GIMA

Geographical Information Management and Applications

Job accessibility, workplace mobility and early career success

Analysing the effect of job accessibility on career starts of school-leavers

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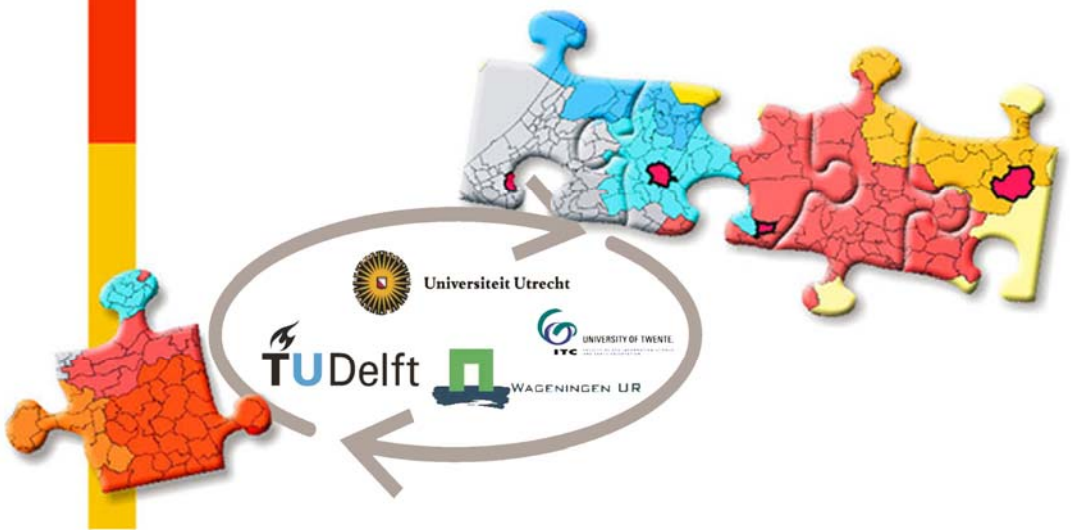

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Personal foreword

In 2012, the Faculty of Spatial Sciences of the University of Groningen started a joint research programme in collaboration with NICIS and a number of local governments. In this project, urban labour market dynamics are studied in relation to individual career paths on the one hand and economic growth potential of regions on the other hand. When my supervisor heard that I had to write a thesis for GIMA when I took on a job at this faculty, he asked me if I had an interest in combining work and study and, if yes, what I would like to focus on. This study matches the first goal of the project: analysing individual career paths at the micro scale, using longitudinally linked registry micro-data from Statistics Netherlands. Combining data and methods to create new information has always been a personal interest, this study is not different. Combining the GIS knowledge I learned at GIMA with the theoretic and political depth of the project, I hope to be able to enrich both fields.

Therefore, this thesis might seem a bit 'different' from other GIMA theses. Although definitely spatial in nature, my main interest is not to develop or apply 'spatial' methods to solve a certain problem, to develop an application or service for geospatial data or to discuss the importance of spatial scale when studying a certain subject. Rather, I want to study and answer research questions in a more spatial way than is normal in my current field of research. Using 'normal' GIS methodologies in combination with a very special dataset, I hope to be able to answer questions that have not yet been answered and shed new light on a topic that is of great importance for policy makers: the interaction of labour market situation at the start of a career and workplace mobility, career characteristics and early career success.

The combination of writing an MSc-thesis and managing a PhD project with third-party funding, hasn't always been straightforward or easy. However, at the end of the road, I think that the combination has resulted in an interesting study for both GIMA and the Faculty of Spatial Sciences. I hope you enjoy reading it!

1. Preface

1.1 Introduction

1.1.1 Problem introduction

Each year, several tens of thousands of young adults enter the labour market. Some find their way in to more or less certain employment very easy, others don't. Finding and keeping work is important; not only for the individual, but also for society. School-leavers who don't find suitable work have a higher chance to become disappointed in themselves or society, isolated from everyday life or find it harder to sustain themselves financially. For society it means 'wasted' public investments in education and higher public spending because of benefit dependence. For all of these reasons, the successfulness of school-leavers' career starts is of interest and many studies have already been undertaken.

Although personal ability, measured as educational level, is the most important predictor of success (higher educational levels greatly increase the chances of finding and keeping a job), other factors also play a part. First of all, many studies have shown that personal characteristics (such as age, gender, ethnicity, household situation, etc.) play an important role in the chance of having a successful career start. Second, abilities (less easy to measure than educational attainment) of the starter also play an important role: having social capital (a disposition to connect to other people, e.g. having a large social network) or skills (abilities that are of use but not directly related to formal training, e.g. having a knack for computers) increases the chances to find and keep a job. Experience is also important; although school-leavers will have limited working experience (mostly limited to internships and part-time jobs), they may also have acquired other relevant experience, e.g. a period of studying abroad.

However, outside the realm of personal characteristics, abilities and experience lies a very important influencer of career starts: the (regional) labour market. The influence of demand for labour cannot be underestimated; when there are no jobs it will be impossible to find one. A shortage of labour demand can be economical in nature (e.g. the financial crisis), but often is more spatial in nature. Jobs are more concentrated than people and as labour demand is less easily relocated than supply, living in an area with lower job accessibility could be solved by being spatially flexible. Seen in this way, workplace mobility (relocating and commuting) expands the local labour market beyond the domicile and might enable jobseekers to find (better) jobs.

1.1.2 Problem definition

From a theoretical perspective, persons at the start of their working career are of great interest. At some point in life, the preparation for working life ends and the professional career starts. For many individuals, the break between learning and working comes at a young age. Being of young age has since long been associated with a higher propensity to move, because younger people have relatively weak ties to the place where they live. Because of this, they make excellent cases for labour market research: the basic assumptions one has to make when doing this type of research fit young individuals best (Venhorst et al., 2011).

The start of a career is also interesting because it has great implications for the further course of that person's career. Missing out in the first years often means less experience, less tenure, lower wages and less job security (Kunze, 2002; Light & Ureta, 1995). Although young people recover from periods of unemployment (i.e. are able to catch up with people that did not experience a period of unemployment) better than older persons (Gregory & Jukes, 2001), the problem is still very significant, given the number of young people that have suboptimal career starts (i.e. career starts with unemployment interruptions). Youth unemployment has always been higher than average (around 10% vs. 5% for the working age population as a whole) and has responded more strongly to the recent economic crisis (Table 1.1, below).

Table 1.1: Youth and general working age unemployment. *Source:* CBS, 2014

	working age (15-65)	15 – 25	25 – 65
2001	3,5 %	7,4 %	2,9%
2002	4,1 %	8,5 %	3,5%
2003	5,4 %	10,6 %	4,6%
2004	6,4 %	13,2 %	5,5%
2005	6,5 %	12,6 %	5,7%
2006	5,5 %	10,4 %	4,8%
2007	4,5 %	9,2 %	3,9%
2008	3,8 %	8,4 %	3,3%
2009	4,8 %	11,0 %	4,0%
2010	5,4 %	11,7 %	4,7%
2011	5,4 %	9,8 %	4,8%
2012	6,4 %	12,6 %	5,7%
2013	8,3 %	15,9 %	7,3%

School-leavers at the start of their careers go through this complex process; a process that will influence their life for a long time (OECD, 1998; Gregory & Jukes, 2001). In recent years, this process has become very complex because of the growing flexibility of the labour market and high youth unemployment rates, leading to longer transitions into the working life (Scherer, 2001; Roberts et al., 1994). The subject has been of growing interest to scientists as well, with many studies into the career starts as a result.

For example, in Scherer (2004), sub-optimal starting jobs are studied and the question is asked whether sub-optimal starting jobs (jobs for which the starter is overqualified, and jobs with fixed contract lengths) should be seen as a way for starters to get into the labour market, might even be a stepping stone to a future career, or that they are career traps, with long-lasting negative effects for the rest of the career. In a study in three countries, the latter proves to be the case, but only for jobs for which the employee is overqualified. Using sequence analysis methods, Brzinsky-Fay (2007) characterised the labour market entry of school-leavers in 10 European countries. He found that there are great differences in the ease of labour market entry between the countries and attributes this to institutional and economical differences between the countries.

Interestingly enough, all these studies neglect labour market conditions, or see them as fixed within a country. However, geography matters since jobs are even less evenly spread across the surface of the earth than people are (Van Ham, 2002). Any research into careers (or career starts) should therefore explicitly take into account the location where a person lives, the spatial distribution of jobs and the way this limits or improves chances on finding a job. Although distance between living and working locations can partly be bridged, this comes at a financial and psychological cost, costs which in most cases rest on the shoulders of individual employees (DaVanzo, 1983). Workplace mobility can thus be seen as an investment in the development of a career, and should theoretically lead to a more successful career. Not every person is willing or able to make this investment, for reasons that are manifold. For example, educational level might be too low to make the investment worthwhile or the household situation (having children at school or a partner with a job) limits the possibility of workplace mobility.

This might lead to a person finding only less attractive jobs, or none at all. In this sense, the location where a school-leaver starts their career, in combination with personal characteristics, might greatly influence the course of this career. The role of location does not stop here: prejudices against persons from a certain region and less advanced connections between locations are examples of how location can influence a career path. Personal characteristics, location, but also career decisions themselves have an influence on the outcome of the first years of a person's career. Main objective of this thesis is therefore to find out which individual, local and career characteristics have an influence on the career starts of young individuals that have ended their learning career and enter the labour market.

1.2 Research goals and questions

In the previous chapter, the background of the study and the reasons for doing it were discussed. In this chapter the scope will be the definition of the research goals and the questions that the research should answer. There will also be attention for specificities of the study, and for what is and what specifically is not in the scope of the study.

From the literature it is clear that the possibility to evaluate more jobs leads to a better result (having work with good pay). However, the number of studies that takes spatial constraints into consideration and has a more longitudinal view of the career start are limited. Main goal of the study is therefore to gain an understanding of to which extent the labour market starting situation influences the development and successfulness of an early career. More specifically, the goal is to analyse whether the labour market situation at the start of the career (measured as job accessibility) has an effect on workplace mobility (relocations and commutes), career characteristics (stability and flexibility) and early career success (being employed and wage height). This leads to the following main research question:

> "To what extent is job accessibility at the start of the career related to school-leavers' early career characteristics and home-work locational decisions, and how do these influence early labour market success?"

To help answering the main question a number of sub-questions have been defined, that will be answered:

1. Where are jobs located and how does this location influence regional job accessibility using various modes of transport?
2. Do school-leavers who start their careers in areas with low access to jobs have different careers than school-leavers from areas which provide access to more jobs?
3. What role do regional differences in job accessibility play in explaining early career labour market success of school-leavers?
4. Can school-leavers offset unfavourable local labour market circumstances by being (spatially) flexible (i.e. changing jobs, moving house, commuting)?

Answering the first sub-question will provide insight in the location of jobs and how this location influences job accessibility. By assessing accessibility using various modes of transport, more light is shed on the influence of vehicle dependency on job accessibility. To answer the second sub-question, the correlation of regional job accessibility and the characteristics of careers are analysed. Attention will be paid to what extent careers of school-leavers from areas with little job access differ from careers of school-leavers from areas which provide access to more jobs, and whether school-leavers from areas with low job accessibility are more mobile. To answer the third and fourth sub-question, the correlation of job accessibility and early career success is studied

using statistical analysis techniques. Here, also the influence school-leavers can have on their chances to find a job and height of salary by being spatially flexible are taken into account. Variables that measure spatial flexibility (e.g. commuting distance, number and distance of moves, timing of first move) are calculated and their effects on the chance to have find a job and height of salary is estimated. When combined, the results of the four sub-questions will deliver the information needed to answer the main question.

1.3 Research scope and specificities

1.3.1 Scope

The research scope of the thesis will be on labour market entrants, defined as school-leavers. They are selected as persons between 15 and 30 that were registered in the data as having the socioeconomic status 'Student' for at least five months in the period January – September 2006. To be selected, they cannot be registered as 'Student' in the period October 2006 – January 2007. This ensures that the selected persons have comparable career lengths and did not leave school for a very limited time. This results in a sample of ± 80,000 persons. Although smaller or larger selections can be made, resulting in other target groups (e.g. 'Persons younger than 30 that have no or limited labour market experience prior to a certain date'); this selection is deliberately made to be able to connect to the research programme's objectives. The school-leavers are then followed for a period of five years with intervals of three months, leaving 21 measuring points. This period of five years will make it possible to study career starts over a relatively long period, a situation that is more like real life than studying labour market entry as a single event (Scherer, 2001).

In this thesis, job accessibility is an important predictor of an individual's chances on the local labour market. It is defined as the average number of jobs that an inhabitant of a municipality can reach within 15, 30 or 45 minutes commuting time. An important assumption made here is that the number of reachable jobs is a proxy of the number of reachable vacancies (i.e. more jobs means more vacancies). This might not necessarily be true (whether vacancies arise has to do with many factors such as age and sectoral structure of employment and the general economic situation in a region), but there is no access to reliable regional data on vacancies. The number of reachable jobs is calculated using proximity counts, a GIS network analysis method. From the centroid of an area (a municipality, or neighbourhood), the number of centroids that can be reached via the network and their weight (in this study, the number of jobs in that region) is summed. Proximity counts will be calculated on a yearly basis, and for multiple modes of transport (personal car transportation and a combination of bike and public transit transportation). Although using municipalities as a spatial unit is not an ideal solution (i.e. will create some noise because of spatial rounding errors), information on jobs is only available at this level, and it is believed that the spatial scale of regional labour markets is large enough to allow this unit of measurement. To somewhat smooth the results of the proximity counts, a disaggregation-aggregation procedure will be used, which is explained further in the methodology.

1.3.2 Micro-data specificities

Statistics Netherlands (the Dutch statistics bureau; CBS) offers researchers the chance to work with micro-data: anonymous registry data at the level of individual persons and businesses. Working with micro-data has many

benefits, which will be discussed further on. A main drawback, however, is that the nature of the data makes them very sensitive to revealing identities. They require a high level of security to ensure that private or sensitive information on persons and businesses does not become public. Therefore, several measures have been taken by its provider (Statistics Netherlands) that will affect this research project. To be able to work with the data, a researcher has to sign a confidentiality agreement, and access is only possible via a fingerprint-secured connection to the CBS servers. Exporting something from the semi-closed environment is subject to approval by CBS, who verify that no possible exposure takes place (there can be no counts below 10 in any table, graph, or analysis).

This brings about some operational and scientific difficulties. Because work is done in a semi-closed environment, the researcher cannot use any piece of software he has access to. Currently CBS is working on supporting GIS applications, but at the moment this is very limited. Therefore, the GIS analyses were executed outside the closed environment (and the results imported). This required the imported files to be of limited file size and completely ready for use in the available software packages; making the management of the project a challenging task. A second difficulty is scientific in nature, and concerns one of the basic principles of science: reproducibility. Because analysis takes place inside a closed environment, it will be hard to reproduce the same results using the same conditions. This will be mostly offset by documenting all research steps thoroughly and by making all *syntax* (computer command language) files immediately available upon request.

1.4 Innovation

Much of the work in this thesis has been done before, and with success. Studies such as Light & Ureta (1995) estimated the effect of 'missing out' on wages earned, and found that the timing of periods of unemployment is indeed very important. This study inspired many more, such as Beblo & Wolf (2002) and Theunissen et al. 2009) (who analyse the effects of different types of unemployment spells), Hospido (2009) (who concurrently analysed the effect of job changes) and Miller (2011) (who analysed the effects of a specific and common break for women, motherhood, on their career). These studies have in common that they all ignore location completely: careers can differ in many ways, but the location of jobs and people are completely ignored when estimating the effects of (un)employment on a person's wage.

GIS and labour markets are a combination that mostly surfaced as policy evaluation studies or in attempts to model the functioning of labour markets (e.g. Ballas & Clarke, 2000). In explanatory labour market analysis GIS techniques are less common. Van Ham (2002) was one of the first to note the importance of job accessibility. In his dissertation, he adds a spatial dimension to the human capital theory (which was discussed in chapter 1.3). Main goal of the thesis is to explain underemployment from a spatial perspective, and in the dissertation several topics are discussed in a more spatial way than was previously the case. Most interesting for this study is the calculation of 'local labour markets', which are hypothesised as job accessibility within 45 minute commuting time. There has been little follow up on this study: most studies still use discrete regions (e.g. Venhorst et al., 2011) or contiguity to control for spatial variation. Not only are Van Ham's methods underused, there is also room for improvement. In his dissertation, car travel time is used, without controlling for congestion. This probably leads to an overestimation of the number of accessible jobs: a simple look at the density maps for jobs and congestions show that the two greatly overlap. This study aims to build further on Van Ham's methods, both by improving the measure of job accessibility by controlling for congestion and looking at the effects of vehicle dependence: what happens to job accessibility when other modes of transportation are used / included?

A third way in which this study is innovative is driven by the availability of longitudinally linked registry micro-data to execute it. Many studies are severely limited in their execution by the availability of suitable data. Venhorst et al. (2011), for example, measured the effect of decisions to move on labour market outcomes of higher educated graduates around one and a half year after graduating. Although their study yields interesting results, nothing is known of the timing of the decision to move, or how many moves were made. By using longitudinally linked registry micro-data, this study has access to very detailed information on the individual level for a longer period. This makes it possible to measure the labour market outcomes of the school-leavers at multiple moments, include the effect of timing of decisions made by the school-leavers and measure the effect of repeated decisions, using multiple locations. In this sense, the study fills a giant gap in the current literature.

2. Theoretical background

2.1 Literature review

2.1.1 The job searching process

In economics, there are two main strands of theories that explain how the job searching process takes place and how it comes that some people find better jobs than others. Although both theories have different approaches, together Human Capital theories and Job Search theory are able to explain the job searching process and its results quite well.

Human Capital theories (Becker, 1964; Schultz, 1961) were developed in the 1960's because researchers in economics found that the growth of income and production greatly surpassed the growth of physical capital. In human capital theories, not only commodities and monetary resources should be seen as inputs to the production process, but also the human is added as an input source; hence human capital. In Becker's (1964) treatise on human capital, he also distinguishes between three ways in which someone can invest in their human capital. *Skills* can be accumulated through education and training, leading a healthy life is an investment in *health* and investments in *information* will lead to the chance to seize opportunities (where others see / know of none).

Job Search theory (Stigler, 1961) explains why the results of the job search process of individuals can differ greatly and its main contribution, the 'reservation wage', has been used in many studies (e.g. Lippman & McCall, 1976; Pissarides, 1976; Herzog et al., 1993). In job search theory, the main idea is that an individual that wants to find a job, will want to have a wage as high as possible, but also has to 'pay' costs for every offer they receive (for example by being unemployed longer). Stigler theorizes that an individual will continue his/her search efforts until the wage they are offered is equal to or surpasses the costs of obtaining another offer. In economic theory, this wage is known as the reservation wage. A person with a high labour market worth, and therefore a high reservation wage will be more prone to accept a job at a distance from their current residence.

