

**Migration behaviour and duration of residence spells of
graduating students in Finland in 1987–2002**

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Abstract

In this paper we examine the determinants of residence duration after finishing full-time education in Finland. The analysis is based on a large register-based data set from the period 1987–2002. Our results show first that the migration propensity depends upon the cyclical trends in the economy. Second, the analysis affirms the importance of residence duration as a determinant of migration in Finland. The longer person stays in a region the smaller are the hazard rates of migration (cumulative inertia). Third, the hazard rates are much higher for those who have moved during the graduation year (i.e. considering repeat migration) compared to those who did not move.

Keywords: Labour migration, residence duration, repeat migration, discrete-time survival analysis

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1. Introduction

An interesting, but yet largely unstudied question concerns migration behaviour in different labour markets from the point of view of duration. We ask: How long are residence spells of graduating students? Why do some migrate soon after graduating from full-time education, while others stay for a long time? Why some re-migrate quite soon after the initial move? How do personal and household characteristics account for differences in the duration of residence spells and repeat migration? What is the role of labour market conditions and other region-specific factors?¹

The aim of this paper is to study migration behaviour of graduating students in Finland in 1987-2002. Our analysis is based on a Longitudinal Census File and a Longitudinal Employment Statistics File constructed by Statistics Finland. Since 1987, the two basic files are updated annually. These two register-based data sets, together with some other registers, provide panel data on each resident of Finland, from which a 7 percent random sample has been taken for this study. The longitudinal data allow us to observe changes of residence and the length of spells remaining in a new location. The data are very rich including hundreds and hundreds of variables for each year.

Individuals leaving full-time education for the first time in 1987–2001 are selected for the analysis. Their residence spells are followed up to the year of the first move (or until censoring year 2002). That is, a movement is seen as terminating an observed residence spell. This resulted in a sample of 49 599 residence spells from different individuals. The maximum of the observed duration of possibly right-censored residence spells is fifteen years.

To analyze the migration process a discrete-time model of residence duration is specified. Discrete-time model is used, since our duration data are interval censored (grouped) – the status of residence spell is only observed at the end of each year. The duration model allows us to study the role of ‘cumulative inertia’ in migration (Gordon and Molho 1995, Molho 1995, Détang-Dessendre and Molho 1999). That is, to what

¹ Previous evidence on the duration of residence spells that focus on labour migration is limited (see, however, Bailey 1993, Détang-Dessendre and Molho 1999, 2000). See also literature that focuses on housing-related moves as opposed to job-related moves (e.g. Henley 1998, Clark and Davies Withers 1999).

extent the propensity to move falls over the course of a residence spell. One would expect a gradual fall in the migration propensity. Individuals form attachments to home, friends, area etc. grow over time, for example, as their social networks develop. The richness of the data set also makes it possible to capture the impact of a variety of personal, household, labour market and regional covariates on the duration of the residence spell.

In estimation a flexible, semi-parametric specification of the baseline hazard is adopted. Most of the covariates are treated as time-varying, so that their values can change during the residence spell. Differently to Détang-Dessendre and Molho (1999, 2000), we also extend the model to allow for individual-level unobserved heterogeneity, because uncontrolled heterogeneity may lead to inconsistent parameter estimates (Lancaster and Nickell 1980).² We also distinguish between those who moved to a new location during the graduation year and those who did not move.

The rest of the paper is organized as follows. Section 2 discusses the data and methods used in the analysis of migration in the residence duration context. Then life-table estimates and other descriptive results are presented in Section 3. Results of the discrete-time duration analysis are discussed in Section 4. Finally, concluding remarks bring the paper to an end.

2. Data, model and variables

Data

The data are based on a Longitudinal Census File and a Longitudinal Employment Statistics File constructed by Statistics Finland. Since 1987, the two basic files are updated annually until 2002. By matching the unique personal identifiers across the censuses, these panel data sets provide a variety of information on the residents of Finland. In addition, data on spouses can be merged under every individual.

For this study, we have in use a 7 percent random sample of those individuals who resided permanently in Finland in 2001. The sample was further restricted on the

² Omitted variables are an important source of possible unobserved heterogeneity. For example, some individuals may have a greater unobserved ‘taste for mobility’ than others.

following grounds. First, only individuals leaving full-time education in 1987–2001 were selected for analysis. By focusing on individuals leaving full-time education, we are able to distinguish, at least for the most part, labour market moves, which are to our interest, from moves to related acquiring educational qualifications. Second, individual's residence spell was included in the sample only if he or she was aged less than 40 years old when leaving full-time education. For older individuals it would be sometimes difficult to role out prior educational qualifications due to data limitations. Third, only the residence spell after the first full-time education in 1987–2001 was included in the sample. We also excluded spells after matriculation examination (general upper secondary education), because they are clearly intermediate phases to further-education. Finally, those living in the Åland Islands were not included in the sample, as in many other Finnish migration studies. Åland is a small isolated region with only approximately 26 000 inhabitants. It has political autonomy and it differs from the other Finnish regions in numerous ways.

In our panel data the last year of observation is 2002. In consequence, the analysis is based on the inflow samples from fifteen cohorts. The maximum observed duration of a possibly right-censored residence spell is fifteen years. This is a longer period than in previous studies (Bailey 1993, Détang-Dessendre and Molho 1999, 2000). Since an observed residence spell may also start after 1987, some of the spells are right-censored at shorter duration. The sample restricted in this way consists of 49 599 residence spells from different graduates, and resulting in 310 790 spell-year observations.

Model

The main emphasis of this study is to analyse the duration of residence spells and the factors influencing it. According to the human capital theory, job search theory, and utility maximising paradigm individuals choose the region that offers the greatest expected utility (Sjaastad 1962, Seater 1977, Schaeffer 1985). Herein, heterogeneous individuals possess different utility functions, and consequently encounter differences in the net benefits of living in a specific location. The individual's utility is affected by personal, household, labour market and regional factors that include both financial and non-financial items. Migration is supposed to result from variations in individual economic utility in different locations.

In order to model determinants of residence duration, we need a measure for the probability of migration in the next period, given that an individual has been living in current region (survived) up to the current period. If we could observe the exact length of residence spell i , the continuous time hazard of the residence spell at duration time t could be parameterised, for example by using a proportional hazard specification

$$\theta_i(t) = \lambda(t) \cdot \exp[\beta'X_i(t)], \quad (1)$$

where $\lambda(t)$ is a baseline hazard at time t , $X_i(t)$ is a vector of (time-varying) covariates, and β is a vector of unknown parameters to be estimated with Cox regression (see e.g. Wooldridge 2002, Ch. 20).

