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Self-Employment Dynamics, State Dependence and Cross-Mobility Patterns

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Self-Employment Dynamics, State Dependence and Cross-Mobility Patterns*

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December 12, 2008

Abstract

This paper analyzes the mobility between self-employment, wage employment and non-employment. Using data for men in West Germany, we find strong true state dependence in all three states. Moreover, compared to wage employment, non-employment increases the probability of self-employment significantly, and self-employment goes along with a higher risk of future non-employment.

Keywords: Self-Employment, State Dependence, Labor Market Dynamics, Unemployment
JEL Classification: J64, L26, C23, C25

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1 Introduction

Self-employment has received substantial attention both from policy makers and academic research in the last two decades. Most of the empirical literature has analyzed self-employment in a cross-sectional framework (see, e.g., Evans and Jovanovic, 1989; Evans and Leigthon, 1989; Taylor, 1996; Blanchflower and Oswald, 1998; Clark and Drinkwater, 2000; Cressy, 2000; Taylor, 2004). While this is an important contribution to understand why people *are* self-employed at some point in time, it neglects the underlying labor market dynamics and more specifically state dependence. Taking account for the possibility of state dependence has been shown to be an important factor in the analysis of labor market dynamics (see, inter alia, Heckman, 1981; Hyslop, 1999).

This paper analyzes the extent of true state dependence in self-employment and whether there exist cross dependencies between self-employment, non-employment, and wage employment. To our knowledge, this is the first study modeling the individual dynamic interdependencies between these three states and taking the potential endogeneity of the initial state into account. The analysis is based on panel data for West German men drawn from the German Socio-Economic Panel (SOEP). We estimate a dynamic multinomial logit model with random effects.

We find strong true state dependence in all three states which is clearly overestimated when not taking the endogeneity of the initial state into account. Moreover, compared to wage employment, non-employment increases the probability of self-employment, and self-employment goes along with a higher risk of future non-employment.

2 Data and Estimation Approach

Our classification of individuals as self-employed, wage employed or not-working is based on a survey question about the occupational status of the respondents. We restrict the sample to individuals between 20 and 60 years of age and exclude farmers, civil servants, and those currently in education, vocational training, or military service. Using the waves from 1984 to 2005 this gives us a total number of around 54,800 year to year transitions for 8,860 men in West Germany.[1]

We estimate the transition probabilities between wage employment ($j = 1$), self-employment ($j = 2$) and non-employment ($j = 3$) from period $t - 1$ to t assuming a

[1]The observed transitions are reported in Table A.1 in the Appendix. Table A.2 contains some descriptive statistics for individuals in the three states.

first-order Markov process. The latent propensity E^* of individual i to be in state j in period t can be written as

$$E^*_{ijt} = X_{it}\beta_j + Z_{it-1}\gamma_j + \alpha_{ij} + \epsilon_{ijt}. \tag{1}$$

X_{it} contains individual observed characteristics in t and Z_{it-1} contains the lagged state, consisting of two dummy variables which indicate the state in period $t-1$ with wage employment as the base category. Vector $\alpha_i = \{\alpha_{i1}, \alpha_{i2}, \alpha_{i3}\}$ describes the individual specific unobserved heterogeneity and ϵ_{ijt} is the error term. The error term is assumed to be independent from observable and unobservable individual characteristics and to follow a Type I extreme value distribution. The labor market state Z_{it} with the highest propensity E^*_{ijt} is realized ($Z_{it} = j$ if $E^*_{ijt} > E^*_{ilt}$ for any $l \neq j$). This ends up in a three states multinomial logit panel data model with random effects.

For a given unobserved heterogeneity the probability of individual i to be in state j in period t corresponds to

$$P(Z_{it} = j|X_{it}, Z_{it-1}, \alpha_i) = \frac{exp(X_{it}\beta_j + Z_{it-1}\gamma_j + \alpha_{ij})}{\Sigma^3_{k=1} exp(X_{it}\beta_k + Z_{it-1}\gamma_k + \alpha_{ik})}. \tag{2}$$

The coefficient vectors β_1 and γ_1 and the unobserved heterogeneity term α_{i1} of the base category are set to 0 for identification reasons.

