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Distinguishing Companies with Different Apprenticeship Training Motivations – Evidence from German Establishment Data

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Abstract

In the theoretical literature on why companies train apprentices three different approaches are usually distinguished: the investment, the substitution and the reputation motive. The aim of our paper is to empirically identify whether a company follows one or the other motive or even more than one training motive. We derive identifying variables from the respective theoretical models and estimate econometric models which help to reliably classify companies with respect to their training motives. The distribution of the companies across the respective motivations we receive is similar to results that can be derived from studies with detailed cost-benefit training information. However, unlike our data set the latter data sets have only a limited set of non-training variables which restricts the possibilities of further analyzing training matters in conjunction with the broader company or industry picture. Using detailed company information we show that the influence of foreign owned firms and work councils on training participation is critical dependent on the training motivation of the companies.

Key Words: Apprentices Training Motives, Investment in Training, Substitution Effects, Foreign Owned Firms, Works Councils

JEL Classification: I21, J24, M53

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I. Introduction

Youth unemployment and in this context particularly a shortage in the supply of apprenticeships or training opportunities young labor market entrants are one of the major concerns for many years now. Usually companies are blamed and the solutions to the problem are seen in all types of policy measures forcing or motivating companies to increase their participation in apprenticeship training or their number of apprentices. However, the reasons for a shortage in training opportunities are threefold and have to be distinguished in order to design effective policy measures. First, the participation of companies in apprenticeship training can vary, i.e. the number of companies offering apprenticeship training at all may change over time. Second, even with a fixed number of companies offering apprenticeships the number of apprentices, i.e. the intensity, per company may vary. Both trends are demand side driven. Thirdly, the number of young people entering the labor market or the share of them looking for an apprenticeship may change, so problems may also be driven by supply side trends[1]. In our paper we focus on demand side issues.

A change in companies' demand for apprentices, participation as well as intensity, can be caused by changes in the production technology (Ryan, 2006) resulting in rising or modified skill requirements. These trends may lead towards a demand for more sophisticated apprenticeships or for more graduates with university education resulting in an absolute or relative reduction of traditional apprenticeships. A change in the demand for apprentices may also be caused by long-term changes in the demand for medium skilled workers, which are typically workers with an apprenticeship degree in the Germanic vocational training tradition (Jacobbinghaus and Zwick, 2002) and by changes in industry and firm size structure (Müller and Schweri, 2006, Neubäumer and Bellmann, 1999). Particularly, a shift to the tertiary sector accompanied by a change in the type of required skills can be expected to have a major impact on the participation of companies training apprentices (Smith and Zwick, 2004).

In our paper we argue that in order to explain the participation and the intensity of apprenticeship training by companies we have to take into account that companies train for different reasons. If companies with different training motives are intermingled empirical results will be distorted as is shown in Zwick (2006) with regard to productivity effects. In the literature three main explanations have been distinguished: training apprentices as an investment, using

[1] A change in the supply side may be caused by different cohort sizes (Müller and Schweri, 2006) or by changing preferences and opportunities o f the youth generation (Ryan, 2006). The latter could be induced by the development of new apprenticeship occupations, the possibility of full-time vocational schools or the change to a B.A./M.A. system in the universities.

apprentices as a substitute for cheap labour[2] and training apprentices to foster labour market reputation. The investment hypothesis is based on the idea that a company trains apprentices to ensure a skilled workforce in the future. The substitution hypothesis assumes that apprentices are only used because they are cheap labor and are able to do the same kinds of jobs as unskilled workers, thus apprentices are only substitutes for unskilled employees. According to the reputation hypothesis, which was for the first time extensively modeled by Sadowski (1980), engaging in apprenticeship training is part of a personnel marketing strategy aiming to gain a better reputation and thus an advantage particularly on a labor market with shortages of skilled employees. In this paper we focus on empirically identifying the investment and the substitution hypothesis because these are the two most acknowledged and widely used theoretical arguments and because of data restrictions[3].

The paper is structured as follows. The second section gives a short literature review, in the third section we derive the identifying variables from the theoretical models and describe the empirical selection process. In Section 4 the structure of firms following different training motives is described. Our results are compared with the distributions that are found in detailed cost-benefit studies by Schweri et al. (2003). We finish with a short summary and conclusions.

II. Literature Review

Whereas the theoretical literature for a long time distinguished between the three hypotheses on why companies train apprentices, empirical evidence on how widespread one or the other motive is used is still sparse. In an early work of Franz and Soskice (1995) assign the crafts sector to the substitution hypothesis and the manufacturing and the service sector to the investment hypothesis. According to their results two third of the companies pursues an investment motive. Neubäumer and Bellmann (1999) argue based on segmentation theory that small companies train for substitution reasons and large firms for investment reasons. They again find a large number of investment motivated firms. Another class of empirical studies are detailed cost-benefit studies for example by Schweri et al. (2003) for Switzerland or Beicht et al. (2004) for Germany. These studies collect a broad range of cost and return variables and are able to generate detailed cost-benefit ratios and thereby identify different types of training strategies. Their results suggest that the majority of firms in Germany pursue a investment

[2] The literature calls mainly the substitution hypothesis the production purpose, but in our view applies the substitution better to the theoretical facts and we can avoid misunderstandings in our further analysis.

