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Low Wage Mobility in Denmark, Germany, and the United States

by

Mette C. Deding*

The Study

In this working paper, mobility out of low wage employment in Denmark, Germany, and the United States is studied. Data used for the analysis are the Danish Longitudinal Database – a representative sample of the Danish population, and the PSID-GSOEP Equivalent File Data. Mobility is analysed as the transition out of low wage in 1993 and 1995 respectively, conditional on low wage in 1992. The econometric model takes selection into low wage in 1992 into account, and results clearly state the importance. At the aggregate level, mobility patterns are similar in Denmark and Germany, while mobility in the United States is more sensitive to the time period. At the micro level, effects of the explanatory variables are similar across the three countries, especially for the one-year period.

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1. INTRODUCTION

Mobility is an important aspect of any discussion of welfare. Whether a given distribution is considered equal or unequal is related to the issue of mobility in the distribution. In the extreme case think of a country where the aggregate level of inequality is small, but where there is no movement in the distribution: People remain at the same position forever. At the other extreme think of a country where the aggregate level of inequality is high, but with frequent movements. Thus it makes no sense to conclude that one country is more equal than the other from the level of inequality alone.

In this paper, mobility out of low wage in Denmark, Germany and the United States is compared. These countries might be examples of the above, since the distribution of wages (and incomes) are much more unequal in the United States than in both Denmark and Germany. Furthermore, mobility is usually considered high in the United States compared to European countries. Whether this is true can be discussed: Aaberge *et al* (1996) compare mobility levels in the Scandinavian countries and the United States and do not find a major difference in levels. And Burkhauser *et al* (1997) find that mobility patterns in Germany and the United States in the 1980s were similar.

Wage and income mobility has been the topic of a number of studies over the years (a comprehensive survey is Atkinson, Bourguignon, and Morrison, 1992). The traditional approach has been analyses at the aggregate level. Indices of mobility are calculated either from transition matrices or from various inequality measures. The classic references are Shorrocks (1978a), who defines an index of mobility from transition matrix data, and Shorrocks (1978b), who lets mobility depend on how much inequality falls when the period of investigation is extended. Aaberge *et al* (1996) and Burkhauser, Holtz-Eakin and Rhody (1997) are examples of empirical applications at the aggregate level.

Another approach is to model the wage or income determination in form of various stochastic specifications of changes in incomes or wages over time. Examples of these statistical models are MaCurdy (1982), Abowd and Card (1989) and Dickens (1996). Baker (1997) presents a very general statistical error structure that nests as special case most of the processes appearing in the literature, and secondly provides a general methodology for fitting the model to data.

A final approach to the study of mobility – and the one used in this paper – is to base the analysis on a micro-econometric framework. Typically, this involves the estimation of transition probabilities, especially the probability of low wage earners to move out of the low wage group. An example is Contini *et al* (1998), who use a logit specification to model the transition of wage earners in Italy between 1986 and 1990. Two transitions are estimated: The probability that those who were low paid in 1986 are still low paid in 1990, and the probability that those who were high paid in 1986 are low paid in 1990. The analysis assumes that the 'initial conditions' are exogenous. In other words, the analysis does not take into account, that whether individuals or low paid or high paid in 1986 are likely to be endogenous to the model, possibly resulting in biased estimates. This econometric problem can be viewed as an endogenous selection problem (see Heckman, 1981).

Another problem is that only transitions between wage earner states are considered. The alternative for many low wage earners is not having a high wage but not having a job at all. When these dropouts from the wage distribution are excluded from the analysis, estimations tend to exaggerate upward mobility. Sloane and Theodossiou (1996) include this in their study of wage mobility in the United Kingdom. They estimate the probability of low wage earners of moving to three different states: low paid employment, high paid employment, or no employment, by a multinomial logit model. Also Sloane and Theodossiou, however, assume that the initial conditions are exogenous. Furthermore, the multinomial logit model might involve another problem because it requires 'independence of irrelevant alternatives'. I.e. the ratio of probability between any two choices must be unaffected by the availability of a third choice. Hausman and McFadden (1984) have derived a test of this property, and in the Sloane and Theodossiou case it cannot be rejected. A more sophisticated econometric analysis is found in Asplund *et al* (1998), who compares wage mobility for low wage earners in Denmark and Finland. The model estimates the change in percentile rank in the wage distribution for individuals, while correcting for sample selection bias. The sample selection can be due to both the 'initial conditions' problem, and due to 'attrition' from the sample (i.e. individuals leaving the wage distribution).