The observation period of transitions does not coincide with the start of the stochastic process generating individual's employment dynamics. Therefore, when modeling transition probabilities the initial condition problem has to be taken into account (see, e.g., Heckman, 1981). We follow Wooldridge (2005), who proposes to estimate the distribution of the outcome variables conditional on the initial state and time invariant variables.

The specification of the unobserved heterogeneity is given by:

$$\alpha_{ij} = \kappa_{ij} + Z_{i0}\theta_j + \overline{X_{it}}\zeta_j. \tag{3}$$

We model the distribution of the individual specific random term κ_i as a one-factor loading model, assuming that one unobserved factor enters the model. The unobserved factor follows a discrete distribution with a finite number of mass-points m (see Heckman and Singer, 1984). In our empirical specification we choose $m = 5$.

The individual likelihood contribution can be written as

$$L_i = \int_{-\infty}^{\infty} \prod_{t=1}^{T} \quad \frac{exp(X_{it}\beta_2 + Z_{it-1}\gamma_2 + Z_{i0}\theta_2 + \overline{X_{it}}\zeta_2 + \kappa_2)^{l_t}}{1 + \Sigma^3_{k=2} exp(X_{it}\beta_k + Z_{it-1}\gamma_k + Z_{i0}\theta_k + \overline{X_{it}}\zeta_k + \kappa_k)} \\ * exp(X_{it}\beta_3 + Z_{it-1}\gamma_3 + Z_{i0}\theta_3 + \overline{X_{it}}\zeta_3 + \kappa_3)^{n_t} f(\alpha) d\alpha \tag{4}$$

with $l_t = 1$ ($n_t = 1$) if the individual is self employed (not employed) in t and $l_t = 0$ ($n_t = 0$) if not.

The individual likelihood contribution consists of the weighted factor loading specific contributions, whereby the weights correspond to the probabilities of factor combinations π_r. The sample likelihood is given by

$$L = \prod_{i=1}^{n} \sum_{r=1}^{m} \pi_r L_{ir}. \tag{5}$$

The measure of true state dependence SD is derived by calculating the average of pairwise individual differences between the predicted probabilities of being in state j conditional on two of the three labor market states. For example, the effect of being self employed ($j = 2$) compared to being in wage employment ($j = 1$) in $t - 1$ on the probability of being self employed in t can be written as

$$SD = \frac{1}{N} \sum_{i=1}^{N} (P_i(j_t = 2|j_{t-1} = 2) - P_i(j_t = 2|j_{t-1} = 1)). \tag{6}$$

In order to derive the individual specific probabilities for each category given observed and unobserved characteristics we assign individual values to the random intercepts. An individual value is given by the mean of the individual specific posterior distribution of unobserved heterogeneity.

3 Results

We estimate the model with and without the inclusion of unobserved heterogeneity α_i. The inclusion significantly increases the log-likelihood and clearly reduces the coefficients of the lagged labor market state variables. These results confirm previous research on unemployment dynamics and emphasize the importance of the initial condition problem within dynamic panel data models. Moreover, we estimate the model with and without interaction effects of the covariates and the lagged labor market states. The inclusion of the interaction effects clearly increases the log-likelihoods. The results we present here are based on the model with interaction effects[2]. The coefficients provide little information about the extent of true state dependence. Therefore, we calculate and discuss the extent of true state dependence and cross-dependencies in the following.[3]

[2]The coefficients of the different models are reported in the Appendix, Tables A.4 and A.5.

[3]Our model reproduces the observed transition probabilities quite well, see Table A.3 for predictions conditional on observed and unobserved characteristics as well on the lagged state, which are very similar to the transition probabilities in Table A.1.

Table 1 contains the transition matrix between the three states, based on averaged transition probabilities across all individuals.

Insert Table 1 about here

The probability of being in wage employment is, independent of the previous labor market state, above 60%. This result can be explained by the influence of observable and unobservable characteristics shifting the main share of individuals into wage employment, independent of their employment state in the last year. However, the probability of being in wage employment is with 92% the highest for individuals who have been in wage employment in the previous period. Previous non-employment goes along with a probability of 63% and previous self-employment with 60% of wage employment in t. Previous self-employment goes along with the highest probability of being self-employed in period t (26%) and previous non-employment leads to the highest probability of future non-employment with 27%.

