OCCUPATIONAL MOBILITY IN GERMANY

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ABSTRACT. This paper studies the patterns and the determinants of worker mobility across occupations in West Germany employing the German Socioeconomic Panel (GSOEP) over the 1984-2004 period. The occupational mobility is considered at the most detailed level possible provided by the dataset, namely four-digit ISCO-88 (International Standard Classification of Occupations-1988) occupational classification generated by the International Labor Organization (ILO). The measurement errors in occupational coding and the strategy to control for it are argued extensively. The time series patterns of occupational mobility demonstrate strong procyclicality where the degree is changing according to the characteristics of the individual such as age, skill and origins. No obvious trend over the time span under analysis is found. Results examining the contributions to these time series patterns show that cross occupation dispersion in labor demand i.e. net reallocation has a strong positive association with worker mobility across occupations. High unemployment, which becomes statistically significant only after the inclusion of the interaction term with education levels, and some individual characteristics such as age, being married or not and belonging to the first generation of foreigner groups has negative interaction with mobility.

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1. Introduction

This paper studies the patterns and the determinants of aggregate worker reallocation among occupations in Germany employing the German Socioeconomic Panel (GSOEP) over the 1984-2004 period. The occupational mobility is considered at the most detailed level possible provided by the dataset, namely 4-digit ISCO-88 (International Standard Classification of Occupations-1988) occupational classifications generated by the International Labor Organization (ILO).

Worker reallocation at this level of disaggregation has obviously an interest for the labor economist. A close look at the occupations at the 4-digit level shows that disaggregation at this level closely correspond to a career. ISCO-88 incorporates 390 4-digit occupations as opposed to 116 3-digit, 28 2-digit and only 10 1-digit occupations. For instance, "Professionals" includes both meteorologists [2112] and chemists [2113] which shows that one would not be able to identify the important career change of becoming a chemist after being worked as a meteorologist or vice versa if the classification was considered in more aggregated level, even at the 3-digit. In 3-digits, both of those occupations are named under physicists, chemists and related professionals [211].

There is a huge literature investigating whether human capital is specific to overall labor market experience or firm tenure (see, for instance, Altonji and Shakotko (1987), Topel (1991), Dustmann and Meghir (2005)). However, Neal (1995) and Parent (2000) argue that human capital is specific to industry of employment. Recently, Kambourov and Manovskii (2002a) provide evidence on occupational specificity of human capital using Panel Study of Income Dynamics (PSID) data for the U.S. They show that if one takes into account the occupational experience, the employer or industry experience have little impact on the wage received. Hence, skills accumulated in a given specific occupation, such as the ones in 4-digit, may not be easily transferable to another 4-digit occupation.

Moreover, worker reallocation among the disaggregated occupations should also be of interest to the macroeconomist. Jovanovic and Moffitt (1990) investigate worker turnover across industries, Farber (1994) across employers, Fallick and Fleischman (2001) across employment states and Davis, Haltiwanger and Schuh (1996) across jobs and lately Moscarini and Vella (2002, 2003) across occupations. Sharing the motivation of Moscarini and Vella (2002, 2003), an occupation represent the best

available empirical definition of a technology. A macroeconomist following Schumpeter should be interested in occupational mobility, as a change of occupation would imply a change of technology for the worker. For instance, a cook can apply her/his labor for different employers in different industries but when a cook becomes an economist, she/he reallocates her/his labor to a different technology.

Canova and Ravn (2000) argue, in a different context, that the German unification of 1990 provides a 'natural experiment' in a labor market. It can be seen as a formidable shock to the west German economy, qualitatively similar to a sudden 26% increase in the low-skilled proportion of the population. The substantial reallocation of labor is among the most pervasive features of any transition economy. Furthermore, German labor markets are known to be rigid, as discussed by Dustman and Perreira (1998). They cite the OECD Employment Outlook (1990), which states that Germany stands out for having a relatively strict employment protection legislation. Moreover it has a tight corporatist labor market. There are strong unions with a coverage of 90% and employers' associations with autonomy to conclude collective agreements virtually on all matters of labor relations. Hence, interesting conclusion can be drawn from a study of occupational mobility under these circumstances and a possible later comparison with other countries.

To my knowledge, the only other study that looks at the occupational mobility in Germany at disaggregated level is Zimmermann (1999). However, in his paper he is mainly focusing on the wage-job mobility relationship and also present some results on the determinants of job and occupational mobility. His study employs the first 8 waves (1984-91) from the GSOEP. He finds around 12% of occupational mobility at the 3-digit level. However, he uses only 1- and 3-digit ISCO codes, as it was the only available level of disaggregation provided by the GSOEP at the time. Also, in 2002 occupational codes in GSOEP has changed retrospectively and now available in 4-digit level. Kambourov and Manovskii (2002a) document large differences in occupational coding between the originally coded and retrospectively coded data in PSID. More detail about this will be given below, but the same effect might have been present in the GSOEP.

The following section describes the employed data and the strategy taken in order to deal with the measurement errors existing in the data. Section 3 explains the patterns of gross reallocation and also provides a more detailed analysis for different groups. Section 4 presents the estimation issues and the results and finally Section 5 concludes.

2. The Data: German Socioeconomic Panel

2.1. **Sample Restrictions.** GSOEP (SOEP Group, 2001) is a nationally representative longitudinal survey of persons and private households which has started in 1984. It was launched in the Federal Republic of Germany (FRG) and expanded to the German Democratic Republic (GDR) in June 1990. In this study, I will exploit 21 waves, (1984-2004) from the "Residents in the FRG" [1] and the "Foreigners in the FRG"[2] samples of the GSOEP. Residents in the former GDR are not used in the analysis as the East German labor market is presumably functioning in a peculiar way. "Foreigners in the FRG" sample represents the countries from which the "guestworkers" were mainly drawn, namely Greece, Italy, Spain, Turkey and ex-Yugoslavia.

The panel expands over time, as children within households of the original panel becoming 16 enter the GSOEP. Split offs from the initial household are considered as new households. Also when third persons move into an existing GSOEP household, they are surveyed and followed up even in case of subsequent leaving of that household. These criteria maintain the representativeness of the sample over time. Furthermore, GSOEP provides a consistent database with no major changes in the surveys through time which helps to measure occupational mobility under different macroeconomic conditions corresponding to almost two decades.

I focus on males aged between 18 and 60, not dually-employed, not working in the government sector and not currently receiving school education or school education and apprenticeship training. One has to take into consideration the characteristics of the German Apprenticeship System (GAS) while analyzing German labor markets. GAS is a vocational training programme, based on the dual system of "on the job training" which is provided by the firm and "school education" provided by the state, which takes on average 1 or 2 days a week. In school, apprentices receive not only general knowledge but also knowledge specific to their occupation. Apprenticeship is completed between 2 and 3.5 years. Today around 60% of each cohort in Germany undertake apprenticeship training. There were approximately

[1] Residents in the FRG sample covers persons in private households with a household head who does not belong to the main foreigners groups of "guestworkers". In 1984, it covered 4528 households with a sampling probability of about 0.0002 (DTC, 2003).