Another solution to the 'initial conditions' problem is found in Stewart and Swaffield (1999), who studies transitions from low to high wages for wage earners in the United Kingdom. Their approach is to model the probability of being low paid in year *t+1*, conditional on being low paid in year *t*, by a probit model. The selection into low pay in year *t* is assumed given by another probit process. Including this in the analysis results in a bivariate probit model with endogenous selection. Cappellari (1999) also use this approach.
In this paper transitions out of low wage employment in Denmark, and Germany and the United States from 1992-1995 are compared, taking the initial conditions' problem into account. The aim of this paper is thus to get more insight into the mechanisms of earnings mobility by using a common framework on the three countries. The mobility literature embraces many cross-country studies or comparisons, but only few use micro-econometric analysis. Exceptions are Asplund *et al* (1998) – mentioned above – and Burkhauser, Wasylenko and Weathers (1997). The latter attempts to explain mobility in Germany and the United States in the 1980s using an ordered probit model (without initial conditions), especially focusing on the importance of education.

The paper is organised as follows. Data are presented in Section 2, and in Section 3 the aggregate level of mobility in the countries are discussed. The econometric model is found in Section 4, while results are presented in Section 5. Finally, concluding remarks are found in Section 6.

2. DATA

Data is a great difficulty in cross-country analyses. The longitudinal data sets needed for mobility studies can be found in many countries, but with varying content. Conclusions are naturally less convincing if the definitions of the explanatory variables vary a lot.
To avoid part of this problem, the data used in this paper for Germany and the United States are from the PSID-GSOEP Equivalent File, provided by Cornell University. As the name implies, the data include variables from both PSID (US longitudinal data) and GSOEP (German longitudinal data) that have been standardised across the countries. The obvious gain from using these data is the comparability of variables, while the loss is that the number of variables is limited.

The Danish data are from the Danish Longitudinal Database which is a 0,5% random panel sample of the Danish population. Variables are chosen to be as comparable as possible to the PSID and GSOEP, with minor alterations. One of the major differences between the two sets of data is that the Danish data origins from registers, while the German and US data are survey based.[1]

The analysis is restricted to individuals between 25 and 55 years of age in order to concentrate on wage earners. Two time periods are considered: 1992 to 1993, and 1992 to 1995. The analysis is thus directed at both short-run mobility (the one-year transition rate) and longer-run mobility (the three-year transition rate).

Means of the variables in 1992 are found in Table 1. The data includes information about gender, age, marital status and number of children. The Americans have more education than the Germans and the Danes, both in terms of years and having completed high school. Part of the explanation is a larger fraction of Germans and Danes with vocational training. As a result, labour market experience (measured by years since finishing education) is less in the United States than in the European countries.

The degree of part-timers is small in Denmark compared to the other two countries. Much is due to definition, however, since the part-time dummy indicates work between 15 and 30 hours a week in Denmark, and between 1 and 34 hours a week in Germany and the United States.

Besides the common variables, few country-specific variables are included in the analysis. Thus, indicator variables are included for living outside Copenhagen and the yearly unemployment degree (Denmark), for being a guest worker (Germany) and for being black or other non-whites (the United States). Finally, occupational dummies are included in the analysis, but are suppressed in the table.

All individuals in the sample are either non-employed, in the low wage group, or in the high wage group. The non-employed are without a job for the whole year, and this share is almost twice as high in Denmark and Germany as in the United States.

Low wage is defined as wages below two-thirds of (country-specific) mean hourly wage, resulting in 30% having a low wage in the United States, 22% in Germany, and only

[1] Note that while Danish data are representative, the German and the US data are not. All of the German and US analyses use the appropriate sample weights. Following the recommendations from the GSOEP staff, sample weights of the terminal year are used in the transition analyses.

8% in Denmark. This reflects a much more equal wage distribution in Denmark than in the other two countries.

Before turning to the econometric analysis, mobility at the aggregate level is discussed in the next section.

3. AGGREGATE MOBILITY

It is useful to begin the analysis at the aggregate level in order to determine the level of mobility in each of the three countries. For this purpose, transition matrices are useful. The transition matrix gives the proportion of individuals moving from one earnings group to another over time and thus answers the question of *how many* moves, but not *who* moves. The transition matrices for Denmark, Germany, and the United States are found in Table 2. All individuals are placed in a cell depending on the wage group in the initial year (1992) and the wage group in the terminal year (1993 or 1995). The margin of the table indicates the overall distribution of individuals in the given year, while the core of the table indicates how the given proportion in a certain group moves over time.

A first thing to notice from Table 2 is that the share of individuals without a wage is relatively high and increasing over time. The share is roughly 20% in Denmark and Germany and 12% in the United States (increasing to 17% in 1995). A reason for the observed difference can be business cycle effects: unemployment rates in the United States were lower than in Denmark and Germany. Furthermore differences in public transfer schemes are likely to play a role.