[3] Alternative models are for example presented by Neubäumer and Bellmann (1999) arguing with a segmentation hypothesis, by Niederalt (2004) using network externalities or by Backes – Gellner (1995) utilizing an inventory model. However, most of their arguments also partly draw on any of the three hypotheses.

motive. In Switzerland one third of the small companies and one half of the large companies are investment motivated (see also fig. 1). However, they use a very different methodological approach compared to the one used in our paper and they only have a limited number of variables considering structural characteristics of the firms or markets. Based on detailed cost-benefit studies companies are classified according to their net profits or losses during the training period. It is assumed that companies pursuing a substitution strategy must realize profits during the training period whereas companies following a pure investment motive realize their profits only after the training period. In our paper we use the cost-benefit studies of Schweri et al. (2003) as a benchmark to validate our empirical classification of company training motives[4].

Further empirical studies on apprenticeship training with firm data can be divided into three different strands. First, there are a number of studies on determinants and intensity of apprenticeship training which however do not distinguish between different training motives. These studies typically use different waves of the IAB Establishment Panel and have a rich set of company characteristics. Examples are Neubäumer and Bellmann (1999) or Niederalt (2004) and the more sophisticated econometrical investigation of the intensity of apprenticeship training by Beckmann (2002). The main findings of these studies are that the probability of participation in apprenticeship training increases with company size, but the intensity decreases. Since the results are quite stable across these different studies we will use the same set of covariates. A related study for Austria is done by Stöger and Winter-Ebmer (2002) and for Switzerland by Müller and Schweri (2006). The latter study use administrative company data and merge supply side factors to the company data. They find that not only company size and industry structure matter for the probability and intensity of apprenticeship training but also the size of the 16 year age cohort and differences in maturity rates across regions explain variations in the probability of apprenticeship training over time (1985-2001) and across Swiss regions. Furthermore, Wolter and Mühlemann (2006) show that regional variations in company training decisions vary with regional variation in full time schooling, number of firms and number of youth.

The second kind of studies focuses on either one of the above mentioned training motives in order to explain differences in apprenticeship training. Harhoff and Kane (1997) using the Mannheim Innovation Panel and show that higher mobility costs and lower labor turnover result in fewer apprentices in cities than in urban fringes and rural regions. They interpret

[4] Although the literature review concentrates on studies analyzing apprenticeship training in German speaking countries, conclusions remain unchanged if studies from other European countries would be listed. For a summary of results for many European countries see for example Ryan (1998).

their result as evidence for the reputation hypothesis. Schwerdt and Fougere (2003) study substitution motivation by estimating productivity functions using the 1993 cross section of the linked Employer Employee data from Germany and only find a positive effect of apprenticeship training on a company's value added in medium size firms in Germany. To our best knowledge, there is no study of substitution effects between apprentices and other employee groups in German speaking countries. With a Norwegian linked employer-employee data set Askilden and Øivind (2005) found that apprentices are substitutes to unskilled workers but complements to skilled workers. A new study by Zwick (2006) estimates the effect of the number of apprentices on company profit using the German linked employer employee dataset from 1997 – 2003. He finds no significant effect after controlling for endogeneity and heterogeneity. He concludes that the investment and productivity effects obviously outweigh each other, resulting in an insignificant effect on average.

The third kind of studies focuses on comparative advantages as the main reason for training apprentices. Schweri et al. (2003) show for Switzerland that in most occupations companies are not faced with net costs but with net gains from training apprentices. Only in very few specialized occupations companies are faced with net costs in Switzerland. With the same dataset Mühlemann et al. (2005) estimate a structural model for the number of apprentices in participating companies using a count data model with a selection equation. Interestingly, they find that fix costs do affect the participation decision, i.e. the probability of engaging in apprenticeship training but do not affect the intensity, i.e. the number of apprentices trained by a company. In contrast, a recent cost study of Beicht et al. (2004) for Germany found net gains from apprenticeship training in only 6% of the companies. The major difference between Switzerland and Germany is that there are no occupations with average net gains in Germany. However, the two studies do not use exactly the same cost measurements. Another important aspect of apprenticeship training is the retention rate, due to necessity of recouping net training costs by net returns in later periods. Euwals and Winkelmann (2004) calculate retention rates for Germany and find a retention rate of 70% immediately after graduation and of 33% five years later. Wolter at al. (2006) find a retention rate of only 36% after graduation for Switzerland.