[2]Foreigners in the FRG sample covers persons in private households with a Greek, Italian, Spanish, Turkish and ex-Yugoslavian household head. Compared to Residents in the FRG sample, population is oversampled and started with 1393 households. The sampling probability was about 0.0008 (DTC, 2003).

370 recognized apprenticeship occupations which include both blue and white collar professions in 1990. They cover many which require college attendance in the UK and the USA (Dustmann and Meghir, 2005).

Given the fact that apprenticeship provides occupation specific capital, I follow Dustmann and Pereira, 2003 and divide workers into three different skill groups [3]. Individuals with no apprenticeship training and no college degree construct the "unskilled" group while those with secondary school and apprenticeship training degree are considered as "medium skilled" and finally the "skilled" group comprises those who have college (and more) degree.

Among this sample, individuals employed in (at least) two consecutive years as wage earner or self-employed and who report a valid ISCO-88 occupational code for both years are considered. The respondent is acknowledged as a "mover" if he reports a different ISCO-88 code for that two consecutive years he was employed. Another measure of "mobility" that considers worker a "mover" if he/she reports a different occupation after a nonemployment spell is also presented for the sake of comparison.

Nevertheless, as I am interested in disentangling the decisions to entering the employment pool and occupational mobility, I exclude the nonemployed population from the sample under investigation. Moreover, excluding nonemployment gives a clearer picture of cyclical patterns of employment reallocation as the countercyclical effect of unemployment which will cause jumps in reallocation in recessions is isolated.

2.2. **ISCO-88 and Codification in the GSOEP.** The International Standard Classification of Occupations (ISCO) is produced by the International Labor Office (ILO) of the United Nations in 1958 for the first time and then revised in 1968 and 1988. ILO is aiming to facilitate the international comparisons of occupational statistics and provide a model for countries developing or revising their national occupational classifications.

Occupational classifications are likely to be different both cross-nationally and within societies over time. They do not only differ regarding to the detail level and specific occupational titles but also regarding to conception. For example, some label employment statuses within the same occupation, some distinguish thousands of detailed occupations while some others only dozens or are intensely industry oriented.

[3]Dustmann and Meghir, 2005 follows the same idea, only they make the distinction between "skilled" and "unskilled".

These cross-national differences partly mirror the differences in the occupational structure of the respective societies and partly show the lack of coordination.

ISCO-88 is a nested classification of occupations at the 4-digit level. The 1-digit distinguishes 9 major groups.[4] Within this 9 groups there are three further levels: 28 major subgroups, 116 minor groups and 390 unit groups i.e. classification at the 4-digit level correspond to 390 different occupations (ILO, 1990). [5]

There are two main reasons for employing the 4-digit ISCO-88 classification in this study instead of the national classification. Firstly, ISCO-88 is based on two concepts: the *kind of tasks and duties executed (job)* and *skill*. Job is the statistical unit classified by ISCO-88 and a set of jobs whose main tasks and duties are characterized by a high degree of similarity constitutes an occupation. The characteristics of the job performed are the basis of any recent occupational classification whereas the logic of classification depending on skill requirements is a novelty of ISCO-88 compared to other classifications.

However, dependence on skill requirements does not automatically mean that the skills necessary to perform the tasks and duties of a given occupation can be acquired only through formal education. The skills may be, and often are, acquired through informal training and experience. In addition, it should be emphasized that the focus in ISCO-88 is on the skills required to carry out the tasks and duties of an occupation - and not on whether a particular worker having some occupation is more or less skilled than another worker in the same occupation.

This feature of ISCO-88 is important considering recent research finding evidence on the occupational specificity of human capital (Kambourov and Manovskii, 2002a). They show that human capital is not employer or industry but occupation specific e.g., when a truck driver switches industries (say, from wholesale trade to retail trade) or employers, he looses less of his human capital generated by the truck-driving experience than when he switches his occupation and becomes a hairdresser.

Secondly, as mentioned above, ISCO-88 allows for international comparisons. Although this paper does not consider a cross-country analysis, it is feasible as many micro datasets also provide ISCO-88 codes. For instance, the most straightforward

[4]ISCO-88 treats members of the armed forces as an undifferentiated major group 0000. GSOEP classifies armed forces as 110 whereas some researchers merged this group with the other nine major groups (see Ganzeboom and Treiman, 2003). In this study, this group is dropped as government sector workers are not included in the analysis.

[5]ISCO-88 reserves a trailing 9 at the 4-digit level for the "not elsewhere classified (NEC)".

direction for further research is comparison of the occupational mobility in two structurally different labor markets, such as Germany and the U.K. where Germany is known for "rigid", and the U.K. for "flexible" labor markets.

Another useful feature of the ISCO-88 is that self-employment, ownership, and supervising status are not acknowledged as such. For example, a pharmacist who also owns the pharmacy he/she is working at would be coded as pharmacist instead of self employed or pharmacy owner.

GSOEP provides the 4-digit ISCO-88 codes for all the periods under investigation. However, occupational information is not asked each year to the whole survey population. Instead, in 1985, 1986, 1987, 1988, 1990, 1992, 1994, 1996, 1999, 2001 and 2003 only someone who declared a "job situation" change was surveyed. In the rest of the waves, the whole population is surveyed via a direct question: "Which occupation are you in at present? Please give the exact description, in other words, e.g., not "clerk" but "forwarding merchant", not "worker" but "engine fitter"". For the years that the question is asked only to the people who experienced a job situation change, the previously declared occupation is coded for a negative response.

Furthermore, a re-coding of the occupations based on the original survey responses took place in 2002 by Hartmann and Schuetz (2002). They analyze and re-code the survey results retrospectively according to some criteria. This is done in two steps, first according to the national coding system ("Klassifizierung der Berufe" of the Statistische Bundesamt) then to ISCO-88. If there was more than one information regarding the occupation, the first one was taken unless the information regarding to the second one was more specific. When the information about the occupation was not sufficient to code it, then also information such as industry branch, training and the job position was taken into account. If those rules were not enough to determine the occupational category of the respondent then the following two rules apply according to the ambiguity type. If the information on the content of the occupation was too unspecific that it fits more than one category, the empirically more frequent i.e. the one more frequently observed in the data, was chosen. If the information was enough for the category of the occupation but the qualification level was not very clear, then the one with the lowest qualification level is chosen. 96,4 percent of the GSOEP population maintained the original codes without any doubt (87,2% without any additional information and 9,2% with additional information). Only for the remaining 3,6% of the cases, the last two rules had to be taken into consideration.

