Occupational mobility in Norway

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Abstract

This thesis investigates how yearly occupational mobility has developed in Norway between the years 1972 and 2015. It also analyses the characteristics of workers that experienced the most occupational switches, and control for demographic changes in the workforce of the population. To investigate this topic, this thesis uses quarterly panel data from the Norwegian Labor Force Survey, where several cleaning procedures have been conducted through the computer program STATA with additional calculations through the computer program Microsoft Excel. The majority of the methodology is replicated from Lalé's (2012) research on occupational mobility in France, with following comparison of estimated results throughout the thesis. Yearly occupational mobility in Norway averages to 4.1 % for the whole period, which is higher than occupational mobility in France, but similar to previous findings from the U.S., U.K., and Germany. However, this average differs between male and female workers from various age-groups with different educational backgrounds. Mobility has also been reduced since 1972, and would have been much higher if the age and educational composition of the workforce remained unchanged over the years. Despite downward trends in yearly mobility, some sub-groups of the workforce experienced both higher reductions and increased mobility over the years. For example, female occupational mobility has converged towards male occupational mobility, reflecting increasing similarities with respect to labor market behaviour over the years of survey. Although several cleaning procedures have been conducted to discard coding misclassifications in the dataset, the results are still highly volatile, proving that the results may suffer from measurement error.

I will like to thank my supervisor Edwin Leuven for all the hours of support through Stata and for writing this thesis. I also thank Etienne Lalé, Andreas Myhre and Mary Claire Pappas for technical advices and correction procedures. Last, I thank my girlfriend, my friends, and my family for their endless care and support throughout the writing process.

Keywords: Occupational mobility, workforce, Labor force survey, demographic changes

Contents

1. Introduction

In light of debates regarding the Norwegian labor market, the individual choice of occupation enters the agenda, including discourses surrounding quotas for female employment in certain industries, participation rates of young workers in the labor market, or the demand for various educational backgrounds. This thesis probes how occupational mobility, defined as direct yearly switches between two occupations, has developed in Norway between 1972 and 2015. I will also analyse how occupational mobility differs between male and female workers in diverse age groups with varying educational backgrounds, where mobility levels are later re-weighted to control for demographic changes of the population. The dataset used is the Norwegian labor force survey called "Den Norske Arbeidskraftundersøkelsen", from here on out known as (AKU). Since the original dataset contains a lot of noise, several cleaning procedures have further been conducted to remove measurement error in the dataset. This thesis follows Lalés (2012) studies on occupational mobility in France between 1982 and 2009, replicating most of the methods and robustness checks from his paper in this thesis.

Occupational mobility is an important research agenda for many areas, including but not limited to: studies on wage inequality, unemployment and job security programs and labor market reforms. By uncovering which groups in the market which experienced the most turbulence, public actions may be more accurate and effective.[1] Since this thesis studies mobility over a long period, it is possible to check whether labor market experiences have become more or less disruptive over the last 43 years.

The Norwegian labor market is an interesting case for studying occupational mobility. Compared to other countries in Europe, Norway has historically been a country with low unemployment and a benevolent welfare system (Røed, 1993) (Wiborg and Møberg, 2010), with changing educational attainment, age levels, and female participation in the labor market from 1972 to 2015. These changes may potentially disturb the labor market flows and therefore, increase the registered mobility rates (Ljungqvist and Sargent, 2008). Although the labor market in Norway (and Scandinavia) may be relatively less flexible than other European countries and the U.S., Organization for economic co-operation and development (OECD) considers Norway to be an egalitarian country with few labor market barriers (Nickell, 1997)

[1] Labor market turbulence is defined as changes that occur rapidly for workers, which changes their productivity, i.e. job switches can be characterised as one factor among several that creates turbulence in the labor market (Pratap and Quintin, 2011).

(OECD:a). Indicators of low barrier levels to the labor market include high levels of employment, low levels of discrimination, and equal access to educational attainment. For instance, in 2003 the Norwegian parliament granted a female quota program to ensure higher shares of female workers on the boards of Norwegian public firms (Ahern and Dittmar, 2012). The low search barriers make it both easier and safer for individuals to switch occupations, possibly increasing the rates of occupational mobility. Other Scandinavian countries such as Sweden, Denmark, and Finland share many characteristics as the Norwegian labor market, and the findings from the study of Norwegian occupational mobility may prove external validity towards these countries.[2]

In addition to Lalés (2012) study for France, several other studies have been conducted on the field of occupational mobility, including Kamburov and Manovskii (2008), Moscarini and Thomsson (2007) and Longhi and Brynin (2010). Kamburov and Manovskii investigates occupational mobility on 1-, 2- and 3-digit levels for U.S. workers for the period 1968-1997. Moscarini and Thomsson analyse U.S. employer-to-employer transitions for the years 1979-2006. Longhi and Brynin (2010) investigate occupational mobility using British and German panel data, connecting mobility with wage and job satisfaction in England and Germany. To the best of my knowledge, no similar studies in Norway have been conducted with respect to the time horizon or/and the research agenda used in this thesis.

The main findings are depicted in figure 1 and shows yearly mobility by ignoring composition effects and yearly mobility on 1-digit level by taking composition effects into account between 1972 and 2015. By ignoring composition effects, yearly mobility averages to 14.1 % between 1972 and 2015, and show high volatility. Both measures indicate that average occupational mobility in Norway has declined since 1972, where the trend line of yearly mobility is steeper than the trend line of mobility measures accounting for composition effects. Additionally, the yearly mobility estimates differ substantially between different sub-groups presented in the survey, with high average mobility among male and young workers and increasing mobility among high-educated workers with time. By taking composition effects into account, keeping age and education shares fixed to the base year of 1973, yearly mobility is higher than the original estimates from the end of the 1980´s. This demonstrates that yearly mobility would have been higher had the composition of the workforce not

[2] External validity refers to the relevance of a study towards other populations and settings (i.e. generalization of findings) (Stock and Watson, 2012).

increased in mean age and educational attainment.

Occupational mobility in Norway is almost double of mobility in France, where Lalé (2012) reports on average approximately 7.4 % yearly mobility over his period (although he estimates mobility on 3-digit level occupational codes, which normally shows higher mobility than 1-digit level). Lalé also finds that the French mobility has increased slightly over time, whereas my estimates show reduced mobility in Norway over the years of survey. Although some of these differences can be attributed to differences in measurement error, there are reasons to believe that the trends in occupational mobility differs between the Norwegian and the French labor markets. On the other hand, occupational mobility in Norway is similar to Kamburov and Manovskii (2008) and Moscarini and Thomssons (2007) findings from the U.S. labor market and Longhi and Brynins (2010) findings from the German and British labor market.

The rest of this thesis is organized as follows: Section 2 presents theoretical aspects of occupational mobility. Section 3 presents the Norwegian labor force survey and the model for measuring occupational mobility. Section 4 describes the correction procedures and potential problems with the dataset. Section 5 describes the main variables of interest. Section 6 discuss the overall mobility and cyclical mobility. Section 7 analyse the patterns of occupational mobility within groups. Section 8 analyses the time trends within the groups from Section 7. Section 9 re-aggregates the within groups mobility estimates taking the composition effects into account. Section 10 discuss potential caveats to measurement of mobility. Section 11 presents the conclusion of this thesis.

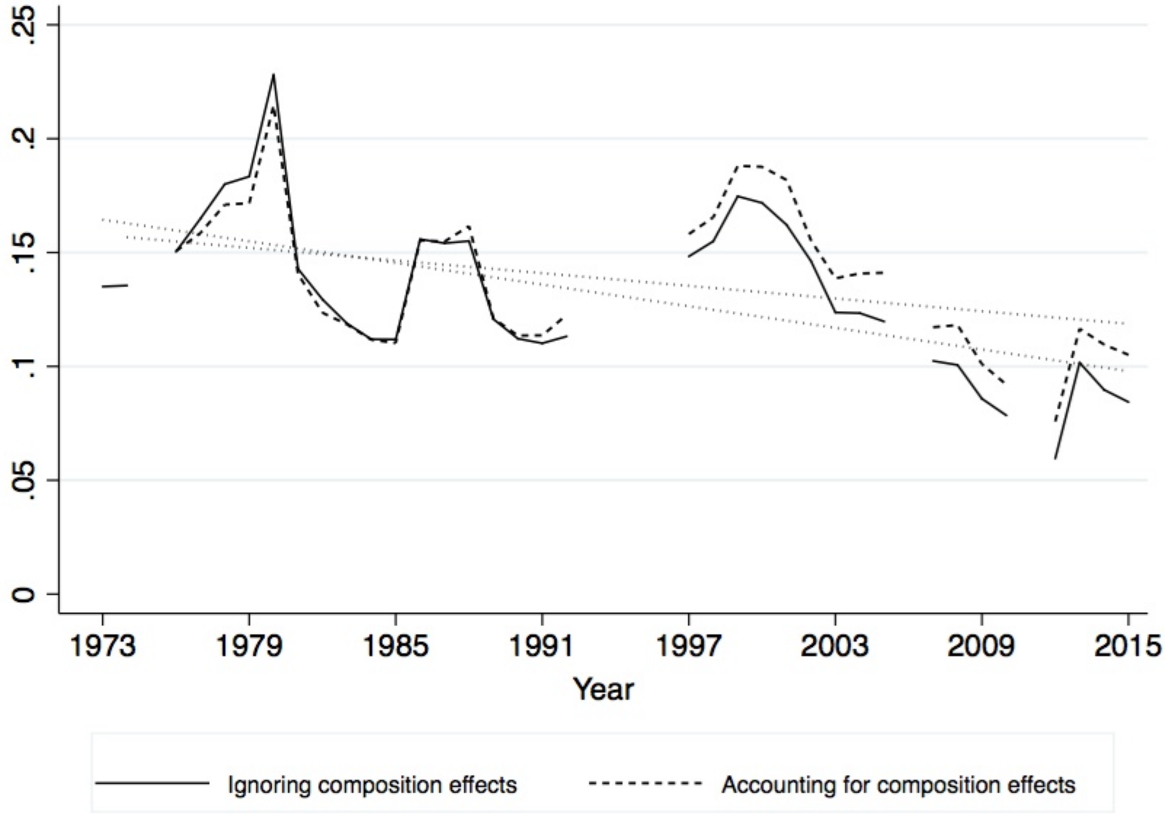

Figure 1 *– Average estimations of yearly mobility on 1-digit level in Norway 1972-2015. The solid line represents mobility by ignoring composition effects. The dashed line represents mobility taking composition effects into account. The dotted lines represent the trend lines of each graph, where the trend line of estimated mobility ignoring composition effects is the steepest. Missing values for both measures in 1975, 1993-1995, 2006 and 2011 (ref. section 3.2 and footnote 6), where accounting for composition effects also show missing values for 1972 and 1973 (ref. section 9). Horizontal axis presents year, vertical axis presents estimated mobility. The sample includes estimates for base sample (see section 4.1).*

2. Occupational mobility: Causes and consequences

There are several factors that determine worker's idiosyncratic choice of occupations. Miller (1984) explains that some workers represent a riskier attitude towards searching for the right occupation by exploring alternative jobs. Other workers may choose to switch occupations due to improvements in economic circumstances, such as wages and amenities (Long and Ferrie, 2003) or geographical location (Hassler et al, 2005). Further, it is clear that occupational mobility is not solely determined by personal preferences, but also by supply and demand in the market, as emphasised by Lucas Jr. and Prescott (1974). For instance, changes in demand for certain goods or services within sectors may induce excess lay offs during employment decisions. Conversely, if a negative demand shock occurs in a given industry, anticipating potential wage loss may steer individuals away from occupational switches, who prefer to ride off shocks in unemployment towards re-employment. Further, Lefranc (2000) shows that high levels of mobility may affect the individual level of human capital. Given that human capital may be occupation specific, wage losses and lower productivity levels could be a consequence of destroyed accumulated skills resulting from occupational switches (Neal, 1995). Since this thesis mainly operates with occupational mobility between sectors the loss of human capital is probably higher for these career switches than within sectors as both technology and knowledge are usually industry specific. It is also important to consider how turbulent labor market experiences may affect workers individually. For example, endless search for the right occupation may reduce incentives to continue searching and even affect a worker's mental and physical health.

3. Data and sample

3.1. Norwegian Labor Force Survey (AKU)

This thesis uses panel data from the 1972-2015 waves of the Norwegian labor force survey (AKU) (SSB:a).[3] The survey was established in 1972 and has been conducted annually thereafter. The main goal of AKU is to give a representative picture of the Norwegian labor market, following the international standards of definition and categorization for easier comparison with findings from other labor markets. This results in both minor and major modifications in various years of the survey.

The survey is a quarterly rotative panel of individuals between the age of 15 (16 before 2006) and 74. Most respondents are directly interviewed, however some are indirectly interviewed through other family members or members of the household when the interview is conducted by telephone or through visits of SSB officials (before 1996) (SSB:a). The survey collects information on individual background variables and information regarding the respondent's employment experience (occupations, preferred hours worked, wages). The survey does not include workers who reside outside of Norway commuting with Norwegian employers, nor

[3] The data used in this thesis represents the Norwegian Labor Force Survey (Arbeidskraftundersøkelsen) conducted by Statistics Norway (SSB). The research is not financed by any part, but distributed under University of Oslo (UIO). Data is arranged and made disposable in anonymous form by Data Protection Official for Research (Norsk Samfunnvitenskapelig datatjeneste AS).

workers who stays in Norway for less than 6 months. Occupation is coded by SSB following standards of classifications, which have been updated twice throughout the history of the survey. Before 1996, answers were registered on paper by interviewers, after which the survey was conducted using computer assisted telephone interviewing (Midtlyng, 1998). From 1972 to 1996, respondents were interviewed 4 times over 6 continuous quarters (2 quarters with interviews, 2 breaks, 2 quarters with interviews), whereas after 1996, respondents were interviewed in 8 consecutive quarters (see Appendix A for further information regarding interviews) (Bø and Håland, 2015).

3.2. Changes and breaks within AKU

Several methodological changes and breaks have influenced the survey over the years. Some changes are major, for instance, the transition to new occupational standard in 1996 and 2011, and re-structure of participation in 1996 (Bø and Håland, 2015). The methodological changes diversely influence the data selection and registration, but the breaks induce a "restart" in the survey where previously participating respondents finish their eligible periods and new waves enter the sample. Restarts occurred in 1975, 1996, and 2006, resulting in fewer respondents and no observable yearly mobility for these years. Further, since there is insufficient information on the respondents previous occupational coding, yearly mobility is not registered for respondents during their first year of survey. Information regarding the most relevant breaks are listed below:

1975: Transition to new selection procedure, resulting in break in the survey with no observable yearly mobility in this period (since no previous period to compare for unique individuals) (SSB, 2001).

1996: Change of standard for classification of occupations from "Nordisk yrkesklassifisering" (NYK) to "Standard for yrkesklassifisering" (STYRK), resulting in more occupations, fewer sub categories, and different sorting among categories (Bø and Håland, 2015) (Arbeidsdirektoratet, 1965) (SSB, 1998). AKU further changed its participation structure to interview respondents over 8 continuous quarters with computer assisted telephone interviewing (Midtlyng, 1998). This resulted in a break in the survey and no observable mobility in this period.

2006: Change in minimum age from 16 to 15 years, resulting in restart of the survey and no observable mobility in this period (Bø and Håland, 2015).