However, the duration data available to us are interval-censored. The data set contains information on whether or not the person moved during a year between 79 NUTS4-level sub-regions, which broadly correspond to the travel-to-work areas as well.³ However, no information on the precise timing of migration is included, since the status of a residence spell is only observed at the end of each year (maximum of 15 observations per spell). Therefore, the hazard rate of migration requires a discrete-time representation.

Fortunately, a discrete-time model, which is consistent with continuous time model and interval-censored survival data, can be specified (see e.g. Prentice and Gloeckler 1978, Sueyoshi 1995). Suppose that T_i is the actual (unobserved) length of a residence spell. Then the discrete interval hazard rate, the probability of a spell being completed by time $t+1$, given that it was still continuing at time t , can be defined as

$$h_i(t) = \text{prob}(T_i < t+1 | T_i \geq t) = 1 - \exp[-\exp(\beta'X_i(t) + \gamma(t))], \quad t = 1, 2, \dots \quad (2)$$

where $\gamma(t) = \ln \left[\int_t^{t+1} \lambda(u) du \right]$ summarises the pattern of duration dependence in the interval hazards (h_i), and the hazard rate is specified by a complementary log-log distribution (Type I extreme value).⁴ The set of the covariates X is discussed below (Table 1). The discrete-time duration model can be estimated semi-parametrically by

³ Studying migration decisions between the 79 sub-regions enable us to focus on moves motivated by labour market reasons. Migration between municipalities would have most likely reflected housing market and personal life-cycle issues more.

allowing the baseline hazard to vary freely with duration time t (see e.g. Meyer 1990).⁵ That is, the full set of γ 's are estimated by adding an indicator variable per duration time t to the model.⁶

One would expect negative duration dependence in migration behaviour (see Gordon and Molho 1995, Molho 1995, Détang-Dessendre and Molho 1999). The marginal costs and benefits of search may change over the residence spell. Individuals' attachments to their homes, friends, jobs and area of residence grow over time, for example, as their social networks develop. This may lead to a process of 'cumulative inertia', where migration propensity falls over the course of a residence spell. Discrepancies in the cumulative inertia can be studied by allowing the baseline hazard rates (the γ 's) to differ between populations. This is what we have done below.

One of the key assumptions of the model is that all inter-individual heterogeneity is due to observed variables. Some variables could be missing from our duration model. As most other migration studies, we do not have, for example, direct measures for the 'tastes' or motives for mobility. The presence of such individual effects, correlated over time, will result in inconsistent parameter estimates. Therefore, it is important to control for such unobserved characteristics.

We generalize the above model by assuming that the unobserved individual effects, ν_i , are normally distributed with mean zero and variance σ_i^2 .⁷ Then the hazard rate (2) can be re-specified as:

$$h_i(t) = 1 - \exp[-\exp(\beta'X_i(t) + \gamma(t) + \nu_i)], \quad (3)$$

where $\nu_i \sim N(0, \sigma_i^2)$. In this case, there is no convenient closed form expression for the survival function and hence likelihood contributions. Instead, the individual random

⁴ Although the hazard rates are only dependent on variables $X(t)$, the survival rate, and thus the residence duration, is a function of the entire prior time paths of the variables.

⁵ That is, the discrete time duration model corresponds to the continuous time Cox proportional hazards model, but the estimates of the baseline hazard are derived directly as part of the estimation procedure.

⁶ If a constant term is included in X , one of the interval-specific dummy variables needs to be removed from the model specification.

⁷ Alternative specifications for the random effects include Gamma distribution for $\exp(\nu_i)$, as in Meyer (1990), and nonparametric approach of estimating 'mass points', as pioneered by Heckman and Singer (1984).

effects must be integrated out numerically during the maximum likelihood estimation.⁸ Significance of the unobserved individual effects can be tested easily with a likelihood ratio test that compares equation (2) with (3). The null hypothesis is that the proportion of the total variance contributed by the individual-specific variance component, $\rho = \frac{\sigma_v^2}{\sigma_v^2 + \sigma_\varepsilon^2}$, is equal to zero, where σ_ε^2 is the variance of the i.i.d. extreme-value distributed error term, ε_{it} .⁹

Variables

Table 1 compiles the explanatory variables X , their definitions and means by migration status. Hypothesis related to these variables are briefly discussed below. For convenience, the variables have been grouped into personal and household characteristics, labour market experience and regional-specific factors, most of which are treated as time-varying. All measurements of the explanatory variables relate the year before the decision to move is taken, so that the consequences of migration are not confused with causes of migration. Situation immediately prior to migration is also likely to carry more weight in the individual's prediction of the future than that related to the distant past.

Literature on the macroeconomic influences on migration has shown that regional mobility in the economy tend to be pro-cyclical.¹⁰ Reflecting the availability of the jobs, migration rates are high at the peak of the business cycle and are low during the recession. In a period of high unemployment, the potential migrant is faced with a greater uncertainty of getting a job at the destination and a lower rate of return from migration. Accordingly, the equilibrating role of migration is reduced during recessions. Therefore, year dummies (y_j) are used to capture the expected pro-cyclical changes in the migration propensity. As discussed above, duration dependence in the migration rates is captured with residence duration dummies (d_t), one for each year.

⁸ Guidelines for practical implementation are given, for example, in Jenkins (1995) and Stata Press (2005).

⁹ For identification we impose the usual normalisation on the variance: $\sigma_\varepsilon^2 = \pi^2 / 6$.

¹⁰ See Milne (1993) for survey of literature on macroeconomic influences on migration and for evidence for Canada; see also Hacker (2000) for evidence for U. S. and Pekkala and Tervo (2002) for Finland.

