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Age and Gender Differences in Job Opportunities

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Age and Gender Differences in Job Opportunities

Abstract

There is only a few literature on age specific occupational segregation. In this descriptive paper, I focus on job opportunities for newly hired older male and female workers. It is an enriched replication study of Hutchens (ILRR,1988), who showed that firms employ older workers, but hire them less. I use a rich dataset for West Germany with information for almost thirty years, the regional file of the IAB Employment Sample (IABS-R04). By drawing segregation curves and calculating different measures, such as Dissimilarity Index and Hutchens Square Root Segregation Index, I find clear evidence that age related segregation exists. While newly hired workers in the age groups of 18 to 34 and 35 to 54 are quiet similar distributed in terms of the indices, the oldest age group of 55 years and older, and especially older women, are more segregated. Differences for older male and female workers over time, may be explained by changes in labor and retirement policies.

Keywords: Labor Demand, Age Segregation, Older Workers, Gender

JEL classification: J23, J24, J21, J14, J16

1. Introduction

There is a broad discussion on the demand for workers. In this context, occupational segregation is mostly discussed in terms of gender segregation, such as Blau and Hendricks (1979), and Anker (1997). The problem of age specific segregation is discussed less. But in times of aging societies, such as Germany, employability of older individuals is more and more relevant. Only some newer surveys give an overview, such as Heywood and Siebert (2009), O`Brian (2010), and Backes-Gellner and Schneider (2012).

In this paper I focus on job opportunities for older male and female workers. It is an enriched replication study of Hutchens (1988), who showed for the United States, that firms employ older workers, but hire them less. I use a rich dataset for West Germany, the regional file of the IAB Employment Sample (IABS-R04), a panel of cross sections for the years 1975 to 2004.

To measures occupational segregation of newly hired workers, I use different types of segregation curves and indices, such as the Duncan or Dissimilarity Index (Duncan and Duncan 1955) and the Hutchens Square Root Segregation Index (Hutchens 2001, 2004). I show a long run decline of occupational segregation over time in Western Germany. While newly hired male and female workers in the age groups of 18 to 34 and 35 to 54 are quiet similar distributed in terms of the indices, the oldest age group of 55 and older, is different. I find rising segregation beginning in the early 1980s till the late 1990s and the early years of 2000. The effect of occupational segregation seams to be stronger for

older women than for older men[1]. Changes in labor and retirement policies may explain the distributions.

Based on theoretical considerations, I argue that an individual's range of job opportunities shrinks with age. While younger worker have a wider range of jobs to choose, older are limited. The demand for older workers is lower than for younger ones. This difference in employability is based on productivity aspects such as skills and maybe on any kind of discrimination. Since the influential papers of Oi (1962) and Becker (1962) human capital aspects are taken into account for recruitment. Oi (1962) shows that hiring new workers is associated with quasi-fix costs of employment. These are costs for recruitment processes, or later on for training activities for newly hired workers. While specific trainings are given by firms to support firm related skills, general trainings do increase the workers own productivity more independent of firm specific needs. Becker (1962) discuss that specific trainings are given more often to younger workers than to older. The younger ones will stay more years in firms, on average, than the older ones and hiring firms get higher returns back, such as increasing productivity. For the case of general trainings, these are indirectly paid by the worker, in general by accepting lower wages. Hutchens (1988) argues, because of different payoff times discussed above, both types of trainings are more attractive for younger workers than for the older ones.

[1] It should be noted, however, that in Germany employment rates of workers older the age of 55 rise since the middle of the 1990s. While employment rates of older female workers are on lower levels, their rates have increased stronger. Fuchs et al. (2011) make projections for the German labor market in the year 2050. They calculate increasing employment rates of the potential workforce for higher age groups. Sixty percent of the females and seventy-five percent of the males will be working at the age of 60 to 64.

Lazear (1979, 1981) demonstrates that firms are interested in paying deferred compensation. Here newly hired workers receive wages that are under the value of marginal product at the beginning and higher than the value of marginal product at the end of their firm careers. As a result, older job incumbents with a long duration of tenure get high wages. Rising wage profiles ensure workers' motivation and save monitoring costs. On one hand, jobs are protected for older workers within the firms. On the other hand firms have less motivation to hire older workers instead of younger ones, from the outside. Pfeifer (2009) shows, if wages are paid on equity considerations, these newly hired older workers would be overpaid or being under productive. Hutchens (1986) describes that delayed payments can be interpreted as fix costs, as well. Firms may see the chance to cheat against the workers and terminate the contract earlier than expected by employees. So the firms have to pay a premium on top of the wage to compensate the workers for the hypothetical risk of being cheated.

The subsequent paper is structured as follows. In the next section I give a review of the literature. Section 3 summarizes different measures of occupational segregation. Section 4 present data description and empirical results for Germany, based on the regional file of the IAB Employment Sample (IABS-R04). The paper concludes with a summary and discussion of the findings in Section 5.

2. Literature Review

Hutchens (1986) composes an Opportunity Index to measure hiring opportunities of older workers. Here the share of recently hired older workers is divided by the share of all older workers. Using U.S. data of the National Longitudinal Survey (NLS) 1970 for men, the Opportunity Index for hiring workers older the age of 55 is used as an independent variable in regressions, such as pensions and mandatory retirement. Because of fixed costs of employment, older individuals face a lower probability of being hired than the younger ones. Hutchens (1988) computes segregation curves to show that new entrants older the ages of 55 have less job opportunities, than entrants at ages of 24-35. Using U.S. data of the NLS for 1983, job incumbents older 55 years are more equal distributed over jobs than newly hires at that age. Hutchens (1993) uses the Survey of Displaced Workers, a supplement of the CPS data, for the years of 1983 to 1988. Here information about male workers between 39 and 59 years are included, who suffer from a plant closure in the last five years. Using the Opportunity Index, there is evidence that older displaced workers face a lower probability of finding a job in a different sector or occupation than younger workers. This is interpreted in a way of no restricted opportunities in the current sector or occupation for older workers.[2]

Scott et al. (1995) use data matched by US Enterprise and Establishment Microdata 1991 (USEEM) and four waves of the Employee Benefits Supplement based on CPS 1979 to 1993. They show that firms' health insurance policies may influence their hiring decisions. Firms, which make higher health insurance offers, employ more older workers, but hire less. Heywood et al. (1999) use the Opportunity Index as a dependent

[2] Hutchens (1993,102) argues that "(t)he index used here may have substantially more noise than signal."

variable to perform regressions for Hong Kong data of 1996. As a central result, the requirement of skills by firms lower the hiring probability of older individuals. This case is special, because the age of 35 is used here to split workers into young and old, and Hong Kong has no anti-discrimination law concerning age. Hirsch et al. (2000) use CPS data for the years 1983 to 1995. They compute segregation curves and Gini coefficients to confirm Hutchens (1988) results for the longer period of time. Based on Gini coefficients, there is no increase in segregation over time in the US for workers older the age of 50. Newly hired older women are less unequal distributed over jobs than newly hired older men. Additionally they show empirical evidence that older workers have less access into jobs with on-the-job training and specific skill needs, such as computer use. But there are only weak results concerning working conditions, such as heavy environmental conditions.

Falk (2002) and Beblo et al. (2008) analyze general gender segregation in Germany. Falk (2002) uses different waves of the German Mikrozensus to compare gender segregation between Eastern and Western Germany for the years of 1991 to 2000. By using different measures of segregation, such as the Duncan and Duncan Index, the Gini coefficient, the Karmel-Maclachlan Index and by using a process of marginal matching, there is straight evidence that the Eastern German labor market is more segregated than the Western one. The different measures show their highest values of occupational segregation in the mid 1990th, because of strong transition effects in the Eastern part of the German economy. Beblo et al. (2008) use linked-employer-employee data (LIAB) for the years of 1996, 2000 and 2005. They have a set of around 290 occupations to compute two types of the Duncan and Duncan Index to measure occupational segregation. As a result, they report that in less segregated firms higher shares of

female, part time, and higher educated workers, exist. By decomposing the Duncan and Duncan Index, they find that the decline in gender segregation between 1996 and 2005, is mostly driven by job composition and not by gender composition. Repeating this method for Western Germany only, changes the picture. Here both types of composition explain the decline in a similar way.

