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# Mitteilungen aus der Arbeitsmarkt- und Berufsforschung

Christian Dustmann, Rob Euwals, Arthur van Soest

Wages in the first job after apprenticeship:  
movers versus stayers

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# Wages in the First Job after Apprenticeship: Movers versus Stayers

Christian Dustmann, Rob Euwals and Arthur van Soest\*

In this article the wage effects of occupational mobility in those who have completed a course of vocational training at a company are studied on the basis of the IAB employment sample. About 70% of this group remains in the company where they did their training, 30% move to another company. There is hardly any difference in the average wages of those who remain in the company which trained them and of the changers, although the wages of the latter group are considerably more widely distributed. The results of the analyses show that the wage effect of a change varies between the different branches of industry. It is not possible to derive clear statements from the empirical findings as to whether changing company after completion of training is linked with a positive or negative wage effect.

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## 1 Introduction

In recent years the German Apprenticeship System (GAS) has attracted some considerable interest, especially in the UK and in the US. A number of papers have appeared which describe the system and highlight its advantages.<sup>1</sup> The most notable feature of the GAS is that it combines on the job training in private firms with formal, state provided education, thus introducing young labour market participants to various practical aspects of their chosen occupation and, at the same time, providing theoretical knowledge in a number of related subjects. More than 60 percent of a cohort go through this system, which seems largely to account for the high skill standard and productivity of the German labour force.

A most important question is why the GAS is sustainable, supported by firms as well as workers. The general view is that particularly in large firms, apprenticeship training provides general skills rather than firm specific skills. This explains why young people are willing to accept wages during their training period which are lower than those they could obtain as unskilled workers. On the other hand, it has been argued that, for large firms at least, the costs of the training programme exceed the gains. Thus the question is why employers are willing to bear the net costs.

Several recent studies have addressed these issues. Soskice (1994) argues that the costs for training apprentices are most relevant in large firms, which require specific settings for training purposes. However, he concludes that for large firms the long run benefits of training workers overcompensate the costs also.

Harhoff and Kane (1996) hypothesise that young workers are heterogeneous in either tastes or mobility costs. If some workers have a strong distaste for moving away from the training firm, these workers are willing to accept wages after the training period which are lower than those they could receive in other firms. Firms are willing to train, as long as overall costs incurred during the training period are lower than the rent they can extract by underpaying workers with a distaste for moving after training. An immediate implication of this explanation is that movers receive higher wages than stayers.

Acemoglu and Pischke (1996) use an asymmetric information framework to explain why firms train workers, and pay them during the training period. Their model extends the asymmetric information model of Gibbons and Katz (1991). Under the assumption that ability and training are complementary, employers train workers to increase the gain from their informational advantage about workers' abilities (monopsony rent). After the training period, the firm dismisses all workers below a certain ability level (which is endogenously determined), and pays the same wages to the remaining workers (which are below their marginal product, but still higher than wages in the outside market). Without voluntary quits, all movers are of lower quality; with quits, there may be high quality workers among the movers. The outside market pays wages which equal the expected marginal product of workers. The model creates positive wages for people in training (in contrast to the human capital model), because it allows firms to extract rents afterwards, and predicts that stayers should receive higher wages than movers.

The different theoretical explanations provided in the literature as to why firms train workers have different empirical implications. A crucial element is the wage differential between movers and stayers in the period after graduation. The evidence provided so far seems to be contradictory.

Harhoff and Kane (1996) find that individuals who leave their training firm within one year after finishing training receive 11 percent higher wages than those who stay. Similar evidence for an earnings advantage of movers is provided by Werwatz (1996). Winkelmann (1994) also finds a wage advantage of movers. Acemoglu and Pischke (1996), using the same data as Harhoff and Kane, come to opposite results. They find that stayers have *higher* wages than movers. The explanation may be that the specifications they estimate are different from those of the other authors.

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<sup>1</sup> For a detailed description of the GAS, see Soskice (1994).

