

Middeldorp, Marten

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## Job access and the labor market entry and spatial mobility trajectories of higher education graduates in the Netherlands

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# **Job access, spatial mobility and early career success**

*Evidence on Dutch higher education graduates using sequence analysis*

**Marten M. Middeldorp**

Department of Economic Geography, Faculty of Spatial Sciences, University of Groningen

**Abstract** Spatial mobility can be instrumental in offsetting the negative effects of a lacking opportunity structure on labor market outcomes. Taking a life course perspective, this paper argues that timing, sequence and reciprocity are important contexts for understanding spatial mobility which the empirical literature currently fails to acknowledge. Using sequence analysis, the study subsequently uncovers five ideal-typical spatial mobility trajectories that account for these factors. The results indicate that job access at labor market entry is negatively related to the probability of becoming spatially mobile and that spatial mobility alleviates the negative effects of thin labor markets. In particular, the study highlights that the effect of spatial mobility graduates with differing spatial mobility trajectories exhibit heterogeneity in the effect of specific mobility forms on labor market outcomes. These findings suggest that failing to acknowledge timing, sequence and reciprocity in spatial mobility choices will result in biased estimates of the effect of mobility on labor market outcomes.

## **Introduction**

This paper studies the effect of job access and spatial mobility on early career labor market outcomes. Success of the transition from education into working life is of interest to graduates, employers and policymakers at both national and local levels of government. Generally, graduates will want to find a job matching their skill set in order to reap the full benefits of their education, whilst employers are interested in attracting the best graduates for their firms. Optimal allocation of human capital enables countries to enjoy sustained competitiveness in a globalizing world economy (OECD, 2012), whilst at a more local level attracting and retaining higher education graduates is associated with higher levels of economic growth (Berry & Glaeser, 2005; Faggian & McCann, 2006). Being a relatively

homogeneous group of high human capital individuals, higher education graduates have long been known to be more spatially mobile because their ties to people, projects and places are weak and their specific skillset yields higher rewards to investments in spatial mobility (Börsch-Supan, 1990; Fischer & Malmberg, 2001; Venhorst, Van Dijk, & Van Wissen, 2011).

Jobs are more spatially concentrated than people, a phenomenon which has received ample attention in the literature regarding spatial mismatch and urban labor markets (Holzer, 1991; Kain, 1968; Simpson, 1992). Workers that live in low access areas have previously been found to search less intensively for jobs, have longer unemployment spells and be employed in lower quality jobs and jobs not matching their education more often (Détang-Dessendre & Gaigné, 2009; Gobillon, Selod, & Zenou, 2007; Hensen, de Vries, & Corvers, 2009). Hence, access to jobs at the beginning of the career is an important determinant of early career success and career advancement throughout the life course (Van Ham, 2001; van Ham, 2003). When local opportunities are insufficient, entrants are able to achieve better matches through spatial mobility – i.e. migrating or commuting. Spatial mobility is thus not only important for individual outcomes, but also for the functioning of the labor market as a whole (Haas & Osland, 2014; Zabel, 2012).

This paper aims to integrate various insights from the literature and adopts a longitudinal perspective on spatial mobility. Migration and commuting can be alternatives or substitutes in the balancing of home and workplace locations, and the decisions may be made jointly or sequentially (Haas & Osland, 2014; Hanson & Pratt, 1988; Van Ommeren, 1996). Past mobility may also act as an accelerant of further mobility: previous migrants are more likely to migrate again, either onwards or back, and mobility is thus path-dependent (DaVanzo, 1983). Moreover, other changes in graduates' lives may severely restrict spatial mobility options or lead to decisions which are suboptimal – at least from an economic viewpoint (Mulder & Hooimeijer, 1999; van Ham & Hooimeijer, 2009). Hence, in this study we conceptualize spatial mobility as a path-dependent decision-making process in which migration and commuting act as alternatives or substitutes. In this sense, this paper adopts a life course perspective on spatial mobility. By focusing on trajectories instead of durations and changes, this study provides a deeper insight into higher education graduates' spatial mobility during the whole period of labor market entry.

This is achieved by using sequence analysis to uncover ideal-typical trajectories of spatial mobility during the first five years after graduation. We then relate job access and other personal factors to spatial mobility and show that the choice for a particular trajectory is related to job access, education and other personal factors. Controlling for time-invariant unobserved heterogeneity we show that, depending on broader spatial mobility trajectory, job access, tenure and job and spatial mobility have diverging effects on wage growth. These findings suggest that by ignoring reciprocity, sequence and timing current conceptualizations of spatial

mobility may result in biased estimates of the effect of spatial mobility on labor market outcomes.

The remainder of this paper is organized as follows. In the next section, the paper summarizes the relevant literature. Then, in Section 3, it presents the data and discusses the empirical strategy. Section 4 presents spatial mobility trajectories, followed by estimates of the influence of job access and various forms of mobility on wages. The final section discusses and concludes.

## **Literature**

### **Spatial mobility and labor market outcomes**

In neoclassical labor market theory, worker mobility balances regional labor markets by supplementing deficits in one region with surpluses from another. Sjaastad (1962) was the among the first to define spatial mobility, in particular migration, as a personal analysis of costs and benefits. Individuals will prefer to remain in their current location, because of the costs associated with migration. An individual will only move if they expect that benefits of migration outweigh the costs associated with a move. Economists interested in urban labor markets developed a job search framework in which labor market size depends on the individual. Jobseekers can use both migration and commuting to cover the distance between home and workplace (Phelps, 1970; Simpson, 1992). Migration allows jobseekers to seize opportunities on other labor markets, whereas commuting serves to effectively increase the size of the local labor market.

The human capital and job search frameworks postulate that mobile workers are compensated or rewarded for their effort, for instance by earning higher wages or escaping unemployment. Within the human capital framework (Becker, 1962), spatial mobility decisions are instrumental in getting higher returns on human capital investments such as higher education. In job search theory (Stigler, 1961), a greater search distance increases the arrival rate of job offers and allows an individual to evaluate more jobs. Börsch-Supan (1990) refers to the ‘double-edged impact’ of education. Because higher education leads to more specific job requirements, job opportunities are spread more thinly. Thus, higher education leads to a greater search distance and greater search distances are associated with better labor market outcomes. In the following, we first discuss the effects of migration on labor market outcomes. We then extend our view by introducing limitations to mobility, which make it likely that individuals opt for commuting or immobility.

