ABS Working paper No. 1/2018

Returns to education at entry into the labour market in West Germany, 1945–2008

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Abstract

In the light of the race between education and technology, it is analysed if and how long-term trends of economic modernisation, tertiarisation of occupations, and educational expansion as well as changing labour market conditions affect the returns to education at graduates' entry into the labour market in West Germany. Employing longitudinal data from the German Life History Study and the ALWA study, the cohort- and period specific effects of skill-biased modernisation on status attainment are investigated directly and continuously for the period between 1945 and 2008. As a measure of women's and men's returns to education at entry into the labour market, the magnitude prestige scale (MPS), has been employed. It has been detected that secular processes such as educational expansion, economic modernisation and the demand of labour markets for highly qualified graduates affected by the dynamics of business cycles have resulted in increasing rates of return across birth cohorts provided that they are well educated. In particular, the interplay of economic modernisation and educational expansion is a key mechanism for the polarising status attainment between the extreme educational groups such as graduates with an academic degree profiting from economic modernisation and the novices with less schooling or no vocational education and training being penalised by the macro changes. This is particularly obvious for male first-time employees. In sum, the analysis contributed to an advanced understanding of how long-term trends of structural changes have influenced social inequality of returns to education in West Germany across several generations.

Keywords

returns to education; labour market entry; modernisation; tertiarisation; gender; German life history study; cohort design

1 Introduction

Since the seminal work by Goldin and Katz (2009) and their previous studies (Goldin and Katz, 1998, 2007) on the '*race between education and technology*' (see also: Acemoglu, 2002; Acemoglu and Autor, 2012), the interest in returns to education due to technological change and educational expansion across cohorts and periods has increased significantly (e.g. Reinhold and Thomsen, 2017; Okazawa, 2013; Boockmann and Steiner, 2006; Beaudry and Green, 2003; Hannan et al., 1990). First of all, in this research