In a research note, Dygalo (2007) uses a long French employer-employee data the Déclarations annuelles des salaires (DADS) for the years of 1976 to 1996. She computes segregation curves and Hutchens Square Root Segregation Indices. Comparing newly hired workers older the age of 55, there is an unequal distribution between workers with a former unemployment duration longer than one year and those shorter. This may be interpreted as an age-related decline in job opportunities, based on unemployment duration between two jobs. Dixon (2009) uses linked employer-employee data (LEED) for New Zealand to compute the Opportunity Index for the years of 2004 to 2007. This statistical report presents industry patterns of recruiting older workers. Workers in the highest age group of 70 to 74 years are mostly hired in the education sector. Del Rio and Alonso-Villar (2010) present age and gender related occupational segregation for the case of Spain. They use data of the Spanish Current Population Survey (EPS) for 2007 to compute segregation curves and different measures of segregation, such as Mutual Information Index and the unbounded Gini coefficient. Workers older the age of 45 years are more segregation than all younger ages and older women have less job opportunities, than older men. Ilmakunnas and Ilmakunnas (2010) use long Finnish linked employer-employee data for the years of 1990 to 2004 to compute segregation curves and Gini coefficients. Workers at age 50 and older, leave firms much more often, than they enter. The authors compare Gini

coefficients over time and find stable values for exits and mixed results for hires. While from 1990 to 2000 age segregation arise, later on the Gini coefficients are on stable levels.

Chan and Stevens (2001) use U.S. data of the Health and Retirement Study (HRS) 1992 to 1996 to show that older individuals have low probabilities of being re-employed after job loss. They compute a gap in employment rates of about 20 percent between displaced and non-displaced workers. Gieseke and Groß (2003) use data of the German Socioeconomic Panel Study (GSOEP) for the years of 1984 to 1999, to show age effects on the risk of holding a temporary working contract. On one hand, older workers have a higher possibility for having a permanent job than the younger one. On the other hand, after a job change, both younger and older workers face higher risks for having a fixed-term contract, because of an u-shaped distribution with a minimum around the age of 42. With the same data for the years of 2001 to 2005, Gieseke (2009) shows that workers, who have been unemployed in the previous twelve month, have higher risks of having fixed term contracts or agency work, but not for working part-time. Adams (2004) finds a negative but not significant effect of anti-age discrimination laws on hiring probabilities of older workers in the U.S. He uses CPS data of 1960 to 1967 with difference-in-differences estimations to evaluate legislation variation of federal states.

Adams and Heywood (2007) use information of the Australian Workplace Industrial Relations Survey (AWIRS) for 1995. They present a negative effect of a rising tenure-wage ration on the probability of hiring older workers. Using UK data of the Workplace Employment Relations Survey (WERS) for 1998, Daniel and Heywood (2007) discuss the importance of steeper wage profiles based on seniority and internal labor markets for lower recruitments of older workers. Adler and Hilber (2009) use U.S. Longitudinal

Employer-Household Dynamics data (LEHD) for 2005 to analyze employment patterns of older workers. They show, that older workers who have to change their employers, try to select into firms who employ a high share of older workers and participate in a growing sectors. Heywood et al. (2010) use German data of the Hanover Firm Panel for 2002 to analyze hiring preference of job searchers older than age 50. There is evidence for the importance of skills and the existence of internal labor markets that both lower the probability of hiring older individuals. Humpert and Pfeifer (2011) use GSOEP data for 2007 and 2008 to show that older male and female workers, and mothers have higher reservation wages and higher preferences for leisure, which can explain lower employment rates in these groups in Germany. Vandenberghe (2011), and Pfeifer and Wagner (2012) compute age and gender related productivity profiles. For the case of Belgian firms, Vandenberghe (2011) shows that older women are less employed than younger women or men at any ages, because of lower productivity. This age and gender specific lack of productivity may not be compensated by lower labor cost, such as lower wages or lower payments to the social security. Pfeifer and Wagner (2012) show for Germany, that firms with higher shares of female workers do not automatically face lower profitability, than firms with lower shares. With a new type of data set, they report higher profitability of these firms. They conclude that lower productivity of women may be over compensated by lower wages costs.

Koller and Gruber (2001), and Boockmann and Zwick (2004) present age related subjective assessments of German human resource managers. The managers rate the perception of productivity of older workers different to younger ones. Older workers are intended to have high practical knowledge, work ethic, quality awareness and firm loyalty, but other characteristics such as physical capacity or learning ability are ranked

low. While Koller and Gruber (2001) use a survey of 154 interviews conducted in 1997, Boockmann and Zwick (2004) use the German IAB Establishment Panel for the state of Baden-Wuerttemberg for 2002. Bellmann and Brussig (2007) use the German IAB Establishment Panel to show that three quarters of all firms which recruit employees in 2004, have no applications received from individuals with the age of 50 and older. The other quarter divides into applications of older individuals with and without appropriate qualifications. Lahey (2008) uses a field experimental approach to analyze the probability of invitations to job interviews in two major US cities. By sending identical job applications to real firms, individuals older the age of 50 have a more than 40 percent lower probability to be invited to an interview, than the younger. In this context, Pfeiffer and Reuß (2008) make simulations on age-related psychological abilities. They show that individuals tend to have the maximum of their cognitive skills before the age of 20, while the so called self-regulatory skills tend to arise till the age of 60. Van Dalen et al. (2010) use data of a Dutch online survey to discuss age related stereotypes. They show that both groups, employer and employees rate the perception of productivity of their own age group higher than of others. While older workers are intended to have higher soft qualities or soft skills, such as reliability and commitment, hard qualities such as physical power and new technological skills are more intended to younger workers.

3. Measurement of Occupational Segregation

In the literature on segregation there is a broad discussion on proper measuring. Occupational segregation is mostly measured in indices scaled from zero to one and visually in Lorenz curves or segregation curves. In general both ways of measuring are used for one points of time. To compare segregation over time a set of index points or an array of curves is needed. While income or GDP are ratio scaled, jobs are nominal scaled[3]. They have to be ordered by their number of observations. Surveys like James and Taeuber (1985), Watts (1998) or Ransom (2000) show the historical development of relevant indicators.

A long time gold standard in measuring any segregation is the Dissimilarity Index *D* defined by Duncan and Duncan (1955). The Dissimilarity Index can be visually interpreted as the maximum distance between the equality line and a segregation curve. See equation (1) for *D*. Let the number of workers in firm $i = 1,...,n$ in a job be p_i for newly hired workers and r_i for job incumbents. For all workers in a firm, P presents the sum of newly hired workers, and R presents the sum of job incumbents.

$$D = \frac{1}{2}\sum_{i=1}^{n}\left|\frac{p_i}{P} - \frac{r_i}{R}\right| \tag{1}$$

James and Taeuber (1985) show that the Gini coefficient *G* is computed out of Lorenz or segregation curves. The Gini can be visualized as the twice of the area between equality line and the curve. Both indices *D* and *G* are scaled from zero to one, where

[3] For example: A butcher is not better or worth than a tailor. But the number of butchers in a given distribution may be higher or lower than the number of tailors.

zero means equal and one unequal distribution. Hutchens (1991) argues that *D* is not as sensitive as *G* in the case of occupational distributions.

Hutchens himself computes segregation curves that take into account occupational specialties. This is a so called RIMFO condition (relative inequality measure for occupation) of four characteristics of segregation measurement[4]. Similar to the well established box illustration of Lorenz curves, equality is drown in a running line from the origin (0,0) to the upper right corner (1,1). There are two extremes: no segregation and total segregation. In the first case the segregation is identical to the equality line. In the second one the curve is a triangle located in the lower right corner. Each hypothetical segregation curve would be a line between these two extremes.

Hutchens (1988) measures on the left side the cumulated percent of type one people and the cumulated percent of type two people on the right. The so called type one people can face any kind of segregation such as being newly hired in old ages and type two people represent all the others. While original Lorenz curves fit for metric counts such as income, segregation curves fit for rankings such as occupations, as well. Only non-intersecting segregation curves can be interpreted in terms of statistical domination. Having two curves, the upper one, which is closer to the equal distribution dominates the other. While intersecting curves cannot be interpreted in the way of dominance, indices can do it. A higher value shows a higher kind of segregation.