Educated individuals stand to gain from spatial mobility and it is thus not surprising that young individuals with high levels of human capital (for instance, higher education graduates) are known to be mobile (Faggian & Mccann, 2009).

The empirical literature regarding spatial mobility and labor market outcomes highlights several factors. Migrants tend to move to labor markets with better opportunities, such as higher economic growth and lower levels of unemployment (Herzog Jr, Schlottmann, & Boehm, 1993). The availability of jobs explains why migrants are able to achieve better labor market outcomes. In an analysis of Dutch graduates, Venhorst et al. (2011) find that they tend to move away from labor markets that have a high unemployment rate and a lower number of available higher educated jobs. Ahlin et al. (2014) use Swedish micro-data on recent graduates and show that they move to regions that have thick labor markets for skills. A faster job matching process, through more frequent job switching, and agglomeration economies lead to better labor market outcomes. Not only do university graduates that start their career in urban regions have a higher probability of being employed and higher initial wages, but wages also increase faster in more dense labor markets. In a study among Dutch graduates, Hensen et al. (2009) also find that spatial mobility leads to better job matching and higher job quality.

It is important to control for several factors when estimating the effect of mobility on labor market outcomes. First, those that stand to gain from mobility are more prone to be mobile (Nakosteen & Zimmer, 1980). Venhorst & Cörvers (2015), for instance, initially find positive returns of spatial mobility on wages, but note that this effect disappears after correcting for self-selection into mobility. They argue that it may be necessity (no suitable job opportunities nearby) rather than opportunity that drives graduate mobility. Détang-Dessendre et al. (2004) and Pekkala & Tervo (2002) also fail to find a direct effect of mobility on wages after controlling for self-selection. Second, mobility decisions are often made concurrent to other factors that may influence labor market outcomes. Krieg (1997) shows that migration effects on earnings can be explained by concurrent changes of employer and occupation. Yankow (2003) on the other hand finds an additional positive effect of mobility that occurs after several years. This highlights that the benefits of mobility may only occur after a certain time lag.

### **Access to jobs and restricted mobility**

The previous literature considers labor perfectly mobile, either explicitly or implicitly: if another location offers better opportunities, workers will be mobile. However, Blau & Duncan (1967, p. 243) note that “men do not flow from places of poor to places of good opportunity with the ease of water”. In practice, worker mobility is limited by monetary and non-monetary barriers that constrain an individual’s ability to seize farther job opportunities. Migration is a costly event and “[p]eople with strong ties to other people, project and places are in general much less prone to move” (Fischer & Malmberg, 2001, p. 368). Simpson (1992) argues that the residential location rather than the workplace is key to understanding labor market outcomes in a spatial context. Commuting thus becomes an instrument to extend the local labor market.

Kent & Eliasson (2003) show that the local opportunity structure influences labor mobility and the form it takes. In a study using Swedish micro-data they show that access to job opportunities on the local labor market has a negative effect on the probability of interregional labor mobility. In addition, interregional job opportunities increase the probability of choosing commuting as the mode of spatial mobility. Carree & Kronenberg (2014) analyze the spatial mobility choices of higher education graduates directly after graduating and find that they balance locations of study, home and work. The authors argue that graduates are drawn towards places of opportunity, but that they also remain attached to the location where they have studied and developed social networks. Balancing of home and work is also common for women, who often have to combine work and family roles, making them less likely to commute long distances (Clark, Huang, & Withers, 2003). Dual-earner households have shown a preference for rural regions that provide access to multiple urban labor markets within commuting distance (Green, 1997). Finally, home-owners lack the spatial flexibility to migrate and therefore may opt for longer daily commutes (van Ham & Hooimeijer, 2009).

It becomes apparent that the interplay between job access and spatial mobility is an important determinant of labor market outcomes. Van Ham (2003) shows that job access at the start of the career is related to higher occupational status and that the effect of job access increases with age. He hypothesizes that access to jobs at the start of the career gives jobseekers a head start over other workers, so that they accumulate human capital more rapidly through job mobility. Accepting a job at a distance from the residence is also related to higher occupational achievement, indicating that spatial mobility is beneficial for careers.

### **Towards a longitudinal integrated approach to spatial mobility**

In this paper, we argue for a more integrated and longitudinal perspective on spatial mobility. The reciprocal relation between migration and commuting has long been acknowledged (e.g. Hanson & Pratt, 1988; Van Ommeren, Rietveld, & Nijkamp, 1997) and we already discussed how migration and commuting can act as alternatives or substitutes (e.g. Eliasson et al., 2003; Reitsma & Vergoossen, 1988). Furthermore, for some commuting may precede migration, whilst for others this may be the other way around (Haas & Osland, 2014). Because of the interrelations of spatial mobility with other life course domains such as housing and family careers, Mulder & Hooimeijer (1999) argue for establishing a life course perspective on spatial mobility. Changes in one domain may create an imbalance in other domains, thus triggering the mobility decision. Adopting the life course perspective means taking a more holistic approach that currently is uncommon in the spatial mobility literature. Spatial mobility is often modeled as one or several dummies, sometimes including lagged variables to account for effects that only appear after some time.

Sequence analysis is a combination of methods that allows to study trajectories as wholes instead of focusing on durations, risks and transitions. Sequence analysis can uncover patterns that account for all states, and their relation to each other, in the period under study. Authors have argued that it fits the life course perspective particularly well (Brzinsky-Fay, 2014) and proposed it as a way to extend our knowledge of such processes (Aisenbrey & Fasang, 2010).

Studies using sequence analysis to uncover career patterns are manifold (see Dlouhy & Biemann (2015) for an extensive chronological overview). Most early studies were descriptive – in the sense that creating and analyzing the typology was the main goal of the study (Abbott & Hrycak, 1990; Halpin & Chan, 1998). Later studies had a more comparative approach and related the trajectories to hypotheses stemming from the literature. For instance, Brzinsky-Fay (2007) attempts to find grounds for a theoretical typology by comparing school-to-work transition trajectories in European countries and Schoon et al. (2001) compare two birth cohorts to identify differences in the extent and direction of changes in school-to-work transitions. A number of studies use the trajectories in further analysis, in order to identify how trajectories are related to other factors. Anyadike-Danes & McVicar (2005) relate observable background characteristics of young men at birth, age 10 and age 16 to the likelihood of following a certain career trajectory in order to identify factors that predict negative career pathways. They find educational achievement and school disciplinary record at age 16, health and learning progress at age 10 and region of birth to be the strongest predictors of career paths. Biemann et al. (2012) use a panel, spanning 20 years of employment data, to distinguish six career patterns that deviate from the traditional career path of employment within a single firm. They then use multinomial logistic regression to relate individual characteristics and occupational sector at the start of the career to the probability of having one of the ‘new’ career patterns. They find that women, young, singles and higher educated more often have career patterns that deviate from the traditional path. Kovalenko & Mortelmans (2014) confront two juxtaposing theories about the effect of ‘transitional’ career patterns on objective and subjective career success. After constructing a career typology through sequence analysis, they relate the career trajectories to objective (wage and home-ownership) and subjective (satisfaction and disappointment) measures of career success. They find that neither of the competing theories is able to completely explain career outcomes, but that a synthesis of the two perspectives would provide an understanding that better matches the outcomes observed in their study.