The share of individuals in the low wage group varies a lot between the countries. The share is approximately 10% in Denmark, 20% in Germany, and 30% in the United States, reflecting as mentioned earlier the spreads in the wage distributions.

Turning to the diagonals of the table, these indicate the share of individuals in a particular wage group, staying in that group. Thus, of the individuals with low wages in for instance Germa ny in 1992, 63% were still low paid in 1993, and 48% were still low paid in 1995.

For all countries, mobility is higher for the three-year period than for the one-year period, a natural consequence of a non-static wage distribution since - as time goes by - more and more people are likely to leave the low wage group or any other group.

Focusing on the low wage group, a considerable share moves from low wage employment to no employment in all three countries: about 10% for the one-year period, and almost 20% for the three-year period. Thus, this is a non-trivial exit-possibility for low waged individuals. The share moving from low wage to the high wage group varies more across the countries. Comparing the one-year mobility in Denmark and the United States, more than twice as many moves to high wages in Denmark (41% compared to 19%, with Germany in between). However, for the three-year period the share is almost the same in Denmark and the United States (48% and 53%), while the share in Germany is somewhat lower (35%). The story to be told thus varies across the countries: in Denmark and Germany time plays a minor role (mobility increases over time, but not dramatically). The level of mobility furthermore seems higher in Denmark than in Germany. In the United States, on the other hand, time seems much more important. In the short run, the United States appears rather immobile compared to the other countries, but at the longer run, mobility increases considerably.

As mentioned in the beginning of this section, the aggregate analysis cannot answer the question about who moves between the groups and who does not. Therefore we now turn to the micro-econometric analysis. The method is discussed first, and the results are then presented.

4. ECONOMETRIC FRAMEWORK

Consider an individual, low paid in year t. What is then the probability that the individual is still low paid in year $t+1$. Often a probit or logit model, restricted to the individuals with low pay in year t, models this transition probability. However, this assumes that the initial conditions (i.e. the state in year t) are exogenous. In the present context, this assumption does not seem plausible: It is peculiar to model movements *out* of low pay while assuming that movements *into* low pay are exogenous. The approach in this paper is to model the

transition out of low pay, taking selection into low pay into account, following the methodology in Stewart and Swaffield (1999).

Let y_{it}^* be earnings of individual i in year t, and assume that these are given by

$$y_{it}^* = f_1(x_{it}\beta^* + \varepsilon_{i1}) \quad (1)$$

where x_{it} is a vector of earnings-determining characteristics, ε_{i1}~N(0,1), and f_1 is a suitable monotonic transformation. Now define the low pay threshold in year t as θ_t, and let the indicator variable y_{it} equal 1 if earnings are below the threshold and 0 otherwise. The probability of earnings being below the threshold is

$$P(y_{it} = 1) = P(y_{it}^* \le \theta_t) = \Phi(f_1^{-1}(\theta_t) - x_{it}\beta^*) = \Phi(x_{it}\beta) \quad (2)$$

The resulting probit model estimates the parameters β, where β is a transformation of the β^*-vector from the earnings equation.

Now assume that earnings in year $t+1$ depend on the earnings status in year t. Then for an individual that was *low paid* in year t, earnings are given by

$$y_{it+1}^* = f_2(z_{it+1}\gamma^* + \varepsilon_{i2}) \quad (3)$$

The vector of explanatory variables z is now a vector of *transition-determinants* i.e. variables that explain earnings status in year $t+1$ *given* low pay in year t. The error term is normally distributed, and f_2 is a monotone transformation. If the individual on the other hand was high paid in year t, the same process applies but with a different γ^*-vector.

Now assume that the two error terms (ε_{i1}, ε_{i2}) are bivariate standard normal distributed with correlation ρ. The joint probability of being low paid in both years is then (where γ is a transformation of the γ^*-vector)

$$P(y_{it} ? 1, y_{it?1} ? 1) ? ? _2(x_{it}?, z_{it?1}?, ?) \quad (4)$$

Likewise the conditional probability, that an individual is low paid in year *t+1* given low pay in *t*, is

$$P(y_{it?1} ? 1 | y_{it} ? 1) ? ? _2(x_{it}?, z_{it?1}?, ?) / ? (x_{it}?) \quad (5)$$