Last but not least, there are two empirical studies based not on company data but on individual data which distinguish between different training motives. Euwals und Winkelmann (2004) use the German Employment Sample 1975 – 1995 to study the first labor market position of apprenticeship graduates. They exploit the fact, that duration of apprenticeships differs and assume high quality apprenticeships to consists of more than three years of training

(which they consider to be equal to investment reasons) and medium and low quality apprenticeships to consist of two years of training (considered to be equal to substitution reasons). High quality apprentices stay longer in their first job and receive higher wages. With a similar idea Büchel and Neubäumer (2001) study post training employment status with the BIBB/IAB Qualification and Career Survey 1991/1992. They find that some industries (e.g. financial services) have systematically higher retention rates and duration of retention and argue that companies in these industries mainly train for investment reasons, whereas in other industries with lower retention rates (e.g. construction) the substitution motive seems to dominate. Taken together there is first empirical evidence that companies engage in apprenticeship training for different reasons. However, differing motives have never been studied based on company data which is what we do in our paper.

III Modeling the Selection Process

The goal of our study is to distinguish between different training motives of companies and to find out what characterizes and separates companies with different motives. We start with a brief summary of the theoretical models that explain why a company would follow one or the other motive in order to be able to derive identification variables in a consistent manner in the second step.

Regarding the investment hypothesis Acemoglu and Pischke (1998, 1999a,b) present one of the most elaborate and credited models. According to their model companies invest in apprenticeship training because it is more profitable to work with skilled workers who have been trained by the company than to work with unskilled workers. One of the main assumption of the model is a compressed wage structure[5]. If the wage function is less steep and more convex than the according production function the respective companies have an incentive to train[6]. The compressed wage structure is caused by imperfect labor markets, like asymmetric information, search costs, labor market institutions (unions, minimum wages), complementary skills or efficiency wages. With respect to apprenticeship training it is followed that apprenticeship training is profitable for firms if a compressed wage structure makes it profitable to

[5] See Bassanini and Brunello (2003) or Freeman and Schettkat (2001) for a discussion of the consequences of a compressed wage structure.

[6] The company train, if the gain from the training is higher than the net costs, but we concentrate in our analyses on the influence of the training incentive.

produce with a high share of skilled workers. Thus, labor markets have to be sufficiently imperfect[7] and a satisfactory number of apprenticeship graduates have to stay within the firm.[8]
The substitution motive was introduced by Lindley (1975) who argued that companies employ apprentices instead of unskilled workers because of their lower unit labor costs. They called it the production motive. In our analysis we prefer to call it the substitution motive because by doing so it more clearly expresses how these companies training decisions have to be treated analytically: they substitute unskilled workers by apprentices due to more favorable wage costs. The relation between the demand for apprentices and the demand for unskilled workers can be modeled by a simple microeconomic model with two substitutable input factors. What matters for the substitution effect are relative wages only. Training outputs, in the sense of increased skills, are a byproduct only, and they are not decisive in these company's decisions to employ apprentices.

According to the theoretical models presented above we have to derive identification variables in this second step. In order to do so we look for empirical implications derived from the above mentioned alternative theoretical models which allow to discriminate one motive from the other, i.e. we have to identify empirical patterns only occurring for example if the investment but not the substitution hypothesis is accurate and vice versa. We apply our idea to the IAB Establishment Panel, waves 2001 – 2003, to identify the training motives of companies (see Kölling, (2000) for a data description).
To identify companies following the investment hypotheses we follow Acemoglu and Pischke (1999a) who argue that an important training incentive is the reduction of search costs. According to Acemoglu and Pischke (1999a) we assume also that company specific search costs are determined by recruitment costs and by introductory training or learning by doing costs. These costs increase if the number of qualified workers on the external labour market decreases because matches will on average be worse with a smaller number of job applicants. If we further assume that the workers are sufficiently immobile within their home region and that qualifications are most useful within the same industry the monopsony power of a company is a good proxy for its search costs[9]. We define the monopsony power of a company as the ratio of the number of skilled workers in the company to the number of skilled workers in

[7] See Harhoff and Kane (1997) for a discussion of imperfection of the German apprenticessip market, Euwals and Winkelmann (2004) calculate a retention rate of 70% directly after the graduation and Freeman and Schettkat (2001) discussed the profitability of employing skill workers in Germany in comparison to the US.
[8] For an overview of the large number of further studies analyzing companies' decisions to invest in general training see Leuven (2005) for an overview.
[9] See also Stevens (19994).

the region in the same industry. We use both the occupational and the regional labor market demarcation in order to get a more precise indicator for the monopsony power of a company. For example in a region with only two companies of the same size in the same industry, the monopsony power of these companies is one half each. They certainly have a stronger incentive to train apprentices to ensure a skilled workforce than a similar company in a region with 20 firms of the same size in the same industry, which would have a monopsony power of only one twentieth according to our indicator. Thus we assume that the monopsony power positively affects apprenticeship training via the investment motive. However, monopsony power does not affect substitution decisions.