2011: Update of the standard of occupational coding from STYRK to STYRK-08, resulting in inclusion of more occupations (SSB, 1998) (SSB, 2011). Some occupations were also merged in common sub-categories, with mostly new sub-categories created. This resulted in very low levels of mobility in 2011, which may be due to measurement error in individual coding from adaption of the new classification (see footnote 8) (SSB:b).

3.3. Model for measuring occupational mobility

This thesis defines occupational mobility when respondents change their occupational coding, where occupational codes are collected for every respondent each participating quarter. Since the dataset used in this thesis consist of periods with unemployment, I further define mobility as a direct switch from old occupation to new occupation. In other words, situations where respondents enter employment after at least 3 months of unemployment wont classify as occupational mobility. All three standards of occupational codes are sorted with digits by order, where the digits represent: 1st digit = *occupational field*, 2nd digit = *occupational area*, 3rd digit = *occupational group,* and 4th digit = *occupation* (where the transition to STYRK in 1996 resulted in different categorizations, see Appendix B for more information regarding occupational coding).[4] Since codes before 1996 only ranges from 1-digit to 3-digit level, this thesis will operate with occupational codes on the 1-, 2- and 3-digit level field level, with the 1-digit level as main focus.[5]

Defining t as the yearly quarter, the following equation defines yearly occupational mobility

[4] The transition to new coding standards resulted in fewer categories on 2-digit and 3-digit level, which increases the probability of different coding between two periods in the survey. Unfortunately, SSB has not released updated panel files with common standards, which means that estimated mobility are measured on different premises (see section 4.3.3 for further discussion on this issue).
[5] Since I follow the standard from SSB and some fields do not directly refer to industries, I choose to refer to codes on 1-digit level as occupational fields as direct translation from SSB´s description

when occupation in period t is different from previous occupation in period $t-4$:

$$Occ_t \neq Occ_{t-4} \rightarrow ymob_t = 1, Occ_t = Occ_{t-4} \rightarrow ymob_t = 0 \quad (1)$$

where $t-4$ represents the same quarter in the previous year. Occ represents the occupational code for each respondent, and $ymob$ represents a dummy variable for yearly mobility equalling = 1 if the respondent report different occupational code between the periods t and $t-4$. Further, if $t-4$ represents a period of unemployment or period where respondents did not participate (years before 1996), the mobility variables report missing values for the period t (i.e. $Sample = employed_t = employed_{t-4}$).

4. Cleaning procedures and measurement issues

4.1. Cleaning procedures

The original uncleansed dataset contains 146 quarterly and yearly panel files with a total of 2,169,256 observations distributed over 379,136 respondents for the years between 1972 and 2015.[6] From these files, I construct a quarterly panel dataset starting in 1st quarter of 1972 up until the 1st quarter of 2015. I restrict the sample to civilians in the workforce within the age-interval of 18 and 65 years old. Since the original panel files likely contains numerous spurious occupational transitions, I remove individuals with no interpretable information on occupational affiliation as well as those who report to many blank cells.[7] This leaves the study with a final dataset of 127 quarterly panel files, containing 1,433,955 observations distributed over 161 time-periods for 306,687 unique respondents, representing the base sample of the study.

[6] Unfortunately, data for the period 1 quarter 1993 to 4 quarter 1995 are not included in the dataset for this thesis. Neither NSD or SSB were in hold of this data, which I was informed by email from representatives of both parties.

[7] Information regarding occupational coding and background variables is collected from NSD:a.

4.2. Fraction of discarded mobility

To estimate how large a fraction of the original mobility has been discarded after the cleaning procedure, I follow the same recipe as Lalé (2012). Table C1 in Appendix C depicts the number of occupational switches that have been discarded after the cleaning procedure. Note that mobility measures have been re-weighted pre- and post-cleaning procedure. At 1-digit level, the cleaning procedure leads me to discard 8.5 % mobility for the 1972-1981 period, 11.7 % mobility for the 1982-1992 period, 9.5 % for the 1996-2005 period and 15.1 % for the 2006-2015 period. Over the whole study, a majority of the discarded mobility is attributed to respondents who reported non interpretable codes, and those that are not civilian. For the period 2005-2015, most of the discarded mobility is due to the year 2011 (ref. footnote 8). As expected, similar trends are reported for 2-digit and 3-digit levels, however with fewer discarded switches because switches from/to military occupations are more frequent on the 1-digit level. These numbers may seem high, but are considerably lower than the numbers from previous literature. For instance, Lalé (2012) discards 51.65 % of job switches from his original dataset for a 6-year period, and Kamburov and Manovskii (2008) report that about 50 % of their estimated mobility are due to coding error. Since I discard considerably lower share of mobility than previous literature, there is reason to suspect that the dataset still contains some measurement error in mobility.

4.3. Measurement issues in the sample

4.3.1. Occupational mobility on the 2-digit and 3-digit level

After estimating mobility on 2-digit and 3-digit level for the period 1972-1981, the mobility estimates show considerably higher numbers than the later years of the study (see Appendix D). Since these outliers are only observed for a short period, some of these potential measurement errors may be traced back to the registration of occupational codes from this period. The panel files in this time interval were conducted by the same cleaning procedure as with other periods (and occupational coding variables are the same until 1987). To the best of my knowledge, there is no sign of errors during the cleaning procedures, leaving me to suspect presence of measurement error for the raw data in the period 1972-1981. The main analysis will thus focus on mobility rates on 1-digit and use the other levels for additional comparisons.[8]

4.3.2. Dependent vs. Independent coding

As mentioned in section 3.1 the labor force survey changed the registration form to computer assisted telephone interviewing (CATI) in 1996 (Midtlyng, 1998). One new feature in the new digital registration was the entry of questions regarding the respondent's previous occupational experience by using forms for several periods. Since the new registration system generates occupational affiliation based on answers from former interviews, occupational coding in period t becomes dependent on the coding in period $t-1$ for the years after 1996. Before 1996, respondents had to report their occupation and employer without referring to the job held last interview (only whether they worked for the same company), making the occupational coding in period t independent of of the coding in period $t-1$. Independent coding before 1996 is likely to generate measurement error in estimated mobility since reported coding error in period $t-1$ may transit into period t, which could either a) mask true occupational switches if the same coding error is repeated in period t, or b) not report true occupational switches if respondents report their true occupation in period t (also if true occupation is reported in period $t-1$ followed up by coding error in period t) (Bound et al, 2000). As occupational affiliation became dependent after 1996, genuine occupational switches were more likely to be identified since respondents reported whether they had changed their occupation and/or employer.

Lalé (2012) faces the same issue in his paper, as occupational coding became dependent on coding from respondent's previous period after the introduction of CATI in 2003. Unlike my dataset, Lalé's sample includes information on respondent's previous occupational experience (before respondent's entry in the survey) after 2003, making these codes independent of later periods. However, information on respondent's previous occupational experience (before they entered the survey) before 2003 were collected through their first interviews (dependent), and respondents had to report their occupation independently for later interviews (independent).

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[8] Additionally, I choose to omit estimates for yearly mobility from 2011 since the mobility estimates drop dramatically on all digit levels from 2010 to 2011 by 60 % (followed by 100 % increase in 2012), After addressing the issue to SSB, I was told that these unusual changes may be tracked to the update of standard of classification on 2011 and further advised to drop these estimates (see Appendix D for further information).

By pooling the years before and after 2003 together for dependent and independent coding separately, Lalé manages to compare differences in estimated mobility between dependent and independent coding over his whole period. His results show that the mobility rates for independent coding always lies higher than mobility for dependent coding, indicating “over reporting” of job switches, and thus measurement error through independent coding.

Although the AKU survey before 1996 contains questions on respondent’s tenure in their current firm, only the years between 1972 and 1975 contains these variables in the dataset, meaning that I only have dependent coding for 3 years of survey before 1996. Further, no occupational codes are collected independently after the use of CATI in 1996, making it impossible for me to quantify the difference between independent and dependent coding over the whole period of study (see Appendix A for further information on interviews). Given Lalés results and the fact that the estimated average mobility on every digit level is considerable higher for the years before 1996 in Norway, some of the estimates mobility from independent coding may suffer from measurement error. This issue will be further examined in section 10.1.2.

4.3.3. Transition to new standard of classifications

The transition from NYK to STYRK in 1996 resulted in fewer occupational areas (from 73 to 31 on 2-digit level) and occupational groups (from 324 to 108 3-digit), where these categories were further expanded with the update in 2011 (to 42 areas on 2-digit level and 121 groups on 3-digit level). These transitions make comparisons between mobility estimates less precise because probability of reporting a job switch decreases through the merging of existing sub categories (Mastekaasa, 2012). These differences may explain some of the excess mobility on 2-digit and 3-digit levels for the years before 1996, with more fragmented sub categories during the first half of the survey (see Appendix D).[9] This is a smaller concern for job switches on 1-digit level, as all three standards have 10 categories. However, the occupational coding in NYK is closer related to the sector of the firms compared to STYRK and STYRK-08, which likely change the occupational coding when workers move between firms (Villund, 2003). Conversely, occupational coding in STYRK and STYRK-08 is closer defined to the

[9] Similarly, the quality of education in Norway has also changed over the year of survey, with new educational reforms introduced in 1974, 1987, 1994, 1997 and 2006. The introduction of these new reforms changed some of the educational scales in the survey, making a direct comparison less precisely.

worker's individual task and educational background, meaning the workers occupational affiliation is more likely to remain unchanged when changing employer. This difference in sorting may explain some of the excess mobility with the NYK standard. Unfortunately, there are no updated panel files with common occupational standards, leaving the comparison to be on different classifications over the time horizon.

5. Descriptive statistics

This section describes the main 3 variables of interest from the cleaned base sample used: Gender, Age and Education.[10] It also presents how the occupational codes are distributed across occupational fields in the sample.

5.1. Gender

The gender composition of the survey is approximately equal between men and women. Over the period between 1972 and -2015, 52,6 % of the respondents are males and 47,4 % are females, where the female share of the workforce is higher for the first years of survey. These estimates are not representative for the true gender structure of the population in the workforce, in which official statistics from SSB:c clearly shows a larger share of male workers in this period. As these female workers are overrepresented in the sample, estimated mobility across genders may suffer from measurement error. This issue will be discussed in section 10.2, but it is important to keep in mind for further reading.

5.2. Age

The mean age over the whole period from 1972 to 2015 is 40.4 years. Figure 2 presents the yearly mean age between 1972 and 2015. The age-level of surveyed individuals is trending downwards from 1972 to 1991 before trending upwards towards 2015. The upward projection in mean age of working individuals show how the age composition of the workforce has increased from the 1990-decade, for instance, the "baby-boom" cohorts from the 1940´s and

[10] The dataset received contains weight variables that re-weigh the values for the variables gender, age and education (Zhang, 1998). To get a representative sample of the Norwegian population in employment, I re-weigh the sample to true gender, age and education shares.

1950´s, which represent a large share of the labor force (SSB:d). Conversely, the reduction from 1972 is a result of declining birth rates form the 1960´s and the inclusion of military recruits as part of the workforce in 1987 (SSB, 1993).

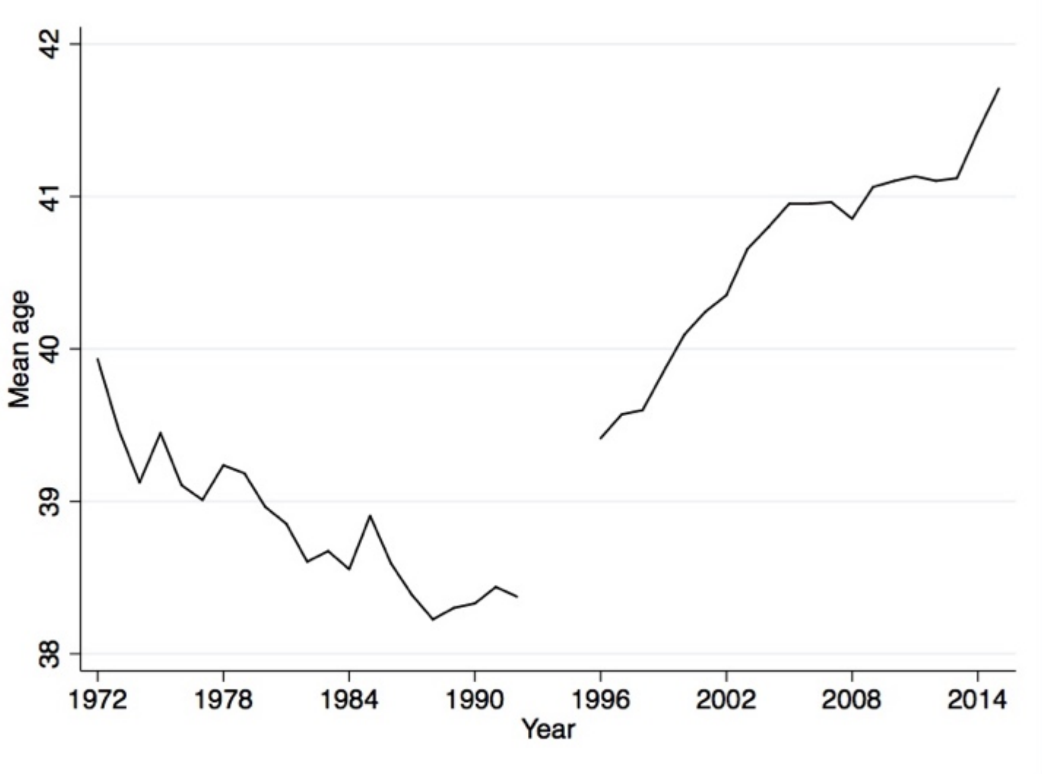

Figure 2 *– Mean age (in years) by year in the Norwegian workforce for the base sample. Missing values for years 1993-1995. Horizontal axis present years, vertical axis present mean age.*

5.3. Education

Figure 3 presents average mean educational level in Norway between 1972 and 2015. The educational variable represents the respondents highest diploma achieved and ranges from 1 through 4, with 1 representing elementary school education, 2 representing secondary school education, 3 representing high school education and 4 representing any university or college degree. Educational categories elementary school and secondary school are merged for later analysis since the respondents with elementary school as highest diploma represents a low share of the sample. 45,570 respondents in the sample reported no information or no educational attainment.

It is clear that the average educational level of the respondents has increased over time, in line with the increasing educational level in general for Norway. Over the whole period, mean education averages to 3.3. In 1972, mean educational level averaged to 2.3 while the level in

2015 averages to 3.3, representing an approximate 43 % increase in educational level over 43 years. The average educational level is nearly equal between male and female respondents for the whole period, but females have gone from being less educated than men during the 1970´s to be substantially more educated on average than their male counterparts over the years.