In this set-up, exogenous initial conditions are analogous to the correlation factor, ?, being equal to 0. When the correlation equals 0, there is no dependence between earnings status in year *t* and earnings status in year *t+1*. In this case the probability of being low paid in year *t+1* reduces to the standard probit model:

$$P(y_{it?1} ? 1 | y_{it} ? 1) ? ? (z_{it?1}?) \quad (6)$$

The probability of being high paid in year *t+1* and low paid in year *t*, is defined analogously to (4)

$$P(y_{it} ? 1, y_{it?1} ? 0) ? ? _2(x_{it}?, ? z_{it?1}?, ? ?) \quad (7)$$

The likelihood function for this problem includes two parts. The first part is selection into low pay in year *t*. For this information is used for all individuals in the sample. The second part is transition out of low pay, given low pay in year *t*. Here, only information about the low paid in year *t* is used. The model can be described as a bivariate probit model with endogenous selection. The likelihood contribution for individual *i* is

$$\begin{aligned} \ln L_i ? & \; y_{it} y_{it?1} \ln ? _2(x_{it}?, z_{it?1}?, ?) \\ & ? y_{it}(1 ? y_{it?1}) \ln ? _2(x_{it}?, ? z_{it?1}?, ? ?) \\ & ? (1 ? y_{it}) \ln ? (? x_{it}?) \end{aligned} \quad (8)$$

where the three parts of the likelihood function correspond to 'low pay in year *t* and low pay in year *t+1*', 'low pay in year *t* and high pay in year *t+1*', and 'high pay in year *t*', respectively.

The present model is formulated with transitions between two labour market states only. Obviously it is of interest to model transitions between more than two states (incorporate the non-working group). A grouping with three levels leads to a trivariate probit model, with no closed-form solution. This is left for the time being.

5. ECONOMETRIC RESULTS

The estimation of the z-vector in (8) is presented in Table 3 for the 1992 to 1993 transition, and in Table 4 for the 1992 to 1995 transition. In order to identify the log-likelihood function, identification restrictions are needed: extra variables in the x-vector, not in the z-vector, are needed as instruments for the endogenous selection into the initial state. The instruments should affect the probability of being low paid, but not affect the transition mechanism. The instrument used is education (both years of and completed high school), as this has proved valid in empirical applications. Furthermore, experience squared and number of children are included in the x-vector, but not in the z-vector.

First we can ask whether the initial state selection matters for the transition probabilities? The answer to this is clearly yes, as the correlation coefficients in all cases are highly significant. There is thus significant correlation between the initial year state and the transition process. This is also confirmed by comparing the coefficients in Tables 3 and 4 to the results for the special case of exogenous initial conditions ($\rho=0$) (Appendix A): The variation in the coefficients is evident.

Secondly, the effects of the explanatory variables are investigated. For this purpose it is useful to study the marginal effects presented in Tables 3 and 4. The probabilities of being low paid in 1993, conditional on low paid in 1992 (Table 3) show similar signs across the countries except for one of the occupational dummies, although magnitudes differ. Being part-time employed reduces the probability of remaining low paid (significant in Germany and the United States) while changing from part-time to full-time employment reduces this probability in Denmark. The latter effect is expected – being job-mobile in hours reduces the risk of low wage, while the former is unpredicted. The part-time labour market is characterised by a lower wage level than the full-time labour market, but

obviously this does not affect the transition probability. Experience increases the risk of remaining low paid in Denmark and the United States, i.e. once a person is in the low wage group, more experience (being older) makes it harder to get out. Females have lower risk of remaining low paid in Denmark and the United States. The effect of being single is insignificant in all three countries, but if an individual changes from married to single between the years the probability of remaining low paid increases in Denmark. This confirms other Danish findings that especially male singles have higher risk of marginalisation. In Germany, both having a child and having bad health reduces the probability of low wages. However, as both events increase the probability of leaving the labour force, this result may be due to attrition selection. More education increases the chance of better wages as expected (in Denmark and Germany). Changing occupational group reduces the probability of low pay in Germany and the United States (being job-mobile increases wage mobility), whereas the effects of unemployment and geographical mobility in Denmark are contrary to expectations.

For the three-year period signs are the same in most cases, but with some differences. In the United States experience has a negative sign, thus implying a reduced risk of low pay. Thus, in the longer run, age/experience contribute positively to reducing low wages in the United States. Being female and having a new child increase the risk of remaining low paid in the United States (insignificant in Denmark and Germany). For the three-year period, the effect of bad health is still negative in Germany, but is positive in both Denmark and Germany. Changing from good to bad health increases the probability of low wage as expected (in Germany and the United States). Finally, changing occupation during the three-year period has a negative effect on wages in Germany, while unemployment and geographical location in Denmark is insignificant.[2]

Summing up, the effects are similar across the countries. For the low paid in 1992, chances of better-paid employment in 1993 increased if the person was part-time employed, less experienced, female, got more education, or changed occupational group. In 1995, however, probability of remaining low paid increased with experience in Denmark and Germany, and decreased in the United States, increased for females and new children (in the United States), decreased for singles in Denmark, decreased with new education in all

[2] Occupational dummies are not available for the United States in 1995.

countries and bad health in Germany, and increased with bad health in Denmark and the United States and change of occupation in Germany. In total, there is thus more variation across the countries in the longer run.