A second aspect that we use to be more precise in the identification of companies following an investment motive is that investment decisions are long-term decisions. They only pay off, if apprentices stay in their company after graduation. Therefore, we assume that in companies following an investment strategy, apprentices are more likely to stay after graduation than in companies pursuing a substitution strategy. Therefore, to identify the investment argument we estimate the probability to stay (STAY) in the same company after graduation with our identifier monopsony power (MONPOWER) conditioned on companies having at least one apprenticeship graduate (GRAD). We expect a positive effect of the monopsony power on the probability to stay.

$$(1) \qquad \Pr(stay = 1) = \Phi(x'\beta + \lambda monpower + u_I > 0 \mid grad = 1)$$

According to the substitution hypothesis companies employ apprentices only in the production process. For very small firms, like for example a hair dresser, who employs one apprentice as a pure substitute for a regular worker substitution means that they will firstly not retain their apprentice after graduation because as a skilled employee they are too expensive, and they will secondly always hire a new apprentice after the first one finishes because they immediately need the new apprentice as a worker for production purposes. Therefore we estimate the probability to hire a new apprentice in t+1 (NEW) under the condition that an apprentice graduated in this firm in t The identifier is whether the apprentice stays within the firm or not after graduation (STAY). We identify companies as pure substitution oriented, if the probability to hire a new apprentice in t+1 is lower when graduate from period t stays within in the firm. i.e.:

$$(2) \qquad \Pr(new = 1) = \Phi(x'\beta + \gamma stay + u_{PK} > 0 \mid grad = 1 \wedge size \leq 30)$$

However, this effect is only unambiguous in small companies since with an increasing firm size companies are likely to train more than one apprentice which may be substituted against each other so that for example in companies with 100 employees and 10 graduates it is not as obvious that each graduate has to be replaced by a new apprentice any time. For larger companies we therefore use another identification strategy. Since apprentices are used as a substitute for unskilled workers the number of apprentices should strictly depend on output level and variations therein (given a fixed production function). Thus, if over time we observe an increase in output levels (measured by product demand) we expect companies to expand the number of apprentices. Accordingly, as an identifier for the substitution hypothesis we use short term product demand increases (DEMAND) on which we regress the probability to employ more apprentices in t+1 than in t (MORE), conditioned on companies engaging in apprenticeship training (APP):

$$(3) \qquad \Pr(more = 1) = \Phi(x'\beta + \delta demand + u_{PG} > 0 \mid app = 1 \wedge size > 30)$$

We expect a positive relationship between an increase in product demand in period t and an increase in the number of apprentices in period t+1, the earliest period in which more apprentices can be employed because apprenticeships only start once a year due to regulations.
Thus, we have two different identification strategies for small vs. large companies. For companies with 30 or less employees we use the first identification strategy since on average the ratio of apprentices to employees is 10% in this firm size, meaning that a company of 30 has approximately 3 apprentices so that every year on average one apprentice finishes and has to be replaced by a new one. For companies with more than 30 employees we use the second identification strategy. Since this cut off size is subject to discussion we did robustness checks and varied our cut off sizes between 20 and 40 employees. The results did not change significantly; therefore we decide to use the number 30 for the above mentioned reasons. For the three selection equations, we get the following regression results which are all as expected:

Table 1: Probit Estimations of Selection Equations (1) – (3)

	Investment Motive		**Substitution Motive**			
Dependent Variable	Stay in the Firm		Hire New Apprentices		Hire More Apprentices	
			Less than 30 Workers		More than30 Workers	
	Coef.	z-Value	Coef.	z-Value	Coef.	z-Value
Relative Monopsony Power	0.1492	2.79				
Demand Change (t-1) to t			1.03E-06	2.81	8.18E-09	2.28
Apprentice Staying Within the Firm (Dummy)			-0.1423	2.08		
Number of Obs.	7.693		912		4.838	
Pseudo R^2	0.21		0.08		0.02	

Covariate: fraction of skilled and temporary worker, firm size (linear, quadratic, cubic), log(replacement invests), development of the workforce (t-1) to t, 15 industry and two year Dummies. Source: IAB Establishment Panel, waves 2001 – 2003, West Germany, own calculation. The whole regression results are in the appendix.

In the next step we use the estimation coefficients of the three regressions to estimate the probability of a potential training company. By doing so we get a distribution of the predicted probabilities (see figure A1 in the appendix). We can use these estimated results to assign a (latent) training motive to each company in the sample. A company is assigned to the respective training motives if the predicted probability is greater than 0.5[10]. As a result we get a 2x2-matrix of training motives as shown in Table 2:

Table 2: Matrix of Training Motives

		Substitution Motive		
		0	1	Total
Investment Motive	0	3.192	4.586	7.778
	1	4.864	221	5.085
	Total	8.056	4.807	12.863

[10] To minimize the estimation error due to a random attendance in one year in the survey we only calculate the mean probability to train for either reason, if a company is at least two times in the panel.