Table 1. Description of covariates and their mean values by migration status

| Covariate | Description | Mean | | |
|-----------------------------------|--|---------|----------|--------|
| | | Stayers | Migrants | All |
| <i>Personal characteristics</i> | | | | |
| Female | 1 if female, 0 if male | 0.503 | 0.541 | 0.505 |
| Age [†] | Age in years | 26.837 | 24.663 | 26.725 |
| Age2 [†] | Age squared divided by 100 | 7.556 | 6.279 | 7.491 |
| <i>Level of education</i> | | | | |
| Secondary educ. [†] | 1 if secondary level education, 0 otherwise (ref. category) | 0.579 | 0.522 | 0.576 |
| Lowest upper educ. [†] | 1 if lowest level tertiary education, 0 otherwise | 0.234 | 0.230 | 0.233 |
| Low upper educ. [†] | 1 if lower-degree level tertiary education, 0 otherwise | 0.061 | 0.090 | 0.062 |
| Higher upper educ. [†] | 1 if higher-degree level tertiary educ. or doctorate degree, 0 otherwise | 0.127 | 0.158 | 0.128 |
| <i>Field of education</i> | | | | |
| Humanities [†] | 1 if field of education is humanities or arts, 0 otherwise | 0.040 | 0.062 | 0.041 |
| Trade [†] | 1 if field of education is business or social sciences, 0 otherwise | 0.224 | 0.208 | 0.223 |
| Technical [†] | 1 if field of education is technology or natural sciences, 0 otherwise (ref. category) | 0.369 | 0.320 | 0.367 |
| Agriculture [†] | 1 if field of education is agriculture or forestry, 0 otherwise | 0.045 | 0.045 | 0.045 |
| Health [†] | 1 if field of education is health or welfare, 0 otherwise | 0.136 | 0.156 | 0.137 |
| Services [†] | 1 if field of education is services, 0 otherwise | 0.156 | 0.172 | 0.157 |
| Other educ. [†] | 1 if field of education is teacher education or educational science, or not known, 0 otherwise | 0.031 | 0.038 | 0.031 |
| Re-educated [†] | 1 if has graduated from another full-time education, 0 otherwise | 0.032 | 0.051 | 0.033 |
| <i>Household characteristics</i> | | | | |
| Married [†] | 1 if married or cohabiting, 0 otherwise | 0.537 | 0.336 | 0.526 |
| Sp. empl. [†] | 1 if spouse is employed, 0 otherwise | 0.357 | 0.170 | 0.348 |
| No children [†] | 1 if no children under 18 years in the family, 0 otherwise (ref. category) | 0.704 | 0.856 | 0.712 |
| All children under 7 [†] | 1 if all children under 7 years, 0 otherwise | 0.195 | 0.114 | 0.191 |
| School-aged children [†] | 1 if 7-18-year-old children in the family, 0 otherwise | 0.101 | 0.030 | 0.097 |
| House-owner [†] | 1 if owner-occupier of a house, 0 otherwise | 0.326 | 0.344 | 0.327 |
| Flat-owner [†] | 1 if owner-occupier of a flat as a shareholder in a housing corporation, 0 otherwise | 0.260 | 0.186 | 0.257 |

Table 1. (continued)

| Covariate | Description | Mean | | |
|--------------------------------------|---|---------|----------|---------|
| | | Stayers | Migrants | All |
| <i>Labour market characteristics</i> | | | | |
| Employed [†] | 1 if employed during the last week of a year, 0 otherwise (ref. category) | 0.665 | 0.527 | 0.658 |
| Unempl. [†] | 1 if unemployed during the last week of a year, 0 otherwise | 0.151 | 0.196 | 0.153 |
| Student [†] | 1 if student during the last week of a year, 0 otherwise | 0.098 | 0.196 | 0.103 |
| Other activity [†] | 1 if in military service, retired or activity unknown during the last week of a year, 0 otherwise | 0.086 | 0.082 | 0.086 |
| Months employed [†] | Number of months employed | 7.392 | 5.719 | 7.306 |
| Earnings [†] | Annual earnings subject to state taxation, 10 000 € | 1.477 | 1.090 | 1.457 |
| Sp. income [†] | Annual labour income of spouse, 10 000 € | 0.807 | 0.393 | 0.786 |
| Commuting [†] | 1 if commuting from the municipality of residence during the last week of a year, 0 otherwise | 0.212 | 0.235 | 0.213 |
| Premigr | 1 if moved to another region during the graduation year, 0 otherwise | 0.097 | 0.184 | 0.101 |
| <i>IV Region-specific factors</i> | | | | |
| Helsinki | 1 if living in the Helsinki metropolitan area, 0 otherwise | 0.281 | 0.150 | 0.274 |
| University region | 1 if living in the regional centre where a university is located, excluding Helsinki metropolitan area, 0 otherwise | 0.217 | 0.192 | 0.215 |
| Urban | 1 if living in a urban municipality (see definition in the text), 0 otherwise | 0.652 | 0.555 | 0.647 |
| Unempl. rate [†] | Unemployment rate in the travel-to-work area, % | 15.186 | 16.227 | 15.240 |
| Share of agriculture [†] | Share of employed labour force in agriculture and forestry (0 = 0–9.99%, 1 = 10–19.99 %, 2 = 20–29.99 %, ...) | 0.315 | 0.511 | 0.325 |
| Share of industry [†] | Share of employed labour force in industry (0 = 0–9.99%, 1 = 10–19.99 %, 2 = 20–29.99 %, ...) | 2.138 | 2.263 | 2.145 |
| Number of observations (spell-years) | | 294 792 | 15 998 | 310 790 |

Notes: The number of residence spells (individuals) is 49 599. All variables are measured on a year before decision to move is made. Duration and year dummies are also used: $d_t = 1$, if duration time is t , 0 otherwise; $y_j = 1$, if year is j , 0 otherwise. [†] Time-varying covariate.

In this paper we are interested in the duration of residence spells after graduation from full-time education. However, a significant proportion of the graduates (12.3 %) moved during the graduation year. We also know that those who have moved before are much more likely to move again (see e.g. DaVanzo 1983, Bailey 1993). We will control for this with an indicator variable (*pre migr*), which is equal to 1, if the person moved during the graduation year, 0 otherwise. For those who moved to a new location (*pre migr* = 1), the length of the residence spell is expected to be shorter because they are likely to be less attached to the new location. In this case movement can be seen as terminating the observed residence spell with *repeat* migration decision. To test for differences in the determinants of residence duration between the two groups, we will interact explanatory variables and duration-time dummies with this variable.

Personal characteristics. Apart from very young individuals, propensity to move is expected to diminish with age. The older the migrant, the fewer will be the years of payoff from the human capital investment in migration (Sjaastad 1962). In addition, young people are usually less experienced decision makers, may be less informed about opportunities in alternative location, and may process information less efficiently (DaVanzo 1983). Prior evidence for Finland suggests that migration intensity starts to drop after the ages of 25 to 30 years (Haapanen 1998). To capture the nonlinearities in the effect of age on the hazard rates of migration, age is also squared in our model.