Because of the ambiguous results of intersecting curves, Hutchens (2001, 2004) develops the so called Hutchens Square Root Segregation Index *H*. Again the *H* index is

[4] First Hutchens (1991) entitles only three characteristic for the RIMFO measure (invariance of scale, symmetry and movement between groups), but later Hutchens (2001) adds a forth characteristic (intensity of proportional divisions).

scaled from zero to one, where zero means no segregation and one total segregation. This measure allows additional for additive decomposition of segregation. See equation (2) for *H*. Let the number of workers in firm $i = 1,...,n$ in a job be p_i for newly hired workers and r_i for job incumbents. For all workers in a firm, P presents the sum of newly hired workers, and R presents the sum of job incumbents.

$$H = \sum_{i=1}^{n} \left[\left(\frac{p_i}{P} \right) - \sqrt{\frac{p_i}{P} * \frac{r_i}{R}} \right] \tag{2}$$

In contrast to other more common types of measuring segregation discussed above, this *H* index does not only fulfill the requirements of four characteristics, it satisfies a set of seven properties for good measuring occupational segregation[5]. So I am in favor of this measure.

[5] Hutchens (2004) entitles the last three characteristics (additive decomposability, symmetry in types and range).

4. Data and Results: IAB Employment Sample 1975-2004

4.1 Data

For the analyzes of long run developments of age specific occupational segregation in Western Germany, I use the regional file of the IAB Employment Sample (IABS-R04), a dataset provided by the German Federal Employment Agency. I have information for the years 1975 to 2004 on a daily base. It is a 2% random sample based on administrative data of German social security information. The data includes the working careers of more than 1.36 million individuals with roundabout 25 million observations. These are working peoples covered by the social security legislation and unemployed who receive public unemployment benefits. Furthermore I have detailed job information for 130[6] different types of occupations and 16 economic sectors. I know the beginning and ending of employment and unemployment spells, gender, birth year, income, and educational information. A much more detailed description of the dataset is given by Drews (2008).

At first I limit the data to 129 job, because of insecure job information in a residual category with non-agricultural family assistants and others. Second I use only individuals working on the cutoff date on the 30th June of every year[7]. Hutchens (1988, 1991, 1993) and Hirsch et al. (2000) use CPS data with the cutoff date 31th of January. I expect, however, that the summer season gives a more compatible picture of job opportunities. I only use workers covered by social security, who work full-time or part-time, and individuals in apprenticeship, but I drop out marginal employed which are

[6] See table A1 in the appendix for the list of 130 jobs. These jobs are aggregated from the German system of job classifications 1988 (Klassifikation der Berufe 1988).

[7] Other surveys for Germany, such as Beblo et al. (2008) use this date, as well.

included in the dataset since 1999. Before 1999 trainees, individuals in partial retirement and working students are handled as general workers who are covered by social security legislation (in German: sozialversicherungspflichtige Beschäftigte ohne besondere Merkmale).

Although Eastern Germany is included since 1992, I only focus on Western Germany. At first I am interested in long run effects for almost thirty years and second there are still different labor market conditions in the two former German states. For instance, see Fuchs-Schündeln et al. (2010) or Kohn and Antoncyk (2011) for a broad discussion of labor market effects in Eastern Germany after the German re-unification in 1990. To identify pure West German workers I follow the papers of Bachmann and Burda (2010), and Wichert and Wilke (2012), and exclude every person, who ever worked in Eastern Germany[8]. I am not able to differentiate clearly between workers from former Eastern and Western part of Berlin. So I have to exclude observations for the German capital, as well.

Because of missing retrospective employment information, I am able to calculate occupational segregation at first in 1977. Using Stata routines described by Drews et al. (2007), I compute individual durations of tenure. In a next step I identify workers with less or more than two years of tenure in a specific firm. Newly hired workers have moved between jobs or have been not employed in the last two years. With these information I am able to draw segregation curves and indices based on occupations. The

[8] It is obvious, that this is a strong assumption concerning the internal migrations. I tried weaker data classifications with similar results in terms of long run distributions of Duncan Indices and Hutchens Indices. Trends in internal migrations between Western and Eastern Germany and vice versa, are discussed in Fuchs-Schündeln and Schündeln (2009).

final data set includes 11,9 million observations and roundabout 425.000 persons per year. There are no sample weights used, because there are not included.

It is known from other data sets, that measurement errors in occupational information may exist, see for instance Kambourov and Manovskii (2008), and Rhein and Trübswetter (2012). Otherwise because of the administrative origin and the tremendous sample size of the data, I suppose to have no structural problems, such as recall biases. See table 1 for a descriptive overview of newly hired workers over age and gender.

Table 1 around here

I follow the ideas of Hutchens (2001, 2004) and present long time developments of occupational segregation measured by Duncan Index and the Hutchens Square Root Segregation Index, discussed above. Both indices are computed separately for three different age groups: The youngest group with 18-34 years, the second with 35-54 years and the oldest with 55 years and older. I suppose that these three groups represent a typical employment structure over the life cycle. The first group will change their jobs more often than the others, because of information lags and early life job mismatches. The second group will be more stable in their employment situation, because of less job shopping than the younger and maybe more equal job opportunities. For the last group I suppose less job changes, but a higher occupational segregation. Table 2 shows exemplary typical jobs for newly hired older workers.[9]

Table 2 around here

[9] I know that some of these jobs are typical for seasonal or fixed-term work, such as security or cleaning jobs.

4.2 Empirical Results

In the perspective of a long run development of occupational segregation in Western Germany, I compare different measures of segregation over the years of 1977 to 2004[10]. At first, I draw segregation curves for newly hired workers. In figure 1 I show segregation for men on the left side and for women on the right. In general segregation is higher for women than for men, and older women have the highest segregation at all ages. The curves do not intersect, so they can be interpreted in terms of domination. The youngest age groups are close to the equality line, so segregation is the lowest. The curves for the middle age groups are similar to the younger, but more segregated. For the oldest workers the curves are much more shaped, so the oldest age groups have the highest levels of segregation.

Figure 1 around here

In a second step I plot the Duncan Index *D* separated for men and women to identify mayor trends in occupational segregation over the time span. In each of the figures I plot smoothed value of *D* indices for the three age groups. The pattern of employment change differs over age and gender.

Figure 2 shows the distribution of job opportunities for men. While in the 1970s all age groups are far apart, beginning in the 1990s the groups seam to converge to each other. While segregation curves present clear evidence that occupational segregation is highest for older workers, the pattern of the *D* index does not clearly prove this result for men. The most of the time the middle age group has the lowest set of job opportunities.

[10] For robustness checks, I tried the analysis with different randomly drawn sub-samples. The measures of segregation show similar results.

It might be a hint that the *D* index is not sensitive enough for smaller observation groups such as the oldest ages.

Figure 2 around here

Figure 3 shows the distribution of job opportunities for women. The female distribution is different to the male. There is a wider range of occupational segregation over time. Apart from the 1990s segregation of the youngest group is higher than the middle age group. While in the 1970s all age groups are close to each other, later they tend to grow apart, and only slightly converge at the end of the time span. Till the early 1990s the values of the *D* Index arise for the oldest group of women. After this point of time, segregation decline. There is evidence that hiring older women tend to be a much bigger problem than hiring older men.

Figure 3 around here

Because of this mixed results I present the Hutchens Square Root Segregation Index *H* over the time span. The pattern of employment change differs over age and gender. Again I show separate figures for men and women to identify mayor trends in occupational segregation over the time span. In each of the figures, I present plotted value of *H* indices for the three age groups.

Figure 4 shows the smoothed distribution of job opportunities for men. While in the 1970s all age groups are far apart, at the end of the time span the groups seam to converge to each other. The coefficients discussed in this section are taken from the original Hutchens Square Root Segregation Index *H*. The youngest age group 18 to 34 has a slight increase from 1977 (0.017) to 2004 (0.020). The highest values are in the year 2000 (0.026) and the lowest values in 1987 (0.013) and 1990 (0.013). While there

are the smallest values in the late of the 1980s, there is a strong increase in the 1990s with peaks in 1993 (0.023), 1997 (0.022) and the year 2000 (0.026). This shape can be described as slightly u-shaped. The *H* index of middle aged West German man decline over time considerable from 1977 (0.030) to 2004 (0.024). After a peak in 1984 (0.032) occupational segregation decline till 1990 (0.019). With a slight re-increase after German unification, segregation tend to be stabile. Beginning in the second half of the 1970s, the oldest age group has a slight decrease from 1977 (0.023) to 2004 (0.018). After a low in 1980 (0.019), segregation arise in the 1980s and the early 1990s. There are peaks in 1988 (0.030), 1992 (0.030), and 2000 (0.039) with a temporary decline in 1998 (0.018). It is obvious that the oldest age group is different shaped than the others. Hiring of older workers seem to be much more sensitive towards the situations of younger workers.