The drop in 2006 is due to new educational reform, in particular with high school structure and content changing. This decreased answers on 1st year high school and increased answers on secondary school as highest educational diploma.[11]

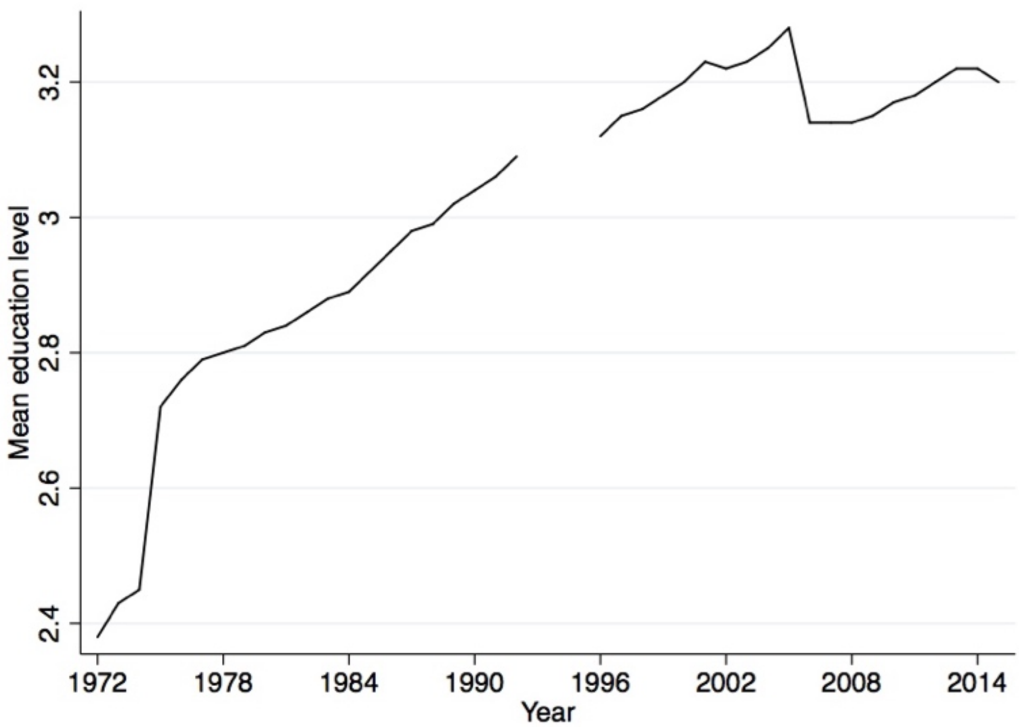

Figure 3 *– Mean educational level by year in the Norwegian workforce. The sample includes respondents who reported a minimum level of education. Educational level presents respondents highest reported educational diploma, where level 1 represent lowest educational level and level 4 represent highest educational level.*

[11] New questionnaire forms changed the criterions for the different educational levels, with the average educational level continuing to increase. However, the share of respondents in the sample with university or college background was virtually unchanged (but slightly increasing in 2007), showing no setback on higher education in the population. Unfortunately, there was no variable that used old education system in the dataset from 2006.

5.4. Occupational codes

The following tables presents the distribution of occupational fields (1-digit level) that is represented in the dataset. As mentioned in section 4.3.3, the survey changed the standard of occupational classification in 1996 from NYK to STYRK (STYRK-08 in 2011) which changed the sorting of the occupational fields. Since the sorting is different, I consider the years before and after the transition in 1996 separately (see Appendix B for more detailed information regarding occupational coding).

Table 1 presents the distribution of occupational codes on 1-digit level for the period between 1972 and 1992 with the NYK standard. From this table we can see that technical, scientific, human and artistic labor (field 0), and industry, building and construction work (field 7-8) represents approximately 52 % of all registered occupations in the period, where the former field represent a major of 30.3 %. Conversely, agricultural, forestry and fishery (field 4), and mining and explosion work (field 5) only represents approximately 5 % of all registered occupations in the period. Military occupations (field A) and unspecified answers (X) were removed from the sample. The total frequency is 526,617 occupational codes, which makes an approximate total of 40 % of the registered codes in the sample.

Table 2 presents the distribution of occupational codes on 1-digit level for the period between 1996 and 2015. From the table we can see that technicians and associate professionals (field 3), and service, shop and market sales workers (field 5) represents approximately 45 % of all registered occupations in the period. Conversely, agricultural, forestry and fishery workers (field 6), and elementary occupations (field 9) only represents approximately 8 % of all registered occupations. Armed forces occupations and unspecified answers (field 0) were removed from the sample. The total frequency of 727,108 occupational codes represents approximately 60 % of the registered codes in the sample.

Some differences in demographic structures are observable, for example among service workers, where 12.7 % of the occupational codes are located in the service occupations category in the NYK standard, while 21.6 % of the occupational codes located in the service + shop and market category in STYRK (STYRK-08). These differences must be examined with caution since some of the related occupations were re-categorized with the new standard. For example, some of the the shop and sales occupations are categorized in other fields for the

NYK standard, and occupations related to sports and athletes were redirected to associate professionals from service occupations with the transition to STYRK. Also, a large share of workers within construction, industry, and building (field 7-8) are largely represented in NYK (22.2 %), while STYRK (STYRK-08) only represents 11.5 % occupations within craft and related trade workers. However, a bulk of the occupations from industry, building, and construction work (field 7-8) were re-categorized towards technicians and associate professionals (field 3) and elementary occupations (field 9) with the new standard. The transition to STYRK also spread occupations from one category to several categories. For example, the high share of technical, scientific, human and artistic labor in NYK (field 0) were fragmented into 4 different categories and mining and explosion occupations (field 5 in NYK) were re-sorted to technicians and associate professionals (field 3), and plant and machine operators + assemblers (field 8), which also explains the more equal distribution among the categories of the new standard.

Table 1:
Distribution of occupational fields 1972-1992.

Occupation, 1-digit	%
Technical, scientific, human and artistic	30.3
Administration and leadership	5.3
Clerks	9.3
Business	8.3
Agricultural, forestry and fishing	4.6
Mining and explosion work	0.9
Transport and communication	6.4
Industry, building and construction work	22.2
Service	12.7
Total	100.00

Table 2:
Distribution of occupational fields 1996-2015.

Occupation, 1-digit	%
Legislators, senior officials and managers	7.6
Professionals	11.4
Technicians and associate professionals	23.5
Clerks	8.4
Service, shop and market sales	21.6
Agricultural, forestry and fishery	3.2
Craft and related trade	11.5
Plant and machine operators + assemblers	7.9
Elementary occupations	4.9
Total	100.00

6. Occupational mobility in Norway

6.1. Overall mobility

Figure 4 presents time series for yearly mobility for the period between 1972 and 2015. On average, approximately 14.1 % of workers from an unique time period experienced yearly mobility. Occupational mobility shows a downward trend from 1972 to 2015, however varies substantially between the years. For instance, mobility drops from 22,9 % in 1980 to 14.3 % in 1981 (37,5 % decrease) and increase from 5,9 % in 2012 to 10.1 % in 2013 (71.2 % increase). The graph also shows 4 spikes for yearly mobility. These spikes will be examined further by comparing mobility rates with the unemployment level in next section.

Compared to previous literature, the mobility levels depicted in Figure 4 are approximately 3 times higher on average than Lalé's (2012) findings (3.8 %) for his yearly mobility estimates on the 1-digit level. Conversely, Kamburov and Manovskii (2008) found that on average 13 % of workers changed their occupation on the 1-digit level annually for United States during the period between 1969 and 1997 (for male respondents only). The estimates for Norway are also similar to Longhi and Brynin's (2010) findings, where mobility averages to approximately 15 % on 2-digit level in the United Kingdom for the period between 1991 and 2006.[12]

Compared to Lalé's (2012) findings, Norwegian mobility estimates are much higher than in France. One reason for this could be differences in employment structures. Lalé explains that his lower estimates compared to findings from U.S. may be a result of a more rigid labor market in France. Although Northern European countries share many of the same labor market structures, the Norwegian labor market may be closer to U.S. than the French labor market (Nickell, 1997). Norway may also be more similar to U.S. than France in technological development. For instance, through the use of IT systems as substitutes for human skills, workers are forced to search for jobs in different sectors (Acemoglu and Autor, 2011). Further, Lalé conducts more cleaning procedures for his sample, where he discards 2.5 to 4 times more mobility for his periods. This discrepancy shows that my dataset probably contains much more measurement error and could explain the higher mobility in Norway.

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[12] My estimations show 20.35 % on the 2-digit level, however by removing the years 1972-1981, I estimate 15,78 % on the 2-digit level.

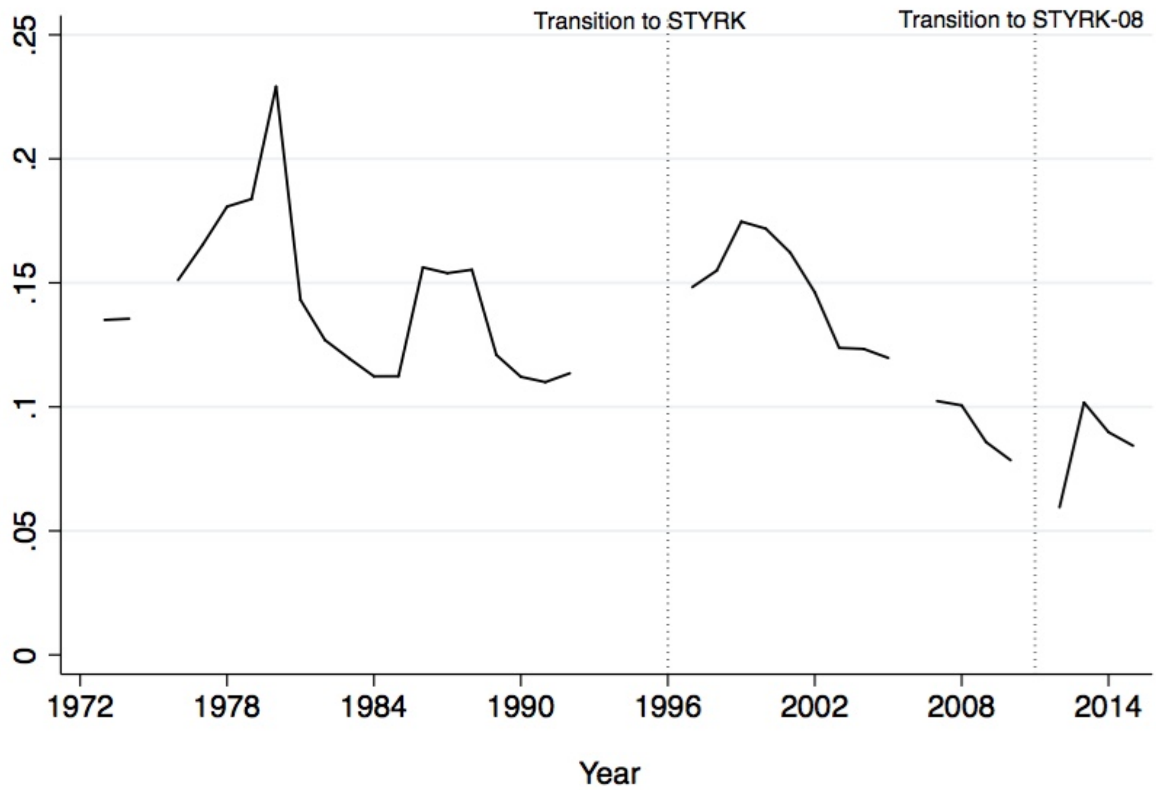

Figure 4 *- Average estimations of yearly mobility on 1-digit level in Norway 1972-2015. The estimations are from the base sample. Missing values in 1975, 1993-1995, 2006 and 2011. Vertical dotted lines represent transitions to new standard of occupations. Horizontal axis presents year, vertical axis presents estimated mobility.*

6.2. Cyclicality mobility

To identify expansions and recessions in the Norwegian labor market, I use measures of the yearly unemployment rate in Norway from 1972 to 2015, where mobility patterns are cyclical if they follow the unemployment rate (SSB:c). As mentioned in the introduction, yearly mobility may react to changes in unemployment levels. For instance, through termination of existing job relations which forces workers to search for new occupations.

Figure 5 presents yearly mobility rates on the 1-digit level compared to the yearly unemployment rates in Norway between 1972 and 2015. Considering economic expansions and recessions in the Norwegian labor market, some clear spikes emerge: Recessions during the periods 1980-1983, 1987-1992, 1998-2005, with ongoing increasing unemployment rates from 2008 to 2015. On the other hand, Norway experienced expansions during the periods

1983-1986, 1993-1999 and 2005-2007.[13] During the recessions and expansions, the mobility rates do coincide with the unemployment level, showing that occupational mobility on the 1-digit level is counter-cyclical. This is confirmed by a correlation coefficient of -0.44 between yearly mobility on 1-digit level and the yearly unemployment rate, which is also significant at 1 % level.[14] Lalé (2012) finds similar results for his sample, with negative correlation coefficients between unemployment and job-to-job mobility and within-firm mobility. These cyclical patterns may show that workers search for better jobs during economic expansions. Similarly, workers may choose to keep their jobs during economic downturns for secure income.

Further, it is interesting to investigate if there is sign of cyclicality with respect to respondents that changed their occupation on the 2 and 3-digit level since they account for approximately 36 % and 41 % of total occupational switches respectively (34 % and 40 % for the period 1982-2015). The correlation coefficients show -0.56 and -0.60 (both significant) respectively, which shows a stronger cyclical relationship than on the 1-digit level. This shows that job switches within firms/branches/occupational fields are even more counter-cyclical than between, possibly reflecting that job promotions are relatively more frequent during economic expansions.

[13] I consider recessions and expansions as significant increase/decrease in unemployment levels relative to their time horizons, with at least 1.4 % increased/decreased mobility over a maximum 7-year time horizon.

[14] I conducted the estimation of the correlation based on the mean values for 36 periods (some years don't show yearly mobility because of breaks in the series and the omitting of mobility in 2011). The correlation between unemployment and yearly mobility show the following results: 1-digit, r=-0.4412 with the directional p-value=0.003535, 2-digit r=-0.5660 with directional p-value=0.0001605, 3-digit r=-0.6007 with directional p-value less than 0.001.

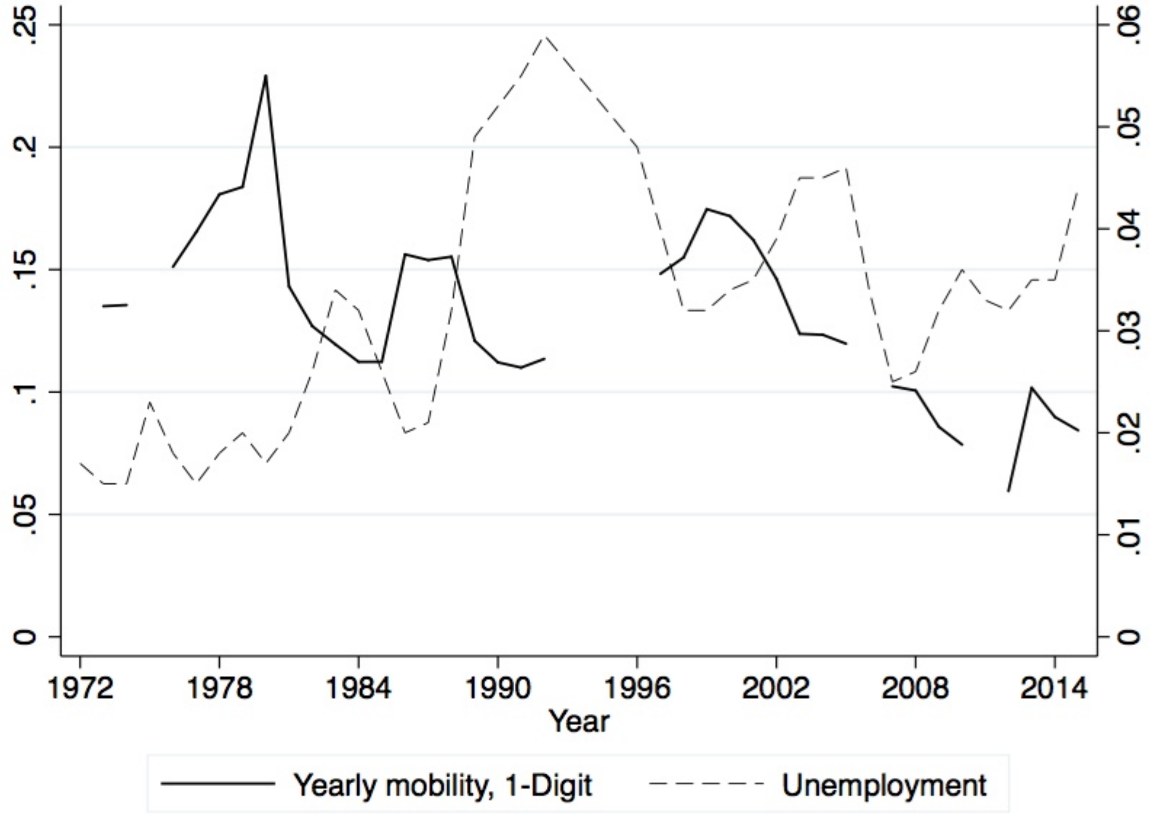

Figure 5 *– Cyclical yearly mobility 1972-2015. The estimated mobility is from the base sample. Solid line represents yearly mobility on 1-digit level, dashed line represents yearly unemployment rate. Left vertical axis present mobility level, right vertical axis present yearly unemployment level, horizontal axis present year. Missing values for yearly mobility in 1975, 1993-1995, 2006 and 2011. Unemployment rates are collected from SSB Statbank.*

7. Mobility by groups

This section follows Lalé's (2012) approach for investigating mobility within education- and gender-groups by age levels in the sample. The analysis focus on yearly mobility on the 1-digit level, however table 3 presents yearly mobility for all the digit levels levels. Although some of the mobility measures on 2-digit and 3-digit levels contains a high degree of measurement errors (ref. section 4.3.1), the numbers still capture differences in relative numbers between sub-groups as controls for their respective results. Respondents who did not report a minimum level of education were not included in the sample.