The analysis of the effects of educational attainment on migratory behaviour is quite extensive (see e.g. Antolin and Bover 1997, Ritsilä and Ovaskainen 2001, Ritsilä and Haapanen 2003). The overall finding of these studies is that educational attainment increases the likelihood of migration. Education is general human capital, which creates employment opportunities and which is easily transferable to different locations. Thus higher levels of education may reduce the risks associated with migration (Shields and Shields 1989). The spatial distribution of job openings is likely to differ from the spatial distribution of individuals graduating from different fields of education. Therefore, we control for the field of education with seven dummy variables, technical education being the reference category. We also control for the possibility that the individuals will go to further-education later during the residence spell. Such individuals are expected to have a higher propensity to move than graduates in general. After controlling for other factors, we would not expect gender to be a significant determining factor for migration.

Household characteristics. The costs and benefits of migration are likely to depend on family and housing characteristics. Besides direct effects, being married and having children may indicate existence of additional local household ties (Mincer 1978). The propensity to move is expected to diminish especially if any of the children are at school or spouse is employed (Nivalainen 2004, Haapanen and Ritsilä 2006). Previous studies also clearly show that home-owners have a low propensity to move (Henley 1998, Tervo 2000, Ritsilä and Ovaskainen 2001). Our data set allows us to distinguish between house- and flat-owners. Our hypothesis is that owning a house ties the graduate more than owning a flat, because of the greater liquidity constraints and non-pecuniary costs of moving.

Labour market experience. Personal unemployment may encourage migration as a result of job seeking (Pissarides and Wadsworth 1989, Kauhanen and Tervo 2002). Students are expected to show a greater propensity to move than employed persons. We also control for the number of employment months because migration propensity is likely to decrease with work experience. A negative association is expected between wealth and migration: the lower the earnings, the lower the opportunity costs of moving (see e.g. Haapanen and Ritsilä 2006). Our measures of wealth are individual's annual earnings subject to state taxation and spouse's labour income. Commuting is also likely to increase the likelihood of migration and thus shorten the duration of the residence spell (Romani *et al.* 2003).

Region-specific factors. The labour market characteristics of the region of origin play a crucial role in migration decisions (Knapp *et al.* 2001; see also Greenwood 1985, for a survey). Living in Helsinki metropolitan area or in some other growth-centre (university) regions is expected to reduce migration rate, since they offer better job opportunities (Ritsilä and Haapanen 2003). A high proportion of service workers reflects local amenities and is likely to discourage migration, and vice versa (cf. Nivalainen 2004). In addition, the Finnish industrial structure has been shifting from primary and industrial sectors to services that are in many cases located in different areas. Therefore, we would expect that the higher is the share of agriculture or industry, the shorter the residence spells will be.

As with personal unemployment, high regional unemployment may encourage migration. If the local unemployment rate is high, the propensity to move is likely to be

high as well, since the probability of job placement in the home area is then low (Tervo 2000). Individuals living in rural areas are expected have a higher likelihood of migration than individuals living in urban areas (Axelsson and Westerlund 1998). Our classification of Finnish municipalities into urban and rural is based both on the degree of urbanisation of the municipality and on the population of the largest urban settlement; see Statistics Finland (2001).¹¹

3. Life-table estimates

Before discussing the estimation results of our residence duration models, it is useful to take a look at some descriptive statistics on the graduates in Finland. Table 2 shows first the number of residence spells started in 1987–2001, and then followed by the proportions of migrating next year and surviving to the end of 2002 for each cohort. The figures have been given separately for those who moved to a new region during the graduation year (pre migr = 1) and are considering re-migration, and for those who did not move during the graduation year (pre migr = 0).

As expected, migration propensity is much higher for those who moved to a new region during the graduation year. For example, on average 8.7 percent of those who did not move during the graduation year migrated on the following year. The corresponding figure for those considering re-migration is 17.5 percent. A similar pattern emerges from the proportion of individuals who are still living in the region in 2002 where they graduated. We can see, for example, that of those, who did not move (moved) during the graduation year 1987, approximately 64.1 (41.5) percent survived to the end of 2002. In accordance with prior evidence, Table 2 also shows that migration rates respond pro-cyclically to business cycles. Deep recession of the Finnish economy in 1990–1993 resulted in a notable downward trend in migration intensity. The migration rates have increased markedly in recent years as the Finnish unemployment rate has dropped.

¹¹ Urban areas consist of municipalities in which at least 90 percent of the population live in urban settlements or in which the population of the largest urban settlement is at least 15 000. An urban settlement refers to a cluster of buildings which are less than 200 metres apart from each other and which together house at least 200 people.

Table 2. Descriptive statistics of residence spells by migration status on the graduation year

| Graduate in | Premigr = 0 | | | Premigr = 1 | | | Unempl. rate in Finland |
|-------------|------------------|----------------------|------------------------|------------------|----------------------|------------------------|-------------------------|
| | Number of spells | Migrate next year, % | Stay to end of 2002, % | Number of spells | Migrate next year, % | Stay to end of 2002, % | |
| 1987 | 2874 | 7.90 | 64.09 | 465 | 17.63 | 41.51 | 5.12 |
| 1988 | 2778 | 9.50 | 63.50 | 410 | 15.85 | 49.27 | 4.55 |
| 1989 | 2815 | 8.81 | 64.40 | 406 | 17.49 | 44.33 | 3.12 |
| 1990 | 2934 | 8.01 | 64.86 | 429 | 11.42 | 48.02 | 3.17 |
| 1991 | 2828 | 7.74 | 64.75 | 405 | 12.35 | 45.43 | 6.65 |
| 1992 | 2980 | 6.78 | 63.56 | 346 | 16.47 | 45.66 | 11.74 |
| 1993 | 3247 | 7.55 | 64.24 | 343 | 15.45 | 44.61 | 16.39 |
| 1994 | 3051 | 8.55 | 66.01 | 352 | 20.74 | 40.91 | 16.62 |
| 1995 | 3122 | 8.30 | 68.61 | 384 | 19.79 | 42.45 | 15.45 |
| 1996 | 3013 | 9.33 | 68.01 | 384 | 20.57 | 44.27 | 14.61 |
| 1997 | 2823 | 9.99 | 71.24 | 420 | 20.71 | 50.71 | 12.70 |
| 1998 | 2816 | 9.13 | 75.60 | 423 | 19.86 | 53.19 | 11.43 |
| 1999 | 2750 | 9.16 | 79.89 | 431 | 14.39 | 66.13 | 10.26 |
| 2000 | 2667 | 9.04 | 85.08 | 448 | 20.98 | 69.20 | 9.83 |
| 2001 | 2792 | 10.60 | 89.40 | 463 | 19.01 | 80.99 | 9.15 |
| All spells | 43490 | 8.67 | 93.22 | 6109 | 17.52 | 51.74 | – |

Notes: Premigr = 1, if individual moved to another region during the graduation year, 0 otherwise. Source for the aggregate unemployment rate is the Labour Force Survey of Statistics Finland.