In both human capital theory and job search theory, job search and acceptance distance is positively correlated with height of wage. In human capital theory, a greater search distance will make a person better informed and lead to a higher wage. In job search theory, a greater search distance will enable a person to have a higher reservation wage (and the other way around: having a higher reservation wage will force a jobseeker to also consider jobs at a greater distance). However, both strands of theories have little explanation power beyond a basic model that explains why evaluating many jobs should theoretically lead to a higher wage. In real life, the job searching process is more complex and influenced by many factors.

2.1.2 Spatial mobility

As already was mentioned in paragraph 2.1.1, information is an important determinant of the chance of finding a job (Becker, 1964; Herzog et al., 1985). Not only does it directly influence the chance of finding possible job offers (i.e. when a possible applicant doesn't know there is a position available, there is no chance that they will get an offer), but it also influences the chance that the applicant knows well to what extent said job suits his / her profile. This was also found by Herzog et al. (1985), who showed that the amount of obtained information is positively correlated with wage height, whilst not directly being correlated with level of education; a clear sign that information is a separate dimension within human capital.

Being willing and able to accept a job at a distance from the current place of residence is also part of the 'information' dimension of human capital, since it influences the number of jobs reviewed and therefore the chance that a job suited to the skills of the individual is found. The notion that migration is a personal consideration of costs and benefits was found already in the 1960's by Sjaastad (1962), who found that migration patterns can seem illogical at first; regions that are economically weak, often still have many immigrants. A region can be a bad choice for certain workers, but an optimal for others, because of the availability of jobs that demand certain skills for example.

Van Ham (2002) calls this the clearing function of the labour market; workplace mobility (i.e. moving house or commuting) reduces local surpluses of and demand for certain types of labour. The costs, both objective (e.g. monetary) and subjective (e.g. psychic), for workplace mobility are, however, often completely borne by individuals. A person unwilling or unable to pay these costs not only limits his own chances on the labour market, but also hinders the clearing function of the labour market. This has been proven to lead to 'lock-in' mechanisms where regions with lower than average job opportunities also have lower than average migration rates (Ballard & Clark, 1981); after the more mobile workers have left, those less prone to migrate are left behind, either unemployed or working in sub-optimal jobs.

For these reasons, spatial flexibility when searching a job is important for both the individual worker and the functioning of the labour market as a whole. However, the propensity to migrate strongly declines with age or as Fischer & Malmberg (2001) put it:

> *People with strong ties to other people, projects and places are in general much less prone to move. Having children, owning a house, being married and being employed are conditions that constrain migration.*
> Fischer & Malmberg, 2001, p. 368.

The school-leavers in this study have the least ties to people, projects and places, and are therefore a very interesting research group. This group will have the largest probability to have a large job searching area, and will be more prone to accept a job at a great distance. This is in line with results from Venhorst et al. (2011) and

Van Ham (2002), who find that young people move more often and that level of education is positively correlated to the chance of moving. The chance of accepting a job at a distance decreases with the size of the local labour market (the number of jobs reachable within commuting distance), and varies among sectors. This indicates that accepting a job at a distance from the residence is often a choice coming from inadequate opportunities on the local labour market, and is a personal consideration of costs and benefits.

Regions differ in supply of and demand for labour as regards the type, quantity and quality of work. Thousands and thousands of persons enter the working life each year; all looking for job opportunities. The degree in which they are successful is dependent on personal characteristics and abilities, but also on the match of their education with the local labour market (Hensen et al, 2009). Having an education that doesn't correspond with the local labour market can potentially lead to mismatches: some of the entrants will accept jobs that are 'below their level', potentially leading to crowding out effects. Not everyone who based on the level of their education seems mismatched, feels mismatched (Green & McIntosh, 2007). However, two out of three entrants that are overqualified for their first job, are still overqualified six years later (Dolton & Vignoles, 2000), which devaluates the human capital of these persons and means that investments (through government funding of education) don't pay off. Again, having a large job search area can solve mismatches and prevent overqualification.

2.2 Hypotheses

H1: *Personal characteristics are important a priori predictors of mobility and success.*

As already mentioned previously, personal characteristics influence the chances of a school-leaver on the labour market. Recent research has shown that young women are more mobile than males (Faggian et al., 2007, Coniglio & Prota, 2008), this in concordance with laws of migration as already formulated by Ravenstein in 1885. Women are expected to have better initial labour market results than men, but this effect is negative or less pronounced for women with a partner and lower educated women.

Within the research population, age is expected to be positively correlated towards labour market success, because of probable experience (Hensen et al., 2009; Pekkala & Tervo, 2002). However, it is expected to be negatively correlated to mobility, since persons of higher age more often have to balance their home and work locations interests with that of family members (Fischer & Malmberg, 2001). This is particularly so for women of higher age, since they tend to follow their partners more often than the other way around.

Education is expected to be positively correlated with the chance of being spatially mobile (Venhorst et al., 2011). A higher education comes with a higher degree of specialization of suitable jobs, which leads to the necessity of a larger search area. Secondly, the higher wage level of jobs suitable for educated persons make longer commuting distances worthwhile. Migration and commuting are expected to be positively correlated to education, with the latter having the strongest correspondence.

Personal characteristics will also positively influence the chances of finding and keeping a job. Having and keeping a job is, of course, a strong predictor of the chances of having a job with a good salary at the end of the observation period.

H2: *Job accessibility at the start of the career is positively correlated to early career labour market success*

As has been found in previous studies, it is expected that job accessibility is positively correlated with early labour market success (Van Ham, 2002). For lower educated, this effect will be stronger for short range automobile accessibility and transit accessibility than for middle and long distance accessibility. Theoretically, high levels of job accessibility at the beginning of the observation period could lead to a lock-in effect, where a person accepts a (suboptimal) job on their local labour market and does not look further for new / better jobs. In this case, high levels of job accessibility at the beginning of the observation period would lead to low mobility (both spatial and non-spatial) and low success.

H3: *Job accessibility at the start of the career is negatively correlated to spatial mobility*

As has been found in previous studies, graduates from rural areas in the Netherlands move in the direction of urban areas, especially those in the Randstad area (Venhorst et al., 2011). Graduates from the west of The Netherlands move less often and over shorter distances. It is expected that job accessibility will be greatest in and around the highly urban Randstad area, and that this will result a negative correlation between job accessibility and spatial mobility. With less jobs in close range, school-leavers from areas with low levels of job access are expected to have higher commuting tolerances (i.e. travel farther to work daily). Furthermore, it is expected that the direction of relocations of school-leavers from areas with low job accessibility is towards areas with higher job access.

H4: *Spatial mobility is positively correlated to early career labour market success*

Higher educated persons have higher human capital; therefore the correlation is stronger. Migration is expected to be negative for lower educated, but positive for middle and higher educated school-leavers. This is in line with earlier results that show that 'speculative migration' (migrating in the hope of finding a job, instead of migrating after finding a job) has a negative effect on labour market success (Herzog et al., 1993).

From Ravenstein (1885), migration is expected to go in the direction of urban areas, a finding confirmed more recently in Venhorst et al. (2011). However, higher educated are expected to settling near instead of in urban areas, because of living preferences and their higher commuting tolerance (Van Ham, 2002). Therefore, an outflow of school-leavers from the peripheral North and East areas is expected towards the West region. The South region will show mixed results, with Noord-Brabant being more urban than the Limburg and Zeeland provinces.

3. Data and methodology

3.1 Data

For this research, access to a special dataset was secured. From 2006 to 2011, longitudinally linked registry micro-data from CBS are available on the socioeconomic statuses, jobs, personal and household characteristics of all inhabitants of the Netherlands. These can be linked through random but constant identifiers, which make it possible to follow these individuals over time. For the years 2006 up to 2011 the micro-data files contain variables concerning gender, age and ethnicity; education (level and field of study) and diplomas; socioeconomic statuses and jobs (size, type, sector, location, wage) and households and home addresses.

There are some important limitations within the micro-data that need to be taken into account. First off, the information on job locations is on the municipal level, and only available for jobs that are held in December of each year. The locations are computed using a location-allocation algorithm, based on the number of jobs that a company has in a municipality (in the micro-data there is no distinction possible between individual plants within a company) and the home locations of the employees in the company at that time (i.e. December). Through the algorithm employees are assigned to the municipality closest to their home location, but if there are more employees in the vicinity than there are jobs, some will be assigned to locations further away. This means that some jobs won't have a location (because the position wasn't held in December, e.g. only from July to October), and some locations won't be the real location of the jobs (because the location-allocation algorithm has allocated an employee to a municipality that is not the actual where their job is). The range of jobs with unknown locations is between 13.7% (April 2007) and 1.9% (January 2011); on average, about 6.7% of the jobs have an unknown location. The percentage of employees that is allocated to a municipality that is not the actual municipality where they work cannot be estimated. A second limitation is that job information is limited to jobs that are held at 'regular' companies. For self-employed (or 'entrepreneurial') jobs, no information on locations, profits or sector is known. Therefore, school-leavers who are self-employed are excluded from the analyses on labour market success.

The data on job counts come from the Dutch 'National Information System on Employment' (LISA). In LISA, data on number of jobs (by gender and a connotation full-time / part-time) are available at the firm level and therefore highly detailed. These can be aggregated at the level of postal codes (four- or six-position) and municipalities. Since the municipal level is used in all other locational variables in this study, it will be used here too.

The geodata in this study come from public sources. The division of the Netherlands in municipalities, districts and neighbourhoods come from CBS Netherlands, which uses Kadaster-data, and have a precision of 5 meters

(municipal borders) to 10-50 meters (district and neighbourhood borders). The division used in this study is that of 2013. The data on roads, the National Road Database (Nationaal Wegenbestand; NWb) come from Rijkswaterstaat. Although other data in this study range from 2006 to 2011, the NWb was only available in the actualisation of October 2013. Public transit data are of a very specific format: they are only valid at a certain moment in time. It was possible to secure transit data with geolocations that were valid from 2014-04-03. These data adhere to the GTFS standard (Google, 2012).

3.2 Methodology

3.2.1 Overview

Figure 3.1 shows a broad overview of careers as they are conceptualised in this study. School-leavers are followed over time, which is symbolised by the arrow at the top of the figure. October 2006 is the starting point of the study, after which a number of variables are recorded every three months. They can be divided into three broad categories: socioeconomic statuses, job characteristics and geographic variables regarding the location of home and work (if any). From the repeatedly recorded variables, the analysis variables can be computed, which are shown at the right side of the figure. The analysis variables summarize stability (occurrences of socioeconomic statuses, time before first employment) and flexibility aspects (number of transitions) of the career and measure workplace mobility (number and distance of relocations, average commuting time when employed and net job accessibility gains through relocations). They are used in a number of regression analyses, together with job accessibility at T=00 and personal characteristics of the school-leavers.

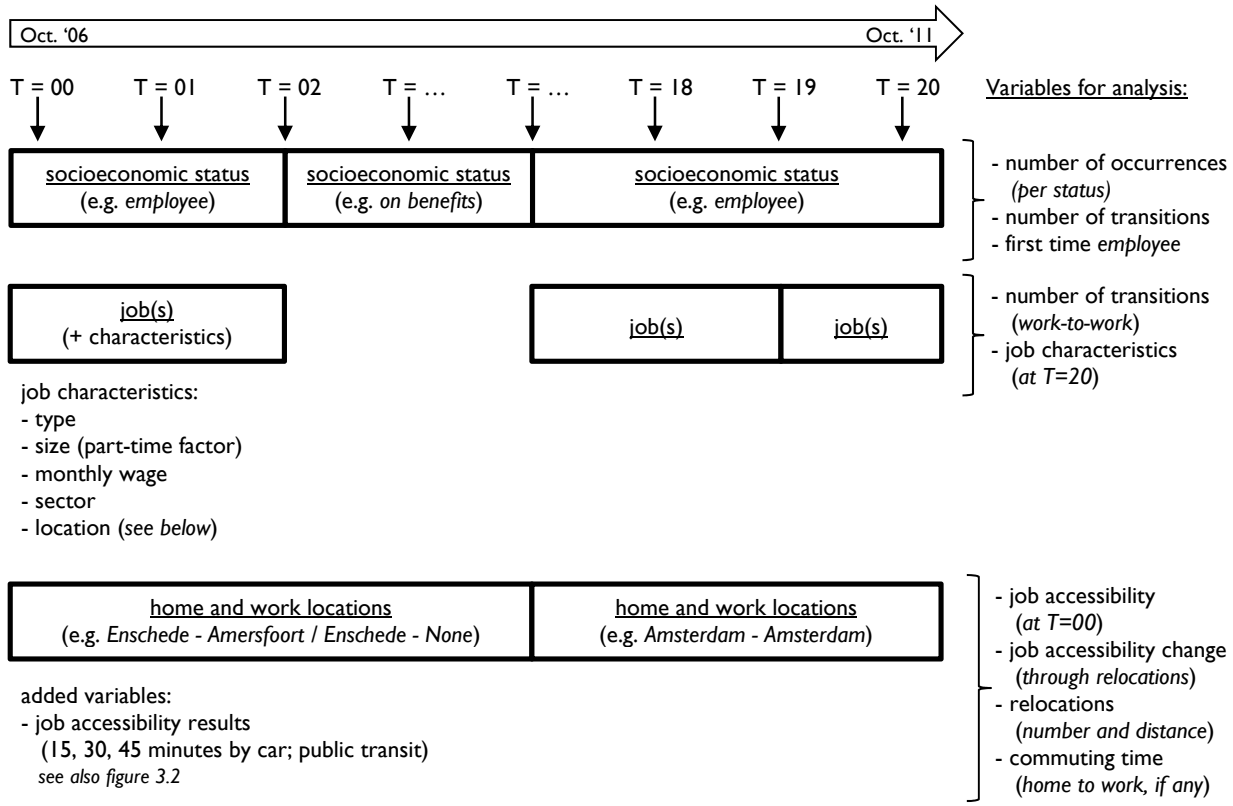


Figure 3.1. Conceptual model of the study. *Source*: Own creation.

Paragraph 3.2.2 will go into further detail on the preparation of the datasets that was necessary before they could be used in analysis. In 3.2.3, the computation of the job accessibility measures is explained in more detail.

The computation of the analysis variables is explained more thoroughly in 3.2.4, whilst the methodology for the analysis of the results is discussed in paragraph 3.2.5.

3.2.2 Data preparation

The longitudinally linked registry micro-data was made available in separate datasets, that must be joined by the researcher before they can be used in any analyses. First step was to select all persons that are seen as 'school-leavers'. For this, all persons who were registered in the Dutch GBA (municipal population register) and had 'Student' as their main socioeconomic category for at least five out of the nine months prior to October 2006 were selected. To be sure that their 'leaving school' was in some way significant, any person that had 'Student' as their main socioeconomic category in any of the four months between October 1, 2006 and February 1, 2007 was excluded from the sample.

Important personal characteristics (gender, age, origin, educational level and field, household situation) were then added to this sample. These personal characteristics are added to the sample as they are on October 1, 2006 (T00). Next, the home locations on the first day of every January, April, July and October starting in October 2006 and continuing until October 2011 were added to the dataset. These locations are very exact, but to prevent identification they cannot be used in any form of analysis. Therefore, municipal codes are joined to the addresses.

Subsequently, data on the jobs the school-leavers hold on the first of every January, April, July and October starting in October 2006 and continuing until October 2011 are added. The data on job positions in the micro-data is very detailed, to the extent that holding many jobs at the same time is a realistic possibility. Therefore, the choice is made to only add detailed information on the 'main job' (in case a person holds multiple jobs on the date), which is defined as the job in which most salary was earned for that month. For every month, the number of jobs and the total wage that is earned in them is added; for the main job the type of contract (flexible or fixed hours), sector, location (available at the municipal level), part-time factor and wage earned are also added.

After this, outliers that might distort the outcomes of this study are deleted. Persons who are older than thirty years on October 1, 2006 are deleted from the sample; it is unlikely that they are really at the start of their career. Secondly, any person that has the socioeconomic status 'Employee' and earns twelve times or more of the average income or only one fifth of the average income of persons with comparable educational attainment in October 2006 or October 2011 is considered an outlier. Finally, all persons that have an unknown socioeconomic status for October 2011 are deleted, since they can't be used in the final analyses. Beside this the

main reasons for not having a socioeconomic status are death and having no address in the Netherlands. This leaves a total of 80,545 school-leavers.

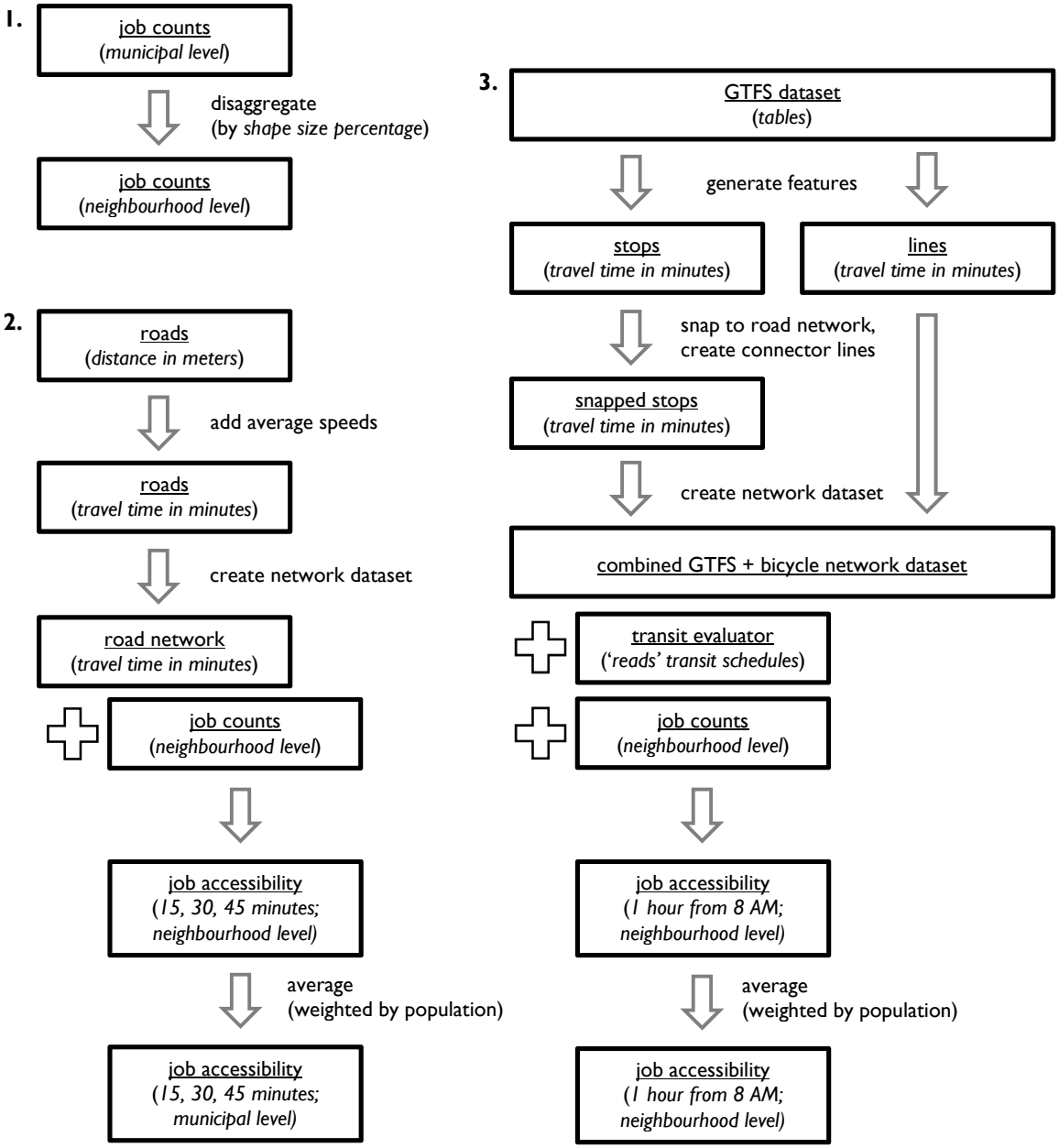


Figure 3.2. Schematic overview of the steps in computing job accessibility measures. *Source*: Own creation.