Figure 4 around here

Figure 5 shows the distribution of job opportunities for women. While in the 1970s all age groups are close to each other, later they tend to grow apart, and only slightly converge at the end of the time span. Similar to the youngest males, the female age group 18 to 34 has a slight u-shaped profile over time. Starting with a first peak in 1977 (0.021), the values decline in two waves. The first low is in 1981 (0.015), the second one in 1992 (0.012). Later there is a re-increase in segregation with two peaks around in 1997 (0.018) and in 1999 (0.026) and a decline till 2004 (0.018). In contrast to the men, the *H* index of middle aged West German women has a much different time trend. From 1977 (0.013) to 2004 (0.015) there is a slight increase in segregation. Till 1987 (0.017) and with the lowest value of 1980 (0.012), the middle age group is less segregated than the younger one. Than both lines converged and run slightly parallel. I find a slight

increase till the middle of the 1990s and two peaks 1997 (0.022) and 1999 (0.028). After the millennium segregation decline. The oldest age group face a rapid increase and strong fluctuations in occupational segregation over time. Starting at the minimum value in 1977 (0.014) there is a nearly linear increase in the 1980s with two peaks in 1982 (0.027) and in 1990 (0.032). After a temporary declines in 1991 (0.030) and 1995 (0.029), there are the highest amplitudes in 1996 (0.041) and in 2000 (0.040). After the year 2000 segregation of newly hired older women hardly decline. It should be kept in mind that this group has the smallest numbers of observations and the members do not always work in all of the 129 types of occupations. In some years there are only around 120 occupations where female workers in this age change their employment. As discovered for the men, female segregation may tend to converge, as well.

Figure 5 around here

Comparing the distributions of male and female workers over time, I detect some trends in convergence of gender related segregation. In the youngest and the middle age groups women have a less segregated employment situation. In the oldest group I find the opposite. Here female workers have much higher values of the *H* index than men. Beginning in the second half of the 1990s, middle aged workers run parallel. Before that time both lines converged by male decrease and female increase. In the oldest group I find a parallel run of the lines, but a proceeding increase in female segregation, beginning in the middle of the 1990s.

The boost of higher female occupational segregation for the oldest age group, may be driven by increasing female employment rates over time. Man older the age of 55 have traditionally higher levels of employment rates than women in this age, but the rates for

the females have a stronger growth. The curves may be explained by changes in labor and retirement policies in Germany[11]. Especially in the middle of the 1980s, the late 1990s and the early years of 2000 strong structural changes happen in Germany. These changes may have different effects on old age occupational segregation. On one hand early retirement is promoted by German politicians in 1984 and 1989, because of high unemployment rates. Early retirement schemes should lower the number of older workers on the labor market and may decline occupational segregation, as long as the distribution over jobs does not change. On the other hand in 1985 and stronger by reforms in 1990 and 1994, politicians try to deregulate the labor market by installation of part-time employment schemes and fixed-term contracts. The retirement age is increased in 1992 to take pressure off the public pension system. These changes in

[11]A short overview of relevant changes in laws of labor and retirement: 1972: retirement age fixed at 63, for handicapped at 62; 1980: retirement age for handicapped lowered at age 60; 1984: law on early retirement "Vorruhestandsgesetz";1985: act on employment promotion "Beschäftigungsförderungsgesetz" (with changes in 1990 and 1994); 1989: new law on early retirement "Altersteilzeitgesetz"; 1992: pension reform, retirement age increased at age 65; 1996: retirement age for handicapped increased at age 63, reforms on employment promotion "Arbeitsrechtliches Beschäftigungsförderungsgesetz"; 1997: new reforms on employment promotion "Arbeitsförderungsreformgesetz"; 1998: installation of the Third Book of the Social Code "3. Sozialgesetzbuch - SGB III" (collection of former reforms on employment promotion); 1999: crucial monthly income level for marginal employment (630 DM); 2001: pension reform, legal right of part-time employment and liberalization of fixed-term contracts "Teilzeit- und Befristungsgesetz"; 2002: law on job activation "Job AQTIV-Gesetz"; 2003-2005: installation of the Second Book of the Social Code "2. Sozialgesetzbuch - SGB II" (collection of strong labor market reforms); 2003: laws on labor market flexibility "1. Gesetz für moderne Dienstleistungen am Arbeitsmarkt" (with liberalisation of temporary employment, but equal treatment), "2. Gesetz für moderne Dienstleistungen am Arbeitsmarkt" (with monthly income level for marginal employment (mini job 400 Euro, midi job 800 Euro)); 2004: additional law on labor market flexibility "3. Gesetz für moderne Dienstleistungen am Arbeitsmarkt"; 2005: additional law on labor market flexibility "4. Gesetz für moderne Dienstleistungen am Arbeitsmarkt" (with merge of unemployment benefits and social benefits). A much more detailed description of policies changes in Germany are given by Feil et al. (2008), Eichhorst and Marx (2011) and Gianelli et al. (2011).

policies should raise the number of older workers and may raise occupational segregation, as long as the distribution over jobs remain the same. In additional reforms in 1996 and 1997, employment promotions should achieve more job flexibility. Later in 1998, former reforms on employment promotions are collected into the Third Book of the Social Code SGB III. In 2001 individuals get the legal right to change full time jobs into part time and fixed-term contract regulations are strongly liberated. The Second Book of the Social Code SGB II is installed from 2003 to 2005, to encourage unemployed individuals to return into work. Among others groups, older individuals could improve their skills by trainings and find more adequate jobs. These more flexible policies should raise the number of older workers and let make occupational segregation, even higher. But this is not the case. Because of the strong effects of implementing part-time work and fixed-term contracts, older workers may be distributed over a higher set of jobs and segregation should decline. If this considerations are true, than a policy of labor market flexibility has lowered occupational segregation for the case of older workers in Germany.

5. Conclusion

The empirical literature on segregation is mostly about the topic of gender segregation. In this paper I turn toward the questions of age and gender. Being inspired by the work of Robert Hutchens (1988, 2001, 2003), I focus on occupational segregation of newly hired older workers in Western Germany.

I use the regional file of the IAB Employment Sample (IABS-R04), a rich dataset with information for almost thirty years. Computing segregation curves and different indices, I plot figures for men and women for three different age groups (18-34, 35-54, and 55 and older).

First of all, I can show that both age and gender specific segregation do exist in Germany. Not only the difference between men and women, but also the difference between young and old, play a role concerning the set of job opportunities. I compare results of Duncan Indices and the Hutchens Square Root Segregation Indices and find slightly similar results for the youngest and the middle aged group. While the *D* Index shows age segregation only for oldest women, the *H* Index presents much clearer results. There is evidence for a long run decline of occupational segregation for both types of gender in Western Germany. While men seem to have a type of convergence over all ages in their opportunities, women are more segregated over age. Especially the group of women older the age of 55, seems to face the hardest segregation on the labor market. While newly hired male and female workers in the age groups of 18 to 34 and 35 to 54 are quiet similar distributed in terms of the indices, the group older the age of 55 is different. Beginning in the 1980s segregation for older male workers tend to arise till the early 1990s and decline later. Around the late 1990s there is a temporary re-

increase. For older female workers, the described distribution is similar, but stronger. Beginning in the 1980s segregation arise till the middle of the 1990s. Later it tend to remain stable and decline in the early years of 2000. As Vandenberghe (2011) shows, the special case of older women`s employability may be based, on a not compensated lack of productivity.

Both curves for the oldest age groups may be explained by changes in labor and retirement policies in Germany. Especially in the middle of the 1980s, the late 1990s and the early years of 2000 strong structural changes happen. While at the beginning, early retirement schemes are used to lower old age labor supply, later on part-time employment and fixed-term contracts should raise it. This shows that appropriate job matching and better working conditions can help to rise job opportunities, even for the older workers. So in the future, participation of older workers on the labor market may foster by installing more flexible work time arrangements.

