*Vierteljahrshefte zur Wirtschaftsforschung*
*70. Jahrgang, Heft 1/2001, S. 102–106*

# Why Do German Firms Subsidize Apprenticeship Training? Tests of the Asymmetric Information and Mobility Cost Explanations

By Damon Clark*

**Summary**

*It is often observed that despite the famous prediction of Becker (1962) that firms will not pay for general training, German firms do in fact subsidize apprenticeship training. This paper examines two prominent solutions to this puzzle — "asymmetric information" and "mobility costs." Our tests do not support the asymmetric information hypothesis, and, while they provide evidence consistent with a simple mobility cost explanation, we argue that this hypothesis is deficient in a number of other respects.*

## 1. Introduction

The subsidization of German apprenticeship training (GAT) presents something of a puzzle for economists brought up to believe that firms will not pay for general training.[1] As Becker (1962) first pointed out, in competitive labor markets, any attempt to recoup training costs by paying trainees less than the value of their marginal product will result in their being poached by other firms. In the case of GAT, the solution to this puzzle is of profound policy interest. Not surprisingly, since German skill levels are widely regarded as being among the highest in the world, many policymakers in the United Kingdom and the United States see GAT as a training model to be emulated. Until the incentives underpinning the system are fully understood, however, there is no guarantee that firms in the United Kingdom and the United States will subsidize training of this kind.

In response to this apparent puzzle, a number of "non-competitive" explanations have recently been put forward. The crucial ingredient in these models is the mechanism enabling firms to offer post-training wages less than the value of post-training product. Two prominent accounts involve asymmetric information and mobility costs. The first idea is that since the poaching firm cannot differentiate the quitters from those laid off, the trainee has no incentive to leave the training firm. The second idea is that since trainees cannot costlessly leave the training firm, firms can offer lower wages and still retain trainees. This paper tests the implications of the asymmetric information model, and in the light of the results, discusses the mobility cost explanation.

Section 2 sets out the asymmetric information model, section 3 discusses some issues associated with testing the model, section 4 presents tests based on the German Socio-Economic Panel, section 5 discusses mobility costs, and section 6 concludes.

## 2. Asymmetric Information

The basic ingredients of the asymmetric information model advanced by Acemoglu and Pischke (1998) can be informally characterized as follows. The model — an asymmetric information game — consists of two periods. At the start of the first period, apprentices are hired. The training firm does not know the ability of the apprentices hired, only the associated distribution function. To keep things simple, we can assume that there are only two types of abilities — "good" workers and bad workers, or "lemons." Apprentices are paid a common wage during this first period, and at the end of it, apprentices' types are revealed to the training firm. Before the second, post-training period, a fraction of trained apprentices leave "exogenously." The firm then lays off the "lemons" and chooses a wage to offer to the remaining "good" workers. Given their assumed quit strategy, apprentices accept this offer and stay, or reject it and leave.

Assuming a competitive outside labor market, the outside wage for layoffs and quits will equal the expected value of the marginal product of those apprentices on the outside labor market, which in turn will be determined by the relative proportions of layoffs and quits on the outside labor market (exogenous movers can be identified as such and are paid the expected value of the marginal product of the whole population of apprentices). Since this depends on the training firm's offer wage and the apprentices' quit strategy, when the training firm sets the offer wage it will always trade off increased profit per apprentice against increased expected quits. Assuming apprentices' quit strategies involve quitting whenever the outside wage exceeds the offered wage, the training firm will set the offer wage slightly above the outside wage. Since this is below the value of the marginal product of the "good" apprentices that stay, firms make a profit on the apprentices, which ensures that firms offer positive levels of training.[2] A free entry condition pins down the first period training wage.

* Nuffield College, Oxford and Centre for Economic Performance (CEP), LSE Centre for Economic Performance, London School of Economics, 11 Furnival St, London, WC2A 2AE, United Kingdom. Tel: +44 (0)20 7955 6955. E-mail: *d.clark@lse.ac.uk*

[1] We assume that (at least large) firms make substantial investments in apprenticeship training. See for example Harhoff and Kane (1997) for evidence on this point.

[2] We actually require that ability and training enter the apprentice's second period product function multiplicatively. Otherwise, the training firm will earn monopsony profits on trainees but these will not be a function of the level of training.