7.1. Education

Table 3 reveals that overall yearly mobility slightly increases with education attainment across gender and age groups (for all digit levels). This may indicate that higher educated workers in Norway represent a more turbulent part of the workforce, possibly reflecting differences in career paths between workers with different educational background. For instance, these workers may apply for jobs in different sectors of the labor market, with these sectors differing in factors such as promotion policies, research and development (R&D), productivity growth, innovation, and so on. These factors determine the need for re-structuring the firm/organizations staff, possibly contributing to push up the mobility levels within these occupational fields.

Although the overall mobility level increases with education, the mobility estimates are mixed between the age groups and genders. Through the estimates, one can see that mobility falls as workers below 30 years old traverse low to medium education. However, workers older than 40 years old face increasing mobility (or unchanged mobility) for the same educational step. This may show that a high-school diploma is more important for the careers of the younger members of the of the workforce in comparison to workers above the age of 40. For instance, these differences may be attributed to variances in tenure, which may function as a substitute for education. As a worker becomes older and thus more experienced, educational background tends to play a more minor role since the older half of the workforce has presumably accumulated more experience than younger workers. The mobility estimates on education also show differences among genders. For instance, male workers among the oldest age-group show decreasing mobility as they attain university or college degrees, whereas all the other age groups (for both genders) becomes more mobile when taking the same educational step. This may reflect that high-educated male workers (in opposition to females) enjoy better careers as they become older (for instance through higher wages), which reduce incentives to change occupation.

As previously mentioned, the mobility estimates only slightly change as educational attainment increase, questioning the educational role on occupational mobility. Both Lalé (2012) and Kamburov and Manovskii (2008) finds weak (positive) relationship between yearly mobility (for all digit levels) and educational level. To explain his weak findings, Lalé argue that it is unclear whether skills acquired at school function as a substitute for specific skills acquired in a respondent's occupation or not. Regarding the weak role of education in my sample, this may also be the case for the Norwegian labor market. Since some occupations are skill specific, accumulated experience could compensate for lack of education, but not necessarily the other way around as employers may find workers educational skills irrelevant for occupation-specific tasks. The Norwegian educational system has also been through several reforms over the years, making it difficult for employers to observe worker's actual expertise over time. The weak relationship may also be explained by exploring behaviour as workers may use certain occupations as "stepping stones" to accumulate experience during the early days of their career (Jovanovic and Nyarko, 1997). These idiosyncratic choices are not necessarily reflected in their educational diploma and thus the mobility estimates are not reflected by their educational level.

7.2. Age

Moving on to differences regarding age groups, table 3 shows that mobility decreases with the age level of the respondents. With exception of increasing mobility among low-educated female respondents from their 30´s to 40´s on 3-digit level, mobility is reduced (or unchanged) on all digit levels for all education and gender categories as workers grow older. For instance, the average mobility among female respondents over all educational levels (1-digit) are 22.4 % before the age of 30, 12.3 % during their 30´s, 11.1 % during their 40´s, and 8.2 % after the age of 49.

Further, the magnitude of reduction in mobility differs between the gender and education groups, with female workers across education groups experiencing higher drops in mobility when entering their 30´s and 50´s than males. Conversely, male workers across all educational levels experience higher drops in mobility into their 40´s than females. This possibly reflects different career paths by male and female workers as they grow older. For instance, both genders are, on average, nearly equally mobile before the age of 30. Yet, higher reduction in mobility into their 30´s for females may reflect that these workers "settle" faster than their male counterparts. The estimates further show that the workers with the lowest educational background experience the highest reduction in mobility with age relative to the respondents with high school and university or college degrees. Since these workers do not have the skills acquired from educational backgrounds, the excess reduction may suggest that the accumulated years of experience work as a stronger substitute for lack of education relative to workers with higher education.

The decline in mobility from one age-group to another is non-linear for both genders, with highest reduction in mobility when workers enter their 30´s. On average, for both genders across all educational levels, the transition of workers into their 30´s shows a drop of 36 %, with a further drop of 16 % into their 40´s, and a 17 % reduction when entering their 50´s on 1-digit level. This pattern is consistent with Millers (1984) theory of workers that are willing to take riskier jobs early in their career before settling in later years, where factors such as child care makes job switches more demanding as workers get older.

Lalé (2012) finds the same relationship between age and mobility in his sample, where average mobility decline non-linearly as workers become older. He further questions the non-linearity of the reduction in mobility, where he argues that the probability of job promotions should increase as workers accumulate tenure. This assumption fits better with the mobility estimates on 3-digit levels since job promotions and career improvements are more present within sectors (occupational groups). When estimating the average decline in mobility from one age category to another (for both genders across all educational levels) on the 3-digit level, mobility among workers falls 38 % into their 30´s, 13 % into their 40´s and 16 % into their 50´s. Although the reduction in mobility is slightly lower into workers 40´s and 50´s, within-sector mobility is similar to between-sector mobility, possibly showing that job promotions are spread over all age categories.

7.3. Gender

Overall mobility for male respondent's averages over their female counterparts for every education group (all digit levels). The overall difference across education groups averages to approximately 3 %, 4 % and 4 % for 1-digit, 2-digit and 3-digit level respectively. Since the largest gender differences are shown on 2-digit and 3-digit level for workers above the age of 30 years old, some of the excess male mobility may be due to difference in promotion possibilities. This may reflect possible dualism in the Norwegian labor market, where female respondents face discrimination in hiring decisions as they get older. However, female workers may be quicker in attaining the required skills for their occupations, whereas male workers need more experience to settle. On the other hand, mobility estimates are similar among the youngest workers, possibly reflecting that both genders share the same searching behaviour during the early days of their career. For instance, both genders may share the same strategy by accumulating experience through exploring many jobs (Jovanovic and Nyarko, 1997).

Contrary to Lalé's (2012) findings of higher gender differences among workers in the youngest age group, I find that gender differences are highest among workers in the oldest age group (for all digit levels). This shows that gender differences in mobility are located differently when comparing age groups between the Norwegian and French labor market, where the genders are more equal as younger members of the workforce in Norway than France. For instance, the majority of older workers with high school or university or college diplomas in Norway are men, while the relationship is reversed among younger workers, possibly demonstrating that younger female workers are more qualified than the older female workers in Norway.

Table 3:
Average estimated yearly mobility by age, education and gender, different digit level, 1972-2015.

	Male			Female		
	1-Digit	2-Digit	3-Digit	1-Digit	2-Digit	3-Digit
	(1)	(2)	(3)	(4)	(5)	(6)
	A. Low education					
Overall	0.13	0.15	0.17	0.10	0.11	0.13
<30	0.22	0.31	0.32	0.25	0.31	0.33
30-39	0.17	0.19	0.21	0.11	0.12	0.12
40-49	0.11	0.12	0.14	0.10	0.11	0.13
50-65	0.10	0.12	0.13	0.07	0.07	0.08
	B. Medium education					
Overall	0.15	0.17	0.20	0.11	0.13	0.15
<30	0.20	0.23	0.26	0.18	0.24	0.25
30-39	0.15	0.18	0.20	0.12	0.13	0.15
40-49	0.13	0.15	0.18	0.10	0.11	0.12
50-65	0.13	0.15	0.17	0.07	0.08	0.10
	C. High education					
Overall	0.16	0.19	0.21	0.14	0.16	0.18
<30	0.27	0.30	0.33	0.23	0.28	0.30
30-39	0.17	0.20	0.22	0.14	0.16	0.18
40-49	0.15	0.17	0.19	0.12	0.14	0.16
50-65	0.12	0.14	0.17	0.09	0.11	0.12

Note: *Average estimated yearly mobility by age, education and gender for different digit levels. Average estimates are for the 1972-2015. Each cell represents different sub-groups of the sample over the whole period of study. The sample sample is restricted to respondents who reported a minimum level of education.*

8. Within groups trend

This section further follows Lalé's (2012) procedure by including time trends to investigate how mobility changes over time within each sub-group. Table 4 shows the same age, education, and gender cells as table table 3 on different digit levels, where the estimates are regression coefficients from regressing yearly mobility on the year variable. For instance, the overall time trend on low-educated male workers (1-digit level) shows that mobility has been reduced by 0.0018*43 = 0.0774 (7.74 %) on average over the years of survey. The figures 6-10 complement table 4 with yearly mobility on the 1-digit level for the various sub-groups between 1972 and 2015. I follow the same restriction as Lalé by restricting the sample to respondents aged 23 through 55 years old to prevent potential outliers.[15] With the exception of high-educated workers on the 1-digit level, all depicted time trends are negative, and most of the coefficients are significant on a maximum 10 % significance level.

Among the different education groups on the 1-digit level, workers with low and medium education experienced a reduction in overall mobility over the years compared to high-educated workers, possibly showing that labor market experiences have become more turbulent among high educational workers over the years. These changes since 1972 are not necessarily due to changes in demand for educational backgrounds in the labor market, but could also be changes in idiosyncratic choices (as emphasised by Miller (1984)). For example, high-educated workers today may be more likely to explore numerous sectors compared to previous years. However, the educational level has increased considerably among the respondents over the years, denoting that the percentage share of high-educated workers in each yearly sample has increased over the survey period. Because the share of high-educated workers represented a less mobile minority of the workforce during the first years of survey, the increasing number of workers in this sub-group likely changed the mobility rate towards the population average. The time trends further show that low-educated workers experienced the highest reduction in mobility, which may evidence that the labor market conditions has improved for unskilled workers over the years.

Considering time trends across age levels, workers between 40 and 49 years old experienced the highest reduction in mobility considering all education groups and both genders. However, the coefficients show mixed results between gender- and education-groups, resulting in no distinct trend in mobility as workers becomes older. Among the low- and medium-educated workers, the workers in their 20´s and 40´s experienced the highest reduction in mobility over the years (average for both genders). Most of the excess reduction among workers in their 20´s are for male workers, where these workers may have adapted a less mobile behaviour due to the increasing importance of tenure in light of the increasing educational attainment in the workforce. On the other hand, workers aged below 40 years old

[15] In removing the youngest (and unexperienced) workers of the sample, I remove new entrants into the labor market that are more likely to experience mobility through the start of their careers. In removing the oldest (and highly experienced) workers of the sample, I remove workers that are less likely to experience occupational changes towards retiring age.

represent the highest increase in mobility (1-digit level) among the high-educated part of the workforce. This may demonstrate increasing competition among the younger half of high-educated workers in the workforce, where university or college degrees are far more common among workers today compared to the first years of survey. However, the value of labor market experience may prove that these workers have adapted a more exploring behaviour over the years using certain occupations as “stepping stones” to attain sector-specific skills (Jovanovic and Nyarko, 1997).

In considering gender differences, the overall time trends show diverse relationships among age- and education-groups (when only considering significant coefficients). Among low-educated workers, gender differences are minor, showing that both male and female low-educated worker have become less mobile throughout the years of survey. However, female medium-educated workers among the oldest age-group experienced far more reduction in mobility than males of the same sub-group. The difference is reversed for the high-educated workers, with female mobility increasing more than male mobility. Given these differences, the medium-educated female workers from the oldest age-group have become a more stabile part of the workforce over the years.

Regarding differences in digit levels, the large differences between the 1-digit level and the 2- and 3-digit levels are due to the high mobility rates on the 2- and 3-digit levels from the period between 1972 and 1981. In the assorted age-groups, one can see that most of the difference in the estimates on the 1-digit level from one age-, education-, and gender-category to another is repeated on the 2- and 3-digit level. However, some relations are different. For instance, low-educated male respondents show less reduction in mobility on the 1-digit level, but more reduction on the 2- and 3-digit level when traversing from their 20´s to 30´s. This proves that within-sector mobility (as opposition to between-sector mobility) has become relatively less frequent for low-educated workers in their 30´s compared to low-educated workers in their 20´s. This relationship possibly suggests differences in promotional mobility between the two age-groups, with a more explorative behaviour across sectors for workers in their 30´s. The same relationship is observable between genders. For example, high-educated female workers below the age of 40 experienced higher reductions in mobility on the 1-digit level than males, but show smaller reduction on 2- and 3-digit level for the same sub-group. As with the age-groups, this relationship may prove that female workers have experienced increased promotional mobility over the years compared to their male counterparts.

Overall, the time trend estimates show mixed results between the sub-groups, where both genders have experienced similar reduction in mobility and with high-educated workers becoming more mobile over the years of survey. Further, the negative time trends of this study contrast Lalé's (2012) findings, in which he estimates an overall increase in yearly mobility for most sub-groups. However, some of the time trends in France express similarities with those in Norway. For example, Lalé finds higher increased female mobility compared to male mobility with time (for all digit levels), with the time trends in my sample showing the same relationship for high-educated workers over the years of the survey. Given that high-educated males were more mobile than high-educated females in 1972, the higher increased female mobility may show that career paths between high-educated genders have become similar over the years in Norway, with increasing educational attainment and higher employment levels among female workers. However, wage inequality between genders persist, strengthening the previous query on possible gender discrimination in the Norwegian labor market (SSB, 2010). By referring to Ljungqvist and Sargent's (2008) theory of rising mobility as a result of a more disturbances in the labor market, I conclude that the Norwegian labor market has become less turbulent with time for low- and medium-educated workers, but more turbulent for high-educated workers.

Table 4:
Estimated time trends of yearly mobility by age, education and gender 1-3 digit 1972-2015.