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Figures and Tables Included in Text

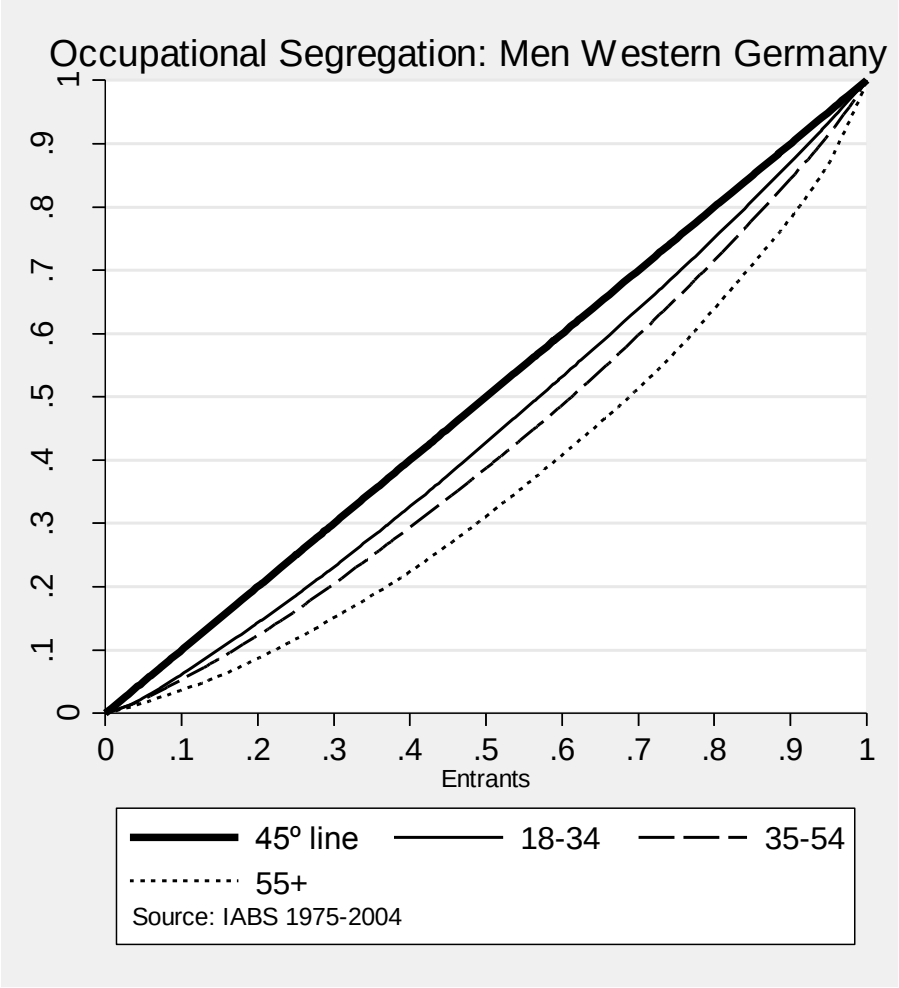
Table 1: Average Distributions - over Age and Gender (1977-2004)

	Men					Women				
Age Groups	Number of Observations	Share of Jobs with newly hired Workers	Number of Jobs	Duncan Index	Hutchens Index	Number of Observations	Share of Jobs with newly hired Workers	Number of Jobs	Duncan Index	Hutchens Index
18-34	2507476	1113936 (44.44%)	129	.1264818	.0138378	2018446	919216 (45.54%)	129	.1315002	.0136558
35-54	2934038	538740 (18.36%)	129	.1608453	.0192117	2000687	432500 (21.62%)	129	.1341335	.0127952
55+	1145817	132208 (11.54%)	129	.141579	.0157255	564539	75373 (13.34%)	129	.1459089	.0136454
All	6587331	17853332 (27.10%)	129	.1367726	.0165156	4583672	1426998 (31.13%)	129	.1242098	.0116221

Table 2: Top 10 jobs for newly hired men and women at age 55+ (1980 and 2000)

1980				2000			
Male Jobs	Obs.	Female Jobs	Obs.	Male Jobs	Obs.	Female Jobs	Obs.
Motor vehicle drivers	510	Office specialists	598	Motor vehicle drivers	357	Household cleaners	548
Office specialists	449	Household cleaners	592	Office specialists	311	Office specialists	499
Entrepreneurs, managing directors, divisional managers	375	Salespersons	573	Doormen, caretakers	219	Salespersons	346
Warehouse managers, warehousemen	254	Stenographers, shorthand-typists, typists	153	Stowers, furniture packers / Stores, transport workers	200	Stenographers, shorthand-typists, typists	90
Bricklayers	229	Housekeeping managers / Consumer advisors /... (and others)	159	Entrepreneurs, managing directors, divisional managers	192	Stowers, furniture packers / Stores, transport workers	88
Factory guards, detectives / Watchmen /... (and others)	198	Cooks / Ready-to-serve meals, fruit, vegetable preservers, preparers	163	Factory guards, detectives / Watchmen /... (and others)	135	Housekeeping managers / Consumer advisors /... (and others)	83
Stowers, furniture packers / Stores, transport workers	189	Packagers, goods receivers, despatchers	78	Household cleaners	124	Cooks / Ready-to-serve meals, fruit, vegetable preservers, preparers	70
Building labourer, general	183	Accountants	83	Other technicians	102	Social workers, care workers / Work, vocational advisers	65
Salespersons	176	Nurses, midwives	54	Salespersons	101	Office auxiliary workers	60
Doormen, caretakers	152	Cutters / Laundry cutters, sewers / Embroiderers / ... (and others)	62	Commercial agents, travelers / Mobile traders	98	Accountants	48

Figure 1: Segregation curves males and females (1977-2004, over all years)



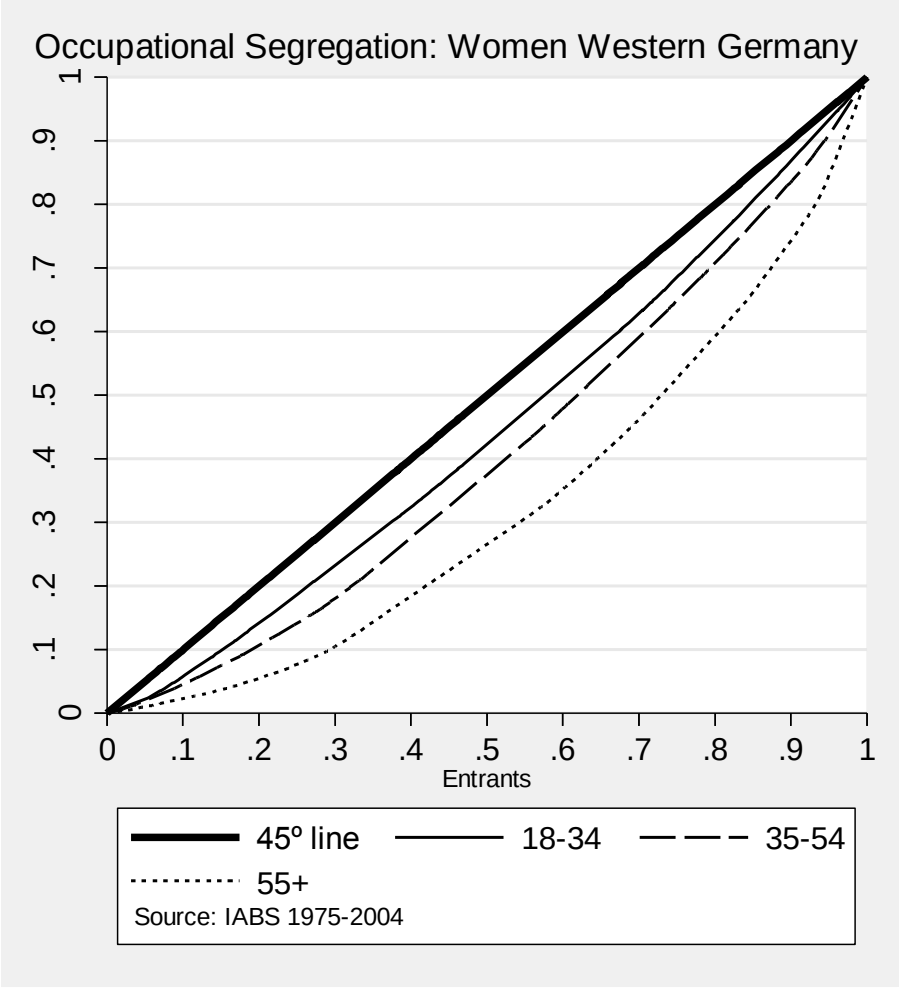


Figure 2: Duncan Index for West German men (smoothed by 5 years moving average).