Application of the methodology on socio-spatial phenomena has been limited and to our knowledge, sequence analysis has not been used to create and analyze spatial mobility trajectories. Coulter & Van Ham (2013) analyze sequences of moving desire and behavior and distinguish between eight types of mobility biographies. The use of sequence data highlights the importance of heterogeneity in experiences. Although for some respondents moves are followed by (desire for) more mobility, for others it does not. Furthermore, it stresses the importance of adopting a life course approach when studying mobility biographies as the results

suggest that the impact of states on personal well-being are better understood in a broader context.

Taken together, the previous indicates that a sequence approach to spatial mobility during labor market entry can be of value for our understanding of the manner in which job access and various forms of spatial mobility interact to influence early career labor market success.

## Data & Methods

### Data and sample

The study draws on longitudinally linked registry micro-data, provided by Centraal Bureau voor de Statistiek (CBS; Statistics Netherlands). The micro-data files contain information on labor market states, jobs (size and type of contract, sector, location, wage), education and personal and household characteristics (such as place of residence) of all inhabitants of the Netherlands for the period 2006-2011. Job accessibility was calculated at level of five digit postal codes (PC5) using the LISA dataset, a database of business establishments. As there are 32,000 PC5 areas in The Netherlands, this is a highly detailed spatial resolution. ESRI's 2008 StreetMap Premium road network dataset was used to calculate travel times for the GIS network analysis.

Our sample consists of all 2006 graduates of tertiary education and was refined to ensure that the selected persons have comparable career experience and did not leave education only for a very brief time. First, we selected all individuals between 20 and 30 years old that obtained a tertiary degree in the period May – August 2006 and were registered in the data as having the state ‘Student’ for at least five months between January and September 2006. The selection was then refined by excluding all graduates that were registered as ‘Student’ anytime between October 2006 and January 2007. We also exclude graduates from the sample who have missing values for labor market states, home locations or job information (when employed) during the period under study. It was unfeasible to exclude all graduates with missing job locations at any moment in the period under study, due to the way the job location is registered<sup>1</sup>, as this would reduce our sample by 25

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<sup>1</sup> Job locations are only available for jobs that exist in the month December of a particular year. Originally, this meant that only about 17 per cent of all job-months had locational information. We imputed the locations of jobs based on two criteria. First, we checked whether a job had a known location in the previous year. If so, that location was used as the location of the job. Then, we checked if more than 80 per cent of all workers in a firm worked in one location in a given year. If so, that location was used as the location of the job. This raised the number of job-months with known locational information to 73 per cent.



per cent. The final selection thus includes all graduates for whom we have complete information on labor market states, home locations and educational achievement, resulting in a sample of 13,621 graduates.

### **Analytical approach**

Our analysis consists of three parts; network analysis using a GIS to calculate job access at the career start, sequence analysis to define ideal-typical spatial mobility histories, and regression modeling to estimate the effect of job access and personal factors on spatial mobility trajectories and of mobility and access on labor market success (measured as hourly wage).

#### *Job access*

Since the formulation of the spatial mismatch hypothesis (Kain, 1968) scholars have been interested in the effect of accessibility of job opportunities. In a methodological paper, Bunel & Tovar (2014) identify job proximity, frontier effects job availability and job competition as elements that are important to consider when measuring job accessibility. Our job access model includes three of these elements; due to data restrictions we were unable to measure job availability. We control for job proximity by measuring job accessibility using six concentric rings of declining commuting tolerance around the centers of each PC5-area. The probability that a worker is willing to commute to a job declines with distance (see Table 1) and jobs are weighted inversely based on this probability. We correct for frontier effects by using a road network dataset that also comprises roads in Belgium and Germany. Job competition is taken into account by calculating, in the same fashion as we calculate the number of reachable jobs, the number of workers that can reach each job. Job counts in each PC5-location are subsequently divided by the number of workers that can reach them.

Our job access index thus takes the following basic form:

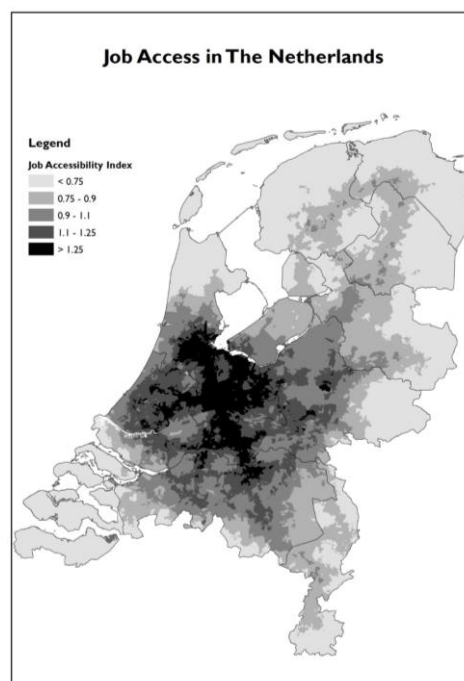
$$A_i = \sum_j \frac{\varphi J_{ji}}{\sum_w \varphi P_{wj}} \quad (1)$$

where  $A_i$  is the job access index of a location  $i$ ,  $J_{ji}$  the number of full-time jobs in locations  $j$  within reach of location  $i$  and  $P_{wj}$  the working age population in locations  $w$  able to reach job location  $j$ . The term  $\varphi$  is the inverse weighting factor. In a final step, we standardize the resulting access indexes using the (working population) weighted average of job access in The Netherlands, thus centering mean job access around 1.