An important issue is the extension of the model to multiple periods. In that case, since the acceptance of a contract in period 2 acts as a signal of ability, to sustain its monopsony power, it must be that the training firm can only learn about apprentice ability slowly. Since GAT lasts between two and three and a half years, such an assumption is questionable. Another important issue concerns mobility costs. Although the quit strategy described in the preceding paragraph assumed that workers had no mobility costs, Acemoglu and Pischke (1998) assume that workers have *negative* mobility costs, thereby generating the following predictions regarding the wages of new apprentices:[3]

$$W_2(\text{stay}) > W_2(\text{move}) \quad (1)$$

$$W_2(\text{exogenous}) > W_2(\text{move}) \quad (2)$$

One could, however, generalize these costs to be positive or negative. In that case neither of these conditions need hold, and the model would be indistinguishable from a simple mobility costs model in which the wages of movers are predicted to exceed those of stayers.[4] Of course, with data on quits and layoffs we can test for the presence of asymmetric information without regard to mobility costs by exploiting the following prediction:

$$W_2(\text{quit}) > W_2(\text{layoff}) \quad (3)$$

## 3. Empirical Tests of the Hypothesis

In moving from equations (1), (2) and (3) to empirical tests, the main issue concerns the individual and firm characteristics that we would like to control for when comparing the wages of these groups. In the asymmetric information case, since we wish to test whether or not the apprentice can break the information constraint to earn higher wages outside of the training firm, we need only include individual and training firm characteristics (remember that asymmetric information applies only to unobserved characteristics). A second point concerns the treatment of unobserved (to the econometrician but not the training firm or outside labor market) heterogeneity. If, for example, apprenticeship test scores are correlated with observed characteristics such as education, then the mover-stayer differential might be downward biased. Intuitively, since the training firm only makes offers to the "good" workers, we may not be comparing movers and stayers with identical observed (again, to the training firm and outside labor market but not the econometrician) characteristics. Similarly with respect to the quits-layoffs comparison, it could be, for example, that the quitters (with high negative mobility costs) also have lower unobserved ability.

The three papers that have tested the hypothesis are detailed in Table 1. While the evidence slightly favors a positive mover-stayer differential (against asymmetric information), all three studies suffer from data deficiencies. In particular, none of them allows comparisons of quits and layoffs or offers a longitudinal dimension to address the unobserved ability issue.

## 4. Using the German Socio-Economic Panel (GSOEP) to Test Asymmetric Information

We use the GSOEP to construct a sample of individuals observed in apprenticeship at the 1984 interview (the *apprenticeship interview*), and after finishing apprenticeship in 1985 (the *first post-apprenticeship interview*). We construct similar samples for each pair of years until 1995 and 1996 (inclusive) and pool them to create an overall sample of about 1,500 observations. Of the 1,000 or so in full-time employment at the first post-apprenticeship interview, we see from Table 2 that approximately one-third of these have already moved from the training firm. Using the GSOEP to distinguish different types of mover, we create the two categories listed in Table 2.[5] By tracking these apprentices for another year (we call this *the second post-apprenticeship interview*), we create another, albeit smaller, sample. Of the two-thirds of completing apprentices who stayed in the training firm, about one-sixth leave. This implies that by the second post-apprenticeship interview, one-half of all apprentices have left the training firm. Note also that of the one-third of completing apprentices who moved before the first post-apprenticeship interview, just under a third have moved again. We again disaggregate into quitters and those leaving for other reasons.

In order to compare wages conditional on observed characteristics (recall that the asymmetric information applies only to unobserved characteristics), Table 3 presents estimates derived from a simple model relating log monthly earnings to a set of individual and training firm characteristics. As expected, the coefficients on log hours worked, sex, and age are positive. That the coefficients on years of school and nationality (this variable is one for

[3] The second inequality comes about because there is always a higher proportion of good workers in the population (and therefore the exogenous movers group) than in the subpopulation of movers.

[4] In such a model, mobility costs are revealed after the first period and, given knowledge of these (or the associated distribution function), the training firm again makes a wage offer that trades off increased profit per apprentice with increased expected quits. Again, positive profits are made and firms invest in training, but now the mover-stayer differential is positive.

[5] Since it could be argued that these may not have been offered a contract, we generated this group with some care. In particular, since GSOEP respondents can list a number of reasons for leaving the training firm, we exclude from the quit category those apprentices who include any other reason for a firm change (e.g., those claiming that training finished and that they quit are classified into the finishing category).