In figure 3.2, the steps to calculate job accessibility are summarized; the preparation steps will be discussed here (and the actual calculation of job accessibility is explained in 3.2.3). To be able to use them in the GIS analyses, job data from LISA are disaggregated onto the neighbourhood level by the area percentage the neighbourhood takes up of its municipality's area total. So, assume municipality A has 1000 jobs, and 4 neighbourhoods: A1

(50% of municipality's size), A2 (30%), A3 (10%) and A4 (10%). As a result of the disaggregation, the neighbourhoods will have 500 (A1), 300 (A2) and 100 (A3 and A4) jobs. Effectively, this is the same as assuming that jobs in a municipality are spread isotropic over the neighbourhoods. Although this is probably not the case in reality, the resulting dataset will give a more smoothed estimate of job accessibility, which is in fact more real than just assuming that all jobs are located in the centre of a municipality.

The National Road Database (Nationaal Wegenbestand; NWb) is prepared for analysis by adding average speeds to its line segments. It is assumed that the average speed on a 'provincial' (interlocal) road is 80 km/h and that the average speed on 'national' roads (highways) is 100 km/h. (Later on in this study, the average speed of a number of highway segments is lowered to 60 km/h to account for congestion) All other roads get an average speed of 40 km/h. A network dataset is constructed which has end point connectivity and does not discriminate between directions.

The transit dataset can be used in ArcGIS through a toolset developed by Morang (2014). The first step is expanding ArcGIS with a special 'transit evaluator', which enables the software to read the transit schedules that are formatted in GTFS format. Then, point and line features are generated (for the stops and transit lines) from the WGS'84 coordinates in the data. Although this produces straight lines for the transit lines, this is no issue since distance will not be used in the actual analyses. Since stops are not located exactly on the streets of the NWb, the next step is to create a version of the stops that are snapped to the streets, and a line feature that connects the snapped version of the stops with the original location of the stop. A copy of the NWb dataset is also created that contains vertices on the location of the snapped stops; this to ensure connectivity in the final network dataset.

After creating all the necessary datasets, the network dataset is compiled. It has three connectivity groups: one for the adjusted NWb road network and the snapped stops; a 'connecting' connectivity group with the original and snapped stops and stops-streets connectors and a public transit connectivity group with the original stops and transit lines. The speed for travelling the NWb network is set to 15 km/h, which is approximately the speed of bike travel. The costs for travelling a connector is -arbitrarily- set to 1 minute; this could be seen as the time it takes to board / get off a transit line. Finally, the costs to travel with a public transit line are governed by the transit evaluator that was installed earlier on. Travel with transit lines is one-way (otherwise it would be possible to go back in time). To be able to use the GTFS data in analysis, a specific date and time has to be chosen; in this study May 20, 2014 (a 'normal' Tuesday) is used.

3.2.3 Job accessibility

In our internet society, the daily commute is as important as it has ever been: around 25% of all traffic is home-work commuting traffic (Kennisinstituut voor Mobiliteitsbeleid, 2013). Recent evidence shows that commuting tolerance has increased over time, to an average of 28 minutes in 2012. Although telecommuting has increased recently, especially among the higher educated, there are no signs of decreasing commuting time (Kennisinstituut voor Mobiliteitsbeleid, 2013). Job accessibility is computed for several time frames, using the two network datasets created in the previous paragraph. Following Van Ham (2002) and Van Ommeren et al. (1997), the maximum normal commuting time by car is set to 45 minutes and job accessibility is also calculated for two shorter intervals. A 30 minutes interval will show job accessibility for the average commuter, whilst the 15 minutes interval will show job accessibility for those with a low commuting tolerance.

Lower educated often have no access to a personal car for daily commutes, or their salaries are not high enough to make lengthy daily commuting trips by car remunerative (Bastiaanssen, 2012). Therefore, job accessibility is also computed using bike and public transit as modes of transport. Because of data limitations, the network dataset containing bike and transit travel modes is constructed a bit differently than the network dataset regarding travel by car. Because the analysis has to start at a fixed point in time (8:00 AM in this study) and there is no way to extract waiting times at the stops, a maximum travel time of 60 minutes is used.

To compute job accessibility, an origin-destination cost matrix is calculated, in which neighbourhoods are both origins and destinations. With a snapping tolerance of 1000 meters, 18 neighbourhood centroids are not located close enough to one of the features in the network datasets, and will therefore not be used in the analysis. Then, the job counts per neighbourhood for every year (from 2006 to 2011) are joined with the destination neighbourhoods. These are aggregated to create job accessibility at the neighbourhood level. To be able to use job accessibility in further analysis, a weighted average of job accessibility per municipality is computed (weighting occurs by number of inhabitants per neighbourhood). Unfortunately, information on inhabitants per neighbourhood was only available for 2013, the year from which the division in neighbourhoods stems, which might cause some slight rounding differences. Since weighted averages of closely located features are used, it is not expected that the errors will be large.

3.2.4 School-leavers' careers

From the dataset that was constructed in paragraph 3.2.2, a number of variables were computed that are used in the analysis:

1. The number of measuring points that a school-leaver is found in a socioeconomic status is counted, per socioeconomic status (Employee / Self-employed / On benefits / Student / Other). This is a measure of the stability / importance of a certain socioeconomic status in a school-leaver's career.
2. The first point in time at which a school-leaver is found in the socioeconomic status Employee is recoded into a variable that measures the number of months that has passed after the beginning of the study period until this point in time (e.g. when a school-leaver starts as employee, the result will be a value of 0; if a school-leaver becomes employee at T=03, the value will be 9). To tackle the problem of missing values (if a school-leaver never becomes employee, this variable will have a missing value), a second version of this variable is computed in which those that never become employees have the same value as those that only become employee at the last measuring point. Both variables will be used in regression analyses.
3. When a school-leaver changes socioeconomic categories (e.g. goes from unemployment to work) or jobs, this is a significant event in their career. The two types of transitions differ greatly from each other: the first is more a sign of career instability (e.g. not being able to keep a job), the latter of flexibility. The number of transitions is counted in two variables; one for changes of socioeconomic statuses and one for job changes.
4. The number and distance of relocations (if any) is computed by measuring the Euclidean distance between the home municipalities at two time points. A total relocation distance is also computed by aggregating the moves between all measuring points. Return migration is counted as two separate moves: if a school-leaver moves from Tilburg to Rotterdam between T=03 and T=04, and then back to Tilburg in T=07, this counts as two moves of 59 kilometres, totalling 118 kilometres. If a change of the home municipality occurs between two measuring points, not only the distance is of interest, but also whether this change results in a greater access to jobs. For this, the number of jobs of the old home location is subtracted from the number of jobs in the new location. These variables are again summed to variable measuring the total job accessibility gain.
5. In much the same fashion, commuting time is calculated: if at a measuring point home and work municipality differ, travel time (by car) between the two municipalities centroids is added to that measuring point. Average commuting time is calculated by computing the mean commuting distance of all measuring points in which a school-leaver is employee.

These variables are all used in the analyses that are discussed in the next paragraph, but will also be used to point at apparent differences between groups of school-leavers (e.g. school-leavers without diplomas).

3.2.5 Hypothesis testing and sensitivity analysis

To be able to answer the research questions, the data produced earlier has to be turned into information. In the next chapter, this information will be presented. To introduce the reader to the research setting and the research group, descriptive statistics on the research group and setting are presented: counts and percentages, crosstables, graphs and maps. After this, the hypotheses posed in chapter two can be tested.

In a first model, the hypothesis that starting a career in an area with low job accessibility is correlated with greater workplace mobility is tested. Of course, correlation does not imply causation (there can be other reasons why school-leavers from areas with low job accessibility move (e.g. areas with high job accessibility could have, causing school-leavers to move there in search for a partner)), but a statistically significant result of a test in combination with the theories presented in this thesis would at least make other causations less likely.
The dependent variable of this test, workplace mobility, is defined as any school-leaver that has had a commuting distance of over 45 minutes and / or moved for more than 50 kilometres at any measurement point in the study. Around 27 % of the school-leavers make this rather large investment somewhere in their early career. The independent variable is job accessibility, and the results are controlled for personal characteristics and regional dummies (to control for regional trends beyond job accessibility).

In a second series of tests, the hypothesis that school-leavers from areas with little access to jobs have less successful career starts is tested. Several models are tried, with varying dependent and independent variables, to be able to distinguish the model that works best and / or test whether certain variables have stronger impacts than others. Again, results are controlled for personal characteristics, but tests are also repeated for specific subgroups, to see if the correlations found are different (e.g. stronger, weaker, non-existent, completely vice versa).

It has already been mentioned in the preface that in previous research on the effects of job accessibility, congestion effects have not been taken into account, which has probably lead to overestimated job accessibility counts in the Randstad area (which is known for suffering from congested rush hour traffic). Unfortunately, it was not possible to obtain data on real / average road segment travel times for this study and the main results will probably also suffer from overestimation in certain areas. However, a sensitivity analysis will be carried out to test to what extent lowering the speed on a number of notoriously congested highway segments changes the results of the study. Using the new travel times, job accessibility will be recalculated and compared to the original results. Also, the recalculated job accessibility measures will be used to re-run the statistical tests, to see whether there are (big) differences in the outcomes.

4. Results

4.1 Descriptive results

In table 4.1 (a and b) the basic characteristics of the population of school-leavers are presented. The distribution over the personal characteristics shows nothing special, although it is interesting to see that almost 70% of the school-leavers still live with their parents. Table 4.1b makes it very clear, however, that the population of school-leavers is much more than graduates. Among the 80,545 persons who were registered as 'Student' for at least five out of the nine months before October 1, 2006 and not for the four months after this date, 35,460 did not receive a diploma between October 1, 2005 and October 1, 2006. When compared with the highest finished education, it seems that the school-leavers without diplomas will predominantly have an elementary, lower or middle education. This conclusion was drawn because the number of school-leavers with bachelor's or master's (and post-academic) degrees closely matches with that with higher or academic education as their highest level of education.

Table 4.1: Gender, age, ethnicity, household composition, diplomas and education of research population; October 2006. *Source:* CBS micro-data; own calculations

a	N	%
Total	*80,545*	*100 %*
Gender:		
Male	39,829	49.4 %
Female	40,716	50.6 %
Age:		
15-20	35,297	43.8 %
20-25	34,532	42.9 %
25-30	10,716	13.3 %
Ethnicity:		
Native	61,062	75.8 %
Immigrant, 1st gen.	7,547	9.4 %
Immigrant, 2nd gen.	11,936	14.8 %
Household composition:		
Single	11,504	14.3 %
Couple without child	8,668	10.8 %
Couple with child	1,659	2.1 %
Only parent with child	487	0.6 %
Indwelling child	54,372	67.5 %
Other / Unknown	3,855	4.8 %

b	N	%
Total	*80,545*	*100 %*
Diploma ('05-'06):		
No diploma	35,460	43.0 %
High school	10,037	12.5 %
Lower vocational	19,029	23.6 %
Bachelor	10,679	13.3 %
Master / post-academic	6,149	7.6 %
Highest education:		
Elementary	4,851	6.0 %
Lower	19,533	24.3 %
Middle	33,881	42.1 %
Higher	10,808	13.4 %
Academic	6,375	7.9 %
Unknown	5,097	6.3 %

Table 4.2: Socioeconomic status by diploma type; October 2006. *Source:* CBS micro-data; own calculations.

Socioeconomic status	*Total*	No diploma	High school	Lower vocational	Bachelor	Master / Post-academic
Employee	*67 %*	60 %	61 %	80 %	74 %	68 %
Self-employed	*1 %*	1 %	0 %	1 %	3 %	1 %
On benefits	*4 %*	6 %	1 %	3 %	2 %	1 %
Student	*0 %*	0 %	0 %	0 %	0 %	0 %
Other	*28 %*	33 %	38 %	16 %	21 %	30 %

At the start of the measuring period, on average 67 % of the school-leavers is already employee (see table 4.2). Since not-being a student is part of the criteria to be included in the sample, no school-leaver is student in October 2006. There are also many in the category 'Other', which could point at many things. Among others, those that are homemakers, on a year abroad or not entitled to benefits are in this category. Between school-leavers with different levels of diplomas there are clear differences in socioeconomic statuses. Those with no diplomas are the ones that are most often dependent on benefits. Together with those with high school diplomas, they are the ones that are found most often in the 'Other' category. Those with lower vocational diplomas seem to have the most direct association with the labour market, as already 80% are employees in October 2006. However, there are also relatively many that are dependent on benefits. Bachelors (both higher vocational and academic) are the ones that are most often self-employed; the actual percentage is still low and many are employee. Interestingly, school-leavers with master's (or higher) degrees are employees only slightly more often than those without diplomas or with only a high school diploma (although they have better degrees). This could hint at a longer job search period (during which they are not entitled to or don't apply for benefits), or it could be that they take extended holidays or have other reasons for being without any source of personal income.

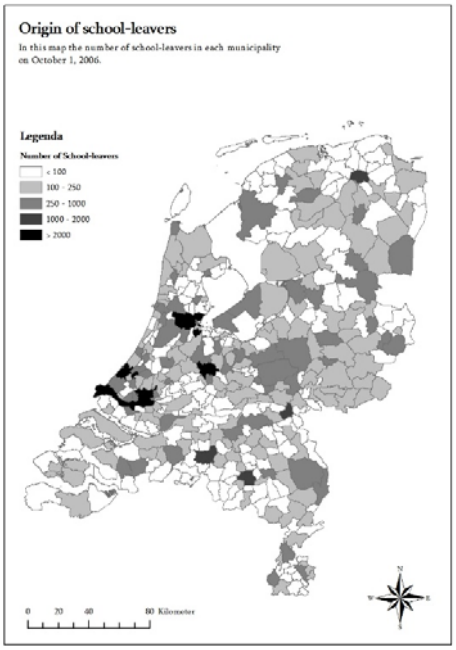


Figure 4.1 (left) shows where the school-leavers live at the beginning of the measuring period (larger versions of this map and all following maps can be found in Appendix 2). The pattern largely follows the settlement pattern in the Netherlands, although a number of municipalities (especially those with universities and vocational colleges; e.g. Groningen, Leiden) are higher on the list, and some municipalities (e.g. Apeldoorn, Zaanstad) are lower.

Figure 4.1. Origin of school-leavers. *Source*: CBS, 2013 (Own calculations)

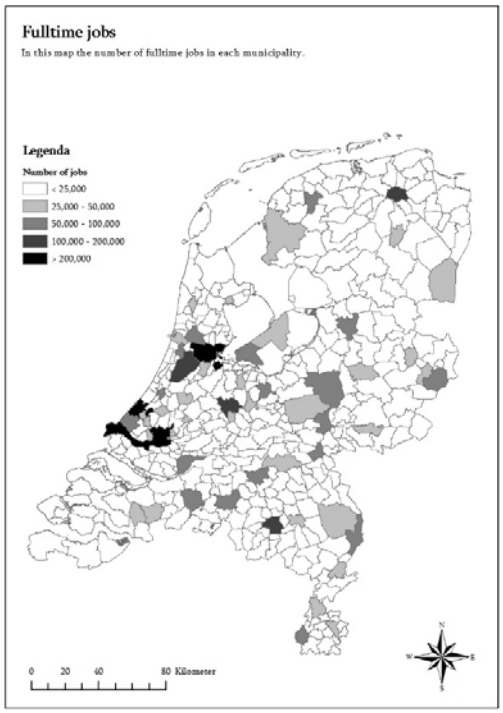


Figure 4.2. Locations of jobs. *Source*: LISA, 2013.

Figure 4.2 (left) shows where jobs are located at the beginning of the measuring period. It is quite clear that job opportunities are best in the urban municipalities in the Randstad area. Other cites follow suit; there are almost no non-urban municipalities with more than 25,000 jobs. However, the number of jobs that a school-leaver can evaluate it is not only the number of jobs that are located within the municipality of the school-leaver that matters, but also that of surrounding. Of course, not every job is as suitable for every school-leaver, because they will have different educational backgrounds and personal preferences when searching for jobs. Although important and interesting, this is beyond the scope for this thesis. This study simply assumes that more jobs equals more opportunities.

Figure 4.3. Study setting. *Source*: Own design

In the next paragraphs (especially 4.2 and 4.5) many references will be made to a number of places and regions. In the map in figure 4.3 (left), the study setting is shown. Note that there is not one 'right' definition of the Randstad area. The definition used here is that of the densely populated area in the provinces Noord-Holland, Zuid-Holland and Utrecht and the relatively sparsely populated 'Groene Hart'-area inbetween. Therefore, Purmerend (North of Amsterdam) is part of the Randstad area, whilst Almere is not.

4.2 Job accessibility

In table 4.3 the average number of jobs that can be reached from a selection of Dutch municipalities is shown. The municipalities selected are those with the highest number of school-leavers at the start of the study, plus five additional municipalities with a high number of school-leavers that are selected to increase the spread of municipalities over the country. Finally, the most remote municipality on the Dutch mainland and the municipality where the benefits of having a large commuting tolerance are highest are selected (see figure 4.3 (study setting) for their location). The average number of reachable jobs is calculated as an average (weighted by the number of inhabitants) of the number of jobs that can be reached from the centroids of neighbourhoods. Since job counts are only available at the municipal level, they have been disaggregated to the neighbourhood level by area percentage. To determine the number of jobs that can be reached, two origin-destination cost matrices were calculated. The first uses personal car transportation, the second assumes travel by bike and public transit. Using the cost matrices, job accessibility from each neighbourhood was calculated and then aggregated to the municipal level, weighted for the number of inhabitants.