According to our identification strategy there are about 4.600 companies following a pure substitution strategy and about 4.900 companies following a pure investment strategy. Additionally, 221 companies follow a two-track strategy. We assume that these companies for example train one part of their apprentices in high skilled apprenticeship programmes of 3.5 years duration and at the same time "train" or rather employ another part of their apprentices in lower skilled apprenticeship programmes of 2 years duration. Given our identification strategy 3.200 companies cannot clearly be assigned, neither to the substitution nor to the investment motive. These companies may pursue a reputation or other strategy.

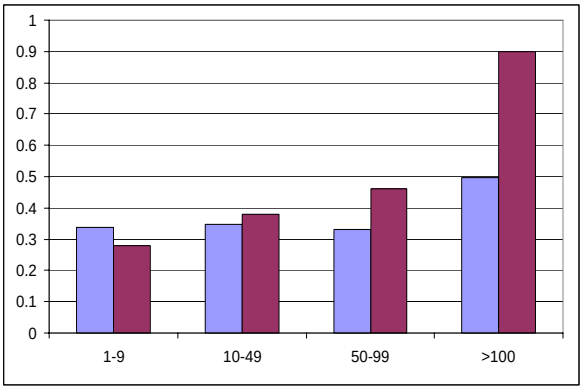
To find out whether our distribution of training motives across companies is vulnerable to the cut off points (0.50) we did robustness checks and varied the probability level a company needs to have to become assigned to a particular motive. We varied the indicator function between 0.4 and 0.6 and used both a more parsimonious and a more extensive set of covariates. Since the means over the respective motives do not substantially change we decide to keep the cut off point at 0.5, which seems the most natural number to cut off.

IV The Structure of Firms

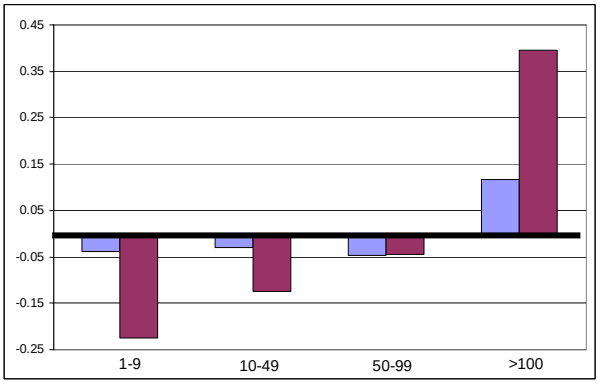
After we have identified the training motives of the companies in the sample we are in the next step interested in whether our identification strategy leads to similar results compared to what is found based on detailed cost-benefit data for Switzerland (Schweri et al. 2003). By comparing the structural characteristics of companies with different training motives we get an impression on how reliable our identification strategy is. However, the empirical results cannot directly be compared because in the cost-benefits studies the single apprentice is the unit of observation, whereas in our analysis the company is the unit of observation. We make the results comparable by weighting a company with the number of its apprentices in order to find out how many apprenticeships are offered by investment oriented companies as opposed to substitution oriented companies. Furthermore we assume that in the cost benefit studies companies pursue an investment motive if their training ends with net costs, i.e. the returns of the apprentice's work for the whole training period are not sufficient to cover the costs of the apprenticeship. These net costs have to be covered by net returns in later periods, which make it by nature an investment project. On the other hand we assume that the companies follow a substitution strategy if their training results in net gains during the training period, i.e. the returns of the apprentice's productivity exceed the costs of his training and it pays for the company to employ an apprentice to do the job. The respective shares of companies following an investment vs. a substitution strategy are given in figure 1.

Figure 1: Investment vs. Substitution Strategy by Firm Size and Data Set

Share of Investment Motivated Apprenticeships by Firm Size



Difference from the Mean in the Share of Investment Motivated Apprenticeships by Firm Size



Blue: Swiss Cost Benefit Data from cross section 2001 (Schweri et al. 2003)

Red: IAB Establishment Panel 2001 – 2003, based on the our Calculation

According to the Swiss cost-benefit study approximately one third of all apprenticeships in small firms with fewer than 100 employees are offered for investment reasons because they result in net costs during the training period. In contrast, in larger firms one half of all apprenticeships are offered for investment reasons. The share of investment motivated apprenticeships increases with firm size with a remarkable increase from companies with less than to companies with more than 100 employees. Given what we know from previous studies for Germany we expected higher shares of investment oriented companies and we indeed estimated a higher share of apprentices in companies with an investment motive. However, despite the differences in level, we find strong structural similarities. Like in the Swiss study the investment motive increases with firm size in Germany. We also find that in companies with more than 100 employees significantly more apprentices are trained as an investment. The higher share of investments in Germany can be explained with a more restricted labour market in Germany and a substantially higher retention rate. Schweri et al. (2003) explain these Swiss-German differences by a more cost efficient institutional setting for apprenticeship training in Switzerland which keep costs comparatively lower in Switzerland. The share of apprenticeships in substitution oriented companies is just the opposite. Overall we conclude that our estimated results for the distribution of the substitution and investment motive is in the line with other studies.