Table 3 presents life-table estimates of residence survival rates and hazard rates of migration by migration status on the graduation year. As discussed above, the hazard rate is defined as the probability that a move will occur in the current year, given that no movement occurred up to beginning of that year. Survival rate gives the estimated probability of staying in the current region until time t after graduating from the full-time education, or $prob(T_i \geq t)$.

On average, the hazard rate of migration is around 10 percent in the first year of residence spell. The hazard rates decrease significantly as residence spells get longer, falling to only 1–2 percent during the last interval. This suggests there is cumulative inertia in the residence spells. Note that during the first years of residence spell, the hazard rates drop faster for those who consider repeat migration (pre migr = 1). Nevertheless, they remain on a higher level during the latter intervals than the hazard rates of those who did not move during the graduation year (pre migr = 0).

A comparison of the estimated survival functions indicates a statistical difference between the two groups. The observed level of significance for the Log-rank test is less than 0.001, leading us to reject the null hypothesis that the survival functions do not differ.¹² A comparison of the median survival time (residence duration) also shows considerable differences. An estimate of the median duration of residence spell is 7 years for those who consider repeat migration. It implies that half of those who moved during the graduation year move again within 7 years. The corresponding figure for those who did not move during the graduation year is over 15 years.

Table 3. Life-table estimates of residence duration by migration status on the graduation year

| Interval (years) | Premigr = 0 | | | Premigr = 1 | | |
|---------------------|-------------------|---------------------|-------------------|-------------------|---------------------|-------------------|
| | Number of obs. | Survival rate, % | Hazard rate, % | Number of obs. | Survival rate, % | Hazard rate, % |
| 1 | 43490 | 91.33 | 8.67 | 6109 | 82.48 | 17.52 |
| 2 | 37225 | 85.61 | 6.27 | 4664 | 71.63 | 13.16 |
| 3 | 32623 | 81.22 | 5.13 | 3740 | 63.54 | 11.28 |
| 4 | 28754 | 77.46 | 4.63 | 3033 | 58.26 | 8.31 |
| 5 | 25293 | 74.12 | 4.32 | 2556 | 54.18 | 7.00 |
| 6 | 22190 | 71.27 | 3.84 | 2164 | 51.53 | 4.90 |
| 7 | 19288 | 69.15 | 2.97 | 1888 | 48.80 | 5.30 |
| 8 | 16573 | 67.20 | 2.82 | 1625 | 47.15 | 3.38 |
| 9 | 14092 | 65.64 | 2.33 | 1426 | 45.46 | 3.58 |
| 10 | 11678 | 64.21 | 2.18 | 1222 | 44.31 | 2.54 |
| 11 | 9530 | 63.04 | 1.82 | 1033 | 43.28 | 2.32 |
| 12 | 7526 | 62.28 | 1.21 | 825 | 42.13 | 2.67 |
| 13 | 5532 | 61.58 | 1.12 | 597 | 41.28 | 2.01 |
| 14 | 3657 | 60.93 | 1.07 | 405 | 40.77 | 1.23 |
| 15 | 1854 | 60.53 | 0.65 | 198 | 39.74 | 2.53 |

Notes: Premigr = 1, if individual moved to another region during the graduation year, 0 otherwise. Estimated median of the residence duration is 7 (over 15) years for those who migrated (did not migrate) during the graduation year. Log-rank test for the equality of the survivor functions: $\chi^2 = 1090.2$ with d.f. = 1 (p-value < 0.001).

¹² The same result was also obtained with Wilcoxon test.

4. The determinants of residence duration

Estimation results obtained from the discrete-time hazards models are presented next. Table 4 displays the parameter estimates of residence duration model with unobserved heterogeneity; see also eq. (3). For comparison, the estimation results without the unobserved effects are given in Appendix.¹³ Looking at the diagnostics reported in Table 4, we can see that the individual-specific variance component, ρ , is estimated to be 0.031.¹⁴ The p-value for the likelihood ratio test is virtually zero, indicating that the null hypothesis of no individual-level unobserved effects is rejected. Thus, the specification in Table 4 is preferred and the interpretation of the results will be based on it. At the same time, the results seem to be robust to the specification.

All the explanatory variables (X) and duration-time dummies have been interacted with migration status on the graduation year (pre migr). Column ‘Direct effect’ gives the parameter estimate for those graduates that did not move during the graduation year. A variable with a positive coefficient is associated with an increased hazard rate of migration and a decreased survival time (and residence duration), while a variable with a negative coefficient is associated with a decreased hazard rate and an increased survival time. Column ‘Interact. with pre migr’ shows the difference between parameter estimates of those who moved and who did not move to a new region during the graduation year. For example, a positive interaction term implies that the hazard rate of migration is higher for those who moved during the graduation year and thus consider repeat migration. Before presenting our conclusions on how migration intensity responds to the duration of residence spell, we briefly discuss other results.

¹³ Year dummies were not interacted because all interaction terms turned out to be insignificant. Simpler specifications were also tried, but they were clearly rejected.

¹⁴ That is, about 3 percent of the variability in the hazard rates of migration is at the individual level.