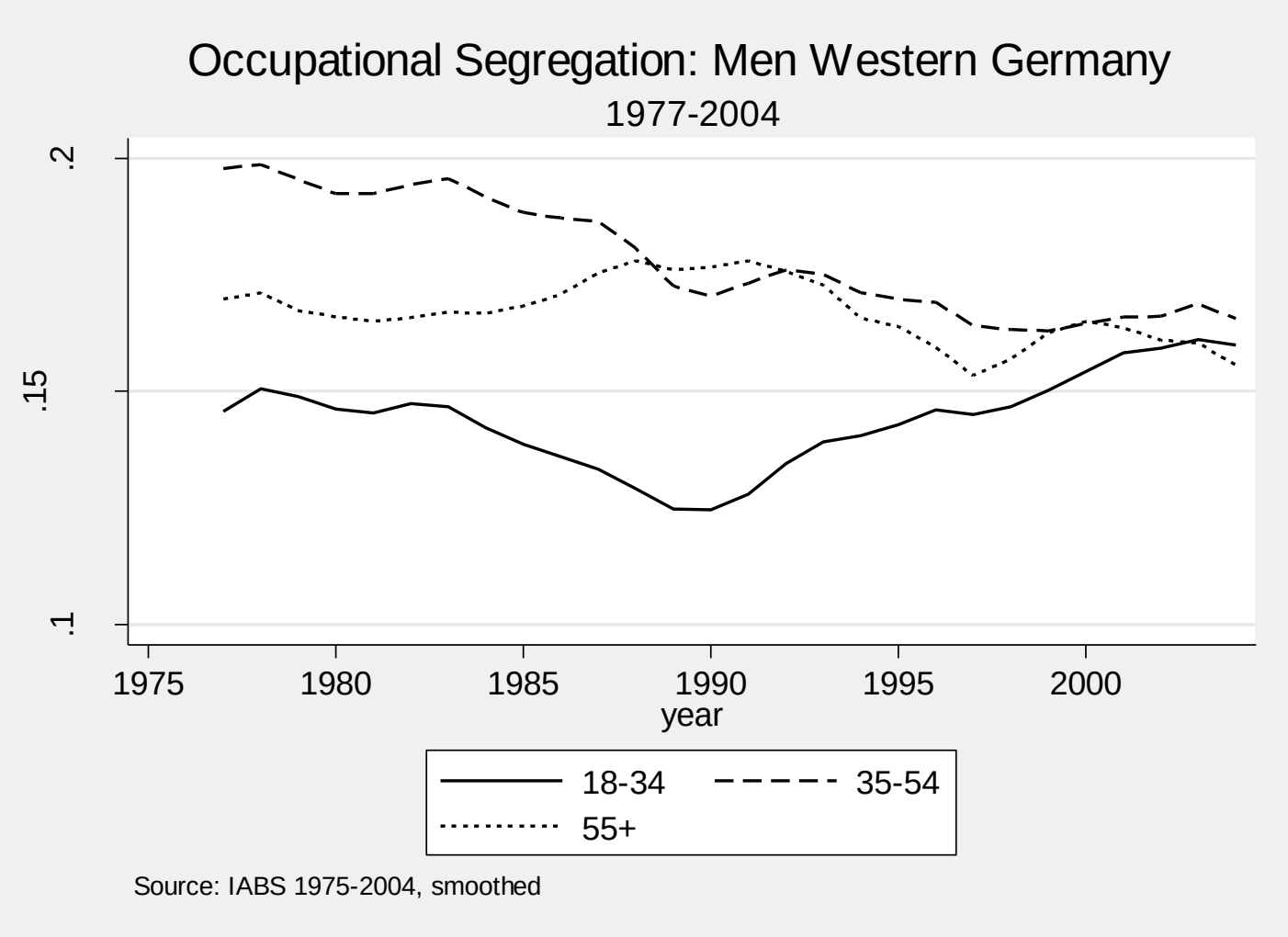


Figure 3: Duncan Index for West German women (smoothed by 5 years moving average).

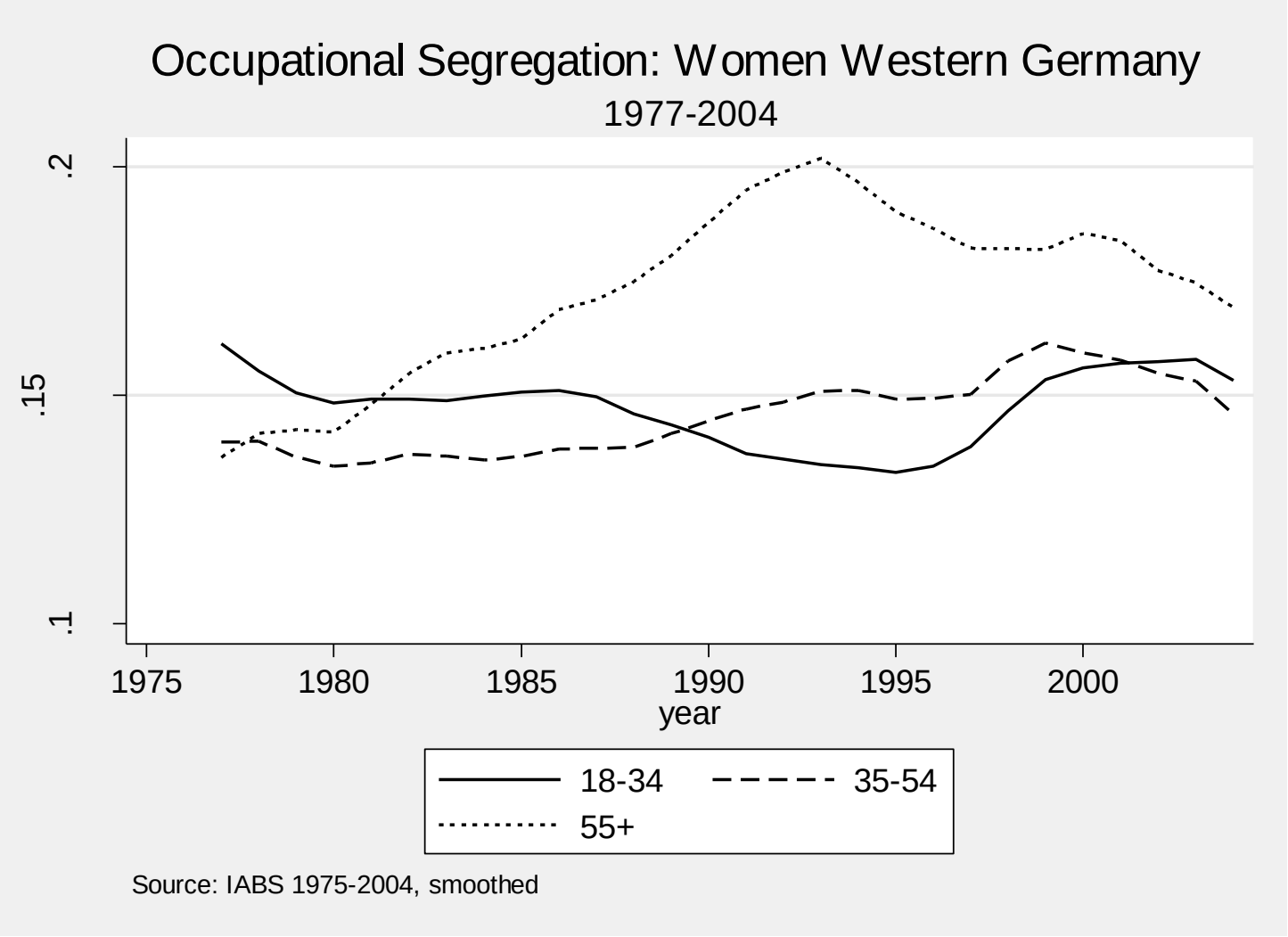


Figure 4: Hutchens Square Root Segregation Index for West German men (smoothed by 5 years moving average).