Table 4.3: Job accessibility (2006); various time frames / modes of transport. Between parentheses multiplication factors compared to Car; 15 min (Car; 30 min, Car; 45 min) or Car; 45 min (Bike & transit, 8:00 – 9:00 AM) *Source:* LISA, 2013; own calculations

		Car; 15 min.	Car; 30 min.		Car; 45 min.		Bike & transit; 8:00 - 9:00 AM	
	Average in sample	*156,628*	*651,319*	*(4)*	*1,423,498*	*(9)*	*348,330*	*(.25)*
1	Amsterdam	470,437	1,321,019	(3)	2,383,024	(5)	912,989	(.38)
2	Rotterdam	297,243	1,162,655	(4)	2,050,866	(7)	727,719	(.35)
3	Den Haag	374,237	1,011,333	(3)	2,050,095	(5)	716,539	(.35)
4	Utrecht	285,110	1,044,319	(4)	2,895,244	(10)	789,111	(.27)
5	Groningen	124,740	251,774	(2)	420,015	(3)	177,337	(.42)
6	Tilburg	99,065	517,964	(5)	1,090,050	(11)	275,710	(.25)
7	Eindhoven	183,201	505,352	(3)	1,068,643	(6)	365,586	(.34)
8	Nijmegen	108,069	382,642	(4)	1,031,780	(10)	271,281	(.26)
9	Enschede	103,491	228,700	(2)	403,404	(4)	159,861	(.40)
10	Breda	113,272	470,803	(4)	1,404,467	(12)	311,000	(.22)
11	Zwolle	81,583	248,349	(3)	693,808	(9)	146,396	(.21)
12	Maastricht	92,879	241,817	(3)	319,925	(3)	147,020	(.46)
13	Leeuwarden	63,635	158,023	(2)	323,953	(5)	103,072	(.32)
14	Apeldoorn	68,355	422,926	(6)	1,165,557	(17)	182,250	(.16)
15	Middelburg	43,309	84,981	(2)	168,161	(4)	61,986	(.37)
16	Sluis	7,415	27,022	(4)	73,675	(10)	9,929	(.13)
17	Korendijk	11,991	350,261	(29)	1,198,857	(100)	30,218	(.03)

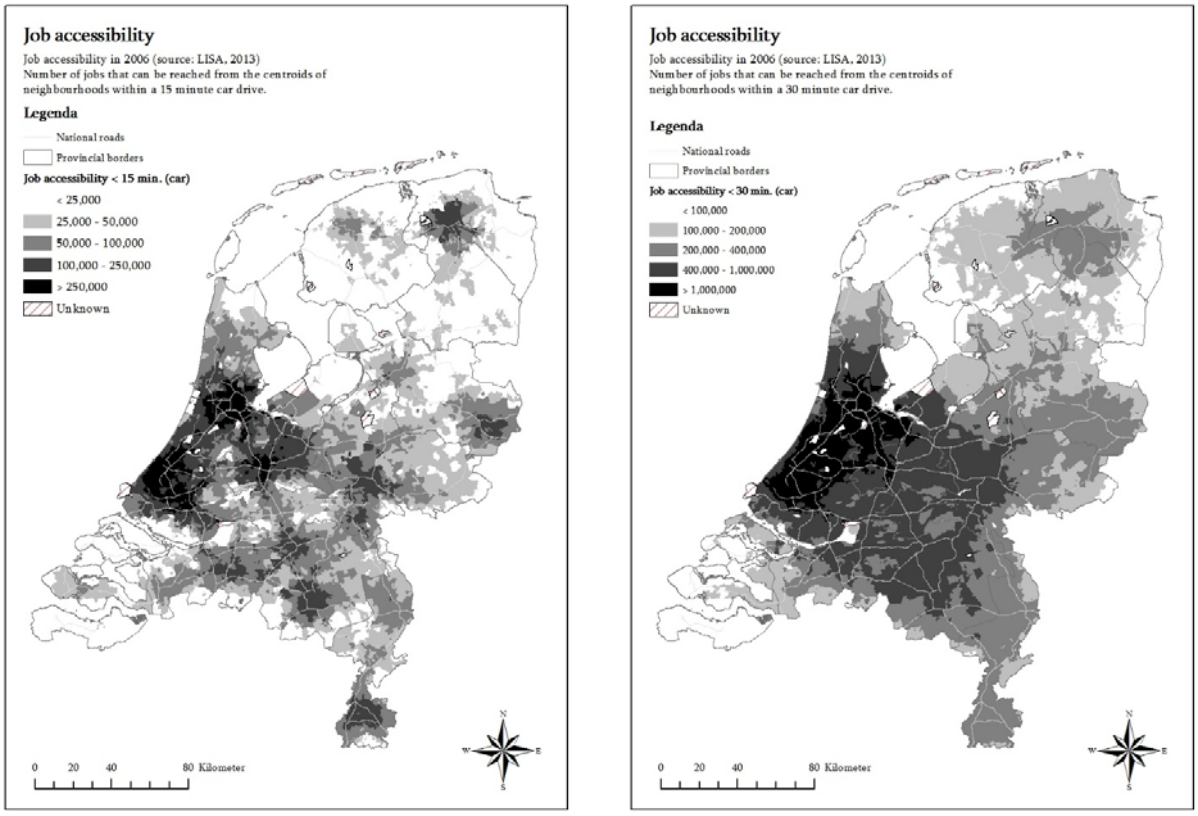
As can be seen in table 4.3, school-leavers in the large cities in the Randstad area have the largest job accessibility with every mode of transportation and in each time frame. Between municipalities there are large differences in accessibility and in the way commuting tolerance influences job accessibility. Job accessibility within 15 minutes driving time is largely dependent on the size of the municipality's labour market, and in that sense very local. With increasing commuting tolerance comes increasing accessibility, but not everywhere to the same amount. Both Apeldoorn and Tilburg are positioned in the midst of a number of substantially sized towns, which explains why they have quite high gains (a job accessibility 5-6 times the number of jobs that can be reached within 15 minutes) from increasing the commuting tolerance to 30 minutes. Korendijk, a small municipality in the North of the Zeeland province, benefits the most of increasing the commuting tolerance to 30 minutes: suddenly the sizeable labour market that is Rotterdam is within reach, resulting in job accessibility that is 30 times higher. Inhabitants of regional centres in relatively unpopulated areas, such as Groningen, Enschede, Leeuwarden and Middelburg, benefit the least: their job accessibility merely doubles from doubling their commuting range.

This pattern is mostly enlarged by increasing the commuting tolerance to 45 minutes of car travel. Those towns that gained from increasing the tolerance to 30 minutes, gain even more by increasing it to 45 minutes; with some notable exceptions. Of the cities in the Randstad area, inhabitants of Utrecht gain most by having a high commuting tolerance. In total, they can reach 44% of the total of 6.6 million fulltime jobs in the Netherlands. Inhabitants of Breda also gain much by having a high commuting tolerance, because suddenly (parts of) Eindhoven and Rotterdam can be reached. Maastricht pops up as a city with very little benefits of a high commuting tolerance. However, for school-leavers who are comfortable speaking French or German, the sizeable labour markets of Liège and Aachen are within reach.

Job accessibility for those dependent on bikes and public transit pales when compared to job accessibility by car. On average, school-leavers can reach only 25 percent of the jobs they could have reached if they had access to a car. Access to only bike and public transit further discriminates against remote areas, it seems. Whereas job accessibility from Korendijk within 45 minutes by car could compete against that of the cities in Noord-Brabant, when dependent on public transit only 3% of these jobs still can be reached. Job accessibility using public transit in Utrecht and Zwolle is surprisingly low, given their status as transit hubs. The hub-and-spoke principle, around which public transit is built, limits access for and to areas that are not centrally located. Apeldoorn's job accessibility by bike and public transit vis-à-vis that of regional centres such as Groningen and Enschede confirm its status as a spoke in the Dutch public transit network (Apeldoorn has no direct railway connection with Zwolle and Arnhem).

The maps in figures 4.4 (a-d) show job accessibility at the neighbourhood level. A number of neighbourhoods have no or surprisingly low job accessibility. This is either because their centroids were not located within 1000

meters of a road or because the closest road had no connection to other roads. The scale of the maps is adjusted by roughly following the average job access gains between time frames and modes of transport for the population of school-leavers (i.e. the upper class boundaries of figure 4.4b are defined as the upper class boundaries of figure 4.4a multiplied by four, 4.4c has upper class boundaries that are ten times those of 4.4a and 4.4d has upper class boundaries that are 25% of the class boundaries of 4.4c).

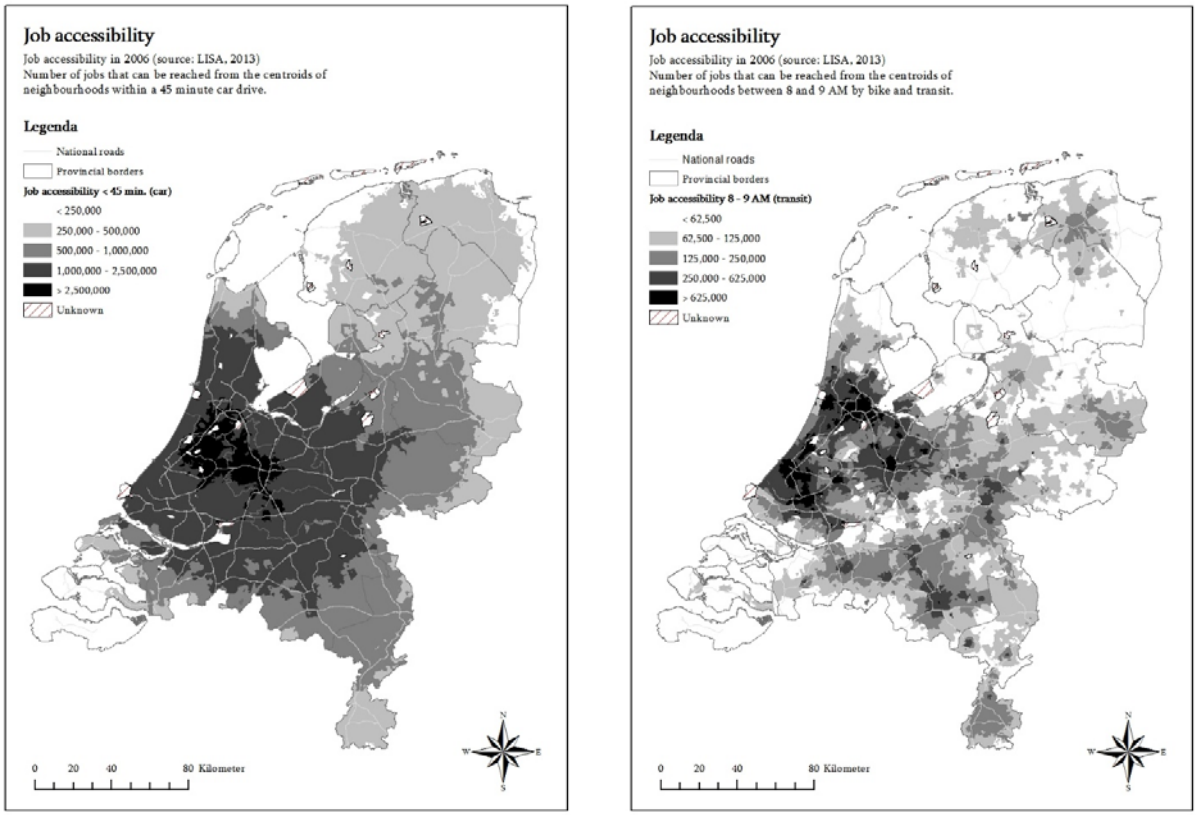


Figures 4.4a & 4.4b. Job accessibility by car, 15 (a) and 30 (b) minutes. Source: LISA, 2013; own calculations.

As can be seen in figure 4.4a, higher levels of job accessibility by car within 15 minutes are mostly confined to cities. Quite clearly, neighbourhoods in the four cities in the Randstad area show up as the areas with best access to jobs. Although at the 15-minute level job accessibility is still very much an urban phenomenon, the inner cities of Delft, Den Haag, Leiden and Rotterdam form a continuous area of highest (>250,000 jobs) job access connected by small corridors along the national roads. This already gives some insight into the importance of national roads. Areas with higher job access (>100,000 jobs) often extend or form around stretches of national roads. A clear example of this is the triangle near Maastricht, where national roads provide inhabitants of neighbourhoods near Maastricht, Heerlen and Geleen access to jobs in one (or more) of these cities. Areas with lowest job accessibility often coincide with areas which have a low density of national roads. However, this does not mean that national roads play an important role in job access within 15 minutes per se.

An example of this is the city of Groningen, where the area with the highest levels of job access (100,000 - 250,000 jobs) spreads far north of its national roads and there are no signs of 'corridors' along the national roads. This is probably due to the fact that most jobs in the city of Groningen are located north from its national road connections.

When commuting tolerance is increased to 30 minutes, job accessibility from neighbourhoods inside the urban centres becomes comparable to that of those at the borders of cities. Because of its good connection to national roads, the Randstad area becomes one large employment centre where, as long as one has access to a car, it does not really matter where one lives because job access will be good. Urban centres outside the Randstad area lose their advantage compared to their immediate surroundings, as they have now comparable levels of job access. Access to national and provincial roads (that give access to cities and jobs over some distance) becomes more important than living in an urban centre. Also, the disadvantaged job accessibility of the areas at the Dutch borders begins to show. The areas with access to less than less than 100,000 jobs almost exclusively lie at the national borders. An interesting exception is the Limburg province (in the far south-east), where job accessibility is comparable to or better than that of more centrally located provinces.



Figures 4.4c & 4.4d. Job accessibility by car, 45 minutes (c) and job accessibility by bike and public transit, between 8:00 and 9:00 AM (d). Source: LISA, 2013; own calculations.

With access to a car and a commuting tolerance of 45 minutes, access to jobs more or less takes the form of a multiple circles, concentrically spreading from the 'Groene Hart' (a relatively green and thinly populated area in the centre of the Randstad) and Utrecht areas, in the centre of the Randstad. There are however some interesting exceptions to this. First, the 'spreading' of the concentric circles goes much faster in some areas than in others. To the south-west of the Randstad, in the Zeeland province, jobs get out of reach much faster because of the necessity to cross bridges (due to its many sea inlets). Towards the North, the concentric circles do not show a truly round form, because of the importance of the triangle Zwolle-Assen-Groningen-Heerenveen as job centres in the North of the Netherlands. Second, small bumps and dips in job access exist, shown on the map as islands of either higher or lower accessibility. These islands correspond to easier or less easy connection to national roads.

This is a completely different picture than that of job accessibility by bike and public transit within an hour from 8:00 AM, which corresponds roughly to an equal amount of commuting tolerance. This map looks more like that in figure 4.4a, although the amount of jobs that can be reached is almost 2.5 times larger (than in figure 4.4a). Furthermore, areas with the best job accessibility by bike and public transit are even more confined to city centres. Not only is the area with access to over 625,000 jobs in the Randstad area smaller, but also for the first time a neighbourhood outside the Randstad area (the city centre of Eindhoven) shows up in the category with the highest job accessibility. In short, central locations become more central, while peripheral locations become even more remote. The effect of access national roads is also less distinct. Although intercity train and bus connections often roughly follow the same route as national roads, there are far less places to get off a train or bus than there are road exits. This too contributes to the more fragmented image that the map in figure 4.4d offers.

In short it can be said that cities offer the best access to jobs when commuting tolerance is low, or for those that don't have access to car transportation (see figure 4.4a and 4.4d). At every level of commuting tolerance, the highest levels of job accessibility are found in the Randstad area. The map in figure 4.4b shows that suburbs can have access to just as many jobs as city centres for those that have an average commuting tolerance. Trading commuting time for lower housing prices and more living space thus becomes a very viable option. At high levels of commuting tolerance, the 'Groene Hart'-area and Utrecht (and its surroundings) provide access to more than 35% of all jobs in The Netherlands (see figure 4.4c). This way, it could be argued that with access to car transportation and a high commuting tolerance, the Randstad area comes close to one single labour market.

4.3 School-leavers' careers and workplace mobility

4.3.1 Career development paths

As already discussed in the first paragraph of this chapter, at the start of the measuring period many school-leavers have already found some kind of employment. As can be seen in figure 4.5, in the year before the study period (from October '05 to October '06) at any point in time most school-leavers are still students. In the last six months, the first transitions into employment are made, and in October 2006 more than 60% of the school-leavers are employee. The number of school-leavers that is employed first increases until July 2007, after which the percentage of employees remains roughly the same. The large number of school-leavers that don't belong to any of the four other socioeconomic categories also shows up on the chart, and it can also be seen that this looks indeed a more or less temporary state. After a year, the percentage of school-leavers that are still in the 'Other' category has decreased to only ten percent. Between July and October 2007, 10 - 15 % of the school-leavers re-enrols in education, a number that then slowly decreases over time. The percentage of school-leavers that becomes self-employed remains low, although it keeps rising steadily until the end of the study period. As time progresses, the percentage of school-leavers that is unemployed rises (to up to around 8% at October 2011).

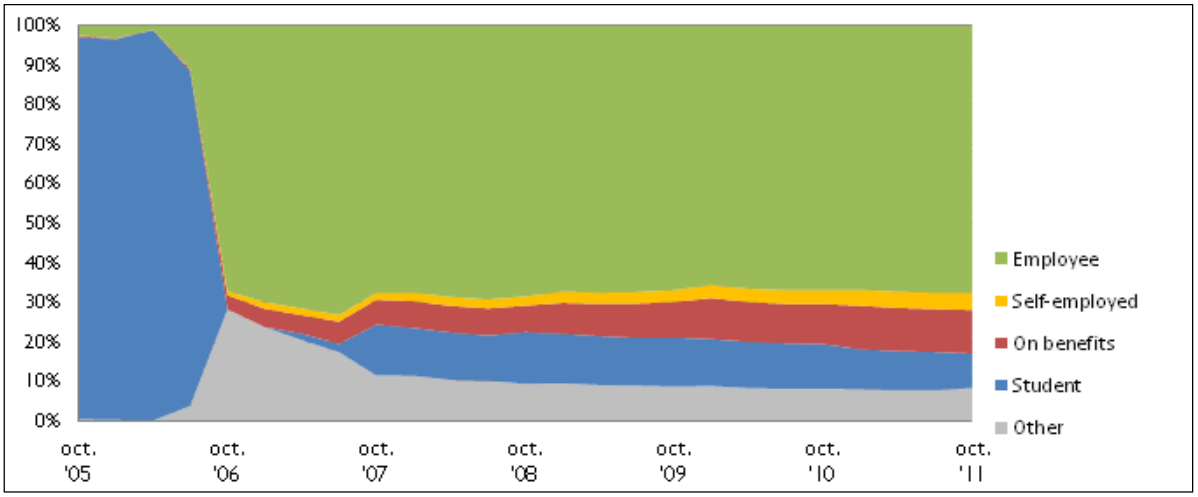


Figure 4.5. Career development path of school-leavers, October 2005 – 2011. *Source*: CBS Micro-data; own calculations.

Previously in this chapter it became clear that there are apparent differences between school-leavers depending on the type of degree or diploma (if any) they received. Next to that, this research is based on the argument that career paths of school-leavers in areas with limited job opportunities might have different career starts than those in areas with better access to jobs. In figure 4.6 and 4.8 the career development paths are shown by diploma type and by reclassified job accessibility.