Insert Table 2 about here

These results indicate strong true state dependence in all three states. Table 2 contains the extents of the true state dependence and cross dependencies between the states non-employment and self-employment and the corresponding standard errors. Previous non-employment increases the probability of being not employed in the future by 22% compared to previous wage employment. The corresponding state dependence in self-employment is also 22%. All numbers are clearly significant different from zero. However, in a model without taking the endogeneity of the initial state into account, these estimates would be clearly overestimated with 54% for non-employment and 87% for self-employment. Previous non-employment leads with a significantly higher probability to self-employment than previous wage employment (6%). Non-employment seems to increase the relative attractiveness and therewith the probability of becoming self-employed for the not employed. On the other hand, self-employment significantly increases the probability of non-employment if it is compared to wage employment (9%) and leads to a lower probability of wage-employment if it is compared to non-employment (Table 1). The direction of most of the results holds if we use the sample of the non-working men for the predictions only, although the extent of the transition probabilities differs due to differences in observable and unobservable characteristics. In contrast to the complete sample, for the unemployed in our data previous self-employment increases the probability of wage employment if it is compared with previous non-employment, see Table 3.

4 Conclusions

We use dynamic multinomial logit panel data models with random effects to analyze the mobility between self-employment, wage employment and non-employment. We show that there is strong true state dependence in all three states. However, in a model not taking the endogeneity of the initial state into account, the extent of state dependence is clearly overestimated. The results also indicate, that there is a high cross-mobility between non-employment and wage employment. The probability to become self-employed is clearly higher in case of previous non-employment compared to previous wage employment. Non-employment seems to increase the relative attractiveness and therewith the probability of becoming self-employed for the not employed. Furthermore, the probability to be not employed is significantly higher for previous non-employment compared to previous self-employment. This indicates that self-employment can be a promising way to end individual non-employment.

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Tables

Table 1: Estimated Transition Matrix

	Wage Employment	Self-Employment	Non-employment
Wage Employment (t-1)	0.915	0.036	0.049
	0.006	*0.006*	*0.002*
Self-Employment (t-1)	0.602	0.260	0.139
	0.054	*0.056*	*0.017*
Non-employment (t-1)	0.628	0.099	0.273
	0.014	*0.008*	*0.013*

Source: SOEP, wave 1984-2005.
Note: All numbers are in shares. Standard deviations are in *italic*, derived using parametric bootstrap with 250 replications.

Table 2: Estimated State Dependence (SD)

SD Non-Employment	22.38	*1.38*
SD Self-Employment	22.40	*6.11*
SD Self-Employment-Non-Employment	8.97	*1.75*
SD Non-Employment-Self-Employment	6.39	*0.85*

Source: SOEP, waves 1984-2005
Note: Standard deviations are in *italic*, derived using parametric bootstrap with 250 replications.

Table 3: Estimated Transition Matrix, not employed individuals

	Wage Employment	Self-Employment	Non-Employment
Wage Employment (t-1)	0.768	0.012	0.220
	0.011	*0.002*	*0.011*
Self-Employment (t-1)	0.388	0.191	0.422
	0.045	*0.057*	*0.040*
Non-Employment (t-1)	0.327	0.031	0.642
	0.008	*0.004*	*0.009*

Source: SOEP, wave 1984-2005.
Note: All numbers are in shares. Standard deviations are in *italic*, derived using parametric bootstrap with 250 replications.

A Appendix

Table A.1: Observed Transitions, 1984-2005

	Wage Employment	Self-Employment	Non-Employment
Wage Employment (t-1)	43,777	475	1,647
	(95.4)	(1.0)	(3.6)
Self-Employment (t-1)	329	4,436	98
	(6.8)	(91.2)	(2.0)
Non-Employment (t-1)	1,298	119	2,574
	(32.5)	(3.0)	(64.5)

Source: SOEP, waves 1984-2005.
Note: Numbers in the first row show the absolute number of observations in each state, conditional on the employment state in the previous year. Number in parentheses are row percentages.