Table 1

**Tests of Asymmetric Information**

| | Acemoglu and Pischke (1998) | | Harhoff and Kane (1997) | | Euwals (1998) | |
|---|---|---|---|---|---|---|
| Data | 3 waves of QaC pooled | | 1985 wave of QaC | | 1 percent Social Security Waves 1975–1990 pooled | |
| Sample Selection | German men aged 23 to 59 employed full-time; finished education after nine or ten years; training firm and current employer in private sector | | Men with more than five years of experience | | Men in first job after apprenticeship; born 1960–1966; working full-time after apprenticeship; not working full-time job before apprenticeship; not employed in agriculture | |
| Dependent Variable | Current Gross Monthly Wage | | Current Gross Monthly Income | | Daily wage in first job after apprenticeship | |
| | Specifications | | Specifications | | Specifications | |
| | (1) | (2) | (1) | (2) | (1) | (2) |
| Training Firm Characteristics | >50 | All | Industry | Craft | >50 | All |
| | Estimates | | Estimates | | Estimates | |
| Base Group | Movers | | Stayers | | Stayers | |
| Military quitters | 0.045<br>(0.025) | 0.011<br>(0.014) | | | | |
| Immediate movers | | | 0.019<br>(0.023) | 0.025<br>(0.020) | –0.029<br>(0.012) | 0.006<br>(0.009) |
| Moved within 1st year | | | 0.066<br>(0.012) | 0.065<br>(0.013) | –0.006<br>(0.016) | 0.045<br>(0.010) |
| Moved in 2nd year | | | 0.011<br>(0.008) | 0.005<br>(0.008) | | |
| Moved between 2nd and 5th year | | | 0.002<br>(0.006) | 0.002<br>(0.006) | | |
| Moved after 5th year | | | –0.003<br>(0.005) | 0.005<br>(0.005) | | |
| Training firm chars | size and sector | size | | | size and sector | size and sector |
| Sample size | 5,355 | 13,051 | 2,302 | 3,711 | 2,659 | 6,451 |

Source: Author's calculations.

Table 2

**Mobility After Apprenticeship**

| | First Post-Apprenticeship Interview Only | First and Second Post-Apprenticeship Interviews | | | |
|---|---|---|---|---|---|
| | | Stay | Move | Quit | Other |
| Stay | 628 | Stay | 478 | 89 | 47 | 42 |
| Move | 368 | Move | 253 | 94 | 38 | 56 |
| Quit | 66 | Quit | 41 | 23 | | |
| Other | 302 | Other | 212 | 71 | | |

Source: Author's calculations.

German nationals and zero for others are negative is surprising, although estimating the equation without those with 13 years of schooling (the remainder have either nine or ten years of schooling) reduces this somewhat. Since the data are pooled across 10 years, we include time dummies. We find a large positive return to leaving the training firm, although distinguishing among the two types of mover, we find no significant difference between the differential for quitters and those leaving for other reasons.

Turning to the sample at the second post-apprenticeship interview, we find no significant differences between the earnings of those staying with the firm and those moving before the first post-apprenticeship interview (and staying with the new firm). However, those who have left between the first and second post-apprenticeship interview earn small premiums over the stayers (consistent with the results of Euwals 1998, and Harhoff and Kane 1997). Again, there are no significant differences between quitters and other movers. All of these results are, of course, subject to the unobserved ability critique, which is the motivation for our estimation of equations in first-differenced earnings.

As seen in the final column of Table 3, while those leaving the training firm for other reasons enjoy a relatively small mover-stayer differential, apprentices quitting the training firm between the first and second post-apprenticeship interviews obtain a huge wage premium of nearly 20 percent. Similarly, the returns to moving again for those who have already left the training firm are also large and positive. As the first study to simultaneously document both the reasons for leaving the training firm and control for unobserved heterogeneity, this is strong evidence against the asymmetric information hypothesis.

## 5. Mobility Costs

Having found evidence against the asymmetric information explanation for firm investment in GAT, we may be inclined to accept the alternative simple mobility cost expla-