2.3. **Identification of Genuine Occupational Changes.** As one of the aims of this study is to uncover the time series patterns of occupational reallocation of employment, I start the analysis plotting the average occupational mobility over the last two decades in Germany. Figure 1 and Figure 2 present average occupational mobility, respectively at the 4 and 1-digit levels. These two figures are in fact self-alerting the evidence for measurement errors in the data. Data showing average occupational mobility swings from 10% one year to 35% next year and then back again to 10% and this in a repeating manner is at least suspicious but more likely to be wrong. Even aggregating 4-digit to 1-digit, which consists of just 9 occupation groups, only results in a decrease of spikes from 35% to 20-25% but the intriguing zigzag pattern remains.

Measurement errors in the occupational coding, especially at a very disaggregated level is a common issue with many micro datasets. Kambourov and Manovskii (2002a, 2002b) document the problems at the PSID (Panel Study of Income Dynamics) with the original coding i.e. coding at the time of the survey and their identification technique of "true" changes using the newly released Retrospective Occupation-Industry Supplemental Data Files (1999). Moscarini and Vella (2003) discuss the advantages and the pitfalls of the occupational coding system in the March CPS (Current Population Survey) in length. McCall (1990), Neal (1999) and Parent (2000) discuss several strategies to address problems of coding errors and missing data in NLSY (National Longitudinal Survey of Youth).

As mentioned in the introduction, Zimmermann (1999) is also employing the ISCO variable in GSOEP. His study covers the 1984-1991 period and he does not address any measurement error issue. It could be due to the fact that he only has two years of "strange" spikes in his sample. Since he is not plotting the average mobility over time and as he is only presenting averages for the whole period, [6] the spurious changes in 1989 and 1991 might not be discovered. Moreover, it is not clear whether he also considers occupational changes before and after unemployment spell as a "change".

Another explanation can be motivated by an example given in Kambourov and Manovskii (2004) related to the PSID. The PSID used 1-digit occupation codes in 1968-1975, 2-digit occupation codes in 1976-1980 and 3-digit codes after 1981. In 1986, the PSID started working on the 1968-1980 files mainly in order to maintain 3-digit occupational codes for the whole period of the survey, including before 1981.

[6] 7 years as the analysis is based on changes, the first wave is lost

To create 3-digit codes, original material, which was also used to create the 1- and 2- digit codes in the past, was used. Surprisingly, they find a considerable disagreement between the originally coded and retrospectively corrected files. Occupational mobility in the retrospective files for the 1981-1994 period is more than twice as small (around 18%) than the mobility obtained through the originally coded occupations (over 40%). In the retrospectively corrected PSID files, all occupational information for each person across all required years was coded by the same analyst before moving to another case. In this way, the analyst also used the past and future information on the occupation of the respondent which obviously leads to a more coherent occupational history. Zimmermann is using 1- and 3- digit ISCO codes as they were the only ones available while he was doing his analysis. It is also probable that the codes were changed in 2002. Hence, if there is an effect like Kambourov and Manovskii are discussing in their paper for the PSID, this might explain the difference between Zimmermann's findings and the ones of the present paper. As GSOEP does not provide the "uncorrected" data that Zimmermann (1999) used, one can not compare the results considering the same sample.

Coming back to measurement errors in the GSOEP, it is clear that the spike years are not coincidental. Unacceptably high average mobility are generated in the years where the occupational information is asked to the whole survey population independently of their job situation changes. Until 1988, every year the question was asked to only job situation changers and the results are in line with common sense.

One important reason that is responsible for those spikes even after the corrections done in 2002 is: although the occupations are re-coded with around 97% precision, there were no retrospective checks on the same individual. This also explains the fact that there are many instances in the data where respondents are coded in two different (quantitatively) but very similar (qualitatively) occupations occasionally. For instance, someone who had declared an occupational change in 1996 and hence had been asked for the new occupational information had been coded as [4115] "Secretary", the year after when all the population was asked the question related to their occupations, although he did not declare any kind of job situation change over the last year, he was coded as [4111] "Stenographer or Typist" and the year after, where again the whole population is surveyed, without experiencing any labor market change, he is coded [2444]"Philologist, Translator, Interpreter". This special case is also a good example to explain the changes in Figure 2. In the example, the

first "highly likely spurious" change from [4115] to [4111] would not be observed if one was considering the occupational changes at the 3-digit level. However, the second "highly likely spurious" change of [4111] to[2444] would not be recognized even at the 1-digit level. So aggregating is not only undesirable for the nature of this analysis but also it does not really help to solve the measurement error problem.

In an effort to minimize the false transitions and to identify the true occupational changes, I closely follow the literature. It is common to consider occupational changes as genuine when they are accompanied by other labor market changes such as changes of employers and/or job changes in the same company. As has been recognized before by Parent (2000) and Neal (1995, 1999) and many others, it is unlikely to observe a genuine occupation switch without any other labor market change for a worker[7].

In the GSOEP, at each wave the interviewees are asked to state the changes in the "job situation" since the beginning of the previous year and if there is any change, to give information on the type and timing of the change such as whether she/he has entered employment for the first time, started paid employment again after not being employed for a while, became self-employed, started a new position with a different employer or changed positions within the same company. Considering the timing of the change, respondents had to answer whether the job situation change has occurred in the previous year or in the current year. Timing has great importance as almost 90% of the survey is held in the first four months of the year and the rest of it all over the year instead of one week or month in a year like in many other micro datasets. As this study also has a macroeconomic perspective, deploying changes to correct years has a great importance. This fact also requires that the last waves that individuals attended the survey or attended before a nonemployment spell should not be considered unless there is a reported change in ISCO-88 code already. Hence not only the first wave, 1984, is omitted due to the changes but also the last wave 2004 is omitted from the analysis.

Another fact that has to be taken into consideration is the change in the survey question in 1994. Since 1994, respondents are asked to report the information regarding the last job change only. This change obviously raises the question of underestimation of the true size of the job mobility, hence occupational mobility, for the period concerning after 1994. But in fact, the data from 1984 to 1994, where

[7]Detailed information on the changes made to the data, imputation methodology and sample selection is presented in Appendix A.

respondents are allowed to declare as many changes as they experienced, show that the size of more than one job change and hence potentially occupational changes observed each year is considerably low[8]. The declaration of only the last job changes after 1994 does not seem to considerably underestimate the occupational mobility in the GSOEP.

3. Occupational Mobility in Germany 1985-2003

Occupational mobility patterns of the employed population in Germany between 1985 and 2003 are plotted in Figure 3, Figure 5, Figure 6 and Figure 7. Figure 8 is an analogue of Figure 3 and alike presents the gross and net reallocation but also taking into consideration the changes in ISCO-88 codes after a nonemployment spell. Average occupational mobility over the last two decades for the sample who are employed in at least two consecutive years is around 5.5%. As mentioned in the Appendix A, there are also double occupational changes in certain years. Those changes are considered while presenting the patterns i.e. in the figures but are not included in the estimation as a "double change" as there are only 37 cases for the sample under analysis. However, 5.5% is probably an underestimation as occupational mobility is considered genuine only if it is accompanied by job situation changes. Nevertheless, cyclical patterns should reflect the truth.