	Male workers			Female workers		
	1-Digit	2-Digit	3-Digit	1-Digit	2-Digit	3-Digit
	(1)	(2)	(3)	(1)	(2)	(3)
	A. Low education					
Overall	-0.0018***	-0.0094***	-0.0109***	-0.0019***	-0.0095***	-0.0108***
<30 years old	-0.0022***	-0.0089***	-0.0102***	-0.0009	-0.0083***	-0.0097***
30-39 years old	-0.0016***	-0.0094***	-0.0112***	-0.0016**	-0.0092***	-0.0105***
40-49 years old	-0.0023***	-0.0101***	-0.0116***	-0.0025***	-0.0104***	-0.0114***
50-55 years old	-0.0007	-0.0090***	-0.0102***	-0.0022***	-0.0098***	-0.0111***
	B. Medium education					
Overall	-0.0016***	-0.0088***	-0.0104***	-0.0013***	-0.0083***	-0.0093***
<30 years old	-0.0019***	-0.0095***	-0.0114***	-0.0006	-0.0067***	-0.0081***
30-39 years old	-0.0014***	-0.0089***	-0.0105***	-0.0006*	-0.0079***	-0.0088***
40-49 years old	-0.0016***	-0.0086***	-0.0101***	-0.0018***	-0.0088***	-0.0096***
50-55 years old	-0.0014***	-0.0083***	-0.0098***	-0.0026***	-0.0098***	-0.0111***
	C. High education					
Overall	0.0010***	-0.0033***	-0.0050***	0.0015***	-0.0023***	-0.0030***
<30 years old	0.0021***	-0.0030***	-0.0057***	0.0027***	-0.0018**	-0.0027***
30-39 years old	0.0010***	-0.0030***	-0.0045***	0.0014***	-0.0023***	-0.0029***
40-49 years old	0.0008***	-0.0033***	-0.0047***	0.0008*	-0.0026***	-0.0035***
50-55 years old	0.0004	-0.0038***	-0.0054***	0.0011***	-0.0025***	-0.0028***

Note: *Estimated time trends are calculated from linear regressions in which the dependent variable is predicted yearly mobility and the independent variable is the year using robust standard errors. *p<0.1, **p<0.05, ***p<0.01. Sample is restricted to respondents aged 23-55 years' old who have reported a minimum level of education. Low education represents educational level 1 and 2 together.*

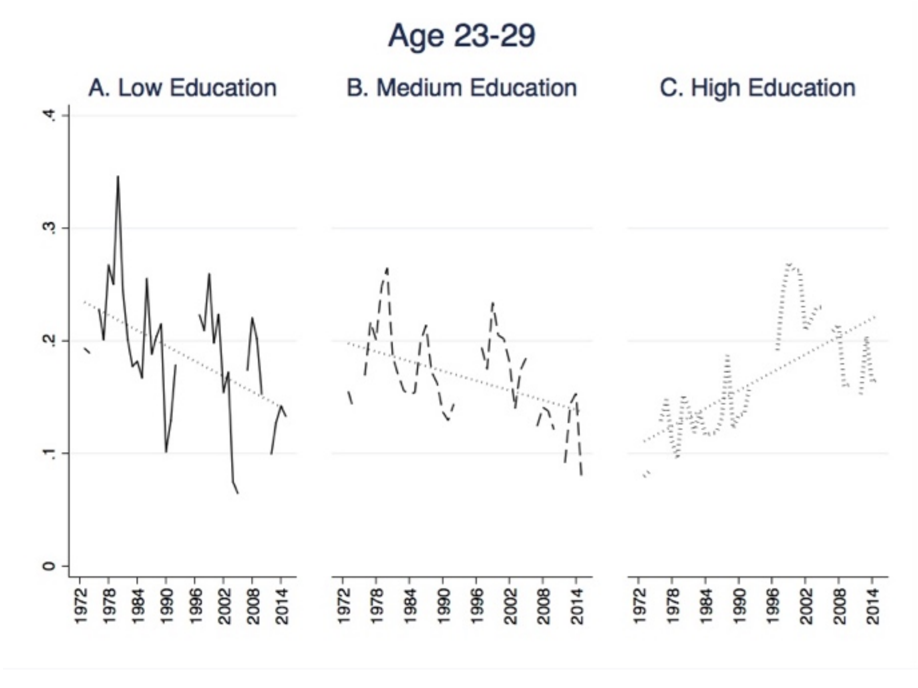

Figure 6 *– Estimated yearly mobility for the age-group 23-29 years old (1-digit level). Each graph show mobility for different education-groups with corresponding trend lines. Low education represents educational level 1 and 2 together, where the sample is restricted to respondents who reported a minimum level of education. Vertical axis present estimated yearly mobility, horizontal axis presents the year.*

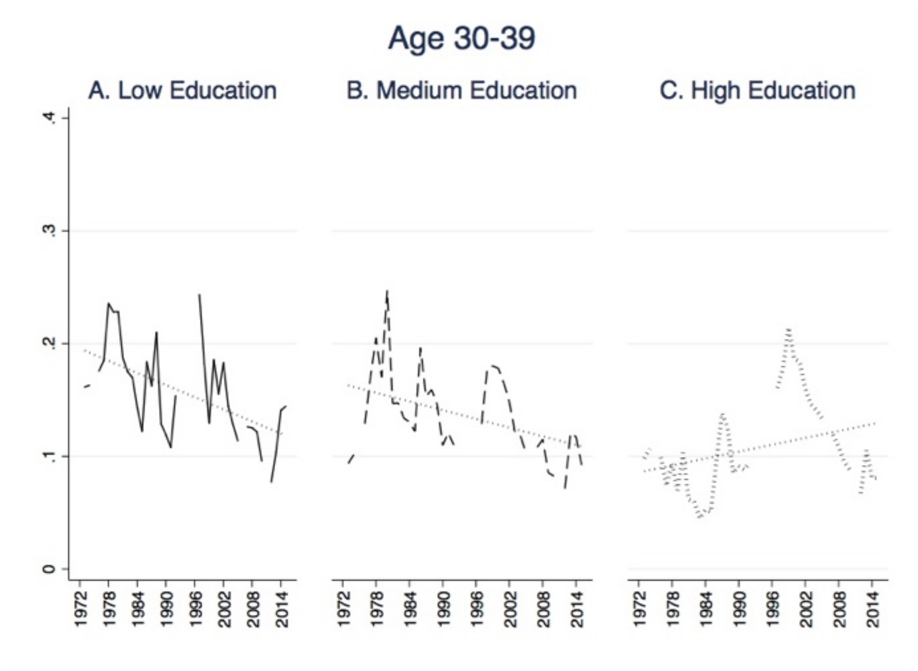

Figure 7 *– Estimated yearly mobility for the age-group 30-39 years old (1-digit level). Each graph show mobility for different education-groups with corresponding trend lines. Low education represents educational level 1 and 2 together, where the sample is restricted to respondents who reported a minimum level of education. Vertical axis present estimated yearly mobility, horizontal axis presents the year.*

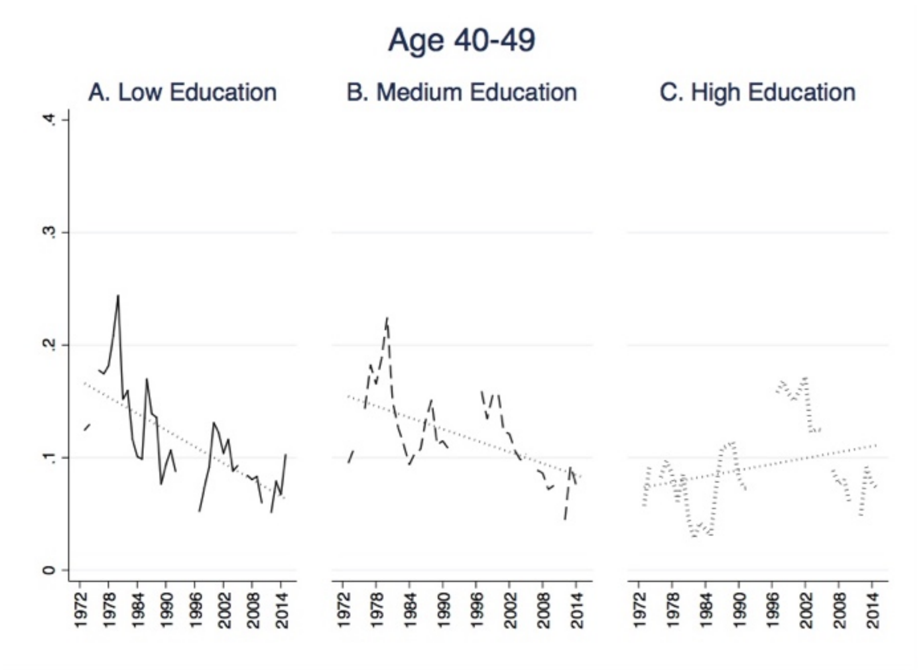

Figure 8 *– Estimated yearly mobility for the age-group 40-49 years old (1-digit level). Each graph show mobility for different education-groups with corresponding trend lines. Low education represents educational level 1 and 2 together, where the sample is restricted to respondents who reported a minimum level of education. Vertical axis present estimated yearly mobility, horizontal axis presents the year.*

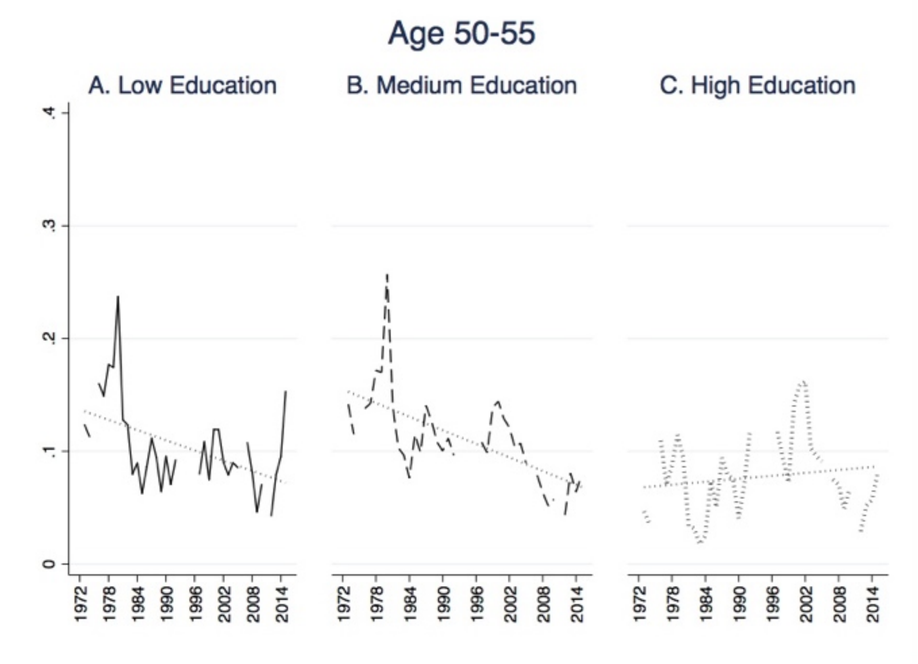

Figure 9 *– Estimated yearly mobility for the age-group 50-55 years old (1-digit level). Each graph show mobility for different education-groups with corresponding trend lines. Low education represents educational level 1 and 2 together, where the sample is restricted to respondents who reported a minimum level of education. Vertical axis present estimated yearly mobility, horizontal axis presents the year.*

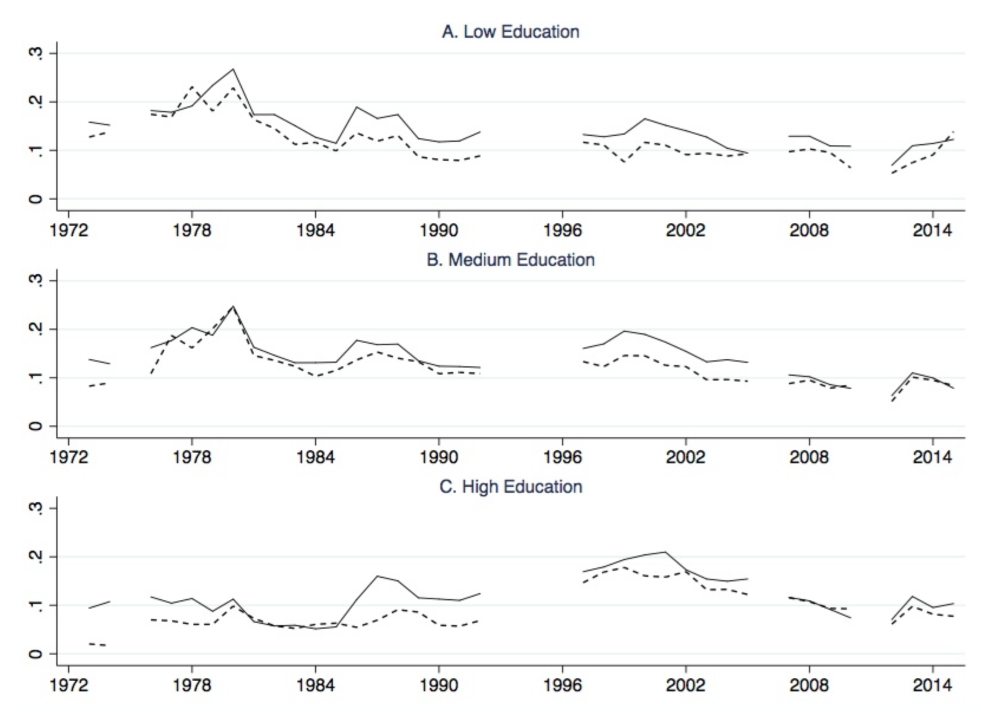

Figure 10 – Average yearly mobility on 1-digit level by educational levels and genders. Solid lines represent male workers, dashed lines represent female workers. Vertical axis present mobility, horizontal axis present year. The sample is restricted to respondents aged 23-55 years' old who have reported a minimum level of education. Low education represents educational level 1 and 2 together.

9. The impact of composition effects

9.1. Demographic changes in Norway

Since this study uses a sample over a 43-year time horizon, changes regarding the composition of the population in employment must be considered. As demographic structures changes, the shares of various sub-groups of the yearly sample are altered, possibly affecting the estimated yearly mobility levels. For example, highly educated workers have increased as a sub-group since 1972 (as discussed in section 8). The expansion of this sub-group (and thus mobility) contributes to higher mobility levels among total sampled workers for a given year, even if the mobility level within the subgroup remains unchanged. This also functions oppositionally, if a reduction of a sub-group occurs with unchanged high mobility rates, mobility levels will decrease for the total sample for a given year. To

quantify these composition effect, I finish Lalés (2012) methodological approach by re-aggregating mobility measures for each sub-group for every year using 1973 as base year (using Lalés formula for estimation of mobility within each subgroup with population shares fixed to the base year for each year separately). The reason why I choose 1973 as my base year is because there is no yearly mobility rate for the year 1972 (since the dataset does not have sufficient information on respondent's previous employment experience before the entry of survey).

Table 5 Show mean age, percentage share of each educational level and the share of female workers over 4 time periods for the base sample. Here I follow the same procedure as in section 8 by merging workers with elementary school and secondary school as highest educational level into low education category, but including workers from 18 to 65 years old. The estimates show a 4.85 % increase in mean age from first period to last period of survey, when mean age is estimated to 39.17 years between 1972 and 1981 and has increased to 41.07 years between 2006 and 2015. As discussed earlier, this reflects a natural aging of the workers over the years, where the "baby-boomers" from the 1940´s and 1950´s represent a sizable share of the workforce. However, the educational attendance increased tremendously, with the numbers of highly educated workers in the sample increasing by 312.2 % between the first and last period. Similarly, the share of workers that have no higher education than secondary school diploma was reduced by 50.64 %. This reflects the increasing importance of educational attainment in the Norwegian labor market, where only a small share of the workers has secondary school as their highest diploma in the last period. Last, the percentage share of female workers has been approximately half of the sample for every year, withe the share decreasing by 4.58 % between the first and last period. As discussed in section 5.1, statistics from SSB shows that the share of females in the dataset are incorrect (SSB:c). For instance, the share of female workers in the workforce is roughly 38 % for the first period, converging towards male shares over time. Given that I have re-weighed the gender shares for individual weights attached to each respondents in my dataset, the weight variables for female workers in the dataset are due to measurement error. Since the share of female workers show biased results, I choose to leave this variable out of the further analysis and discuss this issue in section 10.2.