6. CONCLUSION

The purpose of this paper has been to investigate and compare transition out of low wage in Denmark, Germany, and the United States. Mobility has been investigated both at the aggregate level and by applying a micro-econometric framework. Results show that the mobility patters are similar across the countries especially for the one-year transition rate, while there is more variation across countries for the three-year period. The micro-econometric analysis corrected for selection bias due to the 'initial conditions' problem, and results indicate that this is very important. The analysis does not take transitions out of the labour force into account. As this is a significant exit-possibility for the low paid, incorporating it in the model is a natural extension.

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Table 1. Means of variables, 1992 (standard deviations in parentheses).

Variable	Denmark		Germany		United States	
Female	0.49	(0.50)	0.50	(0.50)	0.53	(0.50)
Age	39.32	(8.83)	39.22	(9.16)	38.35	(8.15)
Years of education	11.77	(2.52)	12.17	(2.81)	13.20	(2.40)
High school degree[1]	0.62	(0.49)	0.73	(0.44)	0.88	(0.32)
Experience[2]	21.55	(9.40)	21.05	(9.72)	19.16	(8.47)
Part-time[3]	0.08	(0.26)	0.22	(0.42)	0.28	(0.45)
Single	0.27	(0.44)	0.31	(0.46)	0.33	(0.47)
Number of Children[4]	0.82	(0.99)	0.83	(1.03)	1.04	(1.18)
Sick or bad health[5]	0.08	(0.27)	0.08	(0.27)	0.09	(0.28)
Live outside Copenhagen	0.66	(0.48)	-	-	-	-
Unemployment degree	0.10	(0.23)	-	-	-	-
Guest worker	-	-	0.05	(0.23)	-	-
Black	-	-	-	-	0.13	(0.34)
Non-white (other)	-	-	-	-	0.02	(0.13)
Wage (hourly)[6]	141.58	(60.17)	22.57	(45.20)	14.52	(14.89)
Not employed[7]	0.23	(0.42)	0.21	(0.41)	0.12	(0.33)
Low wage employed[8]	0.08	(0.26)	0.22	(0.41)	0.30	(0.46)
Number of observations	9002		7935		9064	

1 Dummy for level of education being at least high school.
2 Potential experience calculated as (age-years of education-6).
3 Part-time work. Defined as between 15 and 30 hours a week in Denmark, and as less than 35 hours a week in both Germany and the United States.
4 Defined as children under 18 living in the household.
5 For Denmark, the dummy indicates having received sick leave benefits during the year. For Germany and the United States, the dummy indicates whether individuals have characterised their health as unsatisfactory at the time of the interview.
6 In current year DKr, DM, and US$, respectively.
7 A person is considered not employed if no wage is reported for the year.
8 Wage below two-thirds of mean wage.

Table 2.1 Mobility between wage groups in Denmark.

1992 distribution state probabilities		1993 distribution			1995 distribution		
		No wage	Low wage	High wage	No wage	Low wage	High wage
No wage	21.55%	78.14%	8.07%	13.78%	71.34%	7.56%	21.10%
Low wage	7.88%	12.06%	46.83%	41.12%	19.80%	31.85%	48.35%
High wage	70.57%	6.26%	5.27%	88.47%	9.35%	6.15%	84.50%
All	*100.00%*	*22.22%*	*9.14%*	*68.63%*	*23.54%*	*8.47%*	*67.99%*

Table 2.2 Mobility between wage groups in Germany.

1992 distribution state probabilities (%)		1993 distribution			1995 distribution		
		No wage	Low wage	High wage	No wage	Low wage	High wage
No wage	19.66%	84.73%	7.38%	7.89%	72.89%	11.94%	15.17%
Low wage	22.09%	8.33%	63.21%	28.46%	17.56%	47.60%	34.84%
High wage	58.25%	2.09%	8.62%	89.29%	6.31%	9.39%	84.31%
All	*100.00%*	*19.71%*	*20.44%*	*59.85%*	*22.00%*	*18.48%*	*59.51%*

Table 2.3 Mobility between wage groups in the United States.