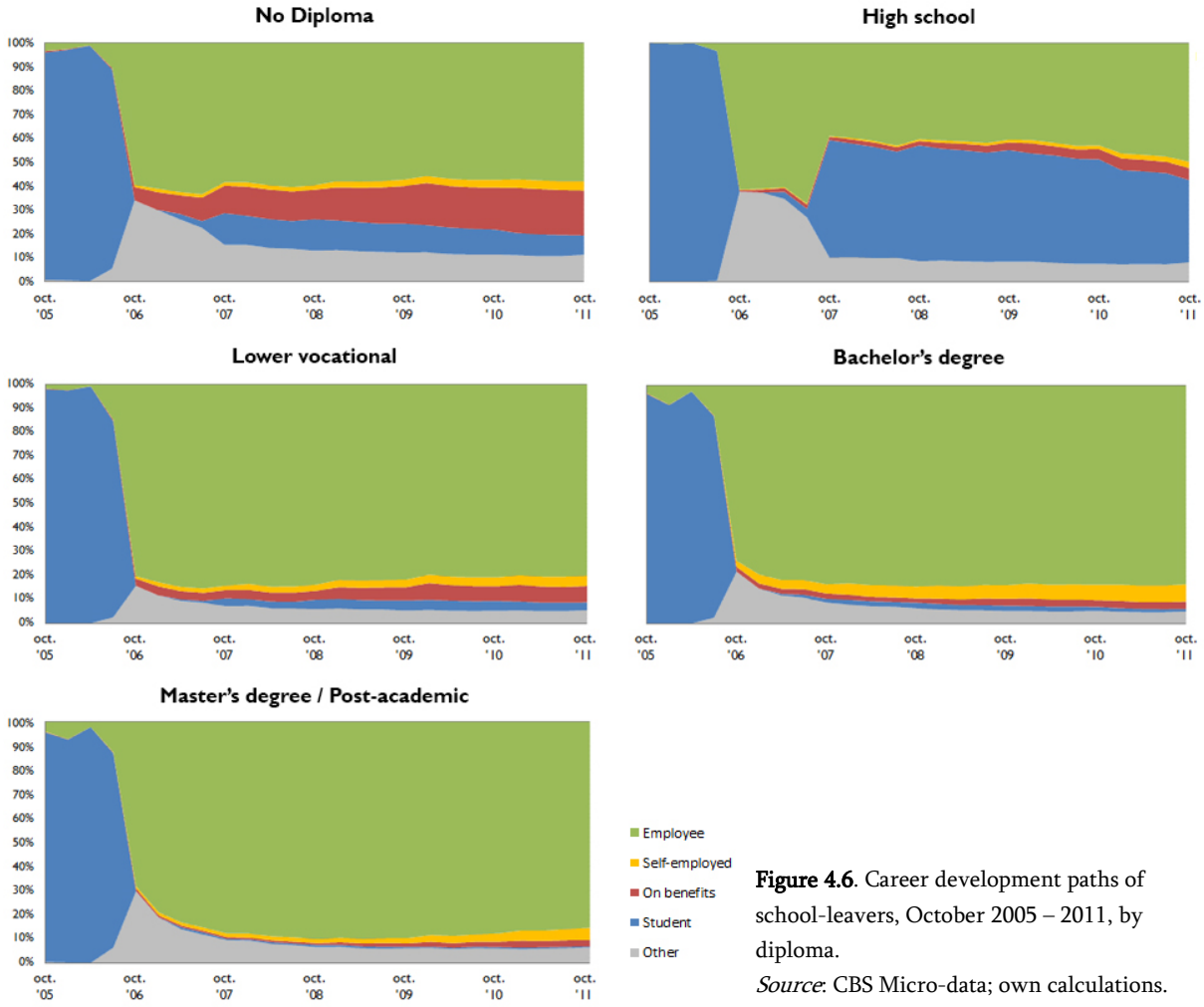


Figure 4.6. Career development paths of school-leavers, October 2005 – 2011, by diploma.
Source: CBS Micro-data; own calculations.

There are clear differences in the career development paths of school-leavers with different diplomas. First, there are those that did not finish their education with a diploma. They have, throughout the complete study period, the largest percentage in 'Other'. Perhaps surprisingly, the number of school-leavers without diplomas that becomes a student again is limited. At its peak, in October 2007, 13.3 % of the school-leavers without any diploma is enrolled in education. Many find their ways into regular employment, but this percentage (around 55 – 60 %) is substantially lower than that of school-leavers with lower vocational diplomas, bachelors or academic degrees. Many of the school-leavers that left high school with a diploma return to education. At its peak, in October 2007, 50% has student as their main socioeconomic status. After that, the number of students shrinks, but even in October 2011 still 35% of the school-leavers with high school diplomas are student. The percentage that becomes employee is lowest in the study group: after October 2007, 40 – 50 % is employee. The pattern seems to resemble that of a break-year, which is common among high school graduates. During a break-year they often travel around the world, or work in part time jobs whilst spending some time of studying.

The careers of graduates with lower vocational diplomas, bachelors or academic degrees are very much alike. School-leavers with lower vocational diplomas are dependent on benefits more often, and among those with bachelor's degrees the percentage of self-employed is a bit higher. Academic graduates have the largest spike in the 'Other' category and, later on, the percentage in this category remains highest of the three. However, the main pattern is the same for all: after graduating, most find their way into employment quite fast (with school-leavers with lower vocational degrees having the most direct connection with the labour market), with at any point in time a small amount in any of the other categories.

Table 4.4. Job accessibility reclassified. *Source*: own calculations.

Job accessibility	Municipalities	School-leavers
Low	91	15 %
Medium	282	60 %
High	34	25 %
Total	*407*	*100 %*

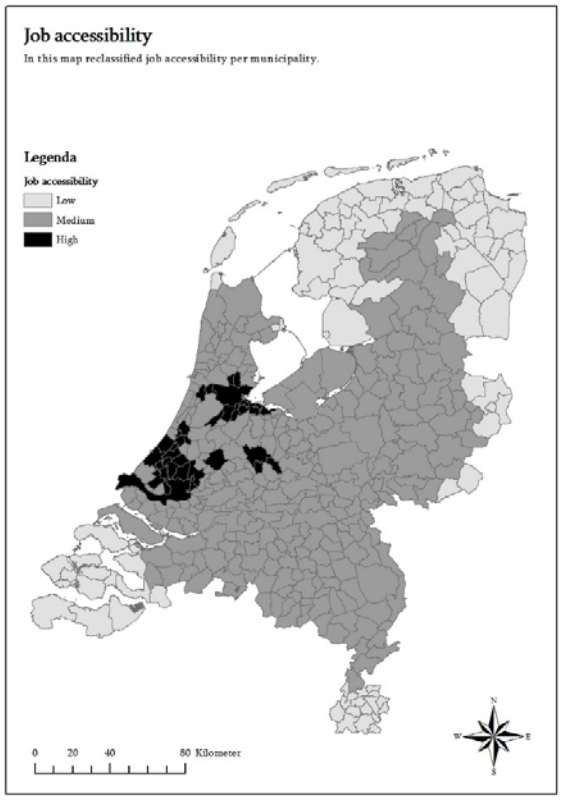


Figure 4.7. Job accessibility reclassified, October 2006. *Source*: LISA, 2013; own calculations.

To be able to also use job accessibility in crosstables, the four job accessibility measures were reclassified into a single variable. First, for each transport mode and commuting tolerance, the deviation from the mean in standard deviations was found. Differences smaller than 1 standard deviation from the mean were scored as 0, differences greater than 1, but smaller than 2 standard deviation from the mean were scored as 1 and differences greater than 2 standard deviations were scored as 2. Then, these differences were classified into a single variable by taking the total difference. If the total difference score was negative, job accessibility was classified as 'Low'; a total difference score between 0 and 5 was classified as 'Medium' and a total difference score of 5 or more as 'High' job accessibility. In table 4.4 and figure 4.7 (to the right), the resulting classification is presented.

According to the classification, most of the Netherlands (± 70 %) has medium job accessibility. However, because of the high concentration of school-leavers in the Randstad area, around 25% of the school-leavers has high job accessibility at the start of their career. Conversely, only 15% of the school-leavers start their careers in a municipality with low job accessibility, although around 25% of the municipalities offers low job accessibility.

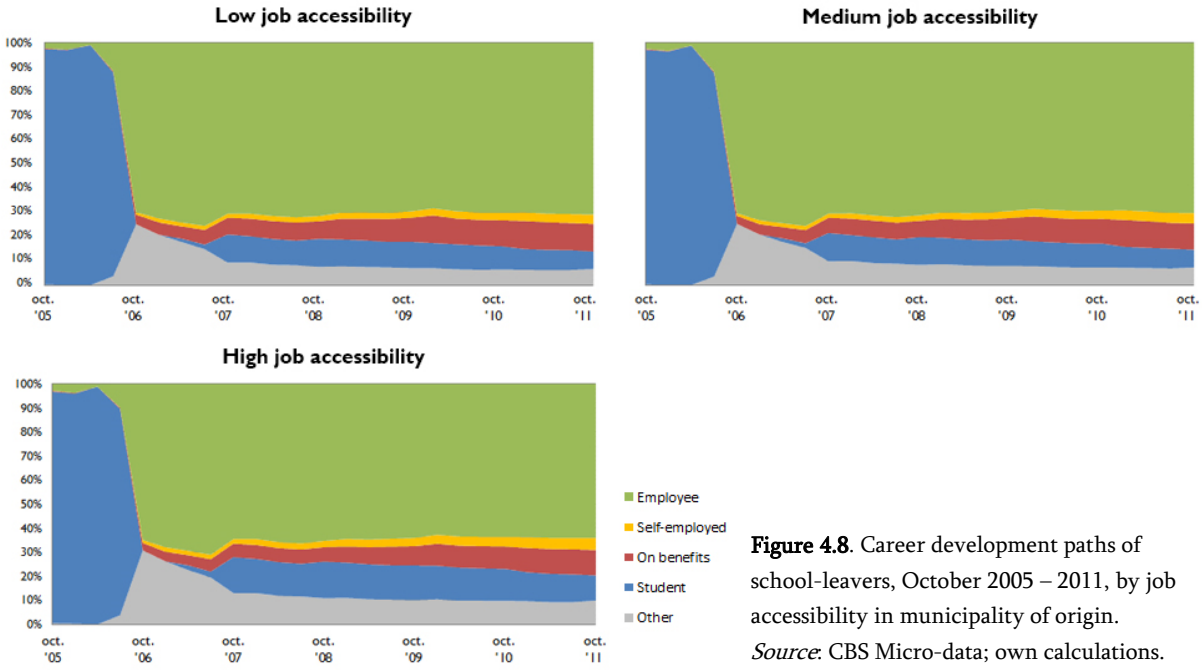


Figure 4.8. Career development paths of school-leavers, October 2005 – 2011, by job accessibility in municipality of origin.
Source: CBS Micro-data; own calculations.

The career development graphs by job accessibility class look almost exactly alike. At any point in time, the percentages of school-leavers in any of the categories are separated only by tenths of percentage points. This suggests similarity between careers, in the sense that the results are roughly the same. In any area, whether access to jobs is easy or limited, school-leavers have the same careers when it comes to the distribution over socioeconomic statuses. It could still be that school-leavers from areas with job accessibility have totally different career behaviour (e.g. being more flexible, having higher degrees of workplace mobility) and that the graphs only show that this behaviour is successful to the extent that they have comparable distribution over socioeconomic statuses. The next section will go into the details of the careers of school-leavers.

4.3.2 Career characteristics

The graphs above already tell an interesting story about career paths of school-leavers and from these graphs it seems likely that there are indeed differences between school-leavers with different diplomas. The effect of differences between job accessibility levels seems limited at first sight. However, the graphs show only cross-sections of socioeconomic statuses (and do not tell anything about other aspects of careers, e.g. differences in the degree of flexibility of careers). The tables in this paragraph give a more detailed insight into differences between careers of school-leavers with different backgrounds. First, the general picture, with a distinction

between careers of those that are successful (in the sense that they are employees at the end of the measuring period) and those that are not:

Table 4.5: Career characteristics of school-leavers (Oct. '06 – Oct. '11). *Source:* CBS micro-data; own calculations.

	Total	Employee at T=20	Not employee at T=20
Times Employee	*14.3*	18.2	6.0
Times Self-employed	*0.6*	0.1	1.6
Times On benefits	*1.7*	0.5	4.2
Times Student	*2.0*	0.9	4.3
Times Other	*2.3*	1.2	4.6
Months before 1st Employee	*3.3*	2.8	4.7
Transitions SES's	*2.1*	1.6	3.0
Transitions jobs	*1.2*	1.4	0.6
Total distance relocated (km.)	*24.7*	21.1	32.2
Times relocated	*0.6*	0.5	0.7
Average Commuting distance (min.)	*15.1*	15.2	14.7
Net change in Job accessibility	*+ 67,109*	+ 67,652	+ 65,975

Table 4.5 shows that, on average, the school-leavers have the socioeconomic status 'Employee' around 14 of the 21 measuring points, and are sometimes found in other statuses. However, there are large differences between the ± 65 % of the school-leavers that are employees in October 2011 and the 35 % that are not. Whereas the first spend most of the study period in socioeconomic status 'Employee', the latter show an indistinct pattern. With higher averages in all categories except for that of Employee, this could indicate very mobile careers (with some time spent in one status, and then some time in another) but could also point at the many different reasons for not being employed: some go back to school (and do not finish in time to become employees), others become and stay dependent on benefits. The second half of the table shows measurements of career flexibility. As already expected in paragraph 3.2.3, successful school-leavers have less transitions between socioeconomic categories (a sign of career insecurity), but more transitions between jobs (a sign of flexibility). Interestingly, they relocate less often, and over smaller distances than those that are not employed at T=20. There are no clear differences in the average commuting distance (when employed) and the net change in job accessibility of relocations.

Table 4.6: Career characteristics of school-leavers (Oct. '06 – Oct. '11), by diploma. *Source:* CBS micro-data; own calculations.

	No diploma	High school	Lower vocational	Bachelor	Master / post-academic
Times Employee	12.3	9.7	17.2	17.4	18.1
Times Self-employed	0.5	0.2	0.6	1.1	0.5
Times On benefits	3.0	0.6	1.1	0.5	0.3
Times Student	2.0	7.6	0.6	0.3	0.1
Times Other	3.1	2.7	1.3	1.4	1.8
Months before 1st Employee	4.5	4.1	1.7	2.2	2.3
Transitions SES's	2.5	2.7	1.5	1.4	1.3
Transitions jobs	1.7	0.9	1.3	1.3	1.1
Total distance relocated (km.)	21.8	39.1	14.6	28.5	41.8
Times relocated	0.6	0.8	0.5	0.6	0.7
Average Commuting distance (min.)	14.0	13.7	14.1	18.4	19.6
Net change in Job accessibility	+ 38,722	+ 131,286	+ 29,065	+ 112,126	+ 162,092

Table 4.6 shows how the careers of school-leavers with different levels of diplomas differ greatly. In the top half of the table, most observations from the graphs of career development paths are confirmed. First of all, school-leavers without diplomas are the group that is responsible for most of the time spent dependent on benefits, although many spend a lot of time employed. The time before they spend finding employment is much longer than that of school-leavers with diplomas (except for those from high school). Many of the school-leavers with high school diplomas re-enrol in education, because average time spent as student is high. Careers of graduates from lower vocational schools, school-leavers with bachelor's degrees and academic graduates all spend most of their time in employment and the connection with the labour market is the most direct for those with lower vocational degrees. Also visible is the longer time that academic graduates need to find employment, but after that employment seems secure: the average time spent in employment is highest.

More interesting insights can be gained from the bottom half of the table. Careers of those without diplomas or with only high school diplomas are less stable than the careers of school-leavers with degrees of higher levels of education. Note that the high number of transitions between jobs of school-leavers without diplomas probably should be interpreted as a sign of instability and not as flexibility (as mentioned in paragraph 3.2.3). High school graduates are very mobile when it comes to relocating: they have the highest average number of relocations, and with almost 40 kilometres they move second farthest. At first glance, relocations seem to be less associated with high levels of human capital than commuting distance. The first are also high among school-leavers without any or with only a high school diploma, whereas the latter clearly rises with level of diploma. Level of degree seems to be also associated with (net) moves to areas with more jobs within reach, with the exception that school-leavers with high school diplomas tend to move to areas with more jobs within reach. This could

possibly be attributed to the fact that many of them become students again; colleges and universities are concentrated in cities and are also more common in the western and southern parts of country.

Table 4.7: Career characteristics of school-leavers (Oct. '06 – Oct. '11), by job accessibility of municipality of origin. *Source:* CBS micro-data; own calculations.

	Low	Medium	High
Times Employee	14.6	14.7	13.3
Times Self-employed	0.5	0.6	0.8
Times On benefits	2.0	1.7	1.6
Times Student	1.7	1.9	2.3
Times Other	2.1	2.0	2.9
Months before 1st Employee	3.3	2.9	3.7
Transitions SES's	2.0	1.9	2.3
Transitions jobs	1.2	1.2	1.1
Total distance relocated (km.)	35.6	24.5	18.3
Times relocated	0.6	0.6	0.5
Average Commuting distance (min.)	18.7	15.5	11.8
Net change in Job accessibility	+ 233,843	+ 97,433	- 105,173

Table 4.7 shows the career characteristics of school-leavers by job accessibility of municipality of origin. Most variables in the upper half of the table have values that are quite close, but some trends can be found. School-leavers from areas with low access to jobs, are dependent on benefits a little more than school-leavers from other municipalities. School-leavers from municipalities with high job accessibility are less often employees than school-leavers from areas with lesser access to jobs. Part of the explanation is that school-leavers from these areas become self-employed more often than school-leavers from areas with lesser access to jobs. However, they are also found more often in the Other category, and return to school more often.

Transitions between socioeconomic statuses and jobs do not differ much, though school-leavers from areas with highest overall job accessibility seem to have slightly more transitions between socioeconomic statuses than school-leavers from other regions. However, the distance over which relocations take place is much larger in areas with low job accessibility and with these moves a lot of jobs are won. An average person from municipalities with low job accessibility 'wins' more than 230,000 jobs during, an average that also includes school-leavers who never move. This is more than double the number of accessible jobs won by school-leavers from municipalities with medium job accessibility. Daily commuting times for employees are also much longer in areas with (very) low job accessibility. This implies that workplace mobility could indeed be a mechanism through which school-leavers from areas with lesser job access mitigate the disadvantage they have when it comes to job opportunities at the local labour market. In the next paragraph, the probability of this hypothesis is tested statistically.

4.4 Job accessibility, workplace mobility and early career success

In the previous paragraph, it became apparent that school-leavers from areas with lower access to jobs use workplace mobility (i.e. relocating and / or commuting) to create more job opportunities than they could have found close to their home. In this paragraph, statistical tests are executed to find out whether living in an area with lower access to jobs is associated with workplace mobility, and whether workplace mobility is correlated to better career results (being employed and height of salary).

In table 4.8, to the right, the results of the first regression analysis are shown. As expected, living in an area with less access to jobs increases the chances of being mobile compared to the 60 % that starts in an area with medium job accesibility, and vice versa: living in an area with higher job accessibility decreases the chances of being mobile. Furthermore, women are slightly less mobile than men, and immigrants of the 2nd generation (children of immigrants) are slightly more mobile than natives. Compared to school-leavers who live with their parents, singles are much more mobile.