**Table 1.** Commuting tolerance boundaries, reflecting the percentage of working persons traveling a certain amount of time to reach their job. Source: SCP (2007), own calculations.

Travel time (minutes)	%
< 15	100
15 – 30	71
30 – 45	38
45 – 60	18
60 – 75	10
75 – 90	5

Figure 1, below, shows that job access is not spread evenly across the country. Although peripheral regions have, generally, the lowest access to jobs, there are also areas close to central locations such as Amsterdam that have low levels of access. Corridors of higher access can be discerned around important highways, whilst peripheral locations have low levels of access. Although the colleges and universities at which they studied are mostly located in the larger cities of the Netherlands which are often located in areas with high levels of access, 65% of all graduates start their careers in areas that have an access index in the range of 0.75–1.25; this range corresponds to approximately 1 standard deviation around the mean (see table A1 in the appendix for more sample statistics by level of access).

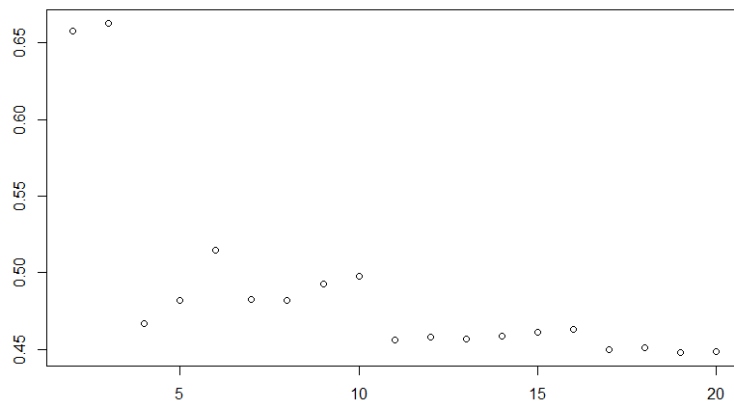


**Fig. 1:** Job access in The Netherlands, 2006. Source: own calculations.

### *Spatial mobility*

We then use sequence analysis to create spatial mobility trajectories. Sequence analysis roughly consists of three steps: defining the sequence, measuring dissimilarity between sequences and grouping similar sequences together. For our analysis of spatial mobility histories, we follow the graduates during the first five years of their careers, plus an additional half year (from April – September 2006) to account for potential pre-graduation mobility. For migration, we consider the number of moves across provincial borders (max. 6 during the period under study). For commuting, we use two levels of commuting (Short  $\leq 30$  min. and Long:  $> 30$  min.), and two types of missing (Not employed and No data).

Both sequences were analyzed in R using TraMineR and WeightedCluster (Gabadinho, Ritschard, Müller, & Studer, 2011; Studer, 2013). We use OM\_future as proposed in (Studer & Ritschard, 2016) to calculate the dissimilarity matrices, because it weighs the dissimilarity by the probability of ending up in a certain state. The dissimilarities were clustered using Ward's (1963) clustering algorithm, which was shown to produce the best results for dissimilarity matrices (Dlouhy & Biemann, 2015). According to the average silhouette width (Kaufman & Rousseeuw, 1990), a solution of two to three clusters would be preferred (Figure 2). However, these solutions only distinguish between the number of migrations across provincial borders (no migration, migration and, in the three cluster solution, multiple migration). We decide on using the six-cluster solution, as it also explains the dissimilarity matrix quite well and shows a trajectory that is defined by commuting. In a final step, we use partitioning around medoids (Kaufman & Rousseeuw, 1990) to improve the extent to which observations belong to their cluster.

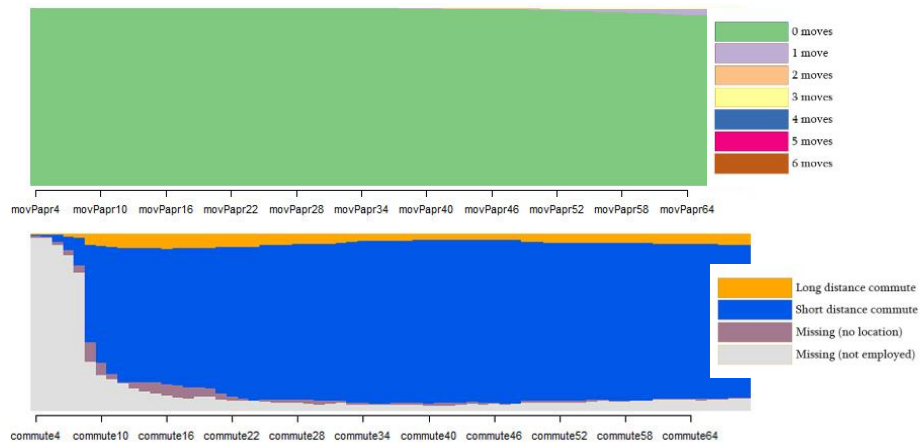


**Fig. 2:** Average silhouette width, by number of clusters. Source: CBS, own calculations.

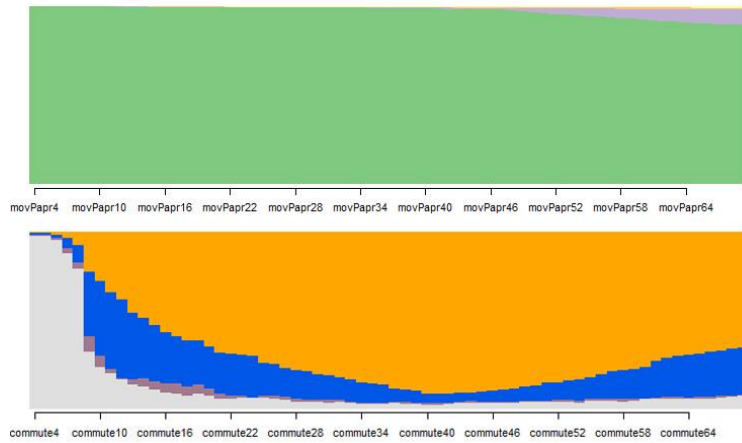
## Results

### Spatial mobility trajectories of higher education graduates

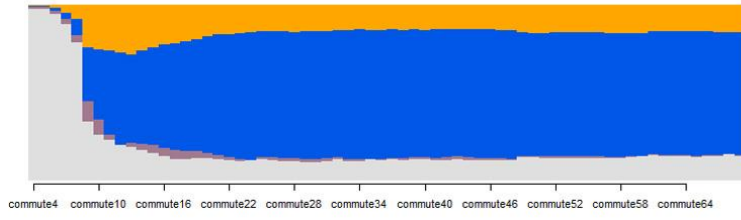
The trajectories resulting from our combined analysis of migration and commuting histories are presented below in figure 3a-f. The upper panel of each graph describes migration, the lower panel commuting.