Table 4. Parameter estimates of discrete-time duration model with unobserved heterogeneity

| Covariate | Estimate (standard error) | | | |
|----------------------------------|---------------------------|---------|------------------------|---------|
| | Direct effect | | Interact. with premigr | |
| <i>Personal characteristics</i> | | | | |
| Female | 0.148** | (0.022) | -0.218** | (0.051) |
| Age | 0.348** | (0.020) | -0.368** | (0.046) |
| Age2 | -0.644** | (0.035) | 0.641** | (0.083) |
| Lowest upp. educ. | 0.316** | (0.028) | -0.204** | (0.065) |
| Low upp. educ. | 0.603** | (0.039) | -0.403** | (0.084) |
| Higher upp. educ. | 0.911** | (0.040) | -0.585** | (0.084) |
| Humanities | 0.285** | (0.044) | -0.162 | (0.093) |
| Trade | 0.024 | (0.030) | 0.064 | (0.069) |
| Agriculture | -0.057 | (0.044) | 0.216 | (0.116) |
| Health | 0.345** | (0.033) | -0.185* | (0.073) |
| Services | 0.199** | (0.030) | -0.063 | (0.070) |
| Other educ. | 0.101 | (0.058) | -0.162 | (0.107) |
| Re-educated | 0.377** | (0.040) | -0.137 | (0.139) |
| <i>Household characteristics</i> | | | | |
| Married | -0.320** | (0.032) | 0.121 | (0.062) |
| Sp. empl. | -0.455** | (0.039) | 0.209** | (0.071) |
| All children under 7 | -0.172** | (0.037) | 0.255** | (0.070) |
| School-aged children | -0.381** | (0.062) | 0.149 | (0.139) |
| House-owner | -0.213** | (0.023) | -0.356** | (0.075) |
| Flat-owner | -0.209** | (0.025) | -0.084 | (0.057) |
| <i>Labour market experience</i> | | | | |
| Unempl. | 0.340** | (0.031) | -0.027 | (0.073) |
| Student | 0.608** | (0.032) | -0.301** | (0.075) |
| Other activity | 0.220** | (0.040) | -0.128 | (0.101) |
| Months employed | -0.011** | (0.003) | -0.011 | (0.007) |
| Earnings | -0.114** | (0.016) | 0.095** | (0.032) |
| Sp. income | -0.098** | (0.017) | 0.070* | (0.032) |
| Commuting | 0.734** | (0.027) | -0.412** | (0.066) |
| Comm.×Helsinki | -0.203** | (0.057) | 0.220 | (0.115) |
| <i>Region-specific factors</i> | | | | |
| Helsinki | -0.575** | (0.046) | 0.372** | (0.089) |
| Univ. region | -0.222** | (0.028) | 0.005 | (0.061) |
| Urban | -0.113** | (0.024) | 0.047 | (0.060) |
| Unempl. rate | 0.032** | (0.003) | -0.003 | (0.004) |
| Share of agric. | 0.210** | (0.016) | -0.065 | (0.042) |
| Share of industry | 0.051** | (0.015) | 0.072* | (0.033) |

Table 4. (Continued)

| Covariate | Estimate (standard error) | |
|---|-----------------------------------|------------------------|
| | Direct effect | Interact. with premigr |
| <i>Duration & year dummies (ref. year = 1988)</i> | | |
| d_1 | -7.552** (0.271) | 5.931** (0.637) |
| d_2 | -7.772** (0.275) | 6.026** (0.645) |
| d_3 | -7.940** (0.278) | 6.138** (0.653) |
| d_4 | -8.014** (0.281) | 5.976** (0.659) |
| d_5 | -8.060** (0.283) | 5.911** (0.665) |
| d_6 | -8.147** (0.285) | 5.684** (0.670) |
| d_7 | -8.369** (0.288) | 6.025** (0.671) |
| d_8 | -8.376** (0.289) | 5.605** (0.676) |
| d_9 | -8.490** (0.291) | 5.842** (0.676) |
| d_{10} | -8.470** (0.293) | 5.532** (0.683) |
| d_{11} | -8.576** (0.296) | 5.581** (0.688) |
| d_{12} | -8.863** (0.304) | 6.076** (0.689) |
| d_{13} | -8.840** (0.311) | 5.814** (0.714) |
| d_{14} | -8.811** (0.326) | 5.355** (0.788) |
| d_{15} | -9.192** (0.404) | 6.519** (0.819) |
| y_{1989} | 0.126 (0.073) | |
| y_{1990} | 0.048 (0.071) | |
| y_{1991} | -0.010 (0.070) | |
| y_{1992} | -0.438** (0.071) | |
| y_{1993} | -0.569** (0.075) | |
| y_{1994} | -0.547** (0.078) | |
| y_{1995} | -0.324** (0.074) | |
| y_{1996} | -0.301** (0.074) | |
| y_{1997} | -0.263** (0.073) | |
| y_{1998} | -0.070 (0.070) | |
| y_{1999} | -0.003 (0.069) | |
| y_{2000} | 0.007 (0.069) | |
| y_{2001} | 0.105 (0.068) | |
| y_{2002} | 0.077 (0.068) | |
| σ_v | 0.232 (0.0014) | |
| ρ | 0.031 (0.0003) | |
| Log-likelihood | -55 412.49 | |
| LR-test for random effects | Chi-sq. (1) = 1398.66 (p < 0.001) | |

Notes: Number of observations = 310 790. Variable definitions are given in Table 1. * (**) = Statistically significant at the 0.05 (0.01) level. Null hypothesis of the LR-test for random effects is: $\rho = 0$.

Personal characteristics. Age has a nonlinear effect on the residence duration for those who did not move during the graduation year. The parameter estimates suggest that hazard rates of migration are highest when the individual is around 27 years old. The propensity to move diminishes significantly after that. For those who have migrated during the graduation year, age does not seem to be a determining factor for repeat migration. The result is consistent with DaVanzo (1983). As hypothesized, hazard rates of migration increase with the level of education. The positive relationship is stronger for those moving for the first time. Nevertheless, highly educated individuals are more likely to re-migrate than less educated individuals. Field of education has also some impact on the duration of residence spell. Hazard rates of migration are increased if an individual graduates from further-education during the residence spell. Somewhat surprisingly, women have a shorter residence spells if they have not migrated during the graduation year, whereas men are more likely to re-migrate than women. Reason for these results may be that the gender correlates with some unobserved characteristics, which effect migration decisions, rather than the gender *per se*.

Household characteristics. The impact of marital status on migration seems to be closely related to spouse's employment status, and thus to attachment to the local labour market. An employed spouse significantly reduces the likelihood of moving. On the contrary, a non-employed spouse may even increase the likelihood of moving (cf. Haapanen and Ritsilä 2006). Having school-aged children significantly increases the duration of residence spell (see also Nivalainen 2004). On the other hand, having only under school-aged children may even increase the likelihood of re-migration. Home-owning status significantly reduces the likelihood of migration. As expected, house-owners are especially reluctant to re-migrate. As a whole, the results clearly indicate the deterring effect of household ties on the propensity to move.