The few empirical studies are all based on two data sets: the German *Qualification and Career Survey*, conducted in 1979 and 1985/86, and the *German Socio-Economic Panel*. In this paper, we use a 1 percent sample from the *German Social Security Statistics*, (the IAB Public Use Data). It covers the period between 1975 and 1990. We shall focus on young men who finish their apprenticeship during this period. We have about 5,500 observations on wages of post-apprentices shortly after graduation. About 70 percent of these are still working at their training firm, the others moved to another firm upon graduation. We focus on the wage differentials between those who stay at their training firm (stayers) and those who move after graduation (movers) in the first year after graduation.

Our results show that while the average wage differential across sectors is negligible, there are significant wage differentials within sectors.

## 2 Data and Variables

From the IAB public use data base, we selected a cohort of graduated male apprentices born between 1960 and 1966. All these individuals obtained an officially recognized apprenticeship diploma. For those born in 1960, the earliest year to start an apprenticeship is 1975, the beginning of the time period covered by the data. To achieve homogeneity of the sample, we excluded those who had a full-time job before starting the apprenticeship training. We also excluded individuals in the agricultural sector, since mobility and wage structure in this sector are likely to differ substantially from those in other sectors. Finally, we only included individuals who worked on a full-time basis after apprenticeship training. This leaves us with a sample of about 10,500 individuals.

We considered two distinct groups: individuals who remain with their training firm after graduation (*stayers*), and individuals who leave the training firm upon graduation (*movers*). For individuals who end their apprenticeship but stay with their training firm, usually no notification is made. Wage information is updated on January 1 of the next year, and the daily wage reported is a mixture of apprenticeship wages and skilled worker wages. For individuals who change firm immediately after graduation, wages for the preceding spell are reported at the time of the move. To make the two groups comparable, we only use wage information from the first year after finishing apprenticeship training onwards. We therefore ignore the additional information we have for movers.

For individuals with an unemployment spell or out-of-labour-force spell after graduation, the wage in the first year after graduation is the wage in the first year of the first job after graduation. In the regressions, we control for unemployment and out-of-labor-force spells, which occur much more frequently for movers than for stayers.

This definition of first year wages implies that no wages are observed for movers or stayers whose first job after apprenticeship ends in the same year as their apprenticeship. Since initial mobility of this group of young workers is quite large, this implies that the number of observed first year wages is much smaller than the total number of individuals in the sample. A further reduction of the number of observed wages is due to the truncation at the end of the sample period 1990. This finally leads to a sample of 5,524 individuals with first year wages, which constitutes the basis for our analysis below.

About 69 percent of the apprentices in the sample stay with their training firm after graduation. 96 percent of these start immediately in their first job. In contrast, only 37 percent of the movers start a new job immediately after graduation. Of the graduated apprentices with a non-employment spell, 42 percent of the stayers versus 74 percent of the movers have an unemployment spell. The remaining individuals leave the labour force. Germany has a compulsory draft system, and individuals who leave the labour force are likely to perform their military service.

## 3 Wages after Graduation

The average raw daily wages in the first job after apprenticeship are very similar for the two groups: 55.62 DM for stayers, and 54.69 DM for movers (see Table 2). Thus, the raw means provide no evidence of positive or negative average wage differentials between movers and stayers. On the other hand, the wage dispersion among movers is substantially larger than among stayers: the standard deviation of stayers' wages is 14.65, as opposed to 17.24 for movers. We also compute mean wages for individuals who do not experience an unemployment spell or an out of the labor force spell before their first job. The numbers are almost identical.