Net reallocation[9], one half of the sum of the absolute changes in occupational employment shares, averages to 1.9%. One can attribute the difference between the gross and net reallocation to idiosyncratic shocks in the economy. Those results suggest that individual heterogeneity explains almost 2/3 of the employment reallocation.

Figure 4 presents the annual Gross Domestic Product growth rate for Germany over the period under investigation. Both gross and net reallocation appear to be strongly procyclical. There are a few exceptional years only, like 1990. However one can easily see the impact of the reunification in 1991 and it is also interesting to see that net reallocation does not explain much of the jump in 1991. This difference between gross and net can be attributed to the turbulence in the economy. Another intriguing fact is the unexpected size of the jump in 2000. It is the best year in the economy after 1994 for the last decade and naturally net reallocation is also reacting

[8]See Appendix A for more on that

[9]Here net reallocation index is calculated also considering the females with the same sample characteristics in order to have a better measure of the demand side.

positively to this change however gross reallocation is at the highest level over the last two decade. It is even surpassing the reunification effect in 1991 by 1.5 percentage points. There is no apparent trend in gross and net reallocation if one ignores the outlier years 1991 and 2000. Figure 5, Figure 6 and Figure 7 are presenting gross reallocation for different groups. Figure 5 shows the difference between natives and foreigners. It is obviously seen that year 2000 is not an exceptional year for natives. However average mobility of foreigners is increasing considerably starting from 1998. Also the reunification effect seems to affect foreigners more but there the difference is more comparable. Figure 6 presents the gross reallocation of different groups according to their skill levels. Surprisingly, it seems that skilled and unskilled are having the lion's share from the reshuffling in 2000. Finally Figure 7 gives some hints that individuals who are below 40 are responsible for both the levels and the cycles of the gross reallocation in Germany. In summary, the group that seems to cause the jump in 2000 comprise the young foreigners belonging to the unskilled group.

4. Estimation Results

In order to estimate occupational mobility at the individual level where the dependent variable is a binary variable taking value 1 if the person change occupation at a certain year and 0 otherwise. I employ a constant term, a 2nd order polynomial in age, a dummy for first generation foreigners, another one for other foreigner generations, one for being married or not, another two for skill levels such as "skilled" or "medium skilled". In order to assess the role of macroeconomic factors probability of occupational changes, I include interaction terms between the regional unemployment rate and skill levels. The panel used for estimation is unbalanced and consists of 3644 individuals and 19 waves which results in 21,240 observations. Around 30% of the sample belong to foreigners. Table 1 summarizes the characteristics of the sample.

GSOEP provides tenure on the current firm variable however as the occupational changes are identified mostly by employer to employer moves, those two variables are highly correlated. Hence I avoid using this information as an explanatory variable. There is no direct experience variable in GSOEP. One can always construct using the panel structure and also some other variables. However, this leads further decrease in the sample hence I avoided doing that. Mincerian experience is also not applicable as age and schooling variables are already among the explanatory variables.

Table 2 presents the pooled Probit coefficients and the marginal effects for the average observation for three different specifications. Estimates that are statistically significant at the 1% level are mentioned with (*) while the ones that are statistically significant at the 5% level are (**). The first specification tries to explore the correlations between the worker characteristics and the probability of occupational mobility. Second adds some macro variables, namely regional unemployment rates and net reallocation and finally third specification further adds two interaction terms involving the regional unemployment rates and skill measures. As the last specification is richer and many important variables of interest becomes significant in that specification, I focus on that while interpreting the results. First generation dummy has a statistically significantly negative relation with probability of occupational mobility. At first sight this result as one would expect a positive sign. But considering that first generation immigrants were accepted to Germany in order to work in physical intensive occupations such as coal miners that were not wanted by the natives. This negative sign explains the lock-in effect. And when it comes to other generations of foreigners, the dummy variable is insignificant in all specifications. Considering that the comparison group is natives, this results suggest no difference of being native or being raised in Germany as a foreigner on probability of occupational mobility. Family commitments are captured by the whether or not married dummy variable. As expected, men who are married are less likely to change occupation than males who are unmarried. The coefficients capturing the role of age are not straightforwardly interpretable, therefore the precisely estimated coefficients from the last specifications is presented in Fig.7. This figure shows that career mobility falls with age. Macroeconomic shocks are assessed via regional unemployment rates published by Statistisches Bundesamt and net reallocation where the latter measures occupation specific shocks which is stemming from technological progress or preference shocks for different goods. Net reallocation has a large positive and statistically significant role within the determinants of occupational mobility where, unemployment has a negative association. The direct effect is not statistically significant at the second specification, however it becomes if the skill unemployment rate interaction terms are included.

Finally the effects of formal education and training i.e. skill levels are analyzed. It is obvious that formal education provides skill specialization hence one should expect a negative effect from college and more and a positive effect from high school but in

Germany they are both negative compared to the unskilled group as apprenticeship system provides occupation specific capital i.e. replaces college degree.

5. Conclusion

Current paper investigates the evolution and the determinants of aggregate employment reallocation across 4-digit occupations in Germany over the last two decades employing panel data at the micro level from the German Socioeconomic Panel. The results suggest that occupational reallocation is strongly procyclical and the degree of procyclicality is changing depending on the characteristics of the individual such as age, skill and origins. Especially during the reunification and in year 2000 due to various reasons, there was substantial gross reallocation where only latter was accompanied with net reallocation. There is no obvious trend over the time span under analysis. In order to reveal the determinants of those patterns, I estimated different specifications using a pooled Probit. The cross occupation dispersion in labor demand i.e. net reallocation index has strong positive association with worker mobility across occupations. High unemployment and some individual characteristics such as age, being married or not and belonging to the first generation of immigrant groups has negative relation interaction with mobility.

Finally, next step consider estimating the model using the panel structure by fixed effects Probit. Although not presented here, conditional Logit model looses many observations. The number of observations decreases to 5,610 from 21,240, while controlling for fixed effects. Although it makes no assumption about the distribution of the fixed effects, it assume that the distribution of the error term is logistic. Moreover, the main variables of interest such as skill levels drop due to time-invariant characteristics of those variables. Random Effects Probit assumes that time invariant individual effects and the error term are normally distributed and that they are uncorrelated with the explanatory variables hence it is very restrictive. One other option is to estimate the model with fixed effects Probit however the severe bias due to incidental parameters problem should be corrected.

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Appendix A-Data Cleaning Procedures and Sample Selection

The original sample of females and males, between age 18-60 (included) that belong to "Residents in the FRG" and "Foreigners in the FRG" samples of the GSOEP for the period of 1984-2004 contains 143,415 observations.

As mentioned in Section 2.3 and showed in Figure 1 and 2, ISCO-88 variable is very likely to be measured with error. In order to correct for the measurement problem, the procedure described in detail below is applied:

GSOEP, apart from the direct responses from the survey, also provides "generated" variables which are calculated by the data provider, the SOEP-Group(2001). Those variables, not only help to receive information in a more user-friendly format but also are more reliable as they are generated after several cross checks, hence provide more consistent information. In this study, generated variables are used if they are available for the information needed.