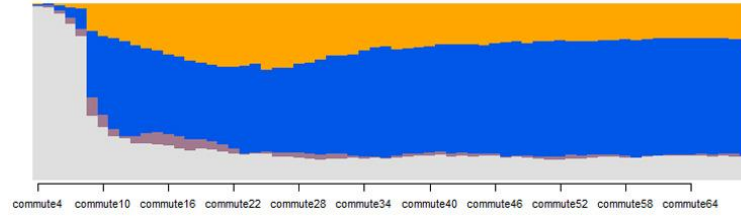
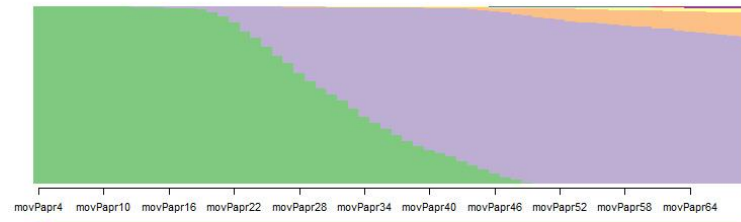
a.



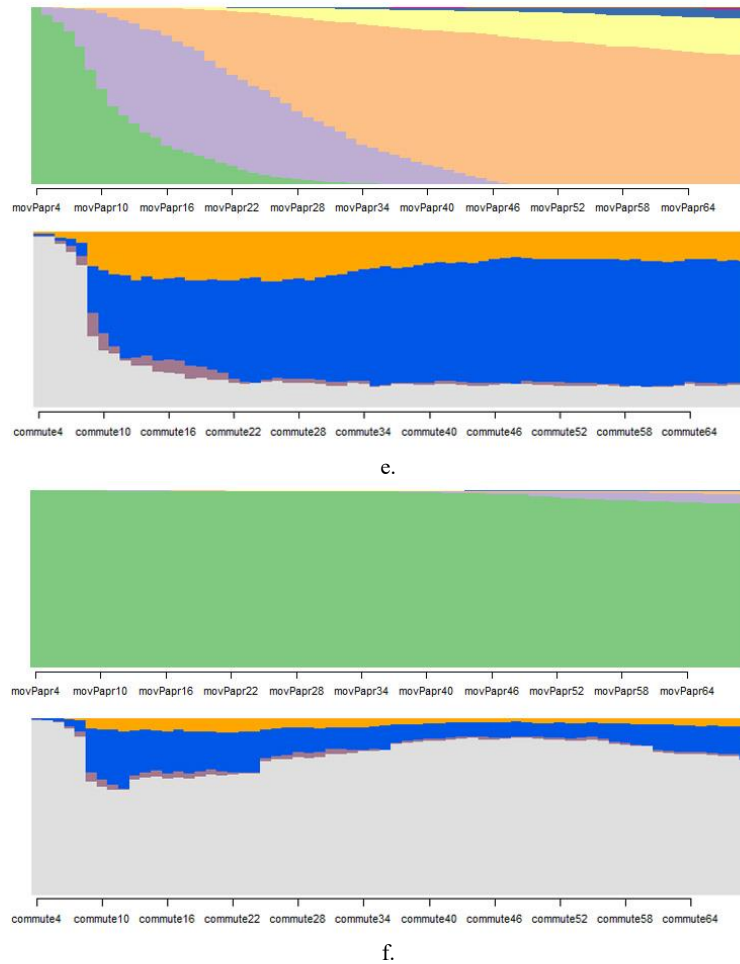
b.



c.



d.



**Fig. 3 a-f:** Proportional transversal state distributions ( $x$  = time in months,  $y$  = cumulative state proportion), by trajectory. Top: migration across provincial borders; bottom: daily commuting distance. Source: CBS, own calculations.

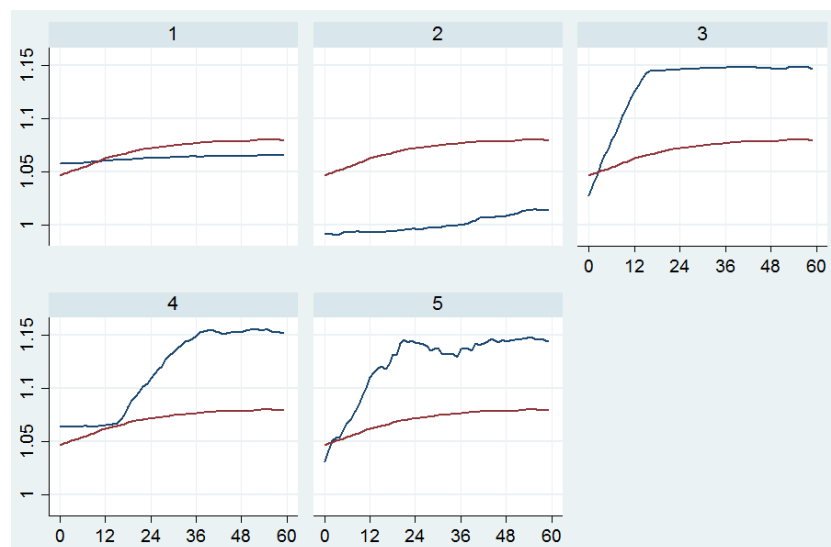
The trajectory in figure 3a corresponds to the spatial mobility histories of approximately 60% of all graduates and is characterized by immobility. At any point in time, at most ten percent of all graduates are making long distance commutes to their job and moves across provincial borders are very rare and happen only in the last year, if at all. Graduates in the second trajectory (fig. 3b) are willing to commute long distances between home and the workplace, whilst moves across provincial borders happen rarely, if at all. At any moment in time, from one year after graduating onwards, 75% of all currently working graduates in this trajectory trav-

el more than thirty minutes during a single commute. The trajectories in figure 3c and 3d are best characterized by their differences in timing. In both trajectories, commuting is only a temporary phenomenon, and a single move is made, sometimes followed by a very late second move. In the third trajectory (fig. 3c), the move happens earlier (within the first two years after graduating) than in the fourth trajectory (fig. 3d). Graduates in the fifth trajectory (fig. 3e) make several moves, and the second move follows the first move very quickly (usually within 18 months). Finally, graduates in the sixth trajectory (fig. 3f) are distinguished more by their labor market states than their spatial mobility choices. This group, a little under ten percent of the total sample, is not employed during the most part of the period under study. This does not mean that the group is homogeneous or that their careers are by definition unsuccessful (e.g. many of the graduates in this trajectory become self-employed). Since this trajectory is best defined by our lack of information on the graduates in it, we will not further discuss the graduates in this trajectory in the remainder of this paper.