Table 5:
Demographic change in Norway, 1972-2015: Summary statistics.

	Base sample				
	1972-1981	1982-1992	1996-2005	2006-2015	Change over the period (%)
	(1)	(2)	(3)	(4)	(5)
Mean age (years)	39.17	38.42	40.41	41.07	4.85
Female workers (%)	49.77	45.76	47.40	47.49	-4.58
Education (%)					
Low	38.82	20.41	11.58	19.16	-50.64
Medium	49.45	58.65	54.29	44.26	-10.49
High	11.72	20.95	34.13	36.59	312.20

Note: Change over the period is calculated as the percentage increase/decrease from 1972-1981 to 2006-2015. The sample is restricted to respondents who have reported a minimum level of education. Low education represents educational level 1 and 2 together.

9.2. Model for measuring composition effects

To estimate the demographic changes, I use the following formula for total gross mobility (mob_t) from Lalé (2012):

$$mob_t = \sum_g \omega_t (g)\, mob_t(g) \qquad (2)$$

where ω_t(g) represents the fraction of workers in subgroup = g in year = t and $mob_t(g)$ represents the yearly mobility (1-digit) within this subgroup for the corresponding year. The sub-groups are the same groups represented in table 3 and 4. By fixing the shares of each respective subgroups from year t_0 = 1973 to each year = t, I calculate re-weighed time series of estimated yearly mobility by using the formula:

$$mob_{t,t_0} = \sum_g \omega_{t_0}(g)\, mob_t(g) \qquad (3)$$

where t_0 represent the base year 1973 and ω_{t_0} represent the fraction of each subgroup in 1973. By using this formula across all subgroups and summing the results for each year = t seperately, I obtain new mobility estimates with the population shares from 1973. The difference mob_t - mob_{t,t_0} represents the increased or reduced mobility caused by changes among sub-groups shares of the sample from period t to period t_0, namely the composition effect. It is important to keep in mind that the choice of base year determines the difference obtained from mob_t - mob_{t,t_0}. Since 1973 represents the earliest yearly mobility estimate and table 5 depicts clear trends in educational changes and aging of the population, I further chose to not investigate the choice of the base year.

9.3. Results

Figure 11 shows the re-weighed yearly mobility measures (1-digit) considered for education alone and age alone as percentage shares of original yearly mobility. Here, a 100 % measure indicates that the re-weighed mobility estimates are equal to the original estimates (for direct comparison with original mobility levels, see figure 1). Considering education alone, the estimates lies above the original levels from 1974 to 1988, below from 1987 to 2006 (with a slightly exception in 1988), before the estimates show higher mobility in 2007 (and increases tremendously after 2014). For the first period above the original level, mobility rates increased among respondents with low educational levels since 1973. Given that the shares of low-educated workers were relatively much higher in 1973 (relative to other education groups), taking these composition effects into account increases the difference in mobility. For the second period below original level, highly educated respondents experienced higher mobility rates (relative to the previous years), resulting in reduced mobility since the base year=1973 has a considerable lower fraction of highly education respondent. The last period above original level is similar to the first period, where respondents with low education represents the highest share of mobility relative to other groups. Given that the share of low-educated workers was relatively higher in 1973, the re-weighed estimates are much higher than the original mobility. The high increase from 2014 is due to growing mobility rates among younger workers, driving the mobility upwards with the high shares from 1973.

Moving on to age alone, the re-aggregated estimates lies above the original estimates for the whole period, with the re-aggregated estimates roughly 5 % higher than the original estimates before the 2003. The increasing mobility differences throughout the 2000-decade are mainly due to downward trends in mobility ratios among workers between the ages of 30 and 49, which are less represented in 1973. Since these workers contribute to a substantially larger share of the respective years compared to 1973, the younger and more mobile age-group becomes a relatively larger share of the re-weighed estimates, increasing the difference in mobility. The sudden decrease in the re-weighted estimates from 2012 to 2013 is due to an increase of approximately 50 % in mobility shares for all age groups, with the mobility ratio of the youngest age group becoming relatively lower in comparison to other age groups. Since the other age groups now contribute more towards the total mobility, there is a reduced difference in estimates compared to 2012 as the population shares of these age groups was lower in 1973.

Overall, the age structure of the survey has increased slightly over the years, with changing mobility rates within various age-groups. For instance, workers from the oldest age group are less mobile in 2015 compared to 1973, while the mobility shares of workers between the ages of 40 and 49 increased steadily over time. On the other hand, the composition of educational level among the surveyed workers has increased considerably since 1972, with a major share of the total mobility moving between the different educational groups over the years. Given this substantial re-structure of mobility shares between the educational groups, the re-weighed mobility estimates as share of original mobility estimates varies over time.

Figure 12 presents re-aggregated yearly mobility (1-digit) considering age and education together, where each age-education cell from table 3 and 4 is calculated with formula (3). The figure shows that composition effects are two-fold. By taking composition effects into account, mob_{t,t_0} accounts for 98.8 % of mob_t on average for the period between 1974 and 1992, while it is estimated to 14.6 % higher when measuring between 1996 and 2015. At the most extreme, mobility would have been higher by 27.3 % in 2012 if the composition of the survey had not shifted towards older and more educated workers.

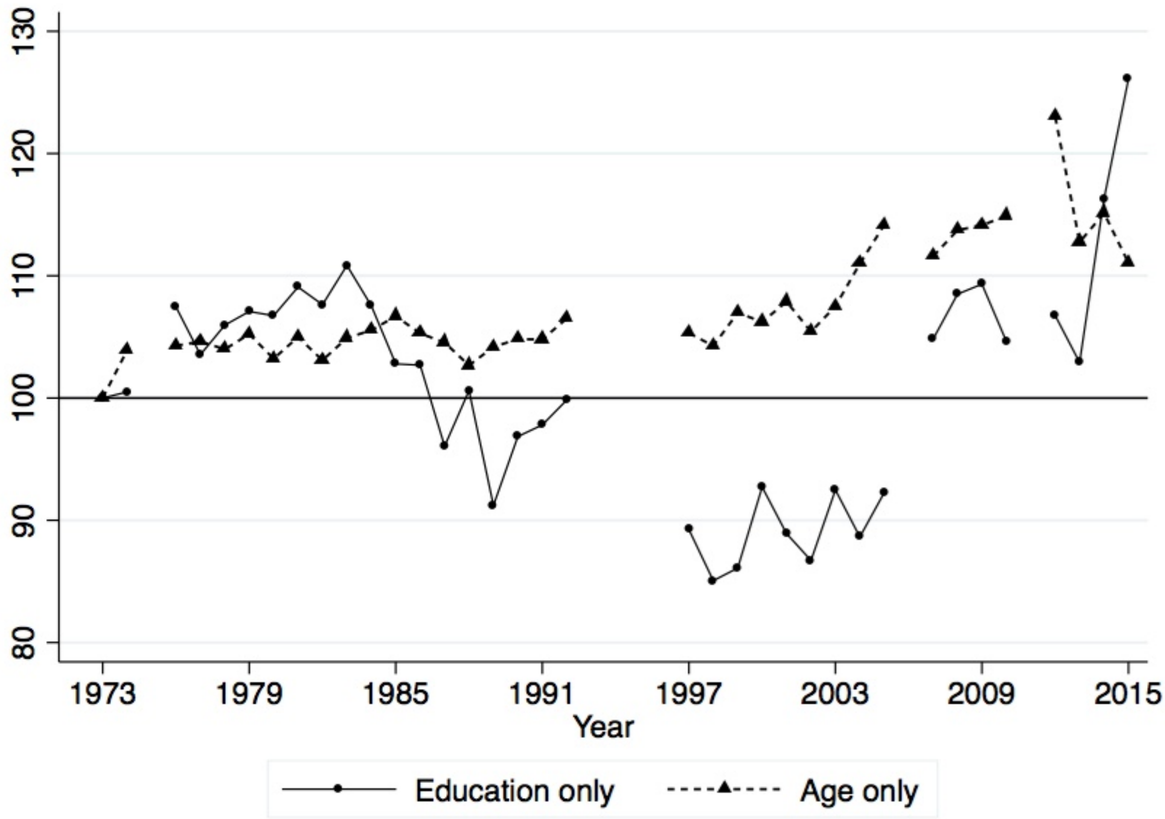

Figure 11 – The impact of composition effects considering education and age separately for mobility on the 1-digit level 1973-2015. Solid line with circle markers represent estimated yearly mobility using educational shares from base year=1973 as percentage of estimated yearly mobility ignoring composition effects. Dashed line with triangle markers represent estimated yearly mobility using age group shares from base year=1973 as percentage of estimated yearly mobility ignoring composition effects. Vertical axis present percentage share of yearly mobility ignoring composition effects, horizontal axis present year. Low education represents educational level 1 and 2 together, where the sample is restricted to respondents who reported a minimum level of education.

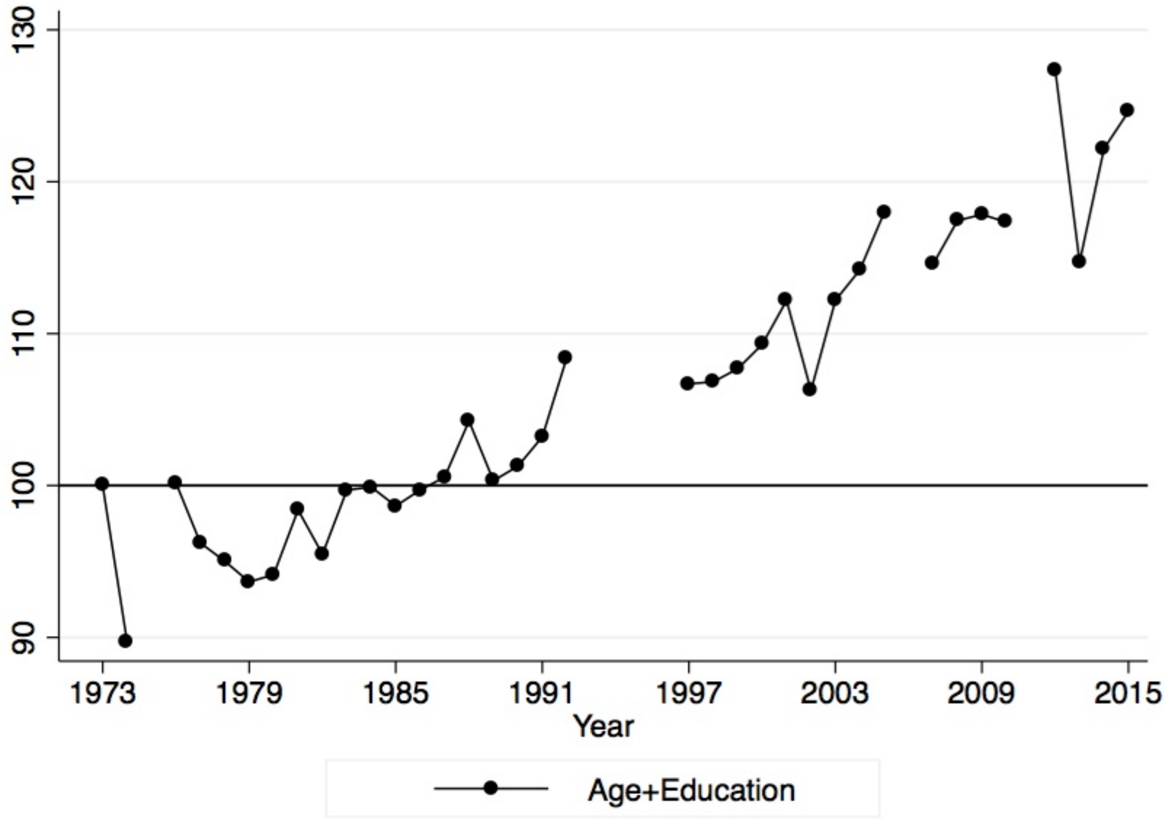

Figure 12 – The impact of composition effects considering education and age together for mobility on the 1-digit level 1973-2015. Graph represent estimated yearly mobility using educational and ag group shares from base year=1973 as percentage of estimated yearly mobility ignoring composition effects. Vertical axis present percentage share of yearly mobility ignoring composition effects, horizontal axis present year. Low education represents educational level 1 and 2 together, where the sample is restricted to respondents who reported a minimum level of education.

Compared to findings from other authors, Kamburov and Manovskii (2008) report minor differences of 10 % inflation after re-weighing their estimates on yearly mobility for the 1–digit level. Conversely, Lalé's (2012) results are comparable to mine. Lalé's estimates on yearly mobility (3-digit level) shows that mobility, at most, would have been 20-30 % higher if age and education shares in France were fixed to first the year of the survey.[16] It should be mentioned that Lalé's estimates of mob_t - mob_{t,t_0} for age and education together are always negative, while my re-weighed estimations lies below during the first 12 years of the survey, after which they exceed the original estimates. One major difference between our estimates are the impact of education alone on measured mobility. Lalé finds almost no effect because

[16] Lalé's (2012) dataset contains information on each respondent's previous labor market experience before their participation of the French Labor Force Survey. Therefore, he is able to estimate yearly mobility for the first year of survey and thus use this year as base the year.

of similar mobility rates across education groups. Conversely, education plays an important role in my estimates since the relative mobility rates across education groups have differed over the years of survey.

The changing mobility rates among the educational groups over time in my sample raises a number of questions. First, has the Norwegian labor market changed its demand for educational qualifications over the year, or does workers from different sub-groups change their jobs on basis of idiosyncratic choices? (as emphasised by Miller (1984)). As with all expertise, the demand for a given educational background may vary within the business cycles in Norway. Conversely, Lalé (2012), as well as Kamburov and Manovskii (2008), conclude that job switches that are due to "churning" among workers represents a fair share of the total estimated mobility, favouring the ladder suggestion. Second, one wonders if the quality of the Norwegian education has changed over the years, altering the employee-to-employer match from year to year. O´Reilly et al (2015) explains that many workers in Europe have educational backgrounds that do not fit the requirement in their job market, arguing that measures such as trainee programs are a better solution to strengthen the employee-to-employer match. Considering that Norway has experienced several educational reforms since 1972, the quality and information provided may well have altered, making certain educational backgrounds in less demand by employers. Third, the mobility shares of highly educated workers have "caught up" with the shares of low and medium-educated workers since 1972. This may demonstrate that high educational attainment is not as privileged today as before, because a substantially larger share of the workforce has higher education today. Changing mobility behaviour may also be a result of technological progress as several occupations are obsolete with technology serving as a substitute for human knowledge (Acemoglu and Autor, 2011). This substitution forces workers to search for jobs in other sectors, increasing their respective mobility rates. However, the technological progress in the Norwegian labor market are found in most sectors, which affects workers with all educational backgrounds.