In a second step we can now use the advantage of our data set which covers a large number of non-training related variables to study the differences between companies pursuing an investment and/or a substitution strategy. The results are presented in table 3.

Table 3: Characteristics of Companies Pursuing an Investment and/or a Substitution Strategy

	All Firms	*Investment Motive*	*Substitution Motive*	*Two Track*	*Other*
Share of Apprentices - Intensity	0.0546	0.0454	0.0581	0.0309	0.0460
Share of Companies with Apprenticeships	0.3270	0.7919	0.2955	0.2940	0.3284
Firm Size	20.69	198.95	8.31	51.39	19.31
Investment per Employee in 1'000 €	8.38	13.11	6.47	60.79	10.44
Sales per Employee in 1'000 €	138.85	233.31	123.33	672.23	132.34
Share of Skilled Workers	0.7315	0.7263	0.7091	0.8990	0.8026
Share of Temporary Workers	0.0207	0.0358	0.0209	0.0103	0.0172
Dummy: Foreign Owned Firms[11]	0.0224	0.1041	0.0121	0.0413	0.0383
Export Share	0.0373	0.1601	0.0282	0.0874	0.0366

About 80 percent of all companies which are identified as investment or potentially investment orientated do indeed train apprentices, whereas only 30 percent of the (potentially) substitution orientated companies do indeed train. As seen above, investment orientated firms tend to be larger. They are also characterized by a higher than average share of foreign owned firms and by higher export shares. So international competition does not seem to weed out apprenticeship training but rather underline the qualities and the international competitiveness resulting from a high quality apprenticeship training system. The pressure resulting from high export shares and international competition obviously make apprenticeship training a profitable investment given the quality requirements and flexibility needs in the international market niche for German firms. Furthermore investment oriented firms are characterized by higher investments per employee. So obviously companies with a higher capital intensity use apprenticeship training to build up a sufficiently skilled workforce to handle their expensive machineries. At the same time the most capital intensive companies are found to follow a two-track training strategy, i.e. they pursue a substitution and an investment motive simultaneously. We suppose that in such highly capital intensive companies' one part of the workforce has to be trained for very demanding jobs like maintenance and servicing, meaning that training costs are high but returns to training are also high in the long run. In another part of the workforce apprentices are employed for substitution reasons, i.e. apprentices are as productive as unskilled workers (most likely in less demanding jobs) and at the same time they

[11] A firm is defined as a foreign owned firm if the majority of the shares is held by foreign firms.

are as cheap as or even cheaper than unskilled workers. Firms with the two-track training strategy are also characterized by a higher than average share of skilled workers. So obviously the two-track training strategy originates in a segmentation of the workforce into two separate segments, one large segment with high skill requirements where the investment motive dominates and one segment with low skill requirements where the substitution motive dominates.

Foreign owned firms are more often assigned to the investment motive and 82 percent of these firms do indeed train apprentices. However after controlling for different firm characteristics, as can be seen in table 4, foreign owned firms are on average still less likely to participate in apprenticeship training (-12%). Due to a lack of information or experience they could have higher set up costs and/or mental reservations leading to a lower than average participation in apprenticeship training. But among the companies pursuing an investment strategy the negative effect of foreign ownership is far less pronounced than on average (7% vs. 12%), i.e. these companies obviously learn to handle the apprenticeship system, and/or competitive pressures force them to find ways and means to overcome their information problems and mental reservations. On the other hand, among the companies pursuing a substitution strategy the negative effect of foreign ownership is far more pronounced than on average (25% vs. 12%). Thus, having no experience or not knowing the apprenticeship system obviously strongly discourages the use of apprenticeship training for short term cost cutting. Both effects of foreign firms are essentially good news for the apprenticeship system as it is: foreign firms heavily use apprenticeships for investment reasons, which is good news, but they are reluctant to use apprentices as pure substitutes, which is good news as well.

Table 4: Marginal Effects of the Probit Regression of Apprenticeship Participation.

	All Companies		*Investment Motive*		*Substitution Motive*	
	Coef.	Z	Coef.	Z	Coef.	Z
Foreign Owned Firms*	**-0.1240**	**6.01**	**-0.0716**	**4.77**	**-0.2539**	**4.82**
Export Share	**0.0023**	**0.08**	**-0.0151**	**0.73**	**-0.1007**	**1.44**
Share of Skilled Workers	-0.1125	6.01	-0.4410	2.28	-0.1261	3.71
Share of Temporary Workers	-0.2071	4.21	-0.1783	2.92	-0.4260	4.78
log(Replacement Investments)	0.5278	17.71	0.0156	5.17	-0.1601	2.62
Number of Employees	0.0044	13.38	0.0001	6.96	0.0017	15.14
Squared Number of Employees	-8.66E-09	11.08	-2.16E-09	4.54	-5.67E-05	10.42
Develop of Employment (t-1) to t	0.4524	2.41	0.0085	0.40	0.002	0.06
Collective Bargain Regime*	0.0650	4.55	0.0286	1.40	0.087	3.86
Above the General Pay Scale*	0.0507	4.65	0.0217	1.97	0.0247	1.30
Works Council*	**0.1127**	**9.19**	**0.0144**	**1.18**	**-0.0929**	**-2.92**
Number of Observations	12604		4413		4009	
Log Likelihood	-6927.864		-1565.642		-2423.511	
Pseudo R^2	0.19		0.1029		0.0952	

* Dummy variables; including 15 sector and 2 year dummies.

