menschen. Geschäftsbericht 2013. Zweiundsechzigster Geschäftsbericht Bundesagentur Für Arbeit, Nürnberg.

Cloutier, J., Renaud, S., & Morin, L. (2008). Predictors of Participation in Voluntary Vocational Training: An Empirical Study among Canadian Female and Male Managers. Les déterminants de la participation à la formation professionnelle volontaire: une étude auprès de cadres féminins et masculins dans les entreprises canadiennes, 63(2), 268-289. doi:10.7202/018576ar

Colemann, J. S. (1994). Foundations of Social Theory. Cambridge, Mass. & London: The Bleknap Press of Harvard University Press.

Doeringer, P.B. & Piore, M. J. (1971). Internal Labor Markets and Manpower Analysis. Lexington (Mass.): Heath Lexington Books.

Düll H, & Bellmann L. (1999). Der unterschiedliche Zugang zur betrieblichen Weiterbildung nach Qualifikation und Berufsstatus. Eine Analyse auf der Basis des IAB-Betriebspanels für West- und Ostdeutschland. MittAB, 32(1), 70–84. http://doku.iab.de/mittab/1999/1999_1_MittA B_Duell Bellmann.pdf

Ebner, C., & Ehlert, M. (2018): Weiterbilden und Weiterkommen? Non-formale berufliche Weiterbildung und Arbeitsmarktmobilität in Deutschland. In: Kölner Zeitschrift für Soziologie und Sozialpsychologie, 70(2), 213–235.

Eisermann, M., Janik F., & Kruppe T. (2014). Weiterbildungsbeteiligung – Ursachen unterschiedlicher Teilnahmequoten in verschiedenen Datenquellen. ZfE, 17(3), 473–495. https ://doi.org/10.1007/s1161 8-014-0561-y

Grund, C. & Martin, J. (2012). Determinants of further training – evidence for Germany. The International Journal of Human Resource Management, 23(17), 3536-3558. doi:10.1080/09585192.2011.654347

Hall, A., & Krekel, E. M. (2008). Berufliche Weiterbildung Erwerbstätiger – zur Erklärungskraft tätigkeitsbezogener Merkmale für das Weiterbildungsverhalten. Report, 31(1), 65–77.

Heckhausen J. & Heckhausen, H. (1989). Motivation und Handeln. Berlin.

Heckhausen, H. & Gollwitzer, P.M. & Weinert, F.E. (1987) (Hrsg.): Jenseits des Rubikon. Berlin, Heidelberg: Springer.

Hubert, T., & Wolf, C. (2007). Determinanten und Einkommenseffekte beruflicher Weiterbildung – Eine Analyse mit Daten des Mikrozensus 1993, 1998 und 2003. Research Notes des Rates für Sozial– und Wirtschaftsdaten (RatSWD) No. 5. RatSWD, Berlin. https ://www.ratsw d.de/downl oad/worki ngpap ers20 07/09_07.pdf

Käpplinger, B. (2016). Theorien und Theoreme der betrieblichen Weiterbildung. In: Tippelt, R. & von Hippel, A. (Eds.), Handbuch Erwachsenenbildung/Weiterbildung, Springer Reference Sozialwissenschaften, DOI 10.1007/978-3-531-20001-9_31-2

Kaufmann, K. & Widany, S. (2013). Berufliche Weiterbildung – Gelegenheits- und Teilnahmestrukturen. Zeitschrift für Erziehungswissenschaft, 16(1), 29–54.

Kuhl, J. (2001). Motivation und Persönlichkeit: Interaktionen psychischer Systeme. München: Hogrefe.

Lewis, M. (2007). Stepwise versus Hierarchical Regression: Pros and Cons. Annual meeting of the Southwest Educational Research Association, San Antonio.

Martin, A.& Behrends, T. (1999): Die empirische Erforschung des Weiterbildungsverhaltens von Unternehmen, Schriften aus dem Institut für Mittelstandsforschung, No. 11, Universität Lüneburg, Institut für Mittelstandsforschung, Lüneburg.

Nienhüser, W. (1996). Die Entwicklung theoretischer Modelle als Beitrag zur Fundierung der Personalwirtschaftslehre. Überlegungen am Beispiel der Erklärung des Zustandekommens von Personalstrategien, pp. 39-88. In: Weber,W. (Ed.). Grundlagen der Personalwirtschaft: Theorien und Konzepte. Wiesbaden: Springer, Gabler Verlag.

Offerhaus, J., Leschke, J., & Schömann, K. (2010). Soziale Ungleichheit im Zugang zu beruflicher Weiterbildung. In R. Becker & W. Lauterbach (Hrsg.), Bildung als Privileg (S. 345–375). Wiesbaden: Springer VS.

Osiander, C. & Dietz, M. 2016. Determinanten der Weiterbildungsbereitschaft: Ergebnisse eines faktoriellen Surveys unter Arbeitslosen [What determines the motivation for further training? Results from a factorial survey among jo_Journal for Labour Market Research, Springer; Institute for Employment Research/ Institut für Arbeitsmarkt- und Berufsforschung (IAB), 49(1), 59-76, July. Handle: RePEc:spr:jlabrs:v:49:y:2016:i:1:d:10.1007_s12651-016-0202-4. doi: 10.1007/s12651-016-0202-4

Renaud, S., Lakhdari, M., & Morin, L. (2004). The Determinants of Participation in Non-Mandatory Training. Los factores determinantes de participación en el entrenamiento no obligatorio, 59(4), 724-743. doi:10.7202/011336ar

Rosenbladt, von, B. (2007). Unterscheidung von beruflicher und allgemeiner Weiterbildung in empirischen Erhebungen zur Weiterbildungsteilnahme. REPORT, (30)4, 1-31.

Sengenberger, W. (1978). Einführung: Die Segmentation des Arbeitsmarkts als politisches und wissenschaftliches Problem, S. 15-42. In: Sengenberger, W. (Hg.). Der gespaltene Arbeitsmarkt. Problem der Arbeitsmarktsegmentation. Frankfurt; New York: Campus Verlag.

Smith, G. (2018). Step away from stepwise. Journal of Big Data, 5(32), 2-12. https://doi.org/10.1186/s40537-018-0143-6

SOEP (2016). Socio-Economic Panel. Data for the year 2014. Version 31.1. SOEP, 2016, doi:10.5684/soep.v31.1

SOEP Group (2016). SOEP 2014 - Documentation of Person-related Status and Generated Variables in $PGEN for SOEP v31.1. SOEP Survey Papers, 307(Series D), Variable Descriptions and Coding. Berlin: DIW Berlin/SOEP.

Tharenou, P. (2001). The Relationship of Training Motivation to Participation in Training and Development. Journal of Occupational and Organizational Psychology, 74, 599-621.

TNS Infratest Sozialforschung (2014). SOEP 2014 – Erhebungsinstrumente 2014 (Welle 31) des Sozio-oekonomischen Panels: Personenfragebogen, Altstichproben. SOEP Survey Papers 235: Series A. Berlin: DIW/SOEP.

Wilkens, I., & Leber, U. (2003). Partizipation an beruflicher Weiterbildung--Empirische Ergebnisse auf Basis des Sozio-Ökonomischen Panels. Mitteilungen aus der Arbeitsmarkt- und Berufsforschung, 36(3), 329-337.

Yendell, A. (2013). Participation in continuing vocational training in Germany between 1989 and 2008. JCE, 133(2), 169–184. https://doi.org/10.3790/schm.133.2.169