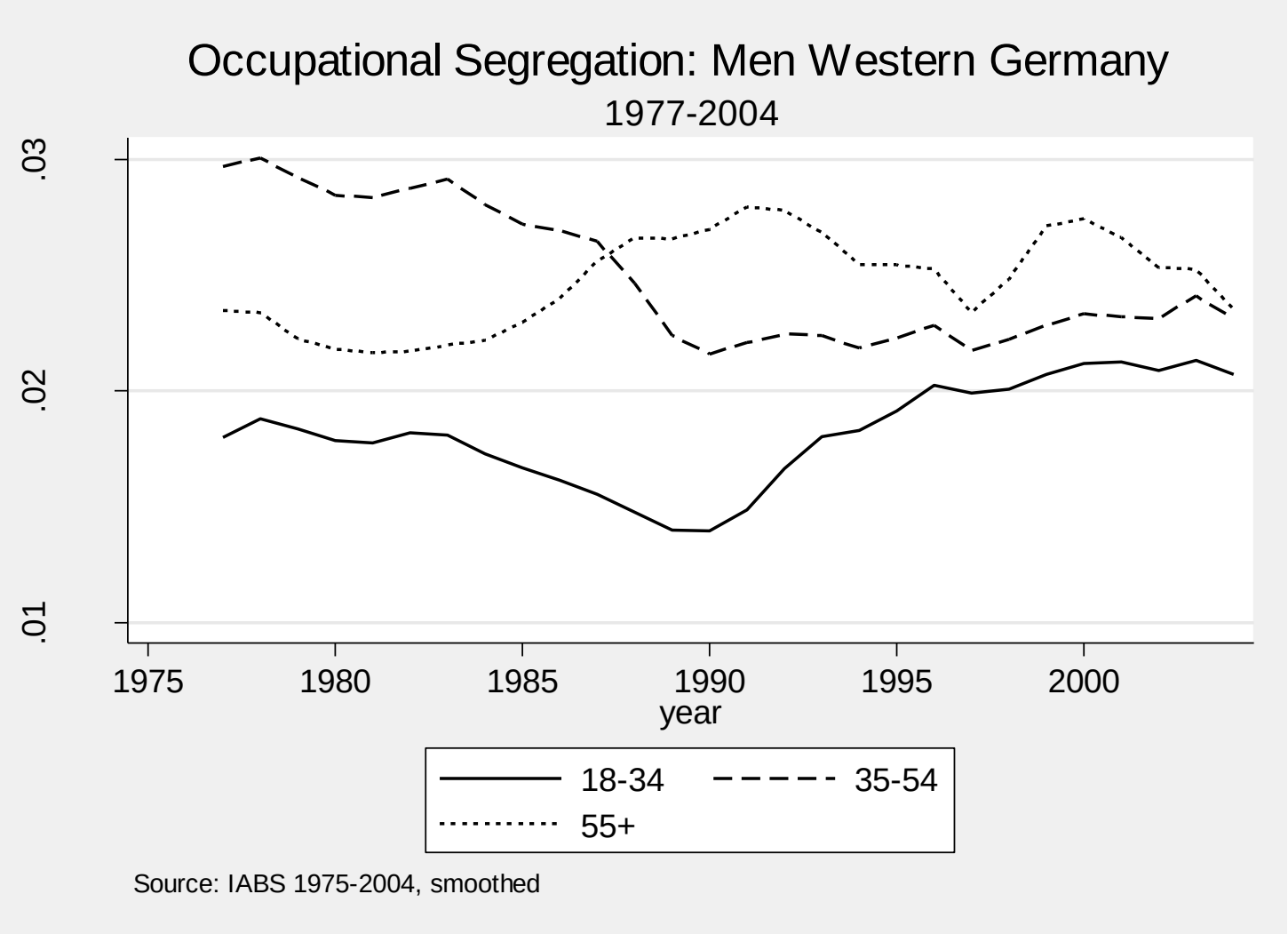
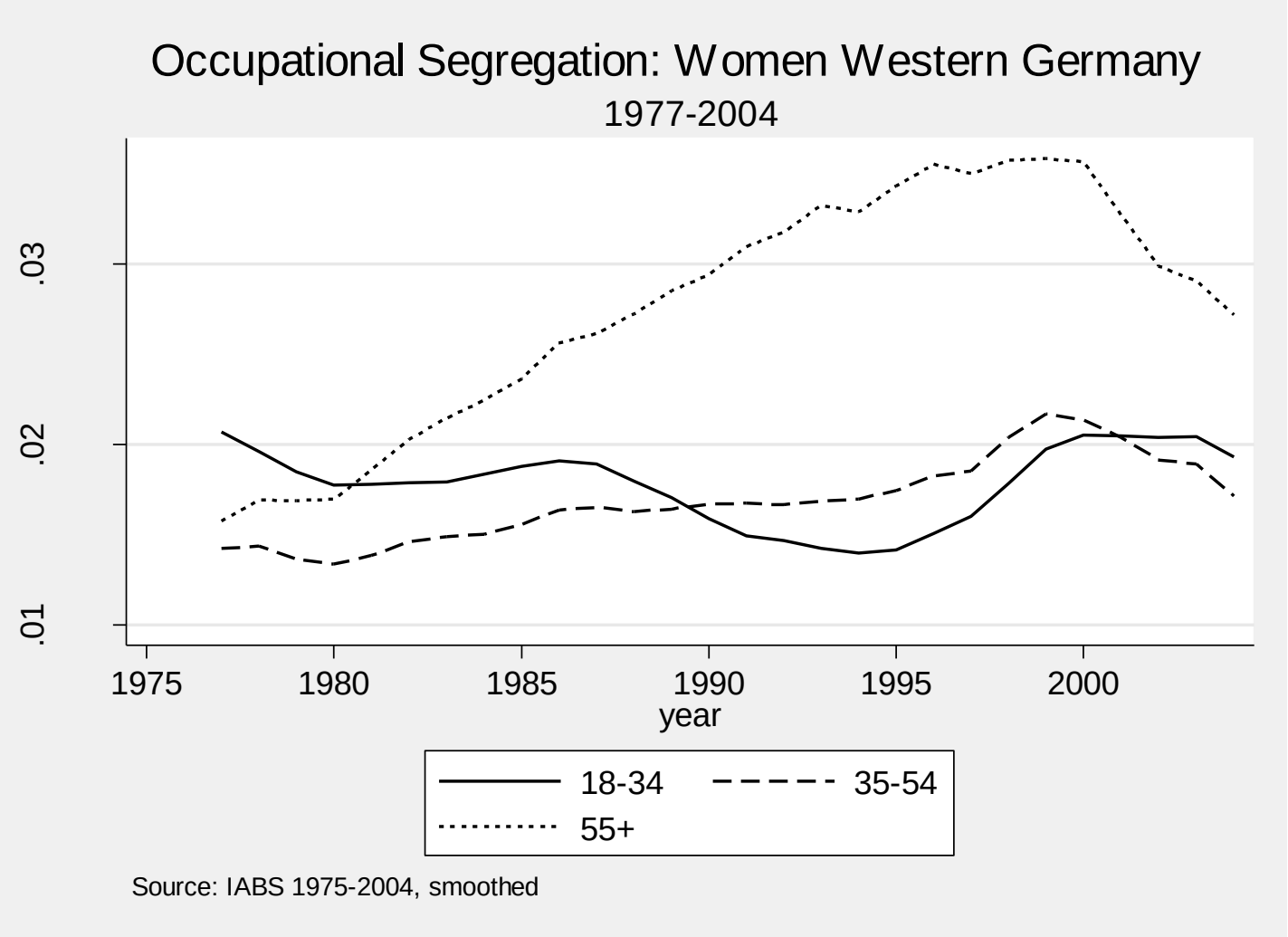


Figure 5: Hutchens Square Root Segregation Index for West German women (smoothed by 5 years moving average).