In order to identify the "job situation" changes that are mentioned in Section 2.3, I am employing the generated variable "erwtyp$$".[10]

Unfortunately, "erwtyp$$" variable does not provide information on the "type" and the"timing" of the "job situation" changes. This information is gathered combining the information provided by this variable and the direct survey responses which presents whether individual is in the labor market for the first time, come back to employment after a non-employment period, become self-employed, change job between firms or change job within the same firm.

Another issue that has to be paid attention while identifying the "job situation" changes is the "exact timing of the change". In the survey, respondents are asked to report job changes from the beginning of the previous year. As more than 85% of the survey is held in the first 4 months of the year, many individuals declare "job situation" changes in the current survey year that are realized previous year. Unfortunately,"erwtyp$$" is only reporting whether the "announcement" of the job situation change is valid or not, not at which year/month it takes place. Since this study also has a macroeconomic perspective, deploying occupational changes to the relevant years has great importance.

Firstly, 930 observation of which "erwtyp$$" can not identify whether the individual change "job situation" or not is dropped.

[10]$ is the symbol used for the wave or year in the GSOEP. For instance, in 1995, erwtyp$$ variable will be called erwtyp95.

Section 2.3 draws attention to another fact that raise questions about the survey i.e. the change in 1994. Before, individuals are asked to declare **all** the "job situation" changes they have experienced from the beginning of the previous year however after 1994 they are asked to declare **only the latest** change. So one may think that will lead a serious underestimation of job, hence occupational mobility for the period after 1994. However, as explained in detail below, this fact is not affecting this study as severe as one may think.

Not only the survey but also the way the information is stored in the dataset differs before and after 1994. Before 1994, individuals are asked to report the "timing" and the "type" of the change after a single question. There are only 12 observations where the "timing" is missing, albeit not the "type". Those are probably the cases where people just put a "yes" in the relevant box in the survey instead of the "month" of the change.

During the same period, for 1102 observations,"erwtyp$$" variable identifies no change although direct responses from the survey suggest there are. A closer look reveals that certain information from the direct responses should be retained missing as they refer to declarations corresponding to "previous year" which are already declared as "current year" change the year before and hence considered as a change by the "erwtyp$$" variable the year before.

There are 57 more observations where the "previous year" declarations in the current year and the "current year" declarations in the year before refer to the same type of change within the same month so almost surely the "same" change but "erwtyp$$" variable still shows a change for both years. It is probably due to the fact that there is another type of change and "erwtyp$$" variable is referring to that one so I consider that 57 observations referring to the same month and type changes missing for the "previous year" declaration in the current year, keeping the "erwtyp$$" variable unchanged.

There are 62 cases where individuals declare two different "job situation" changes for the same month of the same year. Those are possibly but unlikely referring to two genuine different changes. For instance, 50 of them refer to "employed again after a break" and "a new job with a new employer" for the same month which suggest that people are providing extra information about their job situation i.e. they have came back to employment pool with a new employer.

There are only 20 observations for the first 10 waves of the panel which are "potentially" referring to two different changes for the same year. So the size of the

problem due to the change in the questionnaire mentioned above is very small if one considers that the employed population over the same period consists of 55,927 observations. In order to be coherent with the after 1994 data, I only consider the latest changes.

For 54 cases where "erwtyp$$" variable shows a change, two different changes are declared; one for the "current year" and one for the "previous year". However, as the person did not participate the survey or was unemployed or was out of labor force at the time of the last year's survey, the occupational information regarding to that change is missing so those changes referring to previous year are coded missing.

After 1994, GSOEP provides a single variable for the "type" of the change and another two for the "timing" of the change ("start last year" and "start this year"). This variable from direct survey responses identifies 7,914 different types of job situation changes however "erwtyp$$" variable identifies only 6,823. Again for the same reasons mentioned above, I only consider changes corresponding to "erwtyp$$" variable.

Imputation of the ISCO-88 codes are done in two step. First, changes regarding the ISCO-88 variable are considered true only if they are accompanied with a "job situation" change. As "erwtyp$$" variable gives consistent information **only** about the declaration of the change **but the timing** of the change, further deployment to correct years need to be done.

Therefore, the cases where individuals don't declare any change for the "current year" and the year after for the "previous year" or the ones who declare a change for the "current year" only are kept as they are. Persons who are employed and declare that there is no change for the "current year" but a change the year after for the "previous year" are considered as changes for the current year.

However, there are also cases where the person is not employed one year (out of labor force or unemployed) at the time of the survey and the year after declare a change for the "previous year". Now imagine a case where someone is not working one year at the time of the survey and the year after he declares that he had "come back to employment after a break" last year in September. One can consider this individual working two consecutive years and as the ISCO-88 code would not change in both years this individual would be considered as a non-mover. This would definitely lead to a underestimation of occupational mobility. Hence, although arbitrary, I choose to consider someone "working" that year if he works minimum 6 months a year. Respectively, relevant occupational codes are changed.

Furthermore, observations for individuals who are currently receiving education or are having controversial schooling information are dropped and 96,746 remained. Also people who moved to East Germany are dropped (192 observations). As I am interested in "mobility", and as any occupational mobility measure will need two valid occupational code information. People who are employed only once or declared valid occupational information only once during their existence in the survey are dropped and 80,888 observations left.

As I am interested in the employed population only for the reasons given above, not employed population or people with missing values for the ISCO-88 code are dropped. Then, dual employed and government sector workers are dropped which yield to 49,994 observations.

As the first wave, 1984 is used to calculate the average mobility and as the last wave 2004 is not providing enough information for assessing the true changes, observations related to those years are dropped.

Furthermore, 2 observations with the missing information on the marital status and also 490 foreigner observations with missing info on the year of immigration are dropped. Finally females are dropped after the calculation of net reallocation. After dropping the 6202 missing observations for mobility 21,240 observations for the estimation where the characteristics are summarized in Table 1 are remained.