10. Caveats to validity of estimated mobility

10.1. Measurement error in occupational coding

Since information collected through interview formats relies on the fact that workers are aware of the classification of their occupations, measuring transitions in the labor market is occasionally a complex procedure. Moscarini and Thommson (2007) argue that various tasks among workers in the U.S. makes it difficult to precisely describe what is the worker's true occupation. There is no reason to believe that occupations represented in the Norwegian labor market are more precisely described, making this point particularly poignant with respect to measurement error. To shed light in this issue, I discuss two potential sources for measurement error in occupational coding below.

10.1.1. Attrition

As mentioned, mobility estimates were highly volatile for the duration of the survey. Some of the "spikes" representing high mobility may be a result of coding error, which may occur more frequent among certain workers in the sample. For instance, workers who experienced attrition during their participation in the survey. Since attriting respondent possibly devote less time and effort to the survey compared to respondents who have participated for all eligible periods, these workers may have a higher probability of reporting wrong occupations. From table E1 in Appendix E one can see that in removing workers that experienced attrition in the survey, mobility on the 1-digit level is reduced by 2.3 %, possibly indicating that attriting workers represent a high share of mobility during the most turbulent periods. Figure 14 present yearly mobility on the 1-digit level with samples including workers that attrited during the survey and the same measures for workers that did not drop out of the survey (similar figures are observed by removing attriting respondents on mobility for the 2-digit and the 3-digit level). As shown in the figure, the spike between 1987 and 1989 is reduced, following lower mobility for the years after 1996. Since the survey practiced dependent coding after the reform in 1996, fewer of the excess job switches after 1996 does not come from coding error (compared to independent coding mobility before 1996). However, the reduction still shows that attriting respondents represent a fair share of the occupational switches after 1996. Conversely, the high mobility by the end of the 1970´s is virtually unchanged, revealing that most of the measured mobility is not caused by excess coding error from attriting respondents.

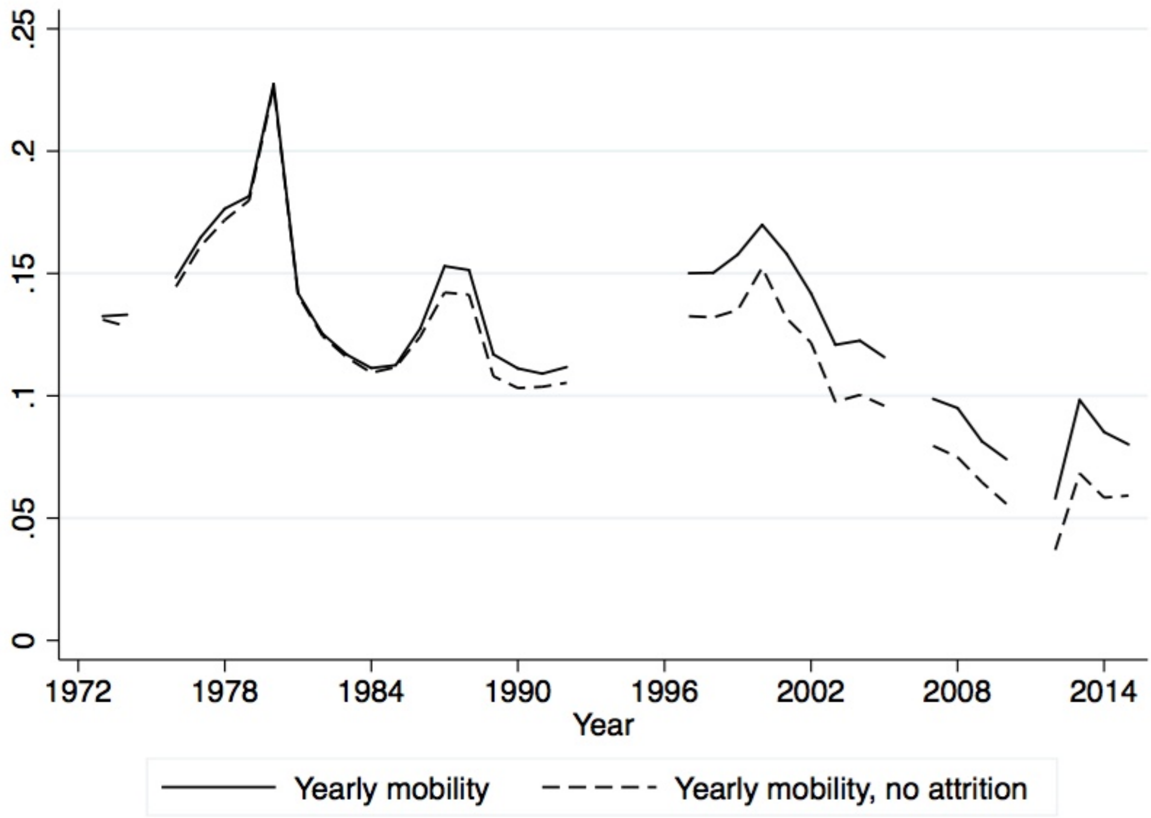

Figure 13 – Yearly mobility on the 1-digit level 1972-2015 for samples with and without respondents who have experienced attrition during their participation of the survey. Solid line represents original base sample, dashed line represents base sample without respondents who experienced attrition in the survey. Vertical axis present yearly mobility, horizontal axis presents the year.

10.1.2. Dependent vs. Independent coding

As discussed earlier, a respondent (or the interviewer) may report two different occupational codes over two interviews in the survey despite no real occupational change for the respondents, resulting in coding misclassification. This previse coding error was probably substantially more frequent before the use of computer assisted telephone interviewing in 1996, because before this time interviewer filled in the answers manually. Since occupational status (and thus occupational coding) is not dependent on coding from previous interviews in the survey for every year, these potential measurement errors can not be quantified over the whole sample period (as Lalé does in with his sample). However, my dataset contains information on each respondent's tenure of current occupation held in their 1st interview for the first 3 years of the survey, where occupational status before the entry of the survey is dependent on answers from 1st interview. Conversely, as the dataset contains no information on tenure for later interviews, occupational status is independent from the next interview. This makes it possible for me to verify if the workers show different mobility rates between their first interview and in the the remaining interviews. When comparing these estimates, the results show that workers interviewed for their 2nd, 3rd, and 4th time in the survey display approximately twice as high average yearly mobility shares on the 1-digit level. The estimates on the 2-digit and 3-digit level are even higher, with estimated mobility, respectively, four and five times higher than estimates from the first interviews (see table F2 for results). These findings demonstrate excess mobility from independent coding and may well prove that the following years between 1975 and 1992 suffer from the same coding error.

10.2. Error in the female weights of the dataset

As previously mentioned in section 5.1, the percentage share of female workers in the dataset does not reflect the true representation of female workers in the Norwegian workforce. This is especially observable between the years 1972 and 1992, with the share of female workers in the sample highly deviating from the true share of the population. For instance, the numbers from SSB shows that the percentage share of female workers in the workforce in 1972 was 36.6 %, while the corresponding weighed share in the dataset consisted of 49.2 % females. This means that female workers are overrepresented in the analysis, and may result in a downward bias in the estimated mobility (predicted by previous findings of lower mobility among female workers).

To quantify the possible bias of female overrepresentation, I practice the same method as in section 9.2. Here, I gather the true gender shares of the workforce from SSB and re-weigh estimated mobility in regards to the respective mobility ratios of female and male workers for each year of survey using formula (2) (SSB:c). Since the shares gathered from SSB are for every worker between the ages of 15 and 74, I re-aggregate mobility ratios on the 1-digit level for both genders in this age interval. Table F2 presents the results, showing that the re-weighed estimates with the true population shares are only marginally higher (0.05 % higher over the whole period) than the original estimates. This is because the male mobility ratios for each year are only slightly higher (and even lower in 2010) than female mobility ratios. Further, the difference in mobility is declining with time, revealing that gender shares of the dataset are more precise in later years of survey. Given these small differences, there is no reason to suspect substantial measurement error in the previous discussed findings. However, it is important to emphasize that I have used mobility rates from my given dataset when re-estimating mobility, which may not reflect the true rates of the population. For instance, mobility rates among female workers may be endogenous to change in total share of female workers in the workforce. Since the female mobility rate can only be affected by their true share of the population, which indeed is reflected through their participation in the labor market and thus the survey, endogeneity should not be an issue for the female mobility rates.

10.3. Missing data in the sample

Although the dataset used for this thesis does represent a large period of study, the lack of yearly panel files between 1993 and 1995 likely contributes to some measurement error in estimated mobility between 1972 and 2015. If a sizeable number of respondents have been left out of the dataset, my estimations of both occupational mobility and explanatory variables for the whole period are less precise than the true estimates of AKU. Additionally, the survey has experienced several breaks and reforms since 1972, with the years after these re-structures containing fewer respondents. This means that the results for some periods are less precise than others, making accuracy diverse between the years. Given the fact that I still have a large dataset in hand, the results are probably not subject to much measurement error, however, it is preferable to have approximately equal numbers of respondents throughout all years of the survey.

11. Conclusion

This thesis has investigated how yearly occupational mobility has developed in Norway from 1972 to 2015, using a majority of the methodological approaches from Lalé's (2012) paper. It has also uncovered how mobility differs between various sub-groups of the population and considered how changing demographics alter the measured mobility. The results showed that occupational mobility averages to 14.1 % for the period of study, but proved more job switches among male and young workers. Mobility has also decreased for most of the sub-groups in Norway over the years, where aging of the population and higher educational attainment has led to fewer job switches. Some of the sub-groups have experienced higher reduction in mobility than others, which raises questions on why these differences are observable. For instance, possible gender discrimination in promotional opportunities may prove that Norway are still far away from reaching the goal of gender equality. The overall declining mobility may further show that Norwegian firms have become more productive through less destruction of human capital, and that workers have become more satisfied with their occupations. However, other labor market conditions such as wages and working hours have also improved since 1972, demonstrating overall economic expansion over the period of survey.

Compared to previous literature, mobility rates in Norway are much higher than in France, but similar to the findings from the U.S., U.K. and Germany. This may prove that the Norwegian labor market is less turbulent than the French labor market, where factors such as job security programs, union bargaining, technological improvement and flexible working hours are more similar to the U.S., U.K., and Germany than France. However, my findings of converging mobility differences between genders in Norway supports the same relationship in France, proving that female workers in both countries have developed as a more mobile share of the workforce. A further interesting question is how the different mobility rates across the countries of study are related to differences in factors such as wages and productivity. As this question was beyond the scope of this thesis, I leave it to be investigated by future research.

Another relevant question to ask is whether increased labor market transitions proves to be positive or negative. From a pessimistic point of view, occupational mobility may disrupt factors such as worker's income, specific human capital, preferred geographical location, amenities and wages. On the other hand, labor market transitions may reflect individual realization of career improvements, which is shown by the cyclical relationship between yearly mobility and unemployment over the years. As Norwegians get more education, and start to build families by older ages today compared to 1972, career building has developed to be more important over the years for Norwegian workers. The higher (and increasing) mobility shares among workers with university or college degrees may also prove that high qualifications leads to curious behaviour in the labor market, where firms possibly consider comprehensive labor market experiences as more valuable today compared to previous years. The positive view on labor market transitions as career improvements questions Ljungqvist and Sargent's (2008) interpretation on occupational mobility, with rising mobility as a consequence of more disturbances in the labor market. However, occupational switches are not always determined by idiosyncratic choices as both lay offs and hiring decisions are determined by supply and demand in the marker (for example, increasing lay offs in the oil industry since 2014). By standing on neutral ground, I conclude that the Norwegian labor market has become less mobile over the years, but the transitions are caused by different factors.

It should finally be mentioned that the average mobility estimates are highly volatile, proving possible measurement error in my dataset. Compared to other studies on the field of occupational mobility, my dataset is missing several cells that could help to remove a majority of the measurement error by cleaning procedures from previous literature. This naturally questions the estimated results. However, this thesis does present an overall picture of the occupational mobility in the Norwegian labor market, both in general and among the various sub-groups. As I leave my results for publicity, further research may follow the findings from this thesis to reach a more accurate description of occupational mobility in Norway.

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Appendix A: Interviewing techniques and structure of participation in the survey

This section presents questions in AKU regarding respondent's occupation, employer and occupational codes. The questions define whether occupations are dependent or independent coded. Questionnaires used a single form per respondent for each interview before 1996, while one form were used for several interviews per respondent for respondents after 1996.

1972-1992 surveys with independent coding

Questions regarding occupation for every interview:

"Where did you mainly work last week?"

→Respondent report firms name and address

"What kind of agency/industry is this?"

→Respondent report firm's agency/industry

"How long is it since you started to work in this agency/industry?"

→Respondent report nr of years.

"What was your main occupation in this agency/industry?"

→Respondent report occupation, SSB register 2-4 digits' occupational code.

Questions are directly translated from the forms used by questionnaires, which were received from SSB. Respondents does not report answers regarding their occupational codes that explicitly refer to periods before, only with respect to the firm they are employed. Note that information on respondent's tenure in firm is only available for the years 1972-1974 in my dataset.

1996-2015 surveys with dependent coding

Questions regarding occupation during first interview:

"Where did you work during the reference week?"

→Respondent report name and address of firm

"Agency/industry"

→Respondent report firms agency/industry

“Interview-objects (IO) occupation”

→Respondent report occupation, SSB register 4 digits’ occupational code.

“Tasks”

→Respondent report his/hers most important tasks in the firm

“Have you been continuously employed in this firm for over a year?”

→Respondent answers yes or no

“Which year did you start in this firm?”

→Respondent report which year. If respondent reported “yes” in last question, skip question.

“Do you also remember which month you started?”

→Respondent report month of his/her start or “do not remember”. If respondent answered “yes” for being employed over a year, skip this question.

Questions regarding occupation for later interviews:

(for respondents that were not employed last interview, use form for first interview)

“During last interview you worked at XXX. Did you still work there during the reference week?” (separate questions for self-employed respondents)

→Respondent report either “yes” or “no”. If “no”, use form for first interview.

“Did you have the same occupation in the firm as in last interview?”

→Respondent report either “yes” or “no”. If “yes”, next question. If “no”, IO report his/her new occupation.

“Have you been working continuously in this firm for over a year?”

→Respondent report either “yes” or “no”. If “yes”, next question. If “no”, IO report since which year.

Questions are directly translated from the forms used by questionnaires, which were received from SSB. Respondents report answers regarding their occupation (and thus occupational codes) that explicitly refer to periods before which makes occupational coding in period t dependent on coding from period $t-1$. This eradicate a substantial part of measurement errors regarding mobility between periods. Note that information on respondent’s tenure in firm from 1st interview is missing in the dataset.

Structure of participation

For the years between 1972 and 1992, individuals participate for 2 yearly quarters followed by 2 quarters break before re-entering the survey for 2 quarters (total of 4 periods participation). For the years between 1996 and 2015, individuals participate for 8 consecutive periods (quarters). Table A1 presents these differences, where new waves of workers enter the survey for every 3rd quarter (with some exceptions due to breaks in the time series over the years).

Table A1:
Structure of participation in AKU for periods 1972-1992 and 1996-2015.

1972-1992			1996-2015		
Year	Quarter	Id numbers	Year	Quarter	Id numbers
1972	1	1-2999	1996	1	1-2999
1972	2	1-2999	1996	2	1-2999
1972	3	3000-5999	1996	3	1-2999, 3000-5999
1972	4	3000-5999	1996	4	1-2999, 3000-5999
1973	1	1-2999	1997	1	1-2999, 3000-5999, 6000-9999
1973	2	1-2999	1997	2	1-2999, 3000-5999, 6000-9999
1973	3	3000-5999, 6000-9999	1997	3	1-2999, 3000-5999, 6000-9999
1973	4	3000-5999, 6000-9999	1997	4	1-2999, 3000-5999, 6000-9999

Table A1 – Structure of participation in "Arbeidskraftundersøkelsen" for years 1972-1992 and 1996-2015. Note that each year and quarter together represent unique time periods. Id numbers are illustrations and do not represent the true ids of the survey.