**Table 1: Characteristics by Industry**

	Age	Abitur	White Collar	Stayer	≤1000 empl.
1: primary,mining	21.11	4.9%	16.3%	59.3%	8.9%
2: raw material	21.07	3.9%	21.0%	77.7%	41.3%
3: investment	21.45	3.5%	22.0%	71.4%	32.9%
4: user goods	20.69	1.6%	11.8%	76.2%	3.1%
5: construction	20.43	1.0%	5.1%	84.7%	1.0%
6: bank,insurance	22.49	28.9%	94.7%	70.5%	19.7%
7: trade,transport	21.61	4.4%	70.8%	62.3%	4.9%
8: services	21.62	5.4%	40.6%	48.4%	12.2%

The nature of apprenticeship training varies strongly across industries. It is therefore worthwhile to look at descriptive statistics of mobility, wages, and background variables by industry. Table 1 shows that post-apprentices in the banking and insurance sector are very different from those in the construction sector. The former relatively often have higher general education level, are older, and have a position as white collar worker. Plant size also varies a lot across industries, with large plants overrepresented in the heavy manufacturing industries (raw materials, investment). Another substantial difference between the sectors is the mover stayer ratio: whilst in the construction sector 84 percent stays with the training firm, this is only 48 percent in the services sector.

Table 2 displays the wages of movers and stayers, broken down by sectors. While, on average, the mover stayer wage differential is negligible, this is no longer true if we disaggregate according to sector. We find significant differentials of opposite sign in different sectors, which apparently cancel out if the mean over all sectors is taken. In the services sector, wages of stayers are higher than those of movers, but in the banking and insurance sector, and in the investment goods manufacturing sector, movers earn more than stayers.

These differentials may simply be due to differences in observed characteristics among industries (see table 1), and between movers and stayers. Much more often movers experi-

**Table 2: Mean Wages in First Job per Sector**

	Stayers			Movers		
	No. Obs.	Mean	SE	No. Obs.	Mean	SE
All	3911	55.62	14.65	1613	54.69	17.24
1: primary,mining	92	46.33	16.74	67	44.98	15.71
2: raw material	363	63.62	15.41	104	62.24	16.04
3: investment	702	60.09	14.53	279	63.42	17.38
4: user goods	689	51.78	11.80	215	54.77	13.63
5: construction	823	58.38	12.71	150	56.75	13.86
6: bank,insurance	373	60.70	13.44	159	61.71	18.53
7: trade,transport	629	46.32	13.42	383	50.25	16.06
8: services	240	52.06	13.29	256	45.66	15.40

ence an unemployment or out-of-labor-force spell than stayers. As a consequence, movers in their first job are, on average, older and observed at a later date than stayers. Movers are also more likely to be married. Stayers have higher general education levels (abitur) than the movers. We therefore run regressions below, where we control for individual characteristics as well as for occupation, industry and firm size effects.

We start with the following simple wage equation:

$$w_i = X_i' \alpha + Z_j' \beta + \gamma_s d_i + \epsilon_i \tag{1}$$

Here  $i$  denotes an individual working in firm  $j$  in sector  $s$ .  $w_i$  is the logarithm of the daily wage in the first year after graduation,  $X_i$  is a vector of (observed) individual specific characteristics, including marital status, age, a dummy for foreign nationality, a dummy for *abitur*, quarterly dummies to take account of spells which end during the year, year dummies accounting for macro-economic effects, the size of the apprenticeship firm, dummy variables for having been unemployed or out of the labour force between the end of the apprenticeship training and the first job, and the unemployment or out of the labour force duration.  $Z_j$  is a vector of firm and job specific characteristics, including firm size dummies, and occupational dummies. Wages are measured in 1976-German Marks.

The dummy  $d_i$  takes the value 1 for movers and 0 for stayers, so that  $\gamma_s$  is the sector specific mover stayer wage differential. Finally,  $\epsilon_i$  is an error term.

We first assume that

$$E(\epsilon_i | X_i, Z_j, d_i) = 0, \tag{2}$$

and apply Ordinary Least Squares (OLS) to estimate equation (1).