1992 distribution state probabilities (%)		1993 distribution			1995 distribution		
		No wage	Low wage	High wage	No wage	Low wage	High wage
No wage	11.53%	77.71%	15.44%	6.85%	18.70%	26.99%	54.31%
Low wage	29.56%	8.15%	73.22%	18.63%	18.78%	28.52%	52.70%
High wage	58.90%	2.73%	15.52%	81.76%	16.64%	29.09%	54.27%
All	*100.00%*	*12.97%*	*32.57%*	*54.46%*	*17.59%*	*28.65%*	*53.76%*

Table 3. ML estimates of the probability of being low paid in 1993, conditional on low pay in 1992.

	Denmark			Germany			United States		
	marg. effect	coef.	std. err.	marg. effect	coef.	std. err.	marg. effect	coef.	std. err.
Intercept	-	0.961	*(0.385)*	-	1.750	*(0.128)*	-	1.432	*(0.136)*
Part-time	**0.008**	0.048	*(0.148)*	**-0.015***	-0.151	*(0.073)*	**-0.060****	-0.375	*(0.064)*
Change to full-time	**-0.189****	-0.700	*(0.259)*	**0.032**	0.219	*(0.122)*	**0.045**	-0.118	*(0.105)*
Experience /100[1]	**0.020****	2.403	*(0.578)*	**0.001**	0.217	*(0.304)*	**0.007****	1.204	*(0.367)*
Female	**-0.045***	-0.320	*(0.141)*	**-0.006**	-0.066	*(0.080)*	**-0.015***	-0.136	*(0.059)*
Guest worker	-	-	-	**0.006**	0.076	*(0.130)*	-	-	-
Black	-	-	-	-	-	-	**-0.018**	-0.132	*(0.077)*
Non white	-	-	-	-	-	-	**-0.014**	-0.105	*(0.087)*
Single	**-0.039**	-0.196	*(0.117)*	**-0.005**	-0.054	*(0.073)*	**-0.004**	-0.033	*(0.064)*
Change to single	**0.027***	0.366	*(0.183)*	**0.017**	0.281	*(0.224)*	**-0.011**	-0.053	*(0.148)*
New child	**-0.006**	-0.036	*(0.212)*	**-0.037***	-0.319	*(0.148)*	**-0.005**	-0.043	*(0.115)*
New education	**-0.209***	-0.781	*(0.364)*	**-0.052***	-0.409	*(0.186)*	**0.021**	0.204	*(0.110)*
Sick or bad health	**0.028**	0.176	*(0.266)*	**-0.066***	-0.492	*(0.205)*	**-0.001**	-0.007	*(0.159)*
Change to bad health	**0.024**	-0.025	*(0.321)*	**-0.036**	0.180	*(0.237)*	**-0.017**	-0.122	*(0.194)*
Farming/Primary	**0.054**	0.397	*(0.297)*	**-0.410****	-1.606	*(0.444)*	**-0.245****	-1.034	*(0.299)*
Manufacturing	**-0.031**	-0.161	*(0.239)*	**-0.013**	-0.130	*(0.101)*	**-0.053****	-0.337	*(0.102)*
Construction	-	-	-	**-0.069****	-0.508	*(0.139)*	**-0.040****	-0.266	*(0.096)*
Trade	**0.014**	0.081	*(0.213)*	**-0.052****	-0.414	*(0.108)*	**-0.033***	-0.228	*(0.089)*
Transportation	-	-	-	**-0.055****	-0.429	*(0.133)*	**-0.017**	-0.126	*(0.141)*
Banking	-	-	-	**-0.149****	-0.854	*(0.222)*	**0.033***	0.356	*(0.175)*
Public sector/Service	**-0.054**	-0.260	*(0.219)*	**-0.083****	-0.576	*(0.092)*	**-0.008**	-0.061	*(0.080)*
Change of occupation	**0.005**	0.028	*(0.136)*	**-0.015***	-0.144	*(0.065)*	**-0.019***	-0.140	*(0.064)*
Unemployment degree	**-0.249****	-0.893	*(0.215)*	-	-	-	-	-	-
Province	**0.031**	0.158	*(0.123)*	-	-	-	-	-	-
Change of province	**0.100****	6.909	*(0.640)*	-	-	-	-	-	-

Rho	-	**-0.780****	*(0.219)*	-	**-0.999****	*(0.164)*	-	**-0.452****	*(0.099)*
Likelihood ratio		-1917			-3190			4689	
No. of observations		5978			4734			6709	

[1] Marginal effect of experience is calculated as the difference between 15 and 20 years of experience.

** - significant at the 1%-level.

* - significant at the 5%-level.