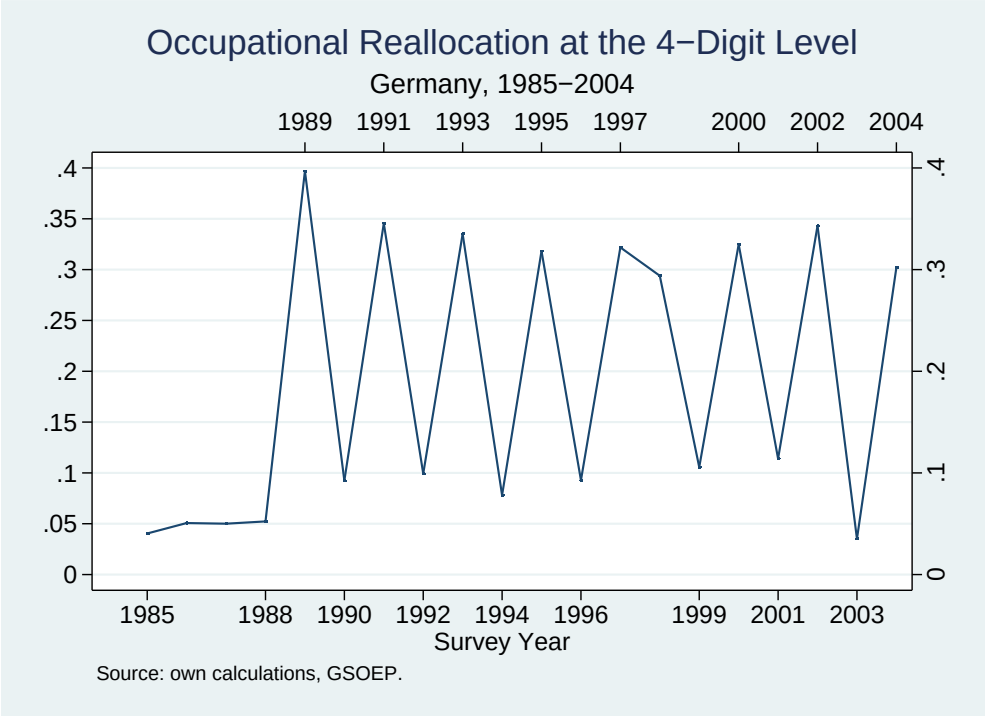

FIGURE 1.

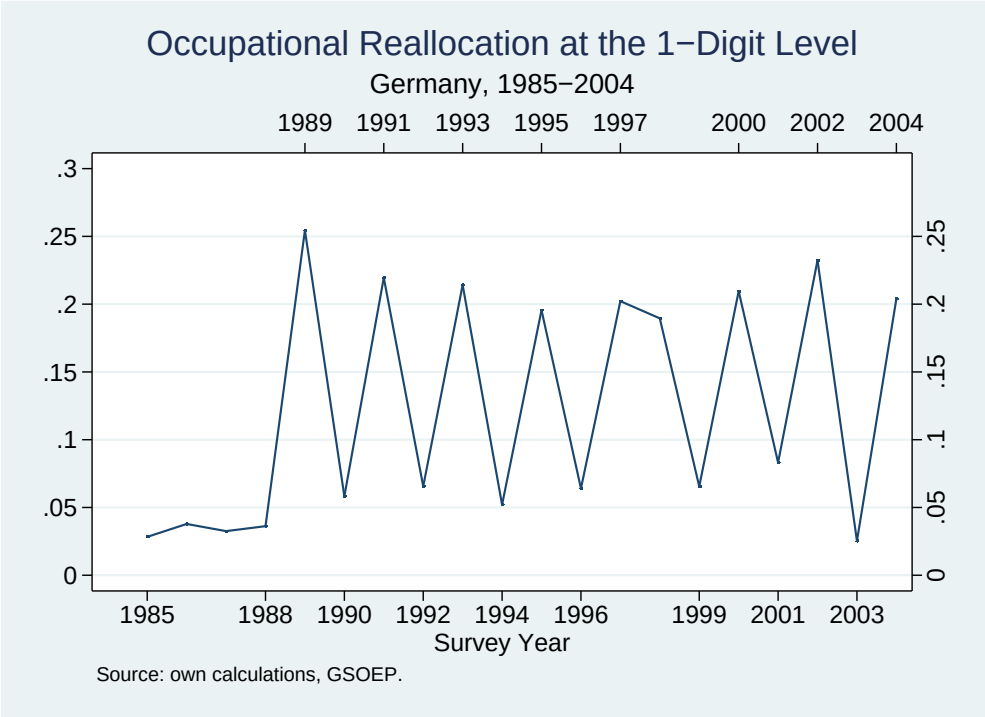

FIGURE 2.

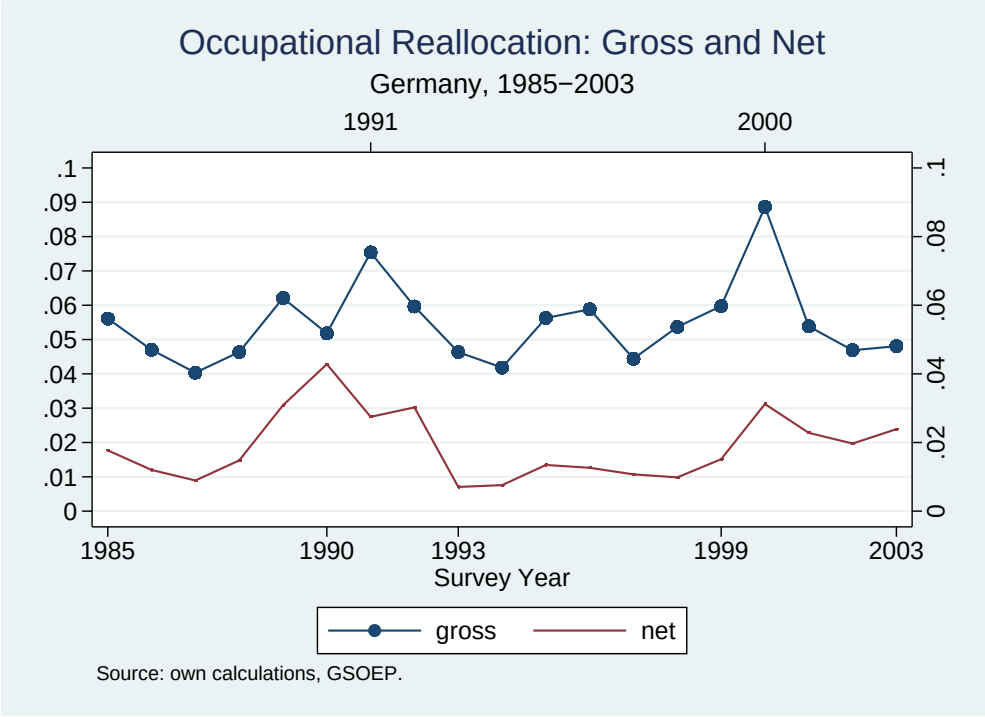

FIGURE 3.

FIGURE 4.