Another interesting finding is the role of the work councils. They have a positive effect on the participation across all companies, but underlying are two separate effects. In companies pursuing an investment motive works councils have a positive effect whereas they have a negative effect in companies following a substitution strategy.

V Conclusion

Companies may train apprentices for various reasons as has been shown by a number of well-known theoretical papers. However, there is hardly any empirical evidence on the relative importance of different training motives and on the characteristics of the respective companies. In our paper we derive variables which should help to identify companies following either an investment and/or a substitution strategy. Based on the IAB Establishment Panel we estimate econometric models to assign the companies to one out of four training motives: investment, substitution, two-track and other training motives. Our distribution of training motives across companies is similar to what has been found by studies based on detailed cost-benefit training information. However, since the latter studies have only a limited set of non-training variables, we go further in this regard and study the economic and technical background of the respective companies more in-depth.

We find the investment motive more often in companies with a higher than average capital intensity. They obviously use apprenticeship training to build up a sufficiently skilled workforce to handle their expensive machineries. However, the effect of capital intensity does not seem to be linear because among the companies with a two-track training strategy capital intensity is even higher than among companies pursuing a pure investment strategy. We conclude that in highly capital intensive companies, one part of the apprentices seems to be trained for very demanding jobs where short term training costs are high but long term returns to training are even higher. At the same time another part of the apprentices is employed in a variety of less demanding jobs and used as substitutes for unskilled workers. So two-track training strategies seem to originate in separate job or worker segments. Investment oriented firms are also characterized by a higher than average share of foreign owned firms and by higher export shares. So given the quality requirements and the flexibility needs of German based but worldwide competing companies, apprenticeship training seems to be a profitable investment for them. This indicates that even under increased international competition apprenticeship training can remain a competitive advantage. However, since foreign owned firms are on average still less likely to participate in apprenticeship training, political measures to reduce information problems and set up costs including mental reservations would

help to stabilize apprenticeship training in a transition period of strongly increasing internationalization. This would particularly help to increase the number of investment oriented apprenticeships because according to our empirical results the investment motive is by far the dominant motive of foreign owned firms. On the other hand, for companies (foreign or national) following a pure substitution strategy, only relative wages and the option to flexibly dismiss graduates after finishing their apprenticeship matter. A relative increase in apprenticeship wages would directly decrease the number of apprenticeships offered by substitution oriented firms. Compulsory legal or collective rules forcing companies to keep apprentices for a substantial time after graduation would also reduce the number of apprenticeships in substitution oriented companies. However, investment oriented companies would not mind such retention rules because they are interested in a long term employment of their graduates anyway. Thus, their training decisions would not be changed. Depending on what the merits of apprenticeships are considered to be, the evaluation of such changes in apprenticeship numbers would differ substantially. As suggested by Ryan (1998) apprenticeships can either be evaluated as an instrument to avoid youth unemployment or to increase vocational knowledge. With the latter perspective a shrinking number of apprenticeships in substitution oriented firms may be seen as a blessing. However, with the first perspective it would have to be seen as a disaster rather than a blessing.

Appendix:

Table A1: Description of the Data

relative monopsony power (MONPOWER)	All qualified workers in a company divided by all qualified workers in a region in an industry
Demand, change from period (t-1) to t (DEMAND)	Short term demand change between (t-1) to t, measured in turnover
apprentices stay within the firm* (STAY)	Dummy; a own graduate apprentice get a work contract
graduate apprentices* (GRAD)	Dummy; a apprentice graduate within the last month
more apprentices* (MORE)	Dummy; the firm hire in (t+1) more apprentices as in t
new apprentice* (NEW)	Dummy; the firm hire a new apprentice in (t+1)

Table A2: Probit Model of the Investment Selection Conditioned on Graduate Apprentices; dependent variable: 1 = staying within the firm.