Table 4. ML estimates of the probability of being low paid in 1995, conditional on low pay in 1992.

	Denmark			Germany			United States		
	marg. effects	coef.	std. err.	marg. effects	coef.	std. err.	marg. effects	coef.	std. err.
Intercept	-	0.793	*(0.346)*	-	0.805	*(0.156)*	-	0.097	*(0.141)*
Part-time	**0.038**	0.220	*(0.150)*	**-0.018**	-0.075	*(0.073)*	**0.029**	0.082	*(0.067)*
Change to full-time	**-0.058**	-0.098	*(0.188)*	**0.010**	-0.032	*(0.074)*	**-0.141****	-0.292	*(0.070)*
Experience /100[1]	**0.019****	2.044	*(0.541)*	**0.012****	1.124	*(0.347)*	**-0.023****	-1.262	*(0.332)*
Female	**-0.033**	-0.185	*(0.141)*	**0.009**	0.039	*(0.082)*	**0.228****	0.584	*(0.061)*
Guest worker	-	-	-	**0.065***	0.353	*(0.154)*	-	-	-
Black	-	-	-	-	-	-	**0.044**	0.125	*(0.082)*
Non white	-	-	-	-	-	-	**-0.007**	-0.019	*(0.106)*
Single	**-0.052***	-0.232	*(0.107)*	**0.007**	0.033	*(0.078)*	**0.057**	0.164	*(0.087)*
Change to single	**-0.112**	-0.216	*(0.128)*	**0.002**	-0.022	*(0.132)*	**0.071**	0.040	*(0.097)*
New child	**0.008**	0.044	*(0.132)*	**0.002**	0.007	*(0.125)*	**0.074****	0.214	*(0.061)*
New education	**-0.198****	-0.709	*(0.207)*	**-0.151***	-0.525	*(0.218)*	**-0.219****	-0.562	*(0.057)*
Sick or bad health	**0.101***	0.940	*(0.373)*	**-0.104***	-0.383	*(0.156)*	**0.059****	0.169	*(0.065)*
Change to bad health	**0.075**	-0.401	*(0.403)*	**0.028****	0.519	*(0.161)*	**0.115****	0.179	*(0.057)*
Farming/Primary	**-0.022**	-0.103	*(0.262)*	**-0.216****	-0.707	*(0.255)*	-	-	-
Manufacturing	**-0.008**	-0.039	*(0.191)*	**-0.035**	-0.144	*(0.103)*	-	-	-
Construction	-	-	-	**-0.057**	-0.227	*(0.126)*	-	-	-
Trade	**0.004**	0.023	*(0.176)*	**0.000**	-0.002	*(0.117)*	-	-	-
Transportation	-	-	-	**-0.124****	-0.446	*(0.126)*	-	-	-
Banking	-	-	-	**-0.292****	-0.903	*(0.186)*	-	-	-
Public sector/Service	**-0.015**	-0.071	*(0.171)*	**-0.146****	-0.511	*(0.096)*	-	-	-
Change of occupation	**-0.008**	-0.042	*(0.093)*	**0.041****	0.201	*(0.067)*	-	-	-
Unemployment degree	**-0.040**	-0.181	*(0.223)*	-	-	-	-	-	-
Province	**0.037**	0.172	*(0.115)*	-	-	-	-	-	-
Change of province	**-0.044**	-0.200	*(0.367)*	-	-	-	-	-	-

Rho	-	**-0.848****	*(0.067)*	-	**-0.688****	*(0.142)*	-	**-0.436****	*(0.103)*
Likelihood ratio		-1760			-3054			-4490	
No. of observations		5750			4488			5732	

[1] Marginal effect of experience is calculated as the difference between 15 and 20 years of e xperience.

** - significant at the 1%-level.

* - significant at the 5% -level.

Appendix A. Results for special case of ? =0.

Table A1. ML estimates of being low paid in 1993, given low pay in 1992. Special case, ? =0.