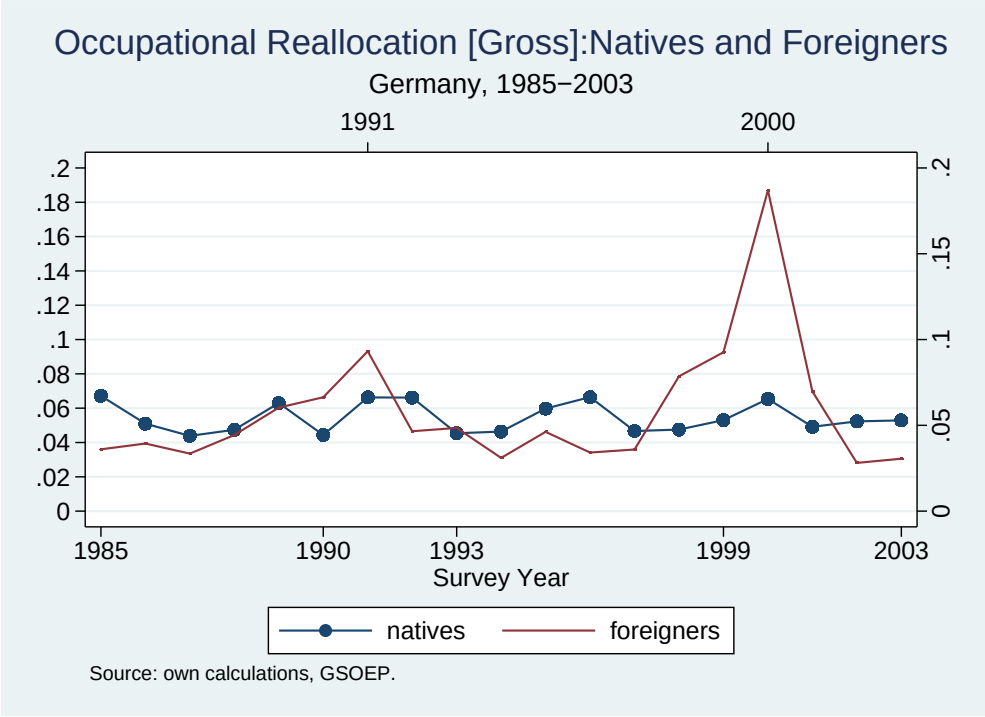

FIGURE 5.

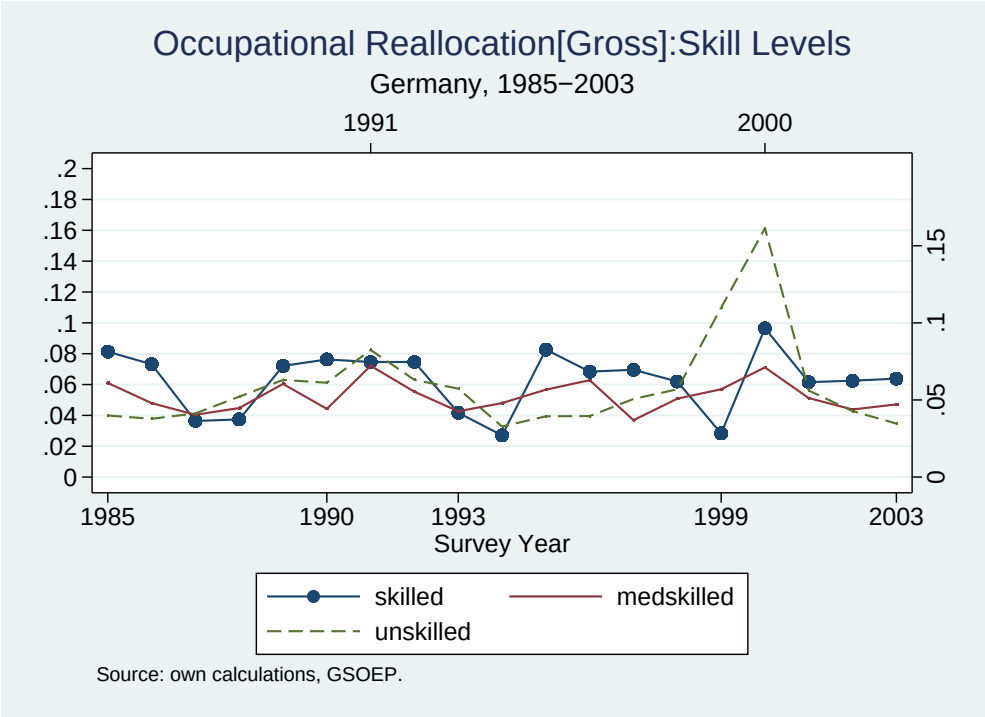

FIGURE 6.

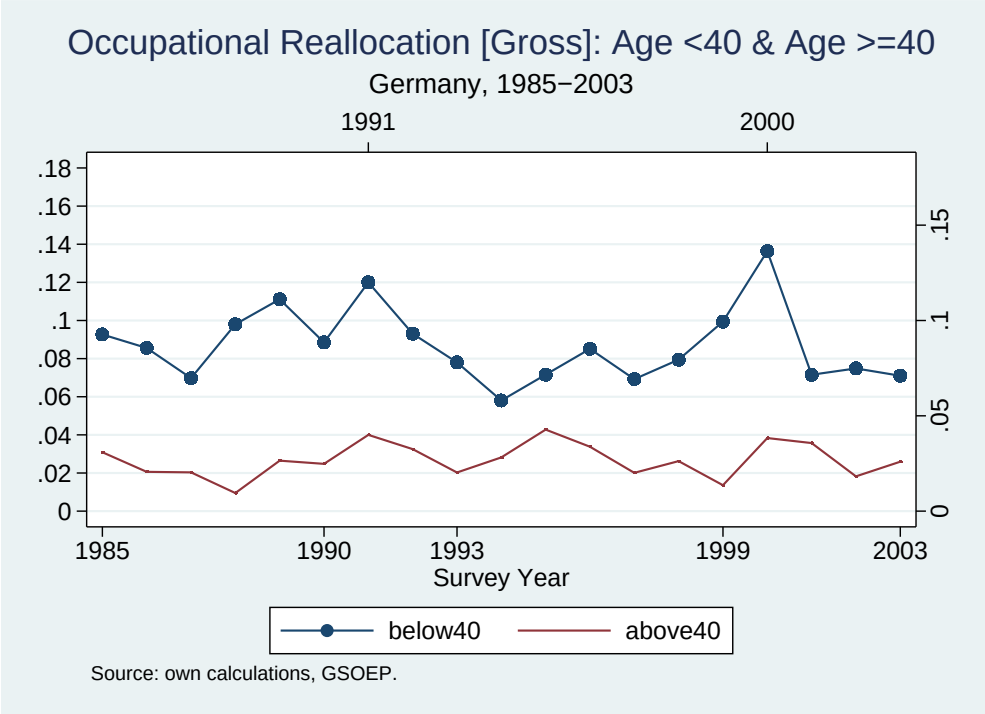

FIGURE 7.

variables	mean	standard deviation
age	41.11	10.15
mobility	0.054	0.22
first generation foreigners	0.15	0.35
other foreigners	0.14	0.35
married	0.76	0.43
skilled	0.11	0.32
medium skilled	0.64	0.48
unskilled	0.24	0.43
legislators, senior officials and managers	0.07	0.25
professionals	0.09	0.28
technicians and associate professionals	0.13	0.34
clerks	0.06	0.23
service workers and shop and market sales workers	0.03	0.16
skilled agricultural and fishery workers	0.02	0.14
craft and related trades workers	0.35	0.47
plant and machine operators and assemblers	0.16	0.37
elementary occupations	0.07	0.25
net reallocation	0.02	0.01
self employed	0.13	0.33
part-time workers	0.01	0.09
vocational degree	0.67	0.47
observations	21240	21240