Table 3

**Mover-Stayer Wage Differentials**

| Log Monthly Earnings | First Post-Apprenticeship Interview | | | Second Interview | First Difference |
|---|---|---|---|---|---|
| Log hours | 0.186<br>(0.192) | 0.154<br>(0.182) | 0.154<br>(0.181) | 0.278<br>(0.114) | –0.061<br>(0.157) |
| Years of school | –0.062<br>(0.029) | –0.062<br>(0.029) | –0.062<br>(0.0292) | –0.022<br>(0.020) | 0.011<br>(0.021) |
| Sex | 0.161<br>(0.042) | 0.166<br>(0.041) | 0.166<br>(0.041) | 0.022<br>(0.004) | –0.009<br>(0.004) |
| Age | 0.040<br>(0.005) | 0.041<br>(0.0047) | 0.041<br>(0.0047) | 0.233<br>(0.025) | 0.05<br>(0.038) |
| German | –0.074<br>(0.044) | –0.073<br>(0.043) | –0.073<br>(0.043) | 0.001<br>(0.028) | 0.012<br>(0.036) |
| Mover | | 0.084<br>(0.042) | | | |
| Mover-Quit | | | 0.083<br>(0.089) | | |
| Mover-Other | | | 0.084<br>(0.045) | | |
| Stay-Move (Quit) | | | | 0.028<br>(0.509) | 0.185<br>(0.091) |
| Stay-Move (Other) | | | | 0.023<br>(0.519) | 0.046<br>(0.106) |
| Move-Stay | | | | –0.012<br>(0.0335) | –0.054<br>(0.036) |
| Move-Move (Quit) | | | | 0.114<br>(0.047) | 0.224<br>(0.135) |
| Move-Move (Other) | | | | 0.093<br>(0.055) | –0.067<br>(0.062) |
| Sample Size | 832 | 832 | 832 | 554 | 552 |
| $R^2$ | 0.221 | 0.221 | 0.2284 | 0.4494 | 0.106 |

Source: Author's calculations.

nation in which the mover-stayer differential is predicted to be positive. As it stands, however, this model is unsatisfactory in a number of respects. A first technical point is that for firms to invest in training, mobility costs can not simply be defined in terms of the difference between the offered wage and the outside wage. In that case, the training firm earns a monopsony premium on wages of retained apprentices, but this is not a function of the training investment. Instead, mobility costs must be defined in terms of the proportional increase in wages available on the outside labor market.

Even with mobility costs of this type, a number of facts remain unexplained. First, why do training firms lay off approximately one-half of their trainees? In a simple model of this kind, firms would make a wage offer to all workers. Perhaps wage bargaining forces training firms to pay minimum wages to those of identical observe characteristics. In that case, how do firms make their layoff/wage offer decisions? Second, if the outside labor market is competitive, how can workers who move again shortly after leaving the training firm increase their earnings by so much? Third, how do we explain the findings of Harhoff and Kane (1997) that firms are more likely to provide training when there are more local firms in the same industry? Is there an industry or occupation-specific element to GAT? Finally, why do only large firms pay for training? Proponents of both explanations agree on this fact but do not attempt to explain it as an equilibrium phenomenon.

Most fundamentally, we do not yet have any direct evidence regarding mobility costs. While Harhoff and Kane (1997) point out that apprentices are often still living at home at the time that apprenticeship is completed, if GAT is general, they need only locate one other firm in the local labor market!

In an attempt to identify some more general mobility costs, we analyze another GSOEP question: "If you were to lose your current job, would it be easy, difficult, or practically impossible to find another equivalent job?" Among apprentices, we find 25 percent claiming it would be easy to find another job, 55 percent claiming it would be difficult, and the remaining 20 percent claiming that it would be practically impossible. This suggests that mobility costs may be substantial, and these data would clearly be worth exploring in relation to other models of mobility costs.

## 6. Conclusions

Mobility cost explanations for firm investment in apprenticeship training are not new. Gospel (1994) argues that apprenticeship training in the United States — inherited from the United Kingdom — could not survive in the face of high apprentice mobility despite the efforts of employers to introduce bonding schemes. In Australia, however, a similar system has survived and prospered in part because mobility is much lower. Analyzing the wages of those staying with and leaving apprenticeship training firms in Germany, we have found some indirect evidence in favor of mobility cost explanations and presented some direct evidence suggestive of large mobility costs. From a policy perspective, these findings are of some interest. In order for them to be convincing, however, a more sophisticated model of mobility costs is required.

## References


*Acemoglu*, D. and J.-S. *Pischke*, 1998, "Why Do Firms Train? Theory and Evidence," Quarterly Journal of Economics 113(1): 79–119.

*Becker*, G.S., 1962, "Investment in Human Capital: A Theoretical Analysis," Journal of Political Economy 70(5): 9–49.

*Euwals*, R., 1998, "Wages in the First Job after Apprenticeship: Movers Versus Stayers," Ph.D. thesis, Tilburg University, Tilburg, The Netherlands.

*Gospel*, H., 1994, "Whatever Happened to Apprenticeship Training: A British, American, Australian Comparison," CEP Discussion Paper No. 190. London: Centre for Economic Performance, London School of Economics. <*http://cep.lse.ac.uk/papers/discussion/download/dp0190.pdf*>

*Harhoff*, D. and T.J. *Kane,* 1997, "Is the German Apprenticeship System a Panacea for the US Labor Market?" Journal of Population Economics 10: 171–196.