**Table 2.** Percentage of graduates per spatial mobility trajectory, by education level and field and level of job access, October 2006. Source: CBS, LISA; own calculations.

	Immobile	Mobile			Other	
		Commuter	Early	Late		Multiple
Education level						
> College (BSc)	58.4	8.7	10.7	6.8	5.0	10.3
> University (BSc)	45.6	5.5	15.4	9.1	6.9	17.6
> University (MSc)	49.1	10.0	16.1	10.7	8.4	5.8
Education field						
> Teaching	72.2	4.3	9.2	5.9	3.3	5.1
> Agriculture	36.5	12.2	25.0	9.6	9.6	7.3
> Natural sciences	56.9	12.0	11.1	7.7	5.5	6.8
> Engineering	53.0	12.2	13.1	6.8	5.8	9.2
> Healthcare	56.7	8.2	13.2	8.9	7.4	5.7
> Economics	55.6	10.7	11.7	8.2	7.3	6.5
> Law	49.6	6.4	18.5	13.0	8.7	3.7
> Behavioral & social	61.0	9.1	11.2	7.8	5.0	5.9
> Language & arts	36.2	5.7	12.9	9.7	6.1	29.5
Access						
> Low (< 0.75)	54.0	11.6	13.1	7.7	7.1	6.7
> Medium (0.75-1.25)	53.1	9.9	13.1	9.4	6.2	8.3
> High (>= 1.25)	56.6	7.2	12.0	7.8	5.6	10.8
<b>Total</b>	<b>55.0</b>	<b>9.0</b>	<b>12.6</b>	<b>8.1</b>	<b>6.2</b>	<b>9.1</b>

The propensity to have a particular trajectory differs by level of job access and level and field of education, as is shown in Table 2 (above). For instance, the percentage of university graduates that have an immobility trajectory is lower than the percentage of college graduates with the same trajectory. Sector of studies also is related to the propensity to be mobile and the specific type of mobility. Those with teaching backgrounds are the least mobile, the commuter trajectory is more common among those with backgrounds in agriculture and those with law degrees are more likely to move quickly after graduation. Interestingly, low levels of access seem related to higher percentages of those with a commuting trajectory, which may seem counterintuitive. However, this can at least partly be explained by the fact that jobs that are more than 30 minutes away are discounted for a large part in the accessibility measure. Long commutes are necessary to reach these jobs, which is why lower levels of job access may be related to a higher propensity to commute. Figure 4 confirms that commuters have job access levels slightly below the average. It also depicts that, on average, graduates who move across provincial borders do so in the direction of locations with higher levels of job accessibility. Interestingly, it seems that this is only a characteristic of the first move; further moves do not further increase average levels of job access, as depicted in the graph for the fifth trajectory (the multiple movers).



**Fig. 4:** Average versus trajectory levels of job access, in time ( $x$  = time in months,  $y$  = job access index), by trajectory. Red: average level of access in sample; Blue: level of access for graduates with trajectory. Source: CBS, LISA; own calculations.



### **Job access, spatial mobility and early career success**

We use multinomial logistic regression to analyze how, net of other factors, level of job access and individual and education characteristics relate to the probability of following one of the spatial mobility trajectories. We test whether the trajectories can be seen as independent from each other, by executing the Small-Hsiao test of the IIA assumption and Wald tests for combining alternatives. Both indicate that the trajectories are suitable to be used as a dependent variable in multinomial logit analysis. Table 3 presents the average marginal effects derived from this model. Marginal effects have the benefit of allowing more straightforward interpretation of the effect of covariates on the probability of having a particular spatial mobility trajectory. In the case of categorical covariates, they are interpreted as the effect of a discrete change with respect to the base level. For job access and age, the only continuous variables in our model, the interpretation is as the effect of a one unit increase on the probability of belonging to a trajectory. We stress that since we cannot control for many factors, among which ability and ambition, the results should be interpreted carefully and in terms of association, not causation.

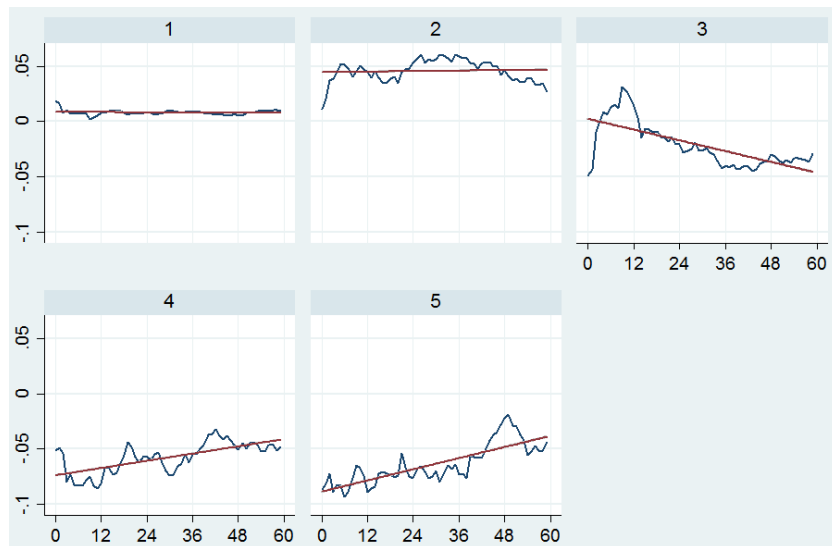
A one unit increase ( $\pm 4$  standard deviations) in job accessibility is very improbable, but a ten percentage point higher level of access is related to a 2 percent higher probability of belonging to the immobility trajectory. This is reflected in particular in a negative correlation with the probability to become a commuter. University graduates are, indeed, more mobile than college graduates, although this relationship may be moderated by field of study as the differences between fields of study in their associations with trajectories are often stronger than those between levels of education. For instance, a behavioral and social sciences college graduate has a higher probability to become a commuter than a university teaching graduate.