Table A.2: Some Descriptive Statistics - Differentiated by Labour Market State

	Wage Employment		Self-Employment		Non-Employment	
	Mean	SD	Mean	SD	Mean	SD
Age (mean)	41.30	(10.11)	44.00	(9.03)	43.20	(12.12)
Number of children (mean)	0.88	(1.07)	0.84	(1.02)	0.79	(1.13)
Father self-employed	0.05	(0.22)	0.21	(0.41)	0.04	(0.20)
High-school degree	0.17	(0.37)	0.32	(0.47)	0.07	(0.26)
Apprenticeship	0.43	(0.50)	0.33	(0.47)	0.34	(0.47)
Higher technical college	0.21	(0.41)	0.27	(0.44)	0.15	(0.36)
University degree	0.14	(0.34)	0.27	(0.45)	0.07	(0.26)
German nationality	0.74	(0.44)	0.87	(0.33)	0.60	(0.49)
Disabled	0.06	(0.24)	0.04	(0.20)	0.17	(0.38)
Married	0.75	(0.43)	0.74	(0.44)	0.66	(0.47)
Unemployment rate[1]	8.46	(2.30)	8.70	(2.21)	8.99	(2.23)
GDP growth[1]	1.99	(1.86)	1.78	(1.86)	1.67	(1.79)
Observations[2]	45,404		5,030		4,319	

Note: Shares are reported (if not indicated otherwise), standard deviations in parentheses.
[1] Measured on state level.
[2] Refers to person-year observations. One person might be in different employment states over different years.

Table A.3: Estimated Transition Matrix, conditional on observed lagged states

	Wage Employment	Self-Employment	Non-Employment
Wage Employment (t-1)	0.954	0.010	0.036
	0.001	*0.001*	*0.001*
Self-Employment (t-1)	0.071	0.908	0.021
	0.005	*0.005*	*0.003*
Non-Employment (t-1)	0.327	0.031	0.642
	0.008	*0.004*	*0.009*

Source: SOEP, wave 1984-2005.
All numbers are in shares. Standard deviations are in *italic*, derived using parametric bootstrap with 250 replications.

Table A.4: Estimation Results for the (Simple) Dynamic Multinomial Logit Model

	Model 1a		Model 1b	
	Coeff.	s.e.	Coeff.	s.e.
Self-Employment				
Unemployment rate	−0.008	0.015	−0.030	0.024
Gross national product	−0.033	0.017**	−0.064	0.022***
Age	0.001	0.004	0.005	0.007
Age squared	−0.001	0.000**	−0.002	0.001***
Number of children	−0.035	0.034	−0.103	0.071
Father self-employed	0.850	0.100***	0.927	0.189***
High school degree	0.196	0.106*	0.236	0.171
Apprenticeship	0.054	0.103	−0.089	0.190
Higher techn. coll.	0.284	0.108***	0.195	0.207
University	0.433	0.135***	0.396	0.259
German	0.242	0.096***	0.345	0.151**
Disabled	−0.185	0.148	−0.074	0.200
Married	−0.105	0.088	0.175	0.205
Self-employed (t-1)	6.993	0.111***	4.639	0.216***
Not employed (t-1)	2.234	0.109***	1.724	0.220***
Self employed (t0)	–	–	4.930	0.868***
Not employed (t0)	–	–	1.196	0.583**
Mean married	–	–	−0.564	0.266**
Mean children	–	–	0.144	0.094
κ_1^2	–	–	−1.664	0.918*
κ_1^3	–	–	−0.399	0.792
κ_1^4	–	–	3.383	0.511***
κ_1^5	–	–	−2.912	0.769***
Constant	−4.681	0.174***	−5.291	0.630***
Non-employment				
Unemployment rate	0.058	0.010***	0.093	0.014***
Gross national product	−0.093	0.012***	−0.113	0.014***
Age	0.030	0.002***	0.045	0.004***
Age squared	0.002	0.000***	0.003	0.000***
Number of children	0.077	0.025***	−0.013	0.048
Father self-employed	0.155	0.108	0.255	0.154*
High school degree	−0.397	0.096***	−0.503	0.121***
Apprenticeship	−0.506	0.061***	−0.567	0.086***
Higher techn. coll.	−0.573	0.067***	−0.679	0.094***
University	−0.617	0.105***	−0.747	0.135***
German	−0.314	0.060***	−0.434	0.092***
Disabled	0.731	0.066***	0.930	0.095***
Married	−0.450	0.058***	0.046	0.126
Self-employed (t-1)	2.104	0.122***	1.225	0.299***
Not employed (t-1)	3.741	0.061***	2.544	0.114***
Self employed (t0)	–	–	1.071	0.484**
Not employed (t0)	–	–	1.835	0.180***
Mean married	–	–	−0.817	0.161***
Mean children	–	–	0.187	0.063***
κ_2^2	–	–	1.469	0.430***
κ_2^3	–	–	−1.202	0.569**
κ_2^4	–	–	0.223	0.854
κ_2^5	–	–	−3.025	1.204***
Constant	−3.012	0.119***	−2.806	0.587***
P_1			0.243	0.115
P_2			0.030	0.057
P_3			0.124	0.048
P_4			0.467	0.154
P_5			0.137	0.028
LL	-13,788.82		-13,191.34	