	Denmark		Germany		United States	
	coef.	std. err.	coef.	std. err.	coef.	std. err.
Intercept	-0.259	*(0.346)*	0.841**	*(0.139)*	1.027**	*(0.121)*
Part-time	0.159	*(0.177)*	0.006	*(0.082)*	-0.325**	*(0.064)*
Change to full-time	-0.658*	*(0.317)*	0.478**	*(0.133)*	-0.006	*(0.105)*
Experience /100	2.356**	*(0.670)*	0.332	*(0.415)*	1.252*	*(0.370)*
Female	0.035	*(0.147)*	0.243**	*(0.080)*	-0.133*	*(0.060)*
Guest worker	-	-	-0.149	*(0.206)*	-	-
Black	-	-	-	-	-0.088	*(0.078)*
Non white	-	-	-	-	-0.093	*(0.178)*
Single	-0.199	*(0.143)*	-0.184*	*(0.083)*	0.003	*(0.065)*
Change to single	0.499*	*(0.215)*	0.455	*(0.442)*	0.021	*(0.161)*
New child	-0.073	*(0.256)*	-0.410*	*(0.185)*	-0.048	*(0.118)*
New education	-0.928*	*(0.450)*	-0.550	*(0.513)*	0.240	*(0.259)*
Sick or bad health	0.185	*(0.326)*	-0.655**	*(0.236)*	0.106	*(0.159)*
Change to bad health	-0.010	*(0.394)*	0.222	*(0.275)*	-0.184	*(0.199)*
Farming/Primary	-0.384	*(0.358)*	-2.131**	*(0.533)*	-1.217**	*(0.307)*
Manufacturing	-0.493	*(0.277)*	-0.209	*(0.119)*	-0.409**	*(0.106)*
Construction	-	-	-0.605**	*(0.174)*	-0.376*	*(0.151)*
Trade	-0.182	*(0.253)*	-0.452**	*(0.126)*	-0.195*	*(0.093)*
Transportation	-	-	-0.401*	*(0.160)*	-0.216	*(0.170)*
Banking	-	-	-1.266**	*(0.253)*	0.253	*(0.186)*
Public sector/Service	-0.464	*(0.261)*	-0.710**	*(0.105)*	-0.096	*(0.083)*
Change of occupation	0.160	*(0.160)*	-0.137	*(0.077)*	-0.142*	*(0.066)*
Unemployment degree	-0.804**	*(0.259)*	-	-	-	-

Province	0.344*	*(0.135)*	-	-	-	-
Change of province	6.742	*(6082.4)*	-	-	-	-
Likelihood ratio	-353		-894		-1182	
No. of observations	567		1551		1629	

** - significant at the 1%-level. * - significant at the 5%-level.

Table A2. ML estimates of being low paid in 1995, given low pay in 1992. Special case, ? =0.

	Denmark		Germany		United States	
	coef.	std. err.	coef.	std. err.	coef.	std. err.
Intercept	-1.160**	*(0.379)*	0.028	*(0.150)*	-0.408**	*(0.103)*
Part-time	0.432*	*(0.209)*	0.017	*(0.084)*	0.133	*(0.073)*
Change to full-time	0.097	*(0.269)*	0.112	*(0.115)*	-0.182*	*(0.073)*
Experience /100	2.157**	*(0.753)*	1.175**	*(0.424)*	-1.227**	*(0.350)*
Female	0.420*	*(0.169)*	0.263**	*(0.082)*	0.626**	*(0.062)*
Guest worker	-	-	0.152	*(0.224)*	-	-
Black	-	-	-	-	0.217*	*(0.094)*
Non white	-	-	-	-	0.034	*(0.173)*
Single	-0.266	*(0.166)*	-0.048	*(0.088)*	0.216*	*(0.093)*
Change to single	-0.291	*(0.203)*	0.078	*(0.216)*	-0.035	*(0.102)*
New child	0.045	*(0.199)*	0.022	*(0.143)*	0.195**	*(0.066)*
New education	-0.945**	*(0.299)*	-0.575*	*(0.252)*	-0.482**	*(0.059)*
Sick or bad health	1.243*	*(0.526)*	-0.323	*(0.268)*	0.362	*(0.293)*
Change to bad health	-0.208	*(0.582)*	0.469	*(0.297)*	-0.041	*(0.318)*
Farming/Primary	0.081	*(0.382)*	-0.959*	*(0.399)*	-	-
Manufacturing	-0.410	*(0.282)*	-0.260*	*(0.123)*	-	-
Construction	-	-	-0.279	*(0.151)*	-	-
Trade	-0.290	*(0.259)*	-0.002	*(0.135)*	-	-
Transportation	-	-	-0.480**	*(0.154)*	-	-
Banking	-	-	-1.144**	*(0.222)*	-	-
Public sector/Service	-0.332	*(0.251)*	-0.626**	*(0.112)*	-	-
Change of occupation	0.027	*(0.142)*	0.261**	*(0.074)*	-	-
Unemployment degree	-0.016	*(0.351)*	-	-	-	-
Province	0.502**	*(0.149)*	-	-	-	-

Change of province	-0.071	*(0.589)*	-	-	-	-
Likelihood ratio	-296		-902		-1249	
No. of observations	517		1428		1240	

** - significant at the 1%-level. * - significant at the 5%-level.