Although previous literature found higher propensities for women to be spatially mobile (e.g. Venhorst et al., 2011), we find a negative association with the probability of having the commuter trajectory and no statistically significant relationship with any of the three mobile trajectories. As expected, singles have a lower probability to be immobile, compared to graduates in other household situations. However, graduates with partners or still living with their parents seem more willing to accept a commute in order to bridge the distance between home and the workplace. The associations with other personal factors are small, if significant at all.

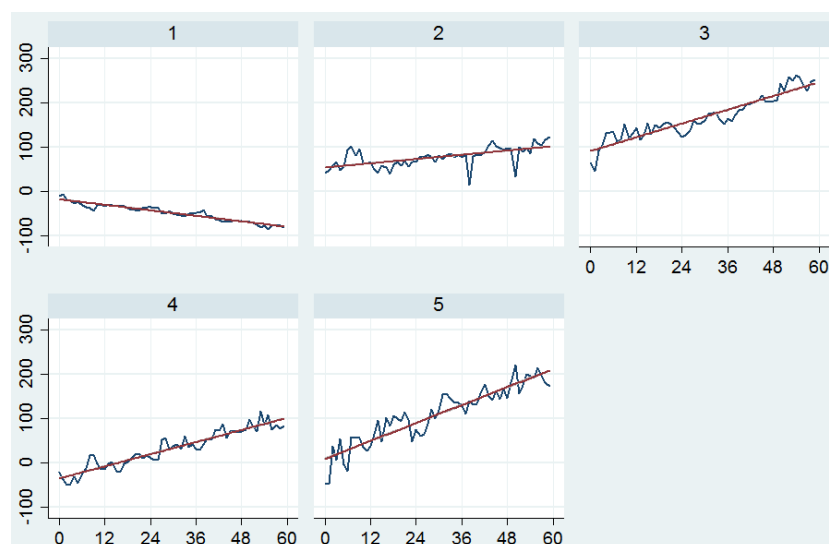
**Table 3.** Multinomial logistic regression results, average marginal effects; dependent variable: spatial mobility trajectory.

	Immobile	Mobile			
		Commuter	Early	Late	Multiple
Job access	.197***	-.101***	-.072***	.014	-.038***
Education level					
> College (BSc)	ref.	ref.	ref.	ref.	ref.
> University (BSc)	-.017	-.026	.021	-.006	.028*
> University (MSc)	-.101***	.022***	.032***	.031***	.015***
Education field					
> Teaching	.06***	-.057***	-.012	.009	.000
> Agriculture	-.171***	.050***	.057***	.039**	.025**
> Natural sciences	-.009	.013	-.022	-.003	.021*
> Engineering	-.05***	.02*	.017*	.005	.008
> Healthcare	-.059***	-.003	.023*	.024**	.015*
> Economics	-.074***	.009	.02**	.02**	.027***
> Law	-.047**	-.038***	.046***	.015	.024**
> Behavioral & social	ref.	ref.	ref.	ref.	ref.
> Language & arts	-.097***	-.001	.034***	.037***	.026***
Gender					
> female	.04***	-.033***	.001	-.004	-.004
Age	-.001	-.001	.006***	-.001	-.002**
Origin					
> Dutch	ref.	ref.	ref.	ref.	ref.
> Western	-.032*	.014	.005	-.004	.017*
> non-Western	.026	.004	-.023**	.002	-.009
Household status					
> single	ref.	ref.	ref.	ref.	ref.
> couple	.132***	.027***	-.091***	-.009	-.028***
> with parents	.123***	.021***	-.075***	-.015**	-.053***
> other	.076***	.017	-.064***	.007	-.036***
High earning parents	-.027***	-.002	.009	.011**	.008*
Chi <sup>2</sup> (df = 120)	1592.6***				
N (individuals)	11,839				

Figures 5 and 6 provide a naive idea of the effect of mobility trajectories on labor market outcomes. In figure 5, the percentage of graduates that are employed in ‘normal’ working arrangements (full-time or part-time jobs with fixed weekly hours) are depicted as deviations from the average. Overall, commuters have the highest levels of employment, but this may well be due to how commuters are defined (i.e. to be a commuter, one has to be employed). For the early movers, this percentage is decreasing over the course of the study period. Interestingly, the decrease seems to set in just before or around the time of the first move, twelve months into the study period. In figure 6, the same is done for wages. The steepest slope can be found among the graduates who move multiple times during the study period. Over the course of five years, they go from earning around or slightly below the average towards around € 200,- more than average. The wages of those in the immobility trajectory lag in comparison.



**Fig. 5:** Percentage in employment as deviations from the average, over time ( $x$  = time in months,  $y$  = deviation in percentage employed), by trajectory. Blue: deviation; Red: trend line. Source: CBS, own calculations.



**Fig. 6:** Wage levels as deviations from the average, over time ( $x$  = time in months,  $y$  = deviation in hourly wage), by trajectory. Blue: deviation; Red: trend line. Source: CBS, own calculations.

Of course, these effects may be as much or more due to personal factors explaining the selection into specific trajectories as to the trajectory itself. To further probe the effect of job access and spatial mobility on labor market outcomes, we employ a fixed effects regression model. A fixed effects regression model eliminates estimate bias due to time invariant factors at the individual level by only explaining within-person differences in the dependent variable by within-person changes in independent variables. In this model, we regress (log of) hourly wage in October 2006-2011 on job access, spatial and job mobility and tenure (we distinguish between full-time and other employment). In line with the literature we discussed, we include variables describing the household situation and the presence of children and include a dummy for living in urban areas. We also control for job and firm characteristics<sup>2</sup>. Table 4, on the next page, presents the results.