	Coefficient	z-value
relative monopsony power	0.1492	2.79
share of skilled worker	0.3426	3.17
share of temporary worker	0.0125	0.04
log(replacement investments)	0.0743	5.18
number of employees	0.0036	7.48
squared number of employees	-2.11*E-6	-6.11
cubic number of employees	3.29*E-10	4.73
develop of the employees /t-1) to t	-0.1857	-1.76
Mining and energy*	-0.0632	-1.17
food and textile*	0.2940	8.62
wood*	0.2295	8.88
chemical*	0.1315	2.14
metal*	0.4443	12.34
vehicle construction*	0.5247	14.29
electronic*	0.2750	7.93
construction*	0.1419	5.38
commerce*	0.3809	16.27
logistics and communication*	0.1751	5.29
consulting and leasing*	-0.0361	-1.59
research and IT*	-0.0735	-2.94
social and health service*	0.0910	3.25
restaurants*	-0.2297	-6.26
year 2002*	-0.0589	-1.96
year 2003*	-0.0728	-2.34
constant	-1.6596	-10.09
Log pseudolikelihood	-4136.459	
number of observations	7693	
Pseudo R^2	0.2067	

* dummy variable; reference category: agriculture in 2001

Table A3: Probit Model of the Substitution Selection

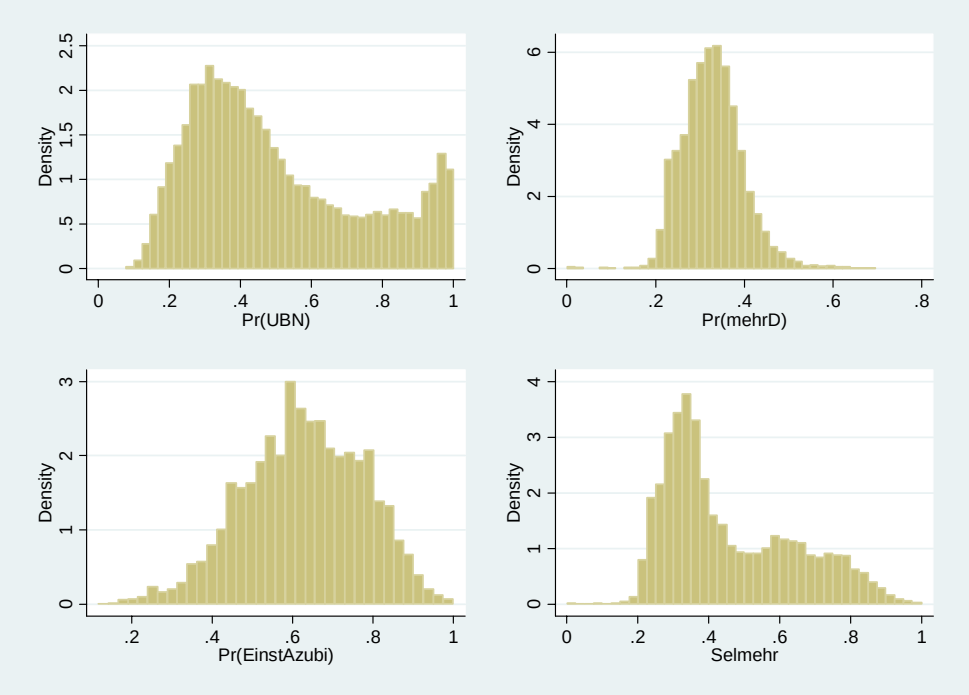
(1) Conditioned on Training Companies, dependent variable: 1 = more apprentices as in the last year.

(2) Conditioned on Graduate Apprentices, dependent variable: 1 = .new apprentice hire.

	Koeffizient	t-Wert	Koeffizient	t-Wert
demand change (t-1) to t	8.18E-09	2.28	1.03E-06	2.81
apprentices stay within the firm*			-0.1423	-2.08
share of skilled worker	0.0369	0.50	-0.8079	-3.93
share of temporary worker	0.6376	1.53	1.1774	1.78
log(replacement investments)	0.0109	0.82	-0.0010	-0.03
number of employees	0.0001	3.77	-0.1279	-1.89
squared number of employees	-9.72E-09	-2.60	0.0116	2.56
cubic number of employees	1.31E-13	1.92	-0.0002	-2.59
develop of the employees /t-1) to t	0.4254	1.62	-0.0665	-0.33
Mining and energy*	-0.1656	-4.22	-0.7719	-9.31
food and textile*	0.0580	2.29	-0.2959	-8.45
wood*	-0.1311	-3.87	-0.3394	-8.89
chemical*	-0.1322	-4.33	-0.4949	-8.13
metal*	-0.0893	-3.35	0.4132	7.46
vehicle construction*	-0.0338	-1.44	0.0621	0.85
electronic*	-0.2894	-9.71	0.1461	2.21
construction*	-0.0118	-0.35	0.1316	2.66
commerce*	-0.2929	-11.14	0.0656	1.32
logistics and communication*	-0.1037	-3.99	0.0287	0.59
consulting and leasing*	-0.2636	-12.96	-0.0482	-1.03
research and IT*	-0.1692	-11.32	-0.3962	-7.98
social and health service*	0.1495	8.10	0.0646	2.28
Log pseudolikelihood	-3898.8096		-1070.8	
Anzahl Beobachtungen	6232		1690	
Pseudo R2	0.0102		0.0428	

* dummy variable; reference category: agriculture in 2001

Figure A1 Distribution on the Predicted Probabilities.



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