Table 4.8: Logit regression analysis on workplace mobility. *Source:* CBS micro-data; own calculations.

	Exp (B)
Job accessibility at T=00 > Low	1.157***
Job accessibility at T=00 > High	.800***
Job accessibility at T=00 > Unknown	.471***
Gender > Female	.938***
Age	1.048***
Ethnicity > Immigrant, 1st gen.	.926**
Ethnicity > Immigrant, 2nd gen.	1.072***
Household status (T=00) > Single	1.612***
Household status (T=00) > Couple	.970
Household status (T=00) > Single parent	.934
Household status (T=00) > Other	1.656***
Diploma > High school	1.909***
Diploma > Lower vocational	.803***
Diploma > Bachelor	1.281***
Diploma > Master / Post-academic	1.981***
Regional dummies	Yes
Nagelkerke R^2	.083

***: coeffcients are significant at the 1%-level of confidence

**: coeffcients are significant at the 5%-level of confidence

Having a diploma and the height of degree of this diploma almost always increase the chances of being mobile, compared to the 43 % that leave school without graduating. Lower vocational graduates are less mobile, but this is perhaps not surprising. First of all, lower vocational colleges try to cater to the local labour market by accommodating studies they offer to the needs of local entrepreneurs. Next to that, for school-leavers with lower vocational degrees the rewards of being spatially mobile might not outweigh the costs (whilst mobility among high school graduates might be caused by their enrolment in studies).

School-leavers in areas with lower job accessibility and those with higher degrees are more mobile, but to what extent is mobility related to being employed at the end of the study period? The logit regression models in table

4.9, below, try to answer this question. With being employed at T=20 (October 2011) as the dependent variable, three different specifications are tested.

Table 4.9: Logit regression analysis on employment at T=20. *Source:* CBS micro-data; own calculations.

	Exp (B)	Exp (B)	Exp (B)
Job accessibility at T=00 > Low	.998	1.068	.956
Job accessibility at T=00 > High	.873***	.783***	.948**
Job accessibility at T=00 > Unknown	1.056	1.241*	1.179
Change in Job accessibility (# jobs)	1.000***	1.000	1.000
Relocations > Distance	.999**	.998***	.998***
Relocations > #	.962**	.880***	.873***
Commuting > Time	1.003***	1.002***	1.001**
First employment	1.090***	1.007***	1.007***
Transitions > SES	1.021***	.716***	.716***
Transitions > Jobs	.871***	1.285***	1.288***
Times Employee	1.436***	-	-
Times Self-employed	1.178***	-	-
Times On benefits	.885***	-	-
Times Student	1.051***	-	-
Times Other	.966***	-	-
Gender > Female	.941**	.791***	.790***
Age	.985**	1.038***	1.037***
Ethnicity > Immigrant, 1st gen.	.811***	.616***	.635***
Ethnicity > Immigrant, 2nd gen.	.867***	.701***	.723***
Household status (T=00) > Single	.935	.932**	.897***
Household status (T=00) > Couple	.876***	.913**	.849***
Household status (T=00) > Single parent	1.002	.659***	.632***
Household status (T=00) > Other	.777***	.733***	.720***
Diploma > High school	1.183***	.616***	.616***
Diploma > Lower vocational	.993	1.649***	1.621***
Diploma > Bachelor	1.551***	2.909***	2.913***
Diploma > Master / Post-academic	1.261***	3.303***	3.355***
Regional dummies	N.S.	Provinces	Urbanity
Nagelkerke R^2	.593	.284	.284

*** / ** / *: coeffcients are significant at the 1 / 5 / 10%-level of confidence

N.S. (regional dummies): Not significant

In all regression models, employment at T=20 is the dependent variable. In the first specification, counts of socioeconomic statuses are included (measures of the stability of a situation), but because it could be argued that

counts of socioeconomic statuses are not really independent variables (each month of employment increases the chance of being employed at T=20, whereas each month of unemployed decreases this chance), they have been excluded from the last two specifications, which will be discussed in more detail. In the last two specifications, the only difference is the regional dummies used; in the first specification dummy variables for all provinces are included, in the second dummy variables for 5 levels of urbanity (based on address density). Results of both models are similar, although including urbanity as a regional control variable decreases the correlation between job accessibility and employment at T=20. This is likely caused by the fact that almost all municipalities with low job accessibility are rural municipalities, and all municipalities with high job accessibility are densely urban municipalities.

The correlation between job accessibility at the start of the career and the chance of being employed is not very strong; only high job accessibility seems to have an effect. Somewhat unexpected, high job accessibility at T=00, is correlated with a lower chance of being employed at T=20. An explanation for this was already mentioned in the hypotheses. High access to jobs can lead to a locking-in effect, where school-leavers from favourably located municipalities limit their search area to their current location, whilst school-leavers from areas with lesser job access search over greater distance. Through competition from school-leavers from areas with low job accessibility, they are actually worse off than those school-leavers from areas with less job accessibility. Because school-leavers in areas with high accessibility feel that there are no gains in moving or commuting, they settle for suboptimal jobs that have a lesser match / offer less security. In this way, the redistributing mechanisms of commuting and relocating work in one direction so that living in an area with higher access to jobs effectively becomes a trap.

However, the effects of workplace mobility on the chance of being employed at T=20 are not that straightforward. Both the number and distance of relocations have a significant and negative effect, whereas commuting time has a positive effect. This last finding could imply that although relocating detaches the school-leavers from their networks, commuting time is positive because it points at an increased search effort and a willingness to 'pay' the costs of a daily commute. Transitions between socioeconomic categories have a significant negative effect on the chances of being employed at T=20, and transitions between jobs have a significant positive effect. This would confirm the idea in paragraph 3.2.3 that the two types of transitions are completely different: the first a sign of career instability and the second as a sign of personal flexibility. Women are less often employed than men, immigrants have disadvantaged position in comparison with natives and of the different household compositions those that are single parents are in employment the least. Consistent with the literature, school-leavers with higher levels of degrees are in employment more often. The only exception to this are the school-leavers with high school diplomas, who are less often employees than school-leavers without diplomas. Given the career development paths of the two groups, this is no surprise: around 50% of high school graduates returns to education after a year and many remain enrolled until the end of the

measuring period. In this case, the lower chances of high school graduates of being employed should therefore not be seen as a bad thing: a higher education will increase their chances of finding employment, later on.

Table 4.10: Regression analyses on salary of employees at T=20. *Source:* CBS micro-data; own calculations.

	Car; 45 min.		Bike and transit	
	B	Beta	B	Beta
Job accessibility at T=00, by car (# jobs)	.000	.053***	-	-
Job accessibility at T=00, transit (# jobs)	-	-	.000	.050***
Change in Job accessibility (# jobs)	.000	.040***	.000	.047***
Relocations > Distance (km)	.300	.023***	.277	.021***
Relocations > #	16.080	.020***	15.658	.019***
Commuting > Time (min.)	2.582	.060***	2.670	.062***
First employment	*.526*	.003	*.497*	.006
Transitions > SES	-23.977	-.072***	-24.318	-.073***
Transitions > Jobs	-25.815	-.057***	-25.960	-.057***
Times Employee	12.320	.078***	12.377	.078***
Times Self-employed	10.797	.016***	10.846	.016***
Times On benefits	-20.963	-.052***	-20.754	-.051***
Times Student	*-2.309*	-.009	*-2.710*	-.011
Times Other	*-1.853*	-.005	*-1.745*	-.005
Gender > Female	-166.141	-.123***	-165.247	-.123***
Age	35.747	.159***	34.989	.155***
Ethnicity > Immigrant, 1st gen.	-21.343	-.008***	-25.441	-.009***
Ethnicity > Immigrant, 2nd gen.	*1.046*	.001	*-3.343*	-.002
Household status (T=00) > Single	47.918	.025***	43.537	.023***
Household status (T=00) > Couple	*3.726*	.002	*3.588*	.002
Household status (T=00) > Single parent	*-4.611*	.000	*-5.448*	.000
Household status (T=00) > Other	38.886	.009***	35.702	.008***
Diploma > High school	-46.383	.020***	-45.958	.020***
Diploma > Lower vocational	-21.364	-.014***	-20.369	-.014***
Diploma > Bachelor	256.458	.141***	255.747	.141***
Diploma > Master / Post-academic	568.037	.249***	563.568	.247***
Job characteristics	Yes		Yes	
Regional dummies (province T=20)	Yes		Yes	
Adj. R^2	.590		.591	
N	53,057		53,057	

*** / ** / *: coeffcients are significant at the 1 / 5 / 10%-level of confidence

In the models presented on the previous page, the effect of job accessibility at the start of a school-leavers career and characteristics of the subsequent career path are used to estimate wage height. In this model, only school-leavers that are employees and of whom job characteristics are known are used. Two specifications have been made: one with job accessibility at T=00 within 45 driving time, the other with job accessibility by bike and public transit.

The models both explain around 59 % of the variance in salaries, which is quite a good fit. Both models have comparable values for coefficients, with the latter of the two models having a slightly better fit. This could mean that more school-leavers are dependent on public transit (and have no access to personal car transportation), or could be confounded by wage levels in urban areas being higher. Control variables on job characteristics are included, since they are important co-predictors of wage height. For example, wages in the financial sector are known to be much higher than those in the public sector.

Job accessibility had a negative effect on the chance of being employed at T=20, but school-leavers who start their careers in areas with access to more jobs and are employed at T=20, have higher salaries (in the order of 5 euros (car, 45 minutes) or 15 euros (public transit) per 100,000 accessible jobs). Being mobile also pays: job accessibility gains, relocations (both distance and number of moves) and commuting time all have a significant and positive effect on the salary of school-leavers that are employed at T=20. Of these variables, commuting time has the largest positive beta coefficients, and thus the strongest correlation. This confirms the results of the logit regressions on the chance of being employed at T=20, and is in line with the literature discussed earlier. In the logit models, moving house had no or negative effects on the chance of being employed at T=20, whereas commuting time had a positive effect. This confirms earlier results that the reason for migration is important: Herzog et al. (1993) note that speculative migration (migration in the hopes of finding employment) has no positive effect on wage, whereas contracted migration (migration after finding a job) has. Of course, there are also many other reasons for migration (e.g. migration to be able to live together with a partner), which makes interpretation of the effects of migration on the success of a career start less straightforward.

Other career characteristics also influence the height of the wage. Being employee or self-employed (both are forms of being active on the labour market) increases the wage, with being employee having a stronger correlation. Being unemployed has a negative effect on wage, because of missed tenure. The correlation coefficient is a little weaker than that of being employed, but the effect is much larger in terms of real monetary value. Being a student has no significant effect on wage level and there is also no significant effect of being in the socioeconomic category 'Other'. Both types of transitions have a negative effect, although this was only expected for transitions between socioeconomic categories. Personal characteristics influence wage levels as expected: women earn less than men, wages rise with age and level of degree has a positive influence on height of salary.

The analyses were repeated for three groups of diploma levels (no or only high school diploma; lower vocational degree; bachelor, master or post-academic degrees), but without big differences. For each group, all (significant) coefficients point in the same direction as in the two model specifications above. However, there are some interesting differences in the strengths of correlations. Job accessibility at the start of the career as well as job accessibility gains have a much stronger correlation with wage levels for school-leavers with bachelor, master or post-academic degrees than for school-leavers with lower (or no) diplomas. For this group it is the strongest correlation after gender. Although hypothesised earlier, the effect of workplace mobility is not stronger for higher educated and transitions between jobs still have a negative effect on wage height. Perhaps the financial crisis (which overlaps with the measuring period) plays a role here, making job switches less voluntary than expected. When a job switch is made out of necessity, instead of out of opportunity, there probably won't be a positive effect on wage level.

4.5 Sensitivity of results

It has already been mentioned in the methodology that the number of jobs that can be reached by car is probably overestimated, because of congestion effects. It is expected that these effects are stronger in the dense urban Randstad area, than in more peripheral areas of the Netherlands. Since there was no accurate data available on average travel times during rush hours, a small test was executed in which average travel speeds were lowered to 60 km/h for a number of road segments that are notorious for their traffic jams (see figure 4.9, below).

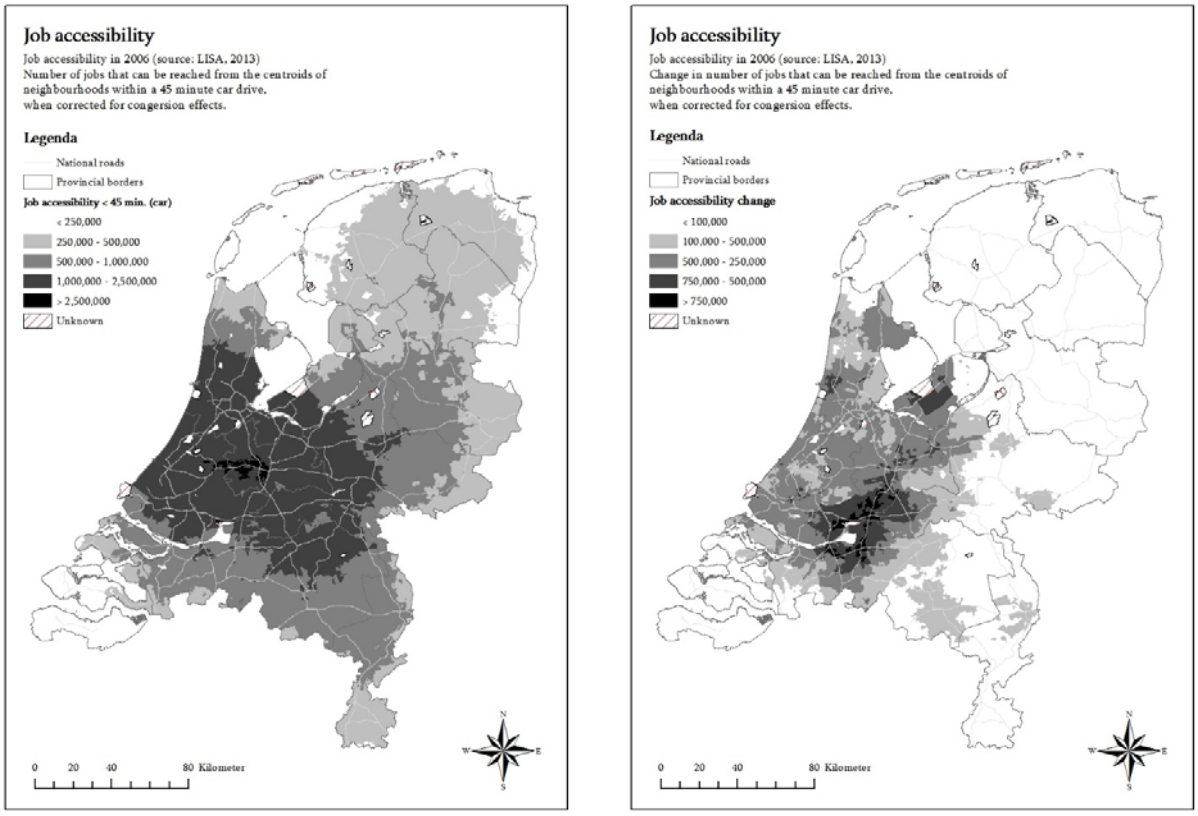
The road segments in figure 4.9 that are marked blue or red are notorious for their congestion in one or both directions. Average travel speed was lowered to 60 km/h for all these segments, in all directions. It is very well possible that congestion effects are still underestimated. First, the list of segments is not exhaustive: these are only segments that have high or very high chances of congestion. Second, 60 km/h might very well be a high estimate of the average speed in a jammed road segment. Finally, only national roads are taken into account, whereas municipal and provincial roads such as ring roads or important link roads will also have slower than usual traffic during these hours.

Figure 4.9. Sections of national roads that are notorious for congestion (during morning rush hour). *Source:* ANWB, 2014.

Table 4.11: Job accessibility (2006); various time frames / modes of transport. Between parentheses the percentage of jobs that is accessible compared to calculations without taking congestion into account. *Source:* LISA, 2013; own calculations

		Car; 15 min.		Car; 30 min.		Car; 45 min.	
	Average sample	*137,641*	*(88)*	*551,532*	(85)	*1,203,366*	(85)
1	Amsterdam	417,059	(89)	1,137,878	(86)	2,119,744	(89)
2	Rotterdam	220,089	(74)	943,843	(81)	1,622,625	(79)
3	Den Haag	335,950	(90)	863,094	(85)	1,735,303	(85)
4	Utrecht	268,777	(94)	907,798	(87)	2,435,814	(84)
5	Groningen	118,870	(95)	233,642	(93)	388,291	(92)
6	Tilburg	98,923	(100)	418,448	(81)	923,305	(85)
7	Eindhoven	180,292	(98)	440,165	(87)	917,311	(86)
8	Nijmegen	108,069	(100)	376,410	(98)	1,000,898	(97)
9	Enschede	103,491	(100)	226,036	(99)	387,477	(96)
10	Breda	111,422	(98)	367,112	(78)	869,530	(62)
11	Zwolle	81,583	(100)	248,344	(100)	690,997	(100)
12	Maastricht	83,296	(90)	234,688	(97)	308,580	(96)
13	Leeuwarden	63,635	(100)	158,023	(100)	299,986	(93)
14	Apeldoorn	68,346	(100)	414,934	(98)	1,045,892	(90)
15	Middelburg	43,309	(100)	84,981	(100)	168,161	(100)
16	Sluis	7,415	(100)	27,022	(100)	73,675	(100)
17	Korendijk	11,991	(100)	225,718	(64)	821,075	(68)

Nevertheless, the effects of incorporating congestion in job accessibility measures are already visible. Table 4.11 (above) shows that school-leavers have, on average, a job accessibility that is 15% lower than when congestion effects are not incorporated. Interestingly, this is the case at all three levels of commuting tolerance. At the shortest commuting tolerance, the effect is largest in Rotterdam, which is divided and surrounded by four segments of national roads that are prone to congestion. Other cities in the Randstad suffer less, and outside the Randstad the effects of congestion disappear almost completely, with Maastricht as an exception. With a commuting tolerance of 30 minutes, job access in other cities is affected by congestion too. Especially cities towards the South-East, congestion seems to affect job accessibility. Korendijk, the municipality which' inhabitants would win most from having a high commuting tolerance is effected the most: only 64 percent of the jobs that could originally be reached from this municipality can still be reached, which means that more than 100,000 jobs are now too far away to travel to in 30 minutes. There seems to be not much difference in job accessibility loss between a commuting tolerance of 30 and of 45 minutes. Only for Apeldoorn and Breda an extra concentration of jobs seems now out of reach, all other municipalities have about the same percentages of reachable jobs.



Figures 4.10a & 4.10b. Job accessibility by car, 45 minutes with congestion (a) and job accessibility loss due to congestion (b). Source: LISA, 2013; own calculations.