Labour market experience. Our estimation results imply that unemployed and students are significantly more likely to move than employed persons. Furthermore, the duration of residence spell increases significantly with months employed but the impact is fairly small. Note also that individuals further-educating themselves are more likely to move than unemployed individuals. For those who have previously moved, the hazard rates of migration are, however, similar. The results also indicate that the higher the individual's earnings or his/her spouses, the less likely she or he is to move. Though, the impact of

wealth on repeat migration is insignificant. As expected, commuting is associated with a significantly higher probability of moving. Incentives for moving seem to be smaller for commuters living in the Helsinki Metropolitan area and those who have migrated during the graduation year.

Regional specific factors. Those graduates living in Helsinki Metropolitan area, university centres and urban municipalities are less likely to move. Regional unemployment rate has a significant but small negative effect on the residence duration (cf. Tervo 2000). In addition, a higher share of service workers in the home region significantly deters migration, and a higher share of primary or industrial workers enhances the likelihood of moving. Thus our results add to the prior evidence that the labour force is moving from declining regions of high unemployment to expanding regions in Finland (see e.g. Ritsilä and Haapanen 2003). Finally, note that year dummies in Table 4 confirm the descriptive results of Section 3. The hazard rates of migration indeed respond pro-cyclically upon trends in the economy.

Turning now to our main question, what is the effect of residence duration on the migration propensity? The preceding descriptive analysis based on follow-up life-tables suggested that hazard rates of migration decrease substantially with the residence duration. Table 4 allows us to investigate whether this finding still holds after other factors have been controlled for. We have predicted hazard rates of migration for a typical graduate¹⁵ from full-time education (Figure 1). The *ceteris paribus* predictions are in line with the descriptive analysis. Firstly, we can see that the longer the individual stays in a region the smaller are the hazard rates of migration (negative duration dependence). Thus, we found evidence in support of the cumulative inertia in the residence decisions in Finland. Secondly, in the first years of residence spell the hazard rates are much higher for those who have migrated during the graduation year and thus considering whether or not to move again. Finally, note that the hazard rates drop faster

¹⁵ Hazard and survival rates have been predicted using parameter estimates in Table 4 and sample mode values for categorical variables and median values for continuous variables. That is, the individual is a 26-year-old woman with secondary level education from technology or natural sciences. She has not graduated from another full-time education during the residence spell. She is married without children or working spouse. She does not own a house or a flat. She was employed during last week of the year, working nine months with annual earnings of 12 400 € She is not commuting and her husband does not have income. She is living in an urban area outside university centres, where the regional unemployment rate is 15.2%, share of agriculture is 0–9.99 % and share of industry is 20–29.99 %. She is deciding whether or not to move in 2002.

for those who consider repeat migration. In fact, no statistical significance between the two groups is found in the latter intervals.

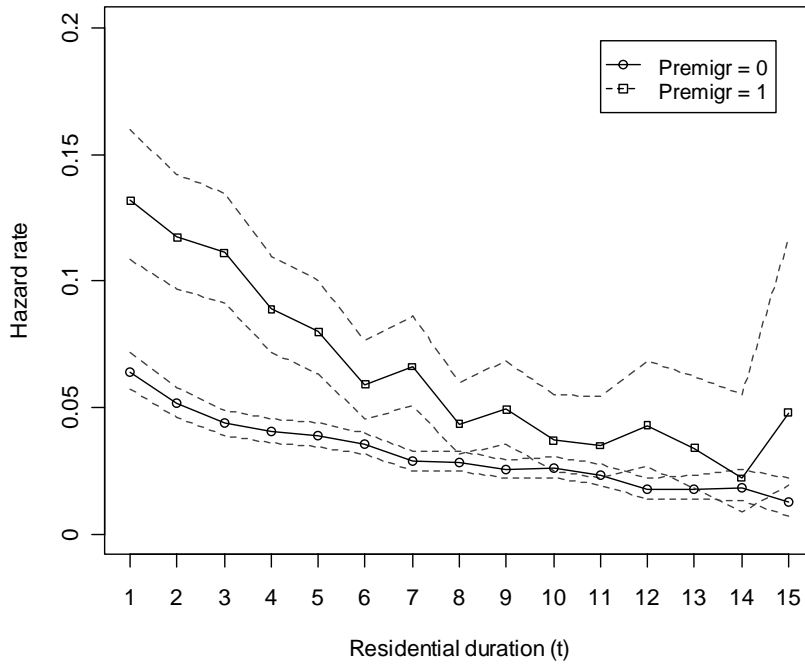


Figure 1. Predicted migration rates with 95 % confidence intervals (Table 4)

Figure 2 shows the corresponding predicted survival probabilities at each residence duration time for the two samples. For example, for those who did not move during the graduation year, the percentage of graduates still staying in the region after 5 years is about 76 %. The figure for those who moved during the graduation year, and consider repeat migration, is significantly lower (54 %).

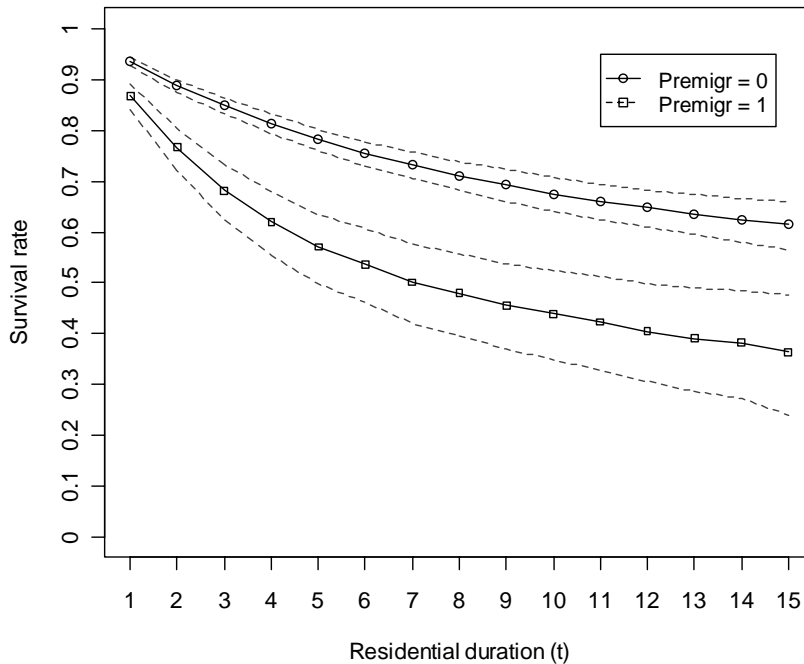


Figure 2. Predicted survival rates with 95 % confidence intervals (Table 4)

5. Conclusion

The aim of this paper was to analyze migration behaviour and the duration of residence spells of graduating students in Finland. Residence spells after leaving the first full-time education in 1987–2001 were selected for the analysis. The residence spells were followed up to the year of the first migration. We also distinguished between those who moved to a new location during the graduation year and those who did not move. The duration of residence spells were estimated with semi-parametric baseline hazard that allowed for individual-level unobserved heterogeneity.