Note: The base category is wage employment. ***/**/* indicate significance at the 1/5/10%-level; robust standard errors.
Model 1a: No unobserved heterogeneity; Model 1b: Wooldridge estimator.

Table A.5: Estimation Results for the (Interaction) Dynamic Multinomial Logit Model

	Model 2a		Model 2b	
	Coeff.	s.e.	Coeff.	s.e.
Self-Employment				
Unemployment rate	−0.010	0.025	−0.034	0.031
Gross national product	−0.014	0.027	−0.029	0.030
Age	−0.023	0.007***	−0.015	0.008*
Age squared	−0.001	0.001	−0.001	0.001*
Number of children	0.019	0.054	−0.044	0.081
Father self-employed	1.073	0.164***	1.119	0.200***
High school degree	0.186	0.166	0.214	0.210
Apprenticeship	0.153	0.172	0.096	0.198
Higher techn. coll.	0.459	0.175***	0.509	0.214***
University	0.690	0.211***	0.713	0.271***
German	0.086	0.158	0.213	0.183
Disabled	−0.141	0.277	−0.186	0.304
Married	−0.339	0.136***	0.013	0.220
UE(t-1)xUnemployment rate	−0.077	0.053	−0.069	0.064
UE(t-1)xGross national product	−0.120	0.066*	−0.126	0.078
UE(t-1)xAge	0.049	0.014***	0.054	0.017***
UE(t-1)xAge squared	−0.003	0.001***	−0.003	0.002**
UE(t-1)xNumber of children	−0.117	0.124	−0.182	0.176
UE(t-1)xFather self-employed	−0.175	0.351	0.083	0.559
UE(t-1)xHigh school degree	0.398	0.352	0.641	0.538
UE(t-1)xApprenticeship	−0.083	0.333	−0.233	0.397
UE(t-1)xHigher techn. coll.	0.157	0.380	0.161	0.470
UE(t-1)xUniversity	−0.298	0.456	−0.406	0.600
UE(t-1)xGerman	0.578	0.319*	0.700	0.359**
UE(t-1)xDisabled	−0.307	0.593	−0.345	0.654
UE(t-1)xMarried	0.304	0.298	0.266	0.351
SE(t-1)xUnemployment rate	0.011	0.048	0.020	0.055
SE(t-1)xGross national product	−0.028	0.045	−0.039	0.052
SE(t-1)xAge	0.053	0.012***	0.034	0.015**
SE(t-1)xAge squared	−0.001	0.001	−0.001	0.001
SE(t-1)xNumber of children	−0.105	0.103	−0.152	0.109
SE(t-1)xFather self-employed	−0.771	0.290***	−0.572	0.336*
SE(t-1)xHigh school degree	−0.025	0.296	−0.026	0.329
SE(t-1)xApprenticeship	−0.496	0.308	−0.484	0.335
SE(t-1)xHigher techn. coll.	−0.647	0.312**	−0.682	0.338**
SE(t-1)xUniversity	−0.759	0.372**	−0.784	0.422*
SE(t-1)xGerman	0.061	0.282	0.126	0.305
SE(t-1)xDisabled	0.504	0.577	0.511	0.621
SE(t-1)xMarried	0.641	0.238***	0.644	0.257***
Self-employed (t-1)	7.265	0.636***	4.815	0.696***
Not employed (t-1)	3.065	0.619***	2.871	0.754***
Self employed (t0)	–	–	5.501	1.213***
Not employed (t0)	–	–	0.433	0.305
Mean married	–	–	−0.537	0.247**
Mean children	–	–	0.124	0.089
κ_1^2	–	–	−5.643	1.947***
κ_1^3	–	–	−6.334	1.404***
κ_1^4	–	–	−1.108	0.749
κ_1^5	–	–	−4.142	0.609***
Constant	−4.658	0.284***	−2.127	0.439***