Figures 4.10 (a and b) confirm this. Compared to the map in figure 4.4c, a lot less black and dark grey is visible in the map. In fact, only around the A12, the national road that connects Utrecht and Den Haag, there are still a few neighbourhoods that are connected to over 2,500,000 jobs within 45 minutes. At first sight, congestion on the A16, which connects Breda with the Randstad, seems to have a huge impact on the amount of jobs that can be reached within 45 minutes from the Western part of Noord-Brabant. However, figure 4.10b shows that the highest losses of accessible jobs also occur in areas more North of Breda. Especially neighbourhoods around A27 and A15 lose access to many jobs, sometimes even over 750,000 (reaching a maximum of 1,000,000 in Gorinchem at the crossroads of A15 and A27, and Lexmond at the crossroads of A27 and A2). This shows that job accessibility counts were probably overestimated, and that this overestimation is stronger in some areas (areas with high job accessibility) than in others. For future research with accessibility measures it is therefore important to try to minimize this bias, either by acquiring a dataset that offers 'real' travel times during rush hour or by controlling for this bias through extra variables that approximate the effects of congestion (e.g. absolute measures of daily incoming and outgoing traffic).

The regression analyses from the previous paragraphs were repeated with the 'congested' job accessibility variables. The main results of the analyses did not change (R^2's were comparable, directions of coefficients pointed in the same direction), but the size of the coefficients was smaller, which is not strange since variance in the accessibility variables controlled for congestion effects is lower.

5. Conclusion

5.1 Conclusion

In this thesis, the aim is to study the effect job accessibility has on the success of school-leavers' career starts. In addition to studying the effect of job accessibility on employment chances and wage height, the actions of school-leavers in response to the situation on their local labour market is of interest. This is of both social and scientific interest, since there is evidence that unfavourable career starts have long term effects on careers: being unemployed or working in lower paid (and therefore probably underskilled) jobs leaves 'scars'. These scars manifest themselves in lower pays or lesser job security.

To study whether job accessibility influenced the success of career starts of school-leavers, the early careers of 80,545 school-leavers were studied. Using longitudinally linked registry micro-data, school-leavers were selected that had been students for at least five out of the nine months prior to October 2006. From this sample, school-leavers that had re-enrolled before February 2007 were deleted, to ensure that their leaving school was of significance. Their career starts were followed for a period of five years.

The first research question of this study concerns the location of jobs and whether regional differences exist in job access. Job accessibility was measured using network analysis techniques, for four combinations of transport modes and time frames (by car within 15, 30 and 45 minutes and by bicycle and public transit within 1 hour from 8 AM). It was found that there are great differences in the job accessibility of municipalities depending on the mode of transport used and the commuting tolerance. With access to a car and a commuting tolerance of 15 minutes, high levels of job accessibility are mostly found in cities and their immediate surroundings. When commuting tolerance increases to 30 minutes, suburban locations offer access to jobs that is comparable to that of cities. At 45 minutes job access roughly takes the form of concentric rings around Utrecht and the Groene Hart area. Job accessibility by bike and public transit resembles accessibility for car with a commuting tolerance of 15 minutes, but with an even starker contrast between central and non-central locations.

To answer the second research question (regarding differences in characteristics of early careers of school-leavers with differing levels of job accessibility at the start of their career), career development graphs and crosstables were presented. In the career development graphs the socioeconomic statuses of the school-leavers in the first five years of their career were plotted against their level of job access at the start of the measuring period. The graphs show almost the same distribution over the different groups (Employee, Self-employed, On benefits, Student and Other) over time. Apparently, careers of school-leavers from areas with lower access to jobs are not very different from careers of school-leavers from areas with better job access. The characteristics of these careers do show differences: school-leavers from areas with lower job access are more mobile than

school-leavers from areas with high job access. They have larger averages commutes (19 vs. 12 minutes on average), relocate over greater distance (36 vs. 18 kilometres) and move towards areas with higher access to jobs (net gains of over 230,000 jobs within reach vs. a net loss of access to more than 100,000 jobs for school-leavers from areas with high job access). This finding was further confirmed in a logit regression analysis, which shows that the chance of being mobile over a great distance (commuting for over 45 minutes or relocating over more than 50 kilometres) at some point in the early career is negatively correlated to job accessibility at the start of the measuring period. The effect of low versus high job access on other career characteristics is less pronounced. The number of transitions between socioeconomic statuses (2.0 vs. 2.3 on average) and job switches (1.2 vs. 1.1) are comparable. This leads to the conclusion that careers of school-leavers from areas with limited access to jobs do not differ much from careers of school-leavers from areas with better job access, but that school-leavers from areas with low job accessibility are more geographically mobile than school-leavers from areas with high job accessibility.

The third research question focuses on the role that regional differences in job accessibility play in explaining early career labour market success of school-leavers. In this study, labour market success is defined twofold: as being employed at the end of the measuring period and, for those school-leavers that are employed at the end of the measuring period, as earning a high salary. Logit regressions were executed in which being employed at the end of the measuring period was the dependent variable. Compared to school-leavers starting a career in an area with medium job accessibility, school-leavers having a career start in a municipality with low access to jobs do not differ significantly. School-leavers who start in a region with high are less often employed at the end of the measuring period, even after controlling for personal and career characteristics. The regression analyses on height of salary show that school-leavers from areas with high job accessibility than school-leavers from areas with low job accessibility; a correlation that is especially strong for higher educated school-leavers. The way job accessibility is measured does not have a strong influence on this result: both job accessibility by car (within 45 minutes) and job accessibility by bike and public transit (within an hour from 8 AM) have a significant correlation with height of salary.

For the final research question, the possibility to offset unfavourable local labour market circumstances by being (spatially) flexible (i.e. changing jobs, moving house, commuting) is examined. In all regression analyses, a negative correlation was found for switches between socioeconomic statuses and labour market success. School-leavers that switch jobs are employed more often at the end of the measuring period, but earn less. For relocations (both amount and distance), positive correlations were found in the models regarding wage height, but negative correlations were found in the models estimating employment, especially for the number of moves. School-leavers who commute are more often employed and receive higher wages than those who don't (or commute less). Thus, 'yes' would be the simple answer to the final research question, but a ready-made solution that leads to a successful career start does not exist. None of the hypotheses in this study can be

undeniably confirmed or disproved, but from this study it has become clear that job accessibility depends heavily on location, mode of transport and commuting tolerance, that it does play a role in early career labour market success of school-leavers and that the actions of school-leavers can help shape their success.

5.2 Reflection

5.2.1 Limitations of the study

The job accessibility counts for commuting by car that were used in this study were calculated without taking congestion effects into account, because reliable data on real / average travel times were unavailable. As has been mentioned previously in this study, this will probably have the effect that job accessibility counts are overestimated. The exact extent of the overestimation, as well as its influence on the results of this study, is unknown. However, a sensitivity analysis was executed that showed that congestion may have a serious impact on the results. Although the sensitivity analysis had its own limitations (only speeds on national roads that are notorious for their rush hour traffic were lowered), it showed that accessibility was overestimated the most in the Randstad area and in northwest Noord-Brabant. On the other hand, highest levels of job access were still found in the same area and the results of regression analyses were largely the same. This means that conclusions probably will still hold if more exact job accessibility measures were used.

In this study, job accessibility counts do not discriminate between level and suitability of jobs, nor are they computed using vacancies. There is no way to know whether jobs in reach match with the diploma of the school-leaver or if there is any chance of getting the position (i.e. that it is vacant). At the moment, there is no reliable data available on vacancies in The Netherlands. Existing data mostly measure vacancies at temporary employment agencies and the municipal unemployment bureaus (Centrum voor Werk en Inkomen), leading to a bias toward insecure and low-paid jobs. Vacancies for specialized and higher-paid jobs are posted and filled through other means (e.g. newspaper ads, job-seeker sites and recruiting agencies) and not centrally registered. Reliable data on vacancies, including level and sector, would therefore be very welcome and improve the results of studies like this.

5.2.2 Suggestions for further research

It could be argued that measuring job accessibility without taking competition from school-leavers and other jobseekers from surrounding areas in to account, further overestimates the results. An index of accessibility that controls for this competition could provide a clearer insight into which areas offer the best access, and might ease interpretation of the results of regression analyses. Using an index was beyond the scope of this thesis but should be implemented in later research. A first step toward an index of job accessibility would be to divide the number of jobs / vacancies in an area by the number of persons that can reach them before they are used in the proximity counts. When calculated this way, the job accessibility measures would result in the number of jobs in reach that are not in reach for someone else (assuming that, at equilibrium, all jobs are filled and everyone is employed). Using such measures require the researcher to first explain who are competition, and who are not.

In this study, there was no real way to test to which extent school-leavers' careers differ and path dependency of careers (being employed at a point in time increases the chance to be employed at a later point in time) could not be taken into account in any way. Circumstantial evidence has been given, but there is no way of telling what causes what. Social sequence analysis is a new strand of analysis techniques that try to delve deeper into this problem and measure resemblance of series of data. Using techniques that stem from biology, to measure resemblance of DNA sequences, the development and resemblance of temporal patterns (e.g. a career) can be categorized and compared. A combination of the techniques used in this study and social sequence analysis techniques would provide further insight into the career starts of school-leavers and could help answer questions regarding the sequence of events (does being mobile lead to higher wages, or is being mobile simply a characteristic of school-leavers who have high wages?).

Literature

Ballard, K. P., and Clark, G. L. (1981). The short-run dynamics of inter-state migration: A space-time economic adjustment model of in-migration to fast growing States. *Regional Studies*, vol. 15 (3), pp. 213-228.

Ballas, D., and Clarke, G.P. (2000). GIS and Microsimulation for Local Labour Market Analysis. *Computers, Environment and Urban Systems*, vol. 24 (4), pp. 305-330.

Bastiaanssen, J. (2012). *Vervoersarmoede op Zuid: Een verkennend onderzoek naar de mate waarin verplaatsingsmogelijkheden van invloed zijn op de arbeidsreïntegratie van werklozen*. Nijmegen : Radboud Universiteit Nijmegen (Masterthesis).

Beblo, M., & Wolf, E. (2002). Wage penalties for career interruptions: an empirical analysis for West Germany *ZEW Discussion Papers*, no. 02-45.

Becker, G.S. (1964). *Human Capital*. New York: Columbia University Press.

Brzinsky-Fay (2007). Lost in Transition? Labour Market Entry Sequences of School Leavers in Europe. *European Sociological Review*, vol. 23 (4), pp. 409-422.

Coniglio, N.D., Prota, F. (2007). Human Capital Accumulation and Migration in a Peripheral EU Region: The Case of Basilicata. *Papers in Regional Science*, vol. 87 (1), pp. 77-95.

DaVanzo, J. (1983). Repeat Migration in the United States: Who Moves Back and Who Moves On? *The Review of Economics and Statistics*, vol. 65 (4), pp. 552-559.

Dolton, P. and Vignoles, A. (2000). The Incidence and Effects of Overeducation in the U.K. Graduate Labour Market. *Economics of Education Review*, vol. 19(2), pp. 179-198.

Faggian, A., McCann, P., Sheppard, S. (2007), Some Evidence That Women Are More Mobile than Men: Gender Differences in U.K. Graduate Migration Behavior. *Journal of Regional Science*, vol. 47 (3), pp. 517-539.

Fischer, P. A., and Malmberg, G. (2001). Settled people don't move: On life course and (im-) mobility in Sweden. *International Journal of Population Geography*, vol. 7 (5), pp. 357-371.

Google (2012). *General Transit Feed Specification Reference*. https://developers.google.com/transit/gtfs/reference; last accessed: 2014-06-30.

Green, F. and McIntosh, S. (2007). Is there a genuine under-utilization of skills amongst the over-qualified? *Applied Economics*, vol. 39 (4), pp. 427-439.

Gregory, M., and Jukes, R. (2001). Unemployment and subsequent earnings: Estimating scarring among British men 1984–94. *The Economic Journal*, vol. 111 (475), pp. 607-625.

Hensen, M.M., Vries, R. de, and Cörvers, F. (2009). The role of geographic mobility in reducing education-job mismatches in the Netherlands. *Papers in Regional Science*, vol. 88 (3), pp. 667-682.

Herzog, H.W., Hofler, R.A. and Schlottmann, A.M., (1985). Life on the Frontier: Migrant Information, Earnings and Past Mobility. *The Review of Economics and Statistics*, vol. 67(3), pp. 373-382.

Herzog, H.W., Schlottmann, A.M. and Böhm, T.P. (1993). Migration as Spatial Job-search: a survey of empirical findings. *Regional Studies*, vol. 27 (4), pp. 327-340.

Hospido, L. (2009). Gender differences in wage growth and job mobility of young workers in Spain. *Investigaciones económicas*, vol. 33 (1), pp. 5-37.

Kennisinstituut voor Mobiliteitsbeleid, 2013. *Mobiliteitsbalans 2013.* Den Haag: Ministerie van Infrastructuur en Milieu.

Kunze, A. (2002). The timing of careers and human capital depreciation. *IZA Discussion paper series*, no. 509.

Light, A., and Ureta, M. (1995). Early-career work experience and gender wage differentials. *Journal of Labor Economics*, vol. 13 (1), pp. 121-54.

Lippman, S.A. and McCall, J.J. (1976). The Economics of Job Search: a survey. *Economic Enquiry*, vol. 14 (2), pp. 155-189.

Miller, A. R. (2011). The effects of motherhood timing on career path. *Journal of Population Economics*, vol. 24 (3), pp. 1071-1100.

Morang, M. (2014). *Add GTFS to a Network Dataset: Using GTFS in ArcGIS Network Analyst*. http://transit.melindamorang.com/overview_AddGTFStoND.html; last accessed 2014-06-30.

OECD (1998). Getting Started, Settling In: The Transition from Education to the Labour Market, in OECD (eds.), *The Employment Outlook*, pp. 81-120. Paris: OECD.

Pekkala, S., and Tervo, H. (2002). Unemployment and Migration: Does Moving Help? *The Scandinavian Journal of Economics*, vol. 104 (2), pp. 621-639.

Pissarides, S.A. (1976). Job Search and Particitpation. *Economica*, vol. 43 (1), pp. 33-49.

Ravenstein, E.G. (1885). The Laws of Migration. *Journal of the Statistical Society of London*, vol. 48 (2), pp. 167-235.

Roberts, K., Clark, S.C., Wallace, C. (1994). Flexibility and Individualisation; A Comparison of Transition into Employment in England and Germany. *Sociology*, vol. 28 (1), pp. 31-54.

Scherer, S. (2001). Early Career Patterns: A Comparison of Great Britain and West Germany. *European Sociological Review*, vol. 17 (2), pp. 119-144.

Scherer, S. (2004). Stepping-stones or Traps? The Consequences of Labour Market Entry Positions on Future Careers in West Germany, Great Britain and Italy. *Work, Employment and Society*, vol. 18 (2), pp. 369-394.

Schultz, T. W. (1961). Investment in human capital. *The American economic review*, vol. 51 (1), pp. 1-17.

Sjaastad, L.M. (1962). The Costs and Returns of Human Migration. *Journal of Political Economy*, vol. 70 (5), pp. 80-93.

Stigler, G.J. (1961). The Economics of Information. *Journal of Political Economy*, vol. 69 (3), pp. 213-225.

Theunissen, G., Verbruggen, M., Forrier, A., and Sels, L. (2011). Career sidestep, wage setback? The impact of different types of employment interruptions on wages. *Gender, Work & Organization*, vol. 18 (1), pp. 110-131.

Van Ham, M. (2002). *Job access, workplace mobility, and occupational achievement*. Delft: Eburon.

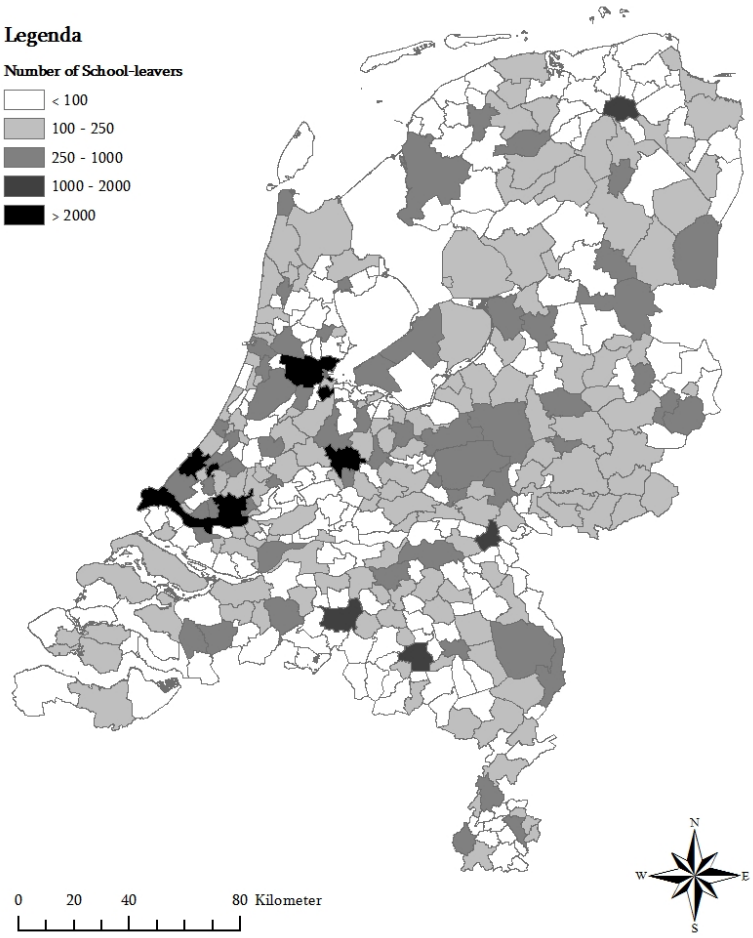
Van Ommeren, J., Rietveld, P., and Nijkamp, P. (1997). Commuting: In search of jobs and residences. *Journal of Urban Economics*, vol. 42 (3), pp. 402-421.

Venhorst, V., Van Dijk, J., and Van Wissen, L. (2011). An analysis of trends in spatial mobility of Dutch graduates. *Spatial Economic Analysis*, vol. 6 (1), pp. 57-82.

Appendix : Full-size maps

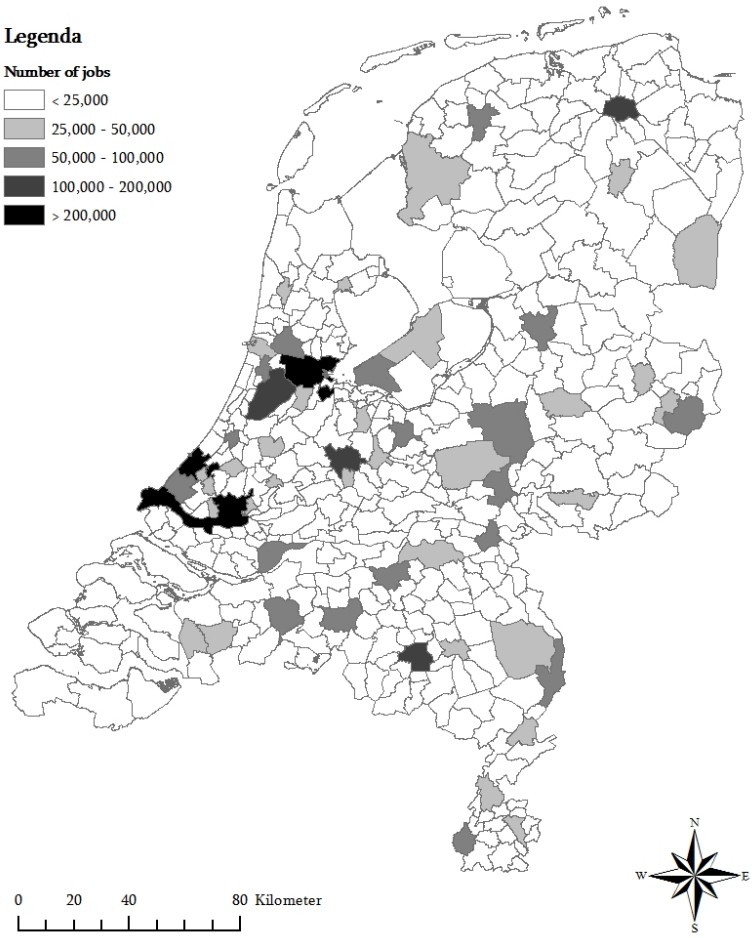
Origin of school-leavers

In this map the number of school-leavers in each municipality on October 1, 2006.