Appendix:

Table A1: List of Occupations. Source: IABS R04

1	Farmers / Winegrowers / Animal breeders / Fishermen / Managers in agriculture and animal breeding / Agricultural engineers, agriculture advisors / Milkers / Family-member land workers, n.e.c./ Animal keepers and related occupations
2	Land workers
3	Gardeners, garden workers
4	Garden architects, garden managers / Florists / Forestry managers, foresters, hunters / Forest workers, forest cultivators
5	Miners / Mechanical, electrical, face workers, shot firers / Stone crushers / Earth, gravel, sand quarries / Oil, natural gas quarries / Mineral preparers, mineral burners
6	Stone preparers / Jewel preparers / Stoneware, earthenware makers / Shaped brick, concrete block makers
7	Ceramics workers / Frit makers / Hollow glassware makers / Flat glass makers / Glass blowers (lamps) / Glass processors, glass finishers
8	Chemical plant operatives / Chemical laboratory workers
9	Rubber makers, processors / Vulcanisers
10	Plastics processors
11	Paper, cellulose makers / Packaging makers / Book binding occupations / Other paper products makers /
12	Type setters, compositors / Printed goods makers / Printers (letterpress) / Printers (flat, gravure) / Special printers, screeners / Copiers / Printer's assistants
13	Wood preparers / Wood moulders and related occupations / Wood products makers / Basket and wicker products makers /
14	Iron, metal producers, melters / Rollers / Metal drawers
15	Moulders, coremakers / Mould casters / Semi-finished product fettlers and other mould casting occupations
16	Sheet metal pressers, drawers, stampers / Wire moulders, processors / Other metal moulders (non-cutting deformation)
17	Turners /
18	Drillers / Planers / Borers / Metal grinders / Other metal-cutting occupations
19	Metal grinders
20	Metal polishers / Engravers, chasers / Metal finishers / Galvanisers, metal colourers / Enamellers, zinc platers and other metal surface finishers
21	Welders, oxy-acetylene cutters / Solderers / Riveters / Metal bonders and other metal connectors
22	Steel smiths / Container builders, coppersmiths and related occupations / Sheet metal workers / Pipe, tubing fitters
23	Plumbers
24	Locksmiths, not specified / Building fitters / Sheet metal, plastics fitters
25	Engine fitters
26	Plant fitters, maintenance fitters
27	Steel structure fitters, metal shipbuilders
28	Motor vehicle repairers
29	Agricultural machinery repairers / Aircraft mechanics / Precision mechanics
30	Other mechanics / Watch-, clockmakers
31	Toolmakers
32	Precision fitters n.e.c. / Precious metal smiths / Dental technicians / Opthalmic opticians / Musical instrument makers / Doll makers, model makers, taxidermists
33	Electrical fitters, mechanics
34	Telecommunications mechanics, craftsmen
35	Electric motor, transformer fitters / Electrical appliance fitters / Radio, sound equipment mechanics

36	Electrical appliance, electrical parts assemblers
37	Other assemblers
38	Metal workers (no further specification)
39	Spinners, fibre preparers / Spoolers, twisters, ropemakers / Weaving preparers / Weavers / Tufted goods makers / Machined goods makers / Felt makers, hat body makers / Textile processing operatives (braiders)
40	Cutters / Laundry cutters, sewers / Embroiderers / Hat, cap makers / Sewers, n.e.c. / Other textile processing operatives / Textile dyers / Textile finishers
41	Clothing sewers
42	Leather makers, catgut string makers / Shoemakers / Footwear makers / Coarse leather goods finishers, truss makers / Fine leather goods makers / Leather clothing makers and other leather processing operatives / Hand shoemakers / Skin processing operatives
43	Bakery goods makers / Confectioners (pastry)
44	Butchers / Meat, sausage goods makers / Fish processing operatives
45	Cooks / Ready-to-serve meals, fruit, vegetable preservers, preparers
46	Wine coopers / Brewers, maltsters / Other beverage makers, tasters / Tobacco goods makers / Milk, fat processing operatives / Flour, food processors / Sugar, sweets, ice-cream makers
47	Bricklayers
48	Concrete workers
49	Carpenters / Scaffolders
50	Roofers
51	Paviors / Road makers / Tracklayers / Explosives men (except shotfirers) / Land improvement, hydraulic engineering workers / Other civil engineering workers
52	Building labourer, general
53	Earth movers / Other building labourers, building assistants, n.e.c.
54	Stucco workers, plasterers, rough casters / Insulators, proofers / Tile setters / Furnace setter, air heating installers / Glaziers / Screed, terrazzo layers
55	Room equippers / Upholsterers, mattress makers
56	Carpenters / Model, form carpenters / Cartwrights, wheelwrights, coopers / Other wood and sports equipment makers
57	Painters, lacquerers (construction)
58	Goods painters, lacquerers / Wood surface finishers, veneerers / Ceramics, glass painters
59	Goods examiners, sorters, n.e.c.
60	Packagers, goods receivers, despatchers
61	Assistants (no further specification)
62	Generator machinists / Winding engine drivers, aerial ropeway machinists / Other machinists / Crane drivers / Earthmoving plant drivers / Construction machine attendants / Machine attendants, machinists' helpers / Stokers / Machine setters (no further specification)
63	Mechanical, motor engineers
64	Electrical engineers
65	Architects, civil engineers
66	Survey engineers / Mining, metallurgy, foundry engineers / Other manufacturing engineers
67	Other engineers
68	Chemists, chemical engineers / Physicists, physics engineers, mathematicians / Building technicians
69	Mechanical engineering technicians
70	Electrical engineering technicians
71	Measurement technicians / Mining, metallurgy, foundry technicians / Chemistry, physics technicians / Remaining manufacturing technicians
72	Other technicians
73	Foremen, master mechanics
74	Biological specialists / Physical and mathematical specialists / Chemical laboratory assistants / Photo laboratory assistants
75	Technical draughtspersons
76	Wholesale and retail trade buyers, buyers /
77	Salespersons

78	Publishing house dealers, booksellers / Druggists, chemists (pharmacy) / Pharmacy aids / Service-station attendants
79	Commercial agents, travelers / Mobile traders
80	Bank specialists / Building society specialists
81	Health insurance specialists (not social security) / Life, property insurance specialists
82	Forwarding business dealers
83	Tourism specialists / Publicity occupations / Brokers, property managers / Landlords, agents, auctioneers / Cash collectors, cashiers, ticket sellers, inspectors
84	Railway engine drivers
85	Railway controllers, conductors
86	Motor vehicle drivers
87	Navigating ships officers / Technical ships officers, ships engineers / Deck seamen / Inland boatmen / Other water transport occupations / Air transport occupations
88	Post masters / Radio operators / Telephonists
89	Postal deliverers
90	Warehouse managers, warehousemen
91	Transportation equipment drivers
92	Stowers, furniture packers / Stores, transport workers
93	Entrepreneurs, managing directors, divisional managers
94	Management consultants, organisors / Chartered accountants, tax advisers
95	Members of Parliament, Ministers, elected officials / Senior government officials / Association leaders, officials
96	Cost accountants, valuers
97	Accountants
98	Cashiers
99	Data processing specialists
100	Office specialists
101	Stenographers, shorthand-typists, typists
102	Data typists
103	Office auxiliary workers
104	Factory guards, detectives / Watchmen, custodians / Soldiers, border guards, police officers / Firefighters / Safety testers / Chimney sweeps / Health-protecting occupations / Arbitrators / Judicial administrators / Legal representatives, advisors / Judicial enforcers
105	Doormen, caretakers
106	Domestic and non-domestic servants
107	Journalists / Interpreters, translators / Librarians, archivists, museum specialists
108	Musicians / Artists' agents / Visual, commercial artists / Scenery, sign painters / Artistic and assisting occupations (stage, video and audio) / Interior, exhibition designers, window dressers / Photographers / Performers, professional sportsmen, auxiliary artistic occupations
109	Physicians / Dentists / Veterinary surgeons / Pharmacists
110	Non-medical practitioners / Masseurs, physiotherapists and related occupations
111	Nurses, midwives
112	Nursing assistants
113	Dietary assistants, pharmaceutical assistants / Medical laboratory assistants
114	Medical receptionists
115	Social workers, care workers / Work, vocational advisers
116	Home wardens, social work teachers
117	Nursery teachers, child nurses
118	University teachers, lecturers at higher technical schools and academies / Gymnasium teachers / Technical, vocational, factory instructors / Music teachers, n.e.c. / Sports teachers / Other teachers
119	Primary, secondary (basic), special school teachers
120	Economic and social scientists, statisticians / Humanities specialists, n.e.c. / Scientists n.e.c. / Nursing staff / Ministers of religion / Members of religious orders without specific occupation / Religious care helpers
121	Hairdressers / Other body care occupations
122	Restaurant, inn, bar keepers, hotel proprietors, catering trade dealers

123	Waiters, stewards
124	Others attending on guests
125	Housekeeping managers / Consumer advisors / Other housekeeping attendants / Employees by household cheque procedure
126	Laundry workers, pressers / Textile cleaners, dyers and dry cleaners
127	Household cleaners
128	Glass, buildings cleaners
129	Street cleaners, refuse disposers / Vehicle cleaners, servicers / Machinery, container cleaners and related occupations
130*	Non-agricultural family assistants, n.e.c. / Trainees with recognised training occupation still to be specified / Interns, unpaid trainees with recognised training occupation still to be specified / Workforce (job seekers) with occupation still to be specified
*	excluded because of insecure job information

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