Our analysis affirmed the importance of residence duration as an important determinant of migration in Finland. First, our results showed that, *ceteris paribus*, the hazard rates of migration depend upon the cyclical trends in the economy. Second, we found evidence in favour of cumulative inertia in the residence decisions in Finland. That is, the longer person stays in a region the smaller are the hazard rates of migration. Third, the hazard rates are much higher for those who have moved during the graduation year (i.e considering repeat migration) compared to those who did not move.

Appendix

Table A1. Parameter estimates of discrete-time duration model without unobserved heterogeneity

| Covariate | Estimate (standard error) | | | |
|----------------------------------|---------------------------|---------|------------------------|---------|
| | Direct effect | | Interact. with premigr | |
| <i>Personal characteristics</i> | | | | |
| Female | 0.146** | (0.023) | -0.217** | (0.050) |
| Age | 0.345** | (0.023) | -0.364** | (0.047) |
| Age2 | -0.637** | (0.043) | 0.632** | (0.084) |
| Lowest upp. educ. | 0.315** | (0.029) | -0.197** | (0.064) |
| Low upp. educ. | 0.600** | (0.039) | -0.402** | (0.082) |
| Higher upp. educ. | 0.896** | (0.041) | -0.555** | (0.082) |
| Humanities | 0.282** | (0.045) | -0.156 | (0.092) |
| Trade | 0.026 | (0.031) | 0.060 | (0.068) |
| Agriculture | -0.057 | (0.044) | 0.211 | (0.118) |
| Health | 0.342** | (0.034) | -0.172* | (0.073) |
| Services | 0.202** | (0.030) | -0.065 | (0.070) |
| Other educ. | 0.102 | (0.060) | -0.161 | (0.108) |
| Re-educated | 0.386** | (0.040) | -0.148 | (0.139) |
| <i>Household characteristics</i> | | | | |
| Married | -0.326** | (0.033) | 0.128* | (0.063) |
| Sp. empl. | -0.452** | (0.040) | 0.199** | (0.072) |
| All children under 7 | -0.174** | (0.037) | 0.258** | (0.071) |
| School-aged children | -0.372** | (0.063) | 0.138 | (0.139) |
| House-owner | -0.211** | (0.022) | -0.355** | (0.075) |
| Flat-owner | -0.207** | (0.025) | -0.087 | (0.056) |
| <i>Labour market experience</i> | | | | |
| Unempl. | 0.340** | (0.032) | -0.028 | (0.074) |
| Student | 0.613** | (0.032) | -0.299** | (0.074) |
| Other activity | 0.219** | (0.041) | -0.130 | (0.102) |
| Months employed | -0.011** | (0.003) | -0.010 | (0.007) |
| Earnings | -0.113** | (0.017) | 0.087** | (0.031) |
| Sp. income | -0.094** | (0.019) | 0.064 | (0.033) |
| Commuting | 0.735** | (0.027) | -0.409** | (0.066) |
| Comm.×Helsinki | -0.209** | (0.058) | 0.223 | (0.115) |
| <i>Region-specific factors</i> | | | | |
| Helsinki | -0.550** | (0.049) | 0.338** | (0.092) |
| Univ. region | -0.225** | (0.028) | 0.010 | (0.060) |
| Urban | -0.114** | (0.024) | 0.051 | (0.061) |
| Unempl. rate | 0.032** | (0.003) | -0.003 | (0.004) |
| Share of agric. | 0.215** | (0.015) | -0.073 | (0.042) |
| Share of industry | 0.048** | (0.015) | 0.081* | (0.033) |

Table 4. (Continued)

| Covariate | Estimate (standard error) | |
|---|---------------------------|------------------------|
| | Direct effect | Interact. with premigr |
| <i>Duration & year dummies (ref. year = 1988)</i> | | |
| d_1 | -7.512** (0.303) | 5.878** (0.642) |
| d_2 | -7.743** (0.307) | 5.978** (0.650) |
| d_3 | -7.920** (0.311) | 6.097** (0.657) |
| d_4 | -7.999** (0.313) | 5.941** (0.664) |
| d_5 | -8.049** (0.315) | 5.879** (0.669) |
| d_6 | -8.138** (0.316) | 5.656** (0.676) |
| d_7 | -8.364** (0.319) | 6.001** (0.679) |
| d_8 | -8.372** (0.320) | 5.582** (0.681) |
| d_9 | -8.489** (0.321) | 5.826** (0.683) |
| d_{10} | -8.472** (0.322) | 5.520** (0.691) |
| d_{11} | -8.581** (0.328) | 5.574** (0.699) |
| d_{12} | -8.871** (0.332) | 6.073** (0.692) |
| d_{13} | -8.852** (0.341) | 5.817** (0.728) |
| d_{14} | -8.825** (0.356) | 5.364** (0.799) |
| d_{15} | -9.217** (0.423) | 6.528** (0.813) |
| y_{1989} | 0.127 (0.072) | |
| y_{1990} | 0.049 (0.071) | |
| y_{1991} | -0.008 (0.069) | |
| y_{1992} | -0.437** (0.071) | |
| y_{1993} | -0.569** (0.075) | |
| y_{1994} | -0.547** (0.077) | |
| y_{1995} | -0.325** (0.074) | |
| y_{1996} | -0.303** (0.073) | |
| y_{1997} | -0.266** (0.073) | |
| y_{1998} | -0.074 (0.070) | |
| y_{1999} | -0.007 (0.069) | |
| y_{2000} | 0.002 (0.068) | |
| y_{2001} | 0.102 (0.067) | |
| y_{2002} | 0.083 (0.068) | |
| Log-likelihood | -56 111.82 | |

Notes: Standard errors have been adjusted for clustering at the individual level. Number of observations = 310 790. Variable definitions are given in Table 1. * (**) = Statistically significant at the 0.05 (0.01) level.

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