<sup>2</sup> Job characteristics: type of contract (permanent, temporary, other), job size (full-time, part-time, small)

Firm characteristics: firm size (very small, small, medium, large, very large), firm sector, dummy: firm location unknown

**Table 4.** Fixed effects regression results; dependent variable: (log of) hourly wage.

	All	Immobile	Mobile			
			Commuter	Early	Late	Multiple
Job access	.068***	.042	.042	.079*	.069***	.047***
Urban	.003	-.008	-.002	.013	.006	.020
Moves	.013***	-.003	.023	.008	.038***	.006
Commute						
> short	ref.	ref.	ref.	ref.	ref.	ref.
> long	.011***	-.011*	.058***	-.001	.030***	.009
> missing	-.140***	-.159***	-.019***	-.135***	-.104***	-.162***
Experience						
> full-time	.107***	.104***	.108***	.106***	.116***	.123***
> part-time	.090***	.090***	.090***	.083***	.093***	.093***
Jobchanges	.048***	.054***	.048***	.022***	.043***	.046***
Household						
> single	ref.	ref.	ref.	ref.	ref.	ref.
> couple	.010***	.008	-.002	.031***	.000	-.004
> w/ parents	-.015***	-.028***	-.006	.014	-.022	.017
> other	-.008	-.022*	.009	.015	.011	-.006
Children	-.06***	-.053***	-.018	-.093***	-.043*	-.139***
Dummies						
> job	Y	Y	Y	Y	Y	Y
> firm	Y	Y	Y	Y	Y	Y
R <sup>2</sup> (within)	.448	.424	.521	.48	.475	.525
N (obs)	66694	41339	6815	8775	5571	4194
N (individuals)	12304	7496	1232	1666	1087	823

The first column presents the results for all graduates combined. Job access, spatial and employment mobility are all positively associated with wage level. The results show that living in areas with a ten percentage points higher job access level is associated with a 0.7% higher wage. The wage premium of a move across provincial borders (1.3%) is comparable to that of long distance commuting (1.1%). Switching jobs can also be instrumental to career advancement (there is an associated wage gain of 4.8 %) and graduates working in full-time jobs have higher hourly wages increases than those part-time employment. We find no significant effect on wage growth of living in urban areas. If there is such thing as an urban wage premium in our results, it is reflected in the effect of job access. The size of its effect is, however, much lower than what is usually found in the literature on urban wage premia.

Our results also indicate that the size of these effects can be quite different depending on spatial mobility trajectory. For those in the immobile trajectory, the effects of job switching are more pronounced, which implies that some are able to

achieve upward mobility by switching to other firms in their vicinity. Commuters are, in almost all respects, similar to graduates who remain immobile, except that they have significant and high wage benefits from commuting. They also experience no wage penalty from the presence of children. This corroborates the argument that commuting, by extending the size of the local labor market, serves as an alternative for migration. The presence of children may limit migration possibilities and by commuting these graduates may be able to avoid the negative effects of being spatially tied. This may indicate that commuters are able to achieve good matches on the labor market relatively quickly and are aware of the value of their current position.

The spatial mobility trajectories also distinguish between moves by necessity and move by opportunity. Our results indicate that, for early movers, there is no wage premium associated with moves across provincial borders. Job access is only significant at the 10%-level and we also find a rather limited effect of jobchanges. For late movers, however, moves result in 3.8% higher wages, within a year. They also have higher returns to tenure, jobchanges and job access. For multiple movers, jobchanges and tenure are the key determinants of wage growth, whereas moves themselves have no significant effect on wages.

## Conclusion

This paper analyses how access to jobs at the start of the career influences the spatial mobility choices of graduates of higher education in The Netherlands. Although the reciprocal relationship between migration and commuting has been noted in previous research, this study is among the first to construct comprehensive trajectories based on migration and commuting histories. This paper focuses on a homogeneous group that is considered highly mobile. Graduates of higher education embody high levels of human capital and suitable job opportunities are generally spread thin across the country. Graduates in areas with lower job accessibility thus can use spatial mobility as an instrument toward gaining a better job or accessing more advantageous labor markets.

Our study highlights a number of issues. First, although higher education graduates are usually depicted as highly mobile, only 35% is mobile during the first 5 years after graduating from college and only 15% is highly mobile (migrating several times or commuting long distances). This may not seem surprising and related to the study setting, as the Netherlands is a dense country and distances are relatively short. However, this is also reflected in our states: the average province is smaller than 3,000 km<sup>2</sup> and a thirty minute commute is considered short in many countries.

Second, access to jobs is negatively associated with spatial mobility and positively associated with early career success. Graduates in areas with better access to jobs are especially less likely to commute or migrate early. Graduates that live in

areas with better access earn higher wages. This effect is stronger for graduates that move early or often than for immobile graduates. A statistically significant effect of access to jobs could not be found for late movers and commuters.

Finally, our study indicates that outcomes of mobility (in terms of wages) are heterogeneous toward the type and timing of mobility. Failure to account for different types of mobility and their timing may underestimate the effect of mobility on labor market outcomes. These results show that distinguishing between type and timing of mobility can be helpful in determining the value of mobility for graduates of higher education entering the labor market.

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<http://books.google.com/books?hl=en&lr=&id=YeFQHikNo0C&oi=fnd&pg=PR11&dq=Finding+Groups+in+Data+-+An+introduction+to+Cluster+Analysis&ots=5zp9F4PGxF&sig=SeUYzccb34LjgB8z8>
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## Appendix 1: Sample statistics

**Table A1.** Sample statistics, October 2006. Source: CBS, own calculations.

	Total	Access		
		Low (< 0.75)	Medium	High (>= 1.25)
Education level				
> College (BSc)	0.65	0.74	0.67	0.52
> University (BSc)	0.03	0.02	0.02	0.04
> University (MSc)	0.33	0.24	0.31	0.44
Education field				
> Teaching	0.11	0.16	0.11	0.06
> Agriculture	0.04	0.04	0.05	0.02
> Natural sciences	0.02	0.01	0.02	0.05
> Engineering	0.15	0.19	0.15	0.10
> Healthcare	0.07	0.07	0.07	0.07
> Economics	0.25	0.27	0.25	0.22
> Law	0.04	0.03	0.04	0.06
> Behavioral & social	0.21	0.17	0.20	0.24
> Language & arts	0.11	0.05	0.10	0.19
Gender				
> female	0.60	0.55	0.59	0.63
Age	23.99	23.67	23.92	24.44
Origin				
> Dutch	0.83	0.90	0.83	0.79
> Western	0.09	0.06	0.08	0.11
> non-Western	0.08	0.04	0.09	0.10
Household status				
> single	0.30	0.18	0.28	0.44
> couple	0.26	0.23	0.26	0.26
> with parents	0.40	0.56	0.42	0.23
> other	0.04	0.02	0.04	0.07
High earning parents	0.31	0.27	0.31	0.35
<b>N</b>	<b>13,621</b>	<b>1,916</b>	<b>8,859</b>	<b>2,846</b>
%	100	0.14	0.65	0.21