Table continued on the next page

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	Model 2a		Model 2b	
	Coeff.	s.e.	Coeff.	s.e.
Non-employment				
Unemployment rate	0.066	0.013***	0.086	0.015***
Gross national product	−0.118	0.014***	−0.131	0.015***
Age	0.012	0.003***	0.029	0.004***
Age squared	0.003	0.000***	0.003	0.000***
Number of children	0.109	0.033***	0.040	0.050
Father self-employed	0.362	0.140***	0.408	0.158***
High school degree	−0.667	0.127***	−0.749	0.150***
Apprenticeship	−0.432	0.079***	−0.444	0.097***
Higher techn. coll.	−0.493	0.088***	−0.553	0.107***
University	−0.563	0.137***	−0.634	0.156***
German	−0.402	0.075***	−0.472	0.094***
Disabled	0.757	0.088***	0.892	0.107***
Married	−0.579	0.075***	−0.142	0.130
UE(t-1)xUnemployment rate	−0.022	0.025	0.000	0.029
UE(t-1)xGross national product	0.059	0.028**	0.056	0.032*
UE(t-1)xAge	0.053	0.006***	0.065	0.006***
UE(t-1)xAge squared	−0.002	0.001***	−0.001	0.001
UE(t-1)xNumber of children	−0.084	0.060	−0.106	0.070
UE(t-1)xFather self-employed	−0.449	0.284	−0.569	0.322*
UE(t-1)xHigh school degree	0.692	0.237***	0.776	0.274***
UE(t-1)xApprenticeship	−0.279	0.151*	−0.349	0.163**
UE(t-1)xHigher techn. coll.	−0.154	0.170	−0.219	0.189
UE(t-1)xUniversity	−0.232	0.251	−0.497	0.271*
UE(t-1)xGerman	0.369	0.141***	0.245	0.153
UE(t-1)xDisabled	−0.099	0.182	−0.030	0.207
UE(t-1)xMarried	0.381	0.141***	0.436	0.156***
SE(t-1)xUnemployment rate	−0.010	0.058	−0.039	0.063
SE(t-1)xGross national product	−0.002	0.067	−0.006	0.078
SE(t-1)xAge	0.008	0.017	−0.003	0.017
SE(t-1)xAge squared	−0.004	0.002***	−0.004	0.002**
SE(t-1)xNumber of children	−0.035	0.154	−0.130	0.160
SE(t-1)xFather self-employed	−1.314	0.519***	−1.501	0.567***
SE(t-1)xHigh school degree	0.466	0.365	0.298	0.469
SE(t-1)xApprenticeship	−0.383	0.354	−0.283	0.388
SE(t-1)xHigher techn. coll.	−0.277	0.392	−0.172	0.431
SE(t-1)xUniversity	0.125	0.447	0.517	0.537
SE(t-1)xGerman	−0.459	0.305	−0.709	0.339**
SE(t-1)xDisabled	0.999	0.539*	1.017	0.581*
SE(t-1)xMarried	0.456	0.341	0.686	0.357*
Self-employed (t-1)	2.904	0.719***	2.683	0.819***
Not employed (t-1)	3.854	0.304***	2.447	0.361***
Self employed (t0)	–	–	0.421	0.357
Not employed (t0)	–	–	1.840	0.122***
Mean married	–	–	−0.777	0.148***
Mean children	–	–	0.143	0.059***
κ_2^2	–	–	2.300	0.544***
κ_2^3	–	–	0.295	0.374
κ_2^4	–	–	1.898	0.636***
κ_2^5	–	–	−1.610	0.434***
Constant	−3.070	0.157***	−3.272	0.316***
P_1			0.175	0.036
P_2			0.038	0.018
P_3			0.081	0.040
P_4			0.594	0.052
P_5			0.111	0.084
LL	-13,531.50		-12,953.16	

Note: The base category is wage employment. **/**/* indicate significance at the 1/5/10%-level; robust standard errors.
Model 2a: No unobserved heterogeneity; Model 2b: Wooldridge estimator.