Fulltime jobs

In this map the number of fulltime jobs in each municipality.

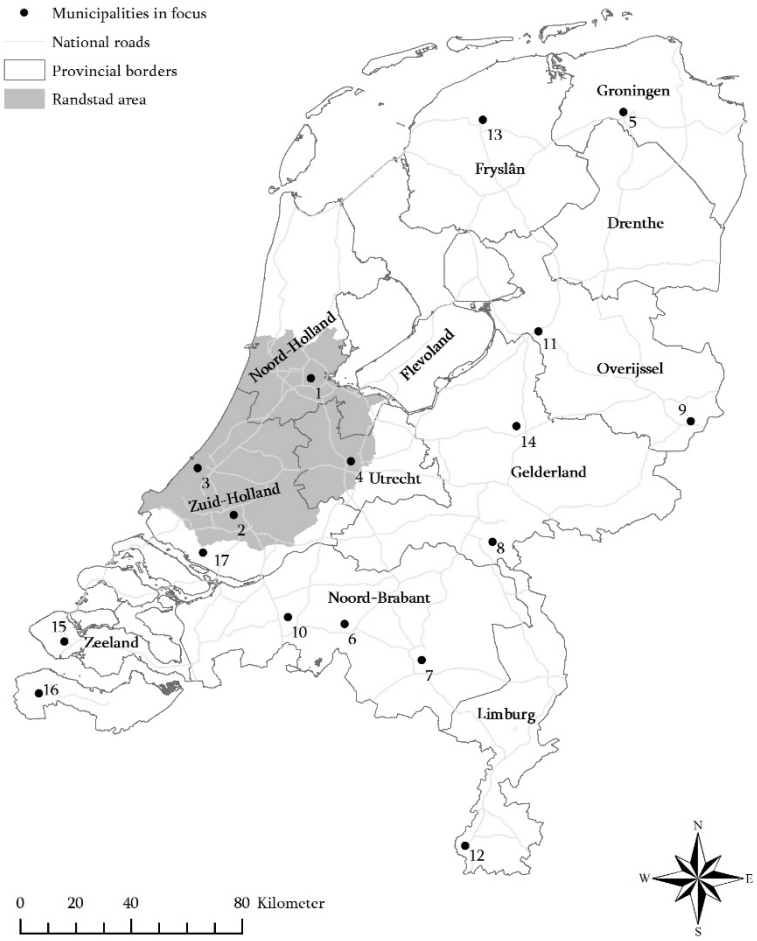


Study setting

In this map the setting of the study. Provinces are labelled,
a number of municipalities that will be used several times
in this study are numbered and the Randstad area is depicted.

Legenda

- Municipalities in focus
- National roads
- Provincial borders
- Randstad area



Job accessibility

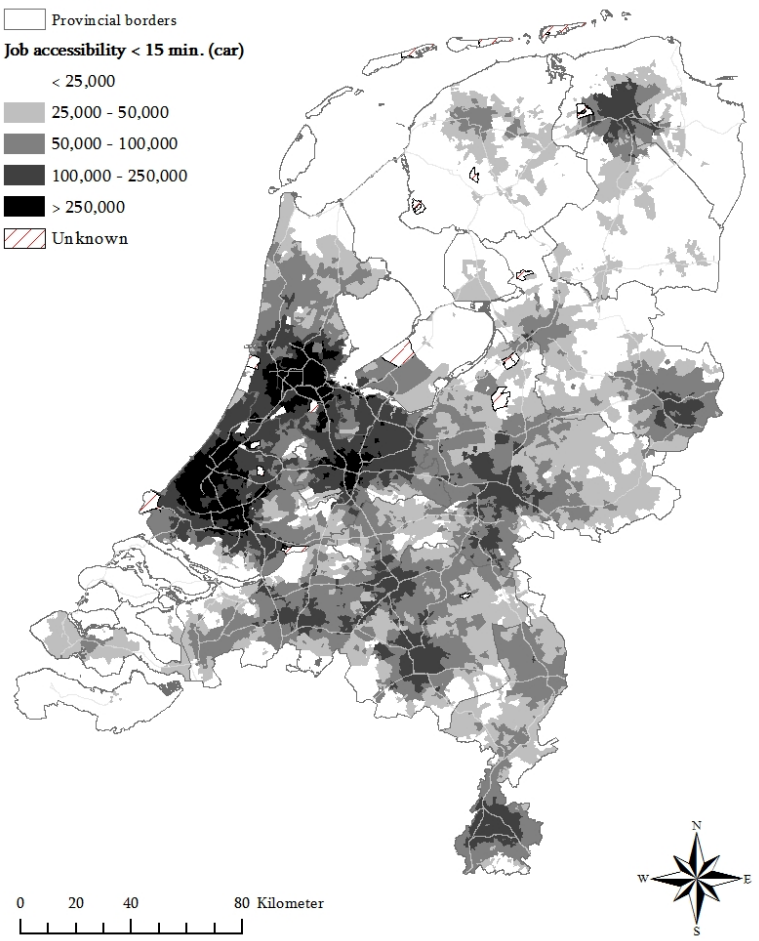
Job accessibility in 2006 (source: LISA, 2013)
Number of jobs that can be reached from the centroids of
neighbourhoods within a 15 minute car drive.

Legenda

- National roads
- Provincial borders

Job accessibility < 15 min. (car)

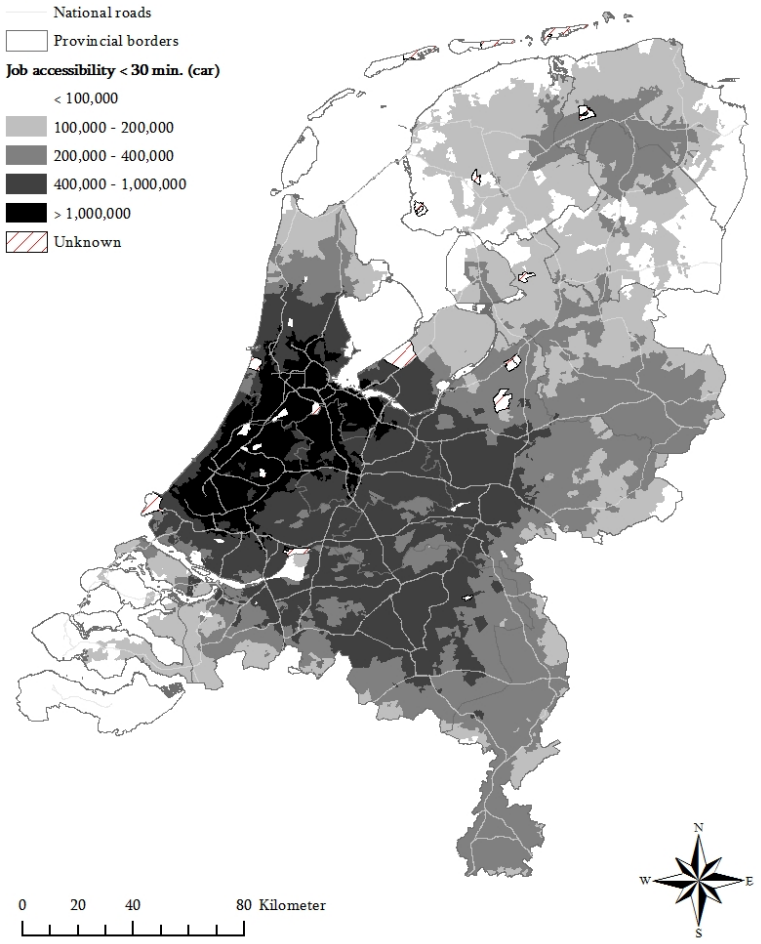
- < 25,000
- 25,000 - 50,000
- 50,000 - 100,000
- 100,000 - 250,000
- > 250,000
- Unknown



Job accessibility

Job accessibility in 2006 (source: LISA, 2013)
Number of jobs that can be reached from the centroids of neighbourhoods within a 30 minute car drive.

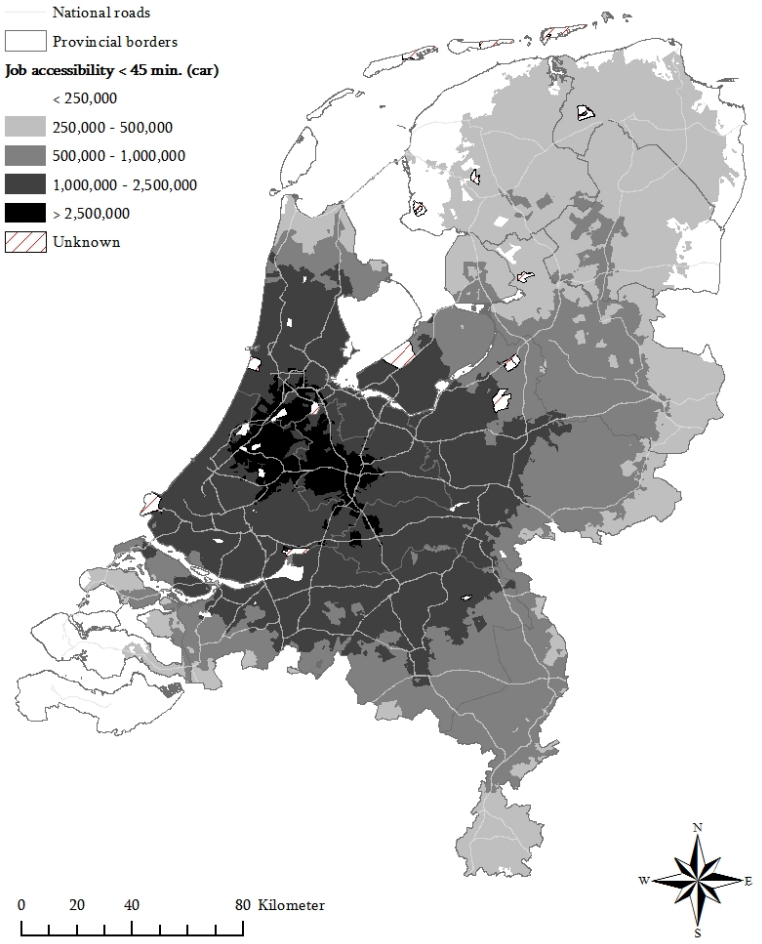
Legenda



Job accessibility

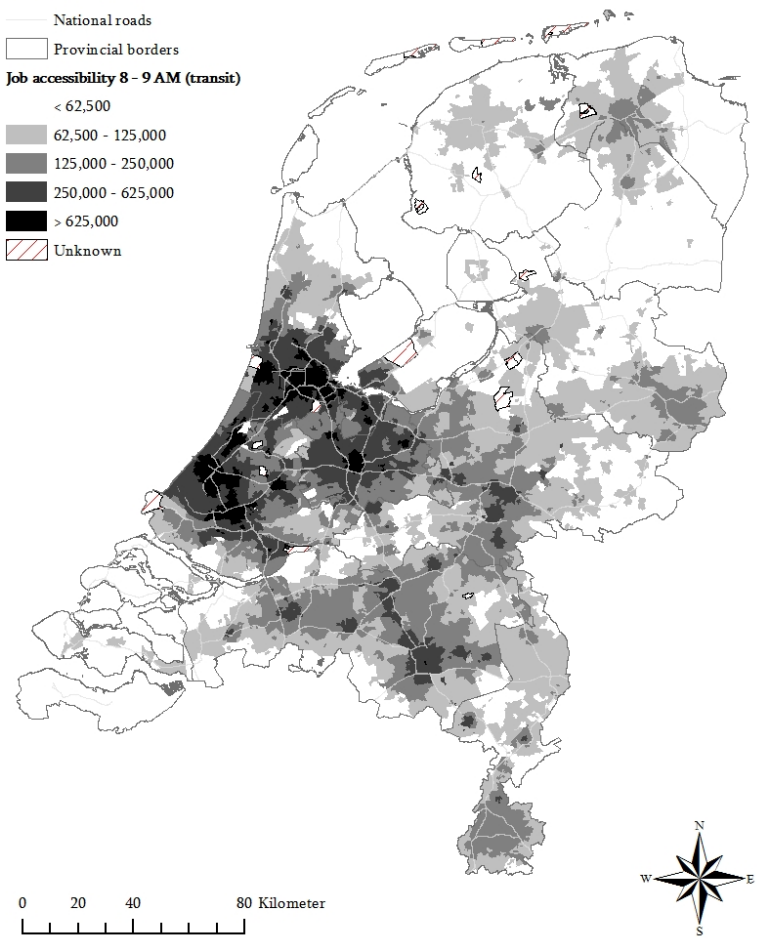
Job accessibility in 2006 (source: LISA, 2013)
Number of jobs that can be reached from the centroids of neighbourhoods within a 45 minute car drive.

Legenda



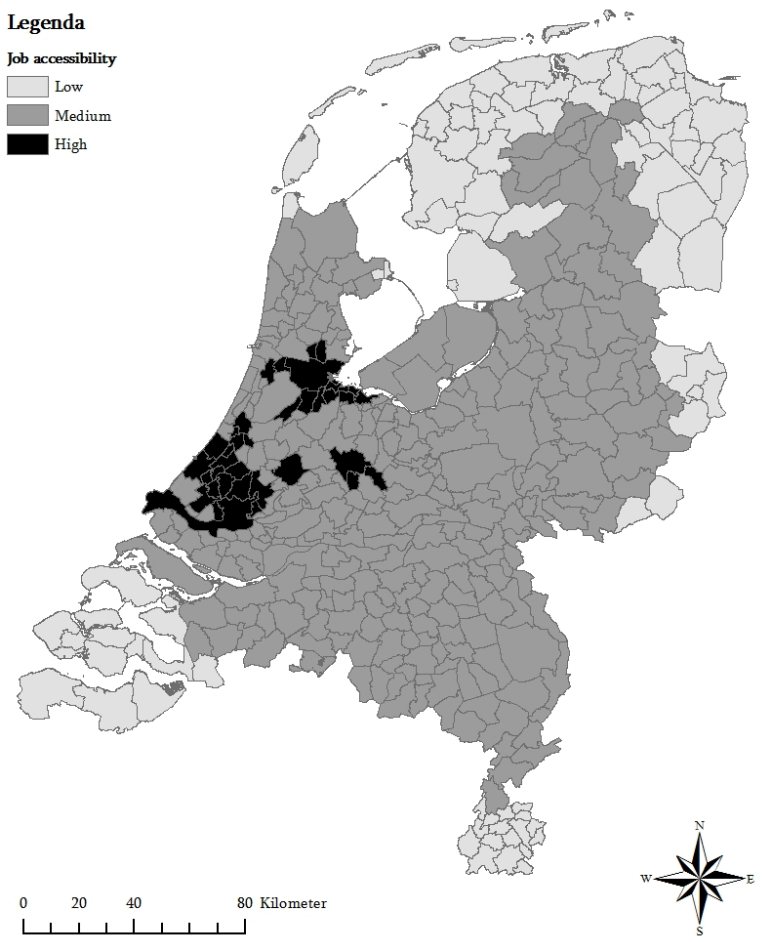
Job accessibility

Job accessibility in 2006 (source: LISA, 2013)
Number of jobs that can be reached from the centroids of neighbourhoods between 8 and 9 AM by bike and transit.



Job accessibility

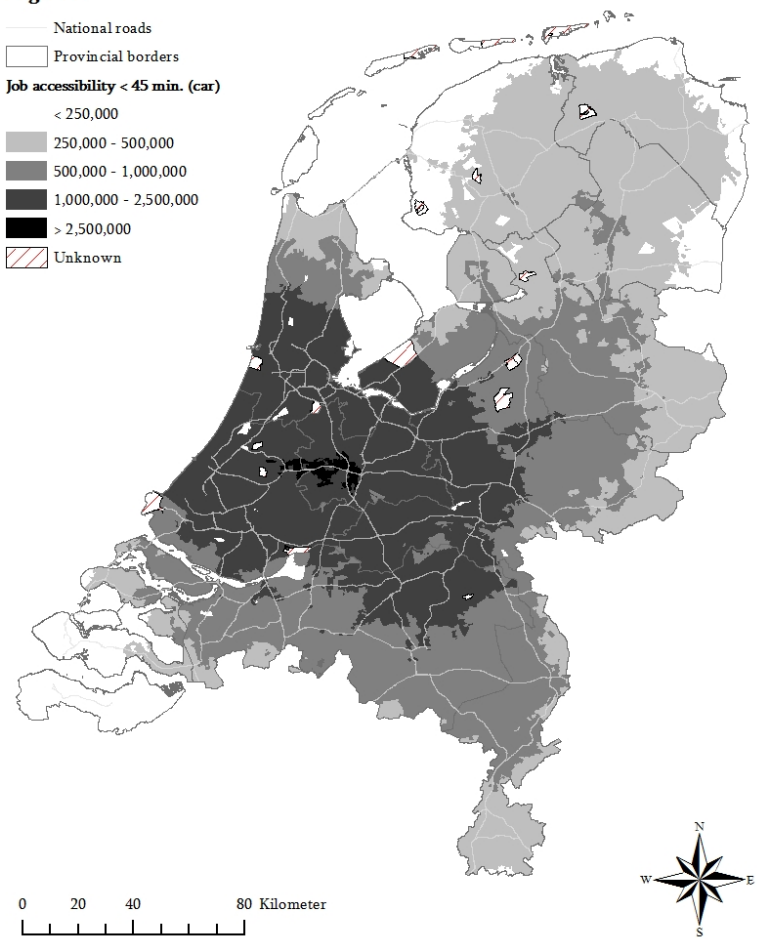
In this map reclassified job accessibility per municipality.



Job accessibility

Job accessibility in 2006 (source: LISA, 2013)
Number of jobs that can be reached from the centroids of neighbourhoods within a 45 minute car drive, when corrected for congersion effects.

Legenda



Job accessibility

Job accessibility in 2006 (source: LISA, 2013)
Change in number of jobs that can be reached from the centroids of neighbourhoods within a 45 minute car drive, when corrected for congersion effects.

Legenda