We focus our discussion here on the mover stayer differentials (see Dustmann, Euwals, van Soest (1997) for a complete set of results). Results are presented in table 3, column 1. The mover stayer wage differential across sectors is positive,

<sup>2</sup> This way of modelling the mover stayer decision and the wages is only one of the many methods available in the literature. An interesting alternative is, for example, the nonparametric strategy proposed by Rosenbaum and Rubin (1985), applied by Lechner (1996) to analyze the impact of vocational training in East Germany. This approach avoids assumptions on the functional form relationship between characteristics, mover stayer decision, and wages. On the other hand, it requires that all variables affecting the mover stayer decision which are also related to earnings are observed. Due to the relatively small number of available individual characteristics in our data set, we considered this approach less fruitful here.

but not significant at the 5 percent level. If wage differentials are allowed to vary across sectors, we find significantly positive differentials in various subsectors of the manufacturing sector and in the trade and investment sector, but also a strongly negative differential in the services sector. In the latter, movers earn about 12 percent less than stayers with similar characteristics. The results correspond reasonably well to the raw differentials in Table 2. Thus controlling for the observed characteristics seems to make little difference for the mover stayer differentials.

These wage differentials may be due to self-selection of movers and stayers, i.e. to endogeneity of the mover dummy  $d_i$ . We endogenize the mover dummy by using a two stage procedure along the lines of Heckman (1976) (see Dustmann, Euwals, van Soest (1997) for details)<sup>2</sup>. Nonparametric identification is achieved by excluding the following variables from the wage equation: Population density in the area where the firm is located (measure of mobility costs), and information on the percentage of firms which close down in the respective year, on a 2 digit industry level.

**Table 3: Regression Coefficient, Dummy MOVE**

	OLS		Selection		Fixed Effects	
	P.E.	S.E.	P.E.	S.E.	P.E.	S.E.
All	0.010	0.010	-0.021	0.027	0.012	0.033
1: primary,mining	0.009	0.041	-0.065	0.070	0.150	0.161
2: raw material	-0.039	0.029	-0.121**	0.060	-0.003	0.055
3: investment	0.043**	0.019	-0.028	0.056	0.004	0.051
4: user goods	0.028	0.021	-0.046	0.057	-0.060	0.081
5: construction	-0.024	0.023	-0.108*	0.058	0.056	0.123
6: bank,insurance	0.016	0.025	-0.070	0.059	-0.017	0.071
7: trade,transport	0.065**	0.017	-0.016	0.057	0.058	0.057
8: services	-0.121**	0.024	-0.229*	0.063	0.004	0.124
Lambda			0.057*	0.032		

\*\* : Significant 5 percent level; \* : significant 10 percent level.

Detailed results are presented in Dustmann, Euwals, van Soest (1997). The point estimates of the wage differentials between movers and stayers change only little compared to the OLS estimations (column 2, Table 3). The standard errors increase substantially, due to multicollinearity between the correction term and the mover dummy per industry. Some of the differentials remain significant. In particular, the significantly negative differential in the services industry seems a robust finding.

An alternative explanation for the observed wage differentials between movers and stayers is that the mover stayer dummies are correlated with firm specific effects. Since we observe firms which employ at least one mover and one stayer, we can control for these firm effects. In our sample 279 firms are represented more than once, employing 771 workers in the first year after their apprenticeship. 164 of these are movers. An F-test on the firm specific effects shows that they are jointly significant. Compared to the results of the base model, many parameter estimates are less precise, which is due to the small number of observations (see column 3, Table 3). The estimates of the wage differentials per sector are insignificant, in most cases with t-values smaller than one.

These results should not be overstressed, since after all, they are based upon the relatively few firms employing more than one graduate apprentice.

#### 4 Conclusions

Theories that explain why firms are willing to support the apprenticeship system have different implications for the wage differentials between movers and stayers. According to the cost of mobility argument, movers should earn more than stayers. The selection by firm argument implies that firms keep the best workers, so that stayers should earn more than movers. Both theories have received some empirical support, based upon cross-section data.

The longitudinal nature of our data allows us to focus on graduated apprentices in the first few years of their career. Both our raw data and our estimates controlling for firm and individual characteristics and selectivity, lead to less unambiguous conclusions: the mover stayer differential varies across the sectors in the economy, being significantly negative in some sectors and positive in others.

As a consequence, at this stage, our empirical results do not support any of the competing theories. Given the heterogeneous nature of jobs and apprenticeships across the sectors of the economy, really this should not come as a surprise.

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