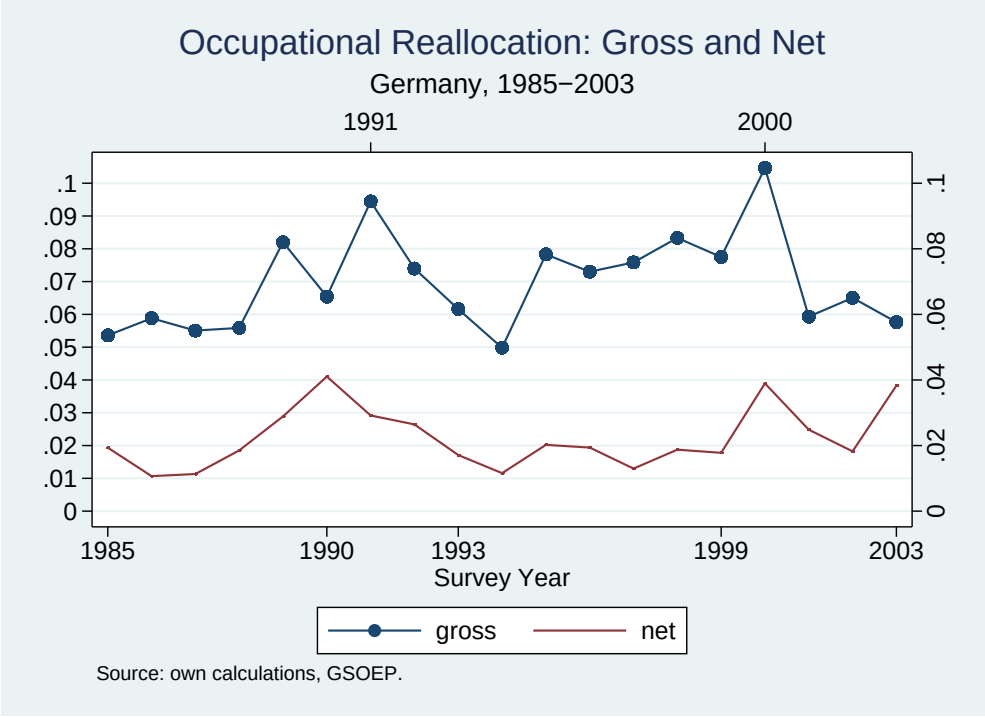

FIGURE 8.

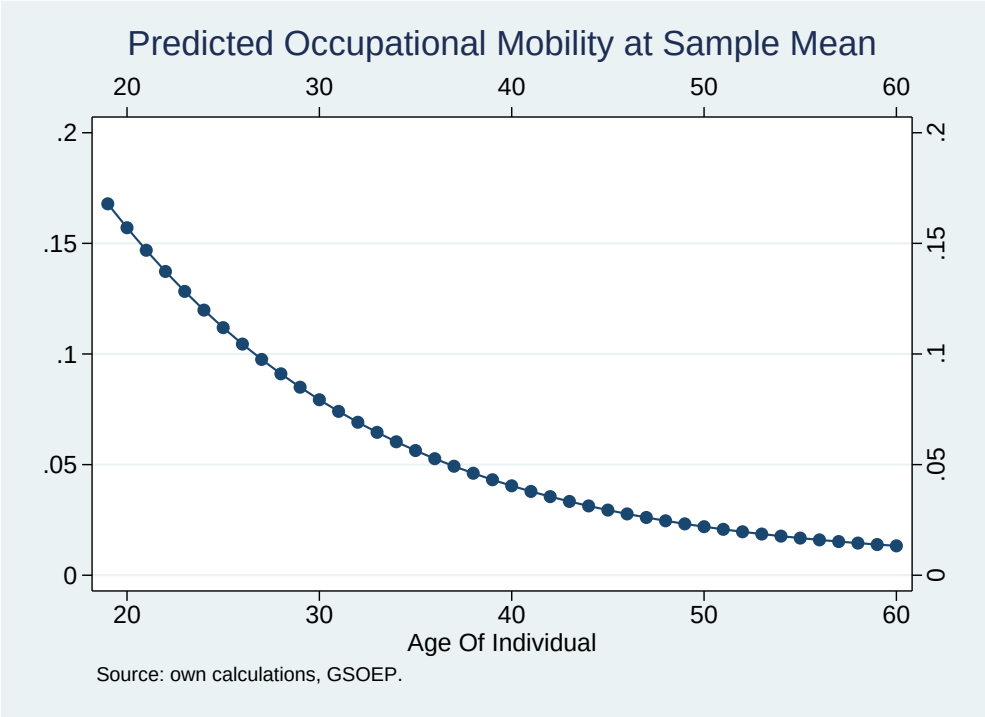

FIGURE 9.

Table 1: Sample Means

	(1)		(2)		(3)	
variables	coefficients	mfx	coefficients	mfx	coefficients	mfx
age	-0.057*	-0.005*	-0.057*	-0.005*	-0.057*	-0.005*
	(0.012)	(0.001)	(0.012)	(0.001)	(0.012)	(0.001)
agesquared	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
first generation foreigners	-0.281*	-0.021*	-0.286*	-0.021*	-0.293*	-0.021*
	(0.065)	(0.004)	(0.065)	(0.004)	(0.066)	(0.004)
other foreigners	-0.043	-0.004	-0.049	-0.004	-0.054	-0.005
	(0.043)	(0.004)	(0.043)	(0.004)	(0.043)	(0.004)
married	-0.190*	-0.018*	-0.189*	-0.018*	-0.188*	-0.018*
	(0.036)	(0.004)	(0.036)	(0.004)	(0.036)	(0.004)
skilled	0.065	0.006	0.065	0.006	-0.389**	-0.026*
	(0.055)	(0.005)	(0.055)	(0.005)	(0.173)	(0.009)
medium skilled	-0.091**	-0.008**	-0.091**	-0.008**	-0.368*	-0.035*
	(0.040)	(0.004)	(0.040)	(0.004)	(0.127)	(0.013)
regional unemployment			-0.003	-0.000	-0.032**	-0.003**
			(0.006)	(0.001)	(0.013)	(0.001)
net reallocation			4.735*	0.414*	4.591*	0.400*
			(1.550)	(0.135)	(1.550)	(0.135)
regunemp*skilled					0.053*	0.005*
					(0.019)	(0.002)
regunemp*mediumskilled					0.034**	0.003**
					(0.015)	(0.001)
constant	0.240		0.169		0.416	
	(0.233)		(0.239)		(0.256)	
observations	21240	21240	21240	21240	21240	21240

Robust standard errors in parentheses. (**) significant at 5%; (*) significant at 1%.

Table 2: Pooled Probit - Different Specifications[11]

[11] "skilled" refers to college degree and more, "mediumskilled" refers to high school graduate with vocational degree and "regunemp*skilled" and "regunemp*mediumskilled" are interaction terms for skill levels and regional unemployment rates.