Appendix B: Occupational/sectorial codes

The occupational/sectorial codes are divided into 12 (NYK) and 10 (STYRK/STYRK-08) occupational fields, whereas NYK and STYRK (STYRK-08) differ in which fields that are related to each number. See Arbeidsdirektoratet (1965), SSB (1998) and SSB (2011) for further readings on 2-, 3- and 4-digit categorization.

The major difference after the transition to STYRK in 1996 was the terms of occupational sorting, where individual's occupations are categorized after occupation-specific tasks and educational background. For the previous standard NYK, categorization is more related to the firm/organization in where the occupations are located. The transition made it easier for comparison between other countries that follows the ISCO-88 standard developed through The International Labor Organization (ILO). The transition also led to merging of categories on area- and group-level, resulting in fewer occupations on 2- and 3-digit level. Further, the transition to STYRK-08 in 2011 followed the ISCO-08 standard, which re-categorized, sub-categorized and merged some occupations. Although occupational fields slightly differ by name, they mostly contain the same categorical definitions. The transition led to more occupations on all digit levels, but the update still contains considerable fewer occupational categories than the NYK standard.

Occupational fields (1-digit level), NYK and STYRK (STYRK-08)

For NYK, 1982-1992
0 = Technical, scientific, human and artistic labor
1 = Administrative/management and firm/organizational leadership
2 = Clerks
3 = Business
4 = Agricultural, forestry and fishing
5 = Mining and explosion work
6 = Transport and communication
7-8 = Industry, building and construction work
9 = Service
A = Military
X = Unspecified

For STYRK and STYRK-08, 1996-2015
0 = Armed forces and unspecified
1 = Legislators, senior officials and managers
2 = Professionals
3 = Technicians and associate professionals
4 = Clerks
5 = Service workers + shop and market sales workers
6 = Agricultural, forestry and fishery workers
7 = Craft and related trade workers
8 = Plant and machine operators + assemblers
9 = Elementary occupations (no requirement of higher education)

(note that some occupational fields differ by name between STYRK and STYRK-08, the list above present the naming from the STYRK-standard (SSB, 1998).

Appendix C: Cleaning procedure

Table C1 presents change in yearly mobility measures before and after the cleaning procedure conducted in section 4.1. Note that occupational mobility on 2- and 3-digit level show substantially higher numbers for the period 1972-1981, which is why I choose to focus on 1-digit mobility measures.

Table C1:
Impact of the cleaning procedure on measured mobility rates.

Period	Raw/cleaned sample size		1-Digit	2-Digit	3-Digit
1972-1981	299,610	Number of occ. switches in the raw data	13,627	38,898	42,714
		Fraction of raw switches that are discarded (%)	8.5	8.3	8.2
	266,737	Post-correction mobility rate (%)	16.8	48.1	52.9
1982-1992	430,359	Number of occ. switches in the raw data	21,451	32,973	40,224
		Fraction of raw switches that are discarded (%)	11.7	9.5	10.0
	391,300	Post-correction mobility rate (%)	13.3	20.0	25.5
1996-2005	374,671	Number of occ. switches in the raw data	24,119	27,776	31,232
		Fraction of raw switches that are discarded (%)	9.5	9.0	8.7
	359,343	Post-correction mobility rate (%)	14.1	16.3	18.5
2006-2015	424,514	Number of occ. switches in the raw data	14,825	17,832	19,474
		Fraction of raw switches that are discarded (%)	15.1	14.1	13.6
	403,220	Post-correction mobility rate (%)	8.9	10.9	11.9

Note: The raw sample represents the uncleansed original dataset. The mobility rates are measured as yearly mobility. The sample size also includes missing values, measuring number of occupational switches as share of sample size does not measure correct mobility rates.

Appendix D: Outlier estimations for mobility

Figure D1 presents average yearly mobility for 1-, 2- and 3-digit occupational codes. The graphs show that the estimations are skewed in the sample as the estimates for mobility on the 2-digit and 3-digit shows very high numbers for the period 1972-1981. For example, the average yearly mobility on 3-digit level shows 0.78 in 1980, meaning that 78 % of the registered occupations differs from 1 year before. Since none of the respondent's occupational affiliation was altered during the cleaning procedure (only given new values by cleaning procedures), the 2-digit and 3-digit estimations may suffer from measurement error in the raw dataset. Therefore, they are left out as main measures for mobility in this thesis.

Further, mobility levels drop substantially in 2011, where yearly mobility drops approximately 60 % from 2010 on all digit levels. The levels increase back to its trending levels in 2012 (approximately 100 % increase), which shows that 2011 represents abnormal estimations for the sample. One potential source to the drop in mobility may be the transition from the old occupational code standard STYRK to the new standard STYRK-08 in 2011, which may have created measurement error in occupational coding. The transition also led to a break in the time series. After corresponding with SSB regarding this issue, SSB advised me to leave the year 2011 with very low mobility out of the main estimation, which may eradicate potential measurement error.

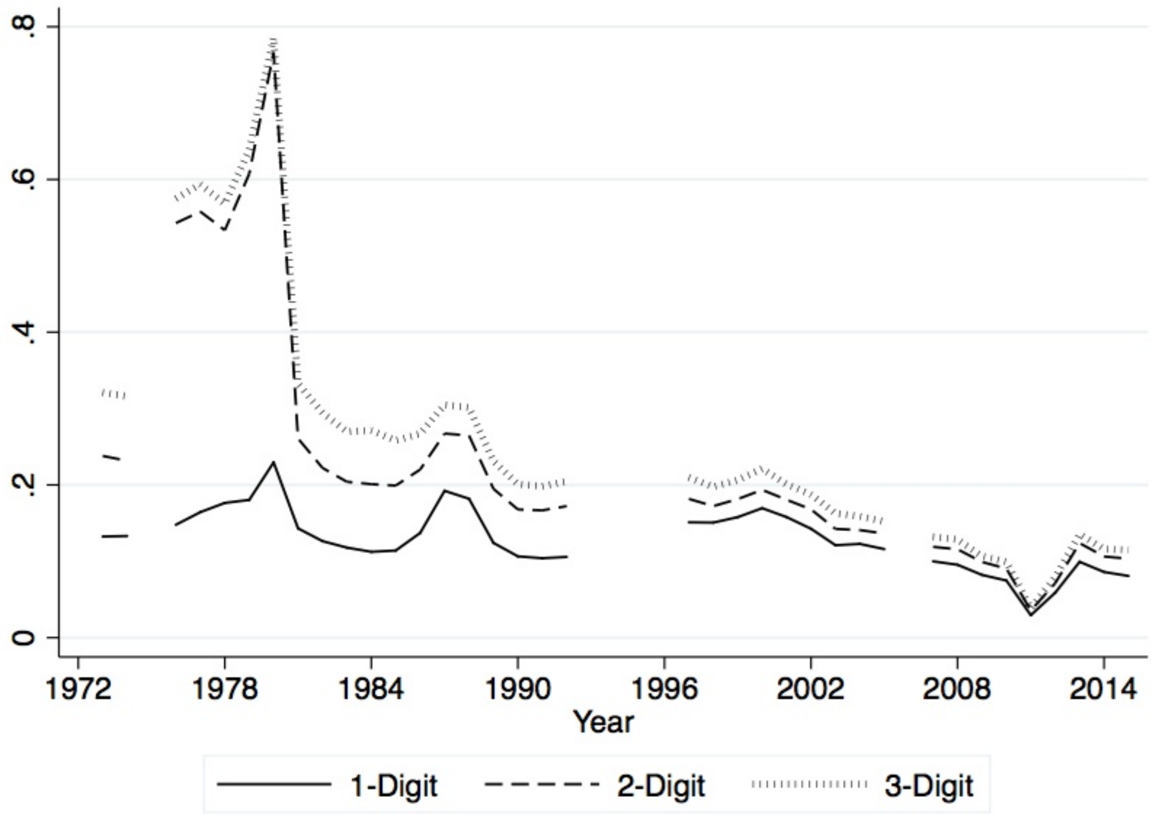

Figure D1 - Yearly mobility on 1-digit, 2-digit and 3-digit level for period the 1972-2015. The estimates are for the base (clean) sample (including year 2011). Vertical axis represents average yearly mobility, x-axis represent year.

Appendix E: Alternative sample dispositions

Table E1 presents re-weighted the estimation of yearly mobility on the 1-digit level with different sample restrictions for both genders and male and female respondents respectively for the period 1972-2015. The table also shows how yearly mobility trends from 1972 to 2015 with the respective samples. The first estimations represent the base sample (which refer to the sample after conducting the cleaning procedure from section 4.1). The second sample estimates base sample minus respondents who report that they are self-employed or family members within firms. The third sample estimates base sample minus indirectly interviewed respondents (help from family members or other members of the household). The fourth sample estimates base sample minus individuals who experienced at least one period of unemployment. The sixth sample estimates base sample minus respondents who experienced attrition from the survey (respondents that participated less than 4 periods for years before 1993 and less than 8 periods for years after 1995).

Self employed respondents and family workers represents 109,549 observations in the sample, respondents who were indirectly interview represents 246,144 observations, respondents who experienced unemployment during their time in the survey represents 367,004 observations, and respondents who attrited from at least one period of the survey represents 361,126 observations

Table E1:
Sensitivity to mobility with alternative samples 1972-2015.

	Average estimated yearly mobility, 1-digit (%)				
	Base sample	- self employed + family	- ind.interviews	- unemployed	- attrition
Both genders	14.1	14.1	12.9	13.3	11.8
Male	15.6	15.8	14.4	14.8	13.5
Female	12.4	12.2	11.4	11.7	9.9
	Time-trend in mobility				
	Base sample	- self employed + family	- ind.interviews	- unemployed	- attrition
Both genders	-0.0107***	-0.0107***	-0.0104***	-0.0108***	-0.0105***

Note: *Mobility rate for base sample refers to levels from figure 4. Time trends are calculated from linear regressions in which the dependent variable is predicted yearly mobility on 1-digit level and independent variable is the year using robust standard errors. *p<0.1, **p<0.05, ***p<0.001.*

Appendix F: Additional tables

Table F1:
Difference in average yearly mobility estimates between first interviews and re-interviews, period 1972-1975.

	Average yearly mobility (%)		
	1-Digit	2-Digit	3-Digit
First interview (20,330 observations)	6.18	6.18	6.18
Re-interview (15,992 observations)	13.28	23.48	31.85
% increase	114.88	279.93	415.37

Note: Difference in average yearly mobility estimates between first interviews and re-interviews for the period 1972-1975. Yearly mobility estimates from the 1st interview are calculated as percentage of workers that report less than a year tenure within firm they a currently hired. The dataset contains no information on occupational coding from previous employment experience before the 1st period in the survey. The % increase shows the increased mobility from first interview to re-interviews as percentage of first interview mobility.

Table F2:
Estimated yearly mobility on 1-digit level with different gender shares for 1972-2015, age interval 15-74 years old.

	Mobility ratios		Gender shares (in dataset)		Gender shares (from SSB)		Estimated mobility using formula (2) (%)	
Year (t)	Male (1)	Female (2)	Male (3)	Female (4)	Male (5)	Female (6)	Using gender shares from dataset (7)	Using gender shares from SSB (8)
1973	0.1463	0.1169	0.4967	0.5033	0.6303	0.3697	13.15	13.54
1974	0.1447	0.1194	0.4926	0.5074	0.6339	0.3661	13.18	13.54
1976	0.1639	0.1397	0.4980	0.5020	0.6084	0.3916	15.17	15.44
1977	0.1698	0.1611	0.4984	0.5016	0.6045	0.3955	16.54	16.63
1978	0.1880	0.1724	0.4952	0.5048	0.5982	0.4018	18.01	18.17
1979	0.1866	0.1823	0.4932	0.5068	0.5908	0.4092	18.44	18.48
1980	0.2338	0.2283	0.4940	0.5060	0.5912	0.4088	23.10	23.15
1981	0.1475	0.1383	0.4946	0.5054	0.5858	0.4142	14.28	14.36
1982	0.1294	0.1249	0.4932	0.5068	0.5839	0.4161	12.71	12.75
1983	0.1261	0.1154	0.4949	0.5051	0.5779	0.4221	12.06	12.15
1984	0.1187	0.1073	0.4980	0.5020	0.5737	0.4263	11.29	11.38
1985	0.1167	0.1112	0.5227	0.4773	0.5679	0.4321	11.40	11.43
1986	0.1655	0.1422	0.5522	0.4478	0.5592	0.4408	15.50	15.52
1987	0.1663	0.1428	0.5568	0.4432	0.5568	0.4432	15.58	15.58
1988	0.1670	0.1471	0.5325	0.4675	0.5538	0.4462	15.76	15.81
1989	0.1225	0.1178	0.5526	0.4474	0.5557	0.4443	12.03	12.04
1990	0.1203	0.1044	0.5513	0.4487	0.5513	0.4487	11.31	11.31
1991	0.1192	0.1014	0.5470	0.4530	0.5472	0.4528	11.11	11.11
1992	0.1249	0.1034	0.5434	0.4566	0.5478	0.4522	11.50	11.51
1997	0.1615	0.1410	0.5364	0.4636	0.5393	0.4607	15.19	15.20
1998	0.1692	0.1400	0.5258	0.4742	0.5385	0.4615	15.72	15.75
1999	0.1949	0.1555	0.5254	0.4746	0.5357	0.4643	17.62	17.66
2000	0.1936	0.1518	0.5288	0.4712	0.5353	0.4647	17.39	17.41
2001	0.1821	0.1415	0.5275	0.4725	0.5336	0.4664	16.29	16.31
2002	0.1586	0.1349	0.5246	0.4754	0.5306	0.4694	14.73	14.74
2003	0.1378	0.1114	0.5243	0.4757	0.5301	0.4699	12.52	12.53
2004	0.1364	0.1119	0.5259	0.4741	0.5302	0.4698	12.47	12.48
2005	0.1359	0.1039	0.5276	0.4724	0.5302	0.4698	12.07	12.08
2007	0.1101	0.0989	0.5260	0.4740	0.5279	0.4721	10.47	10.48
2008	0.1050	0.0978	0.5256	0.4744	0.5285	0.4715	10.15	10.16
2009	0.0907	0.0818	0.5246	0.4754	0.5274	0.4726	8.64	8.64
2010	0.0785	0.0796	0.5274	0.4726	0.5295	0.4705	7.90	7.90
2012	0.0658	0.0523	0.5269	0.4731	0.5298	0.4702	5.94	5.94
2013	0.1106	0.0915	0.5253	0.4747	0.5290	0.4710	10.15	10.16
2014	0.0950	0.0863	0.5241	0.4759	0.5290	0.4710	9.08	9.09
2015	0.0850	0.0840	0.5185	0.4815	0.5303	0.4697	8.45	8.45

Note: Estimated yearly mobility on 1-digit level with different gender shares for 1972-2015, age interval 15-74 years old. Note that the year 1972 is not shown since there is no registered yearly mobility for this year. The years 1975, 1996, 2006 are not shown since there is no registered mobility because of break in the time series. The years 1993-1995 are missing in the sample and the year 2011 is omitted due to potential measurement error. Mobility is estimated with formula (2) from section 9.2. Gender shares from SSB are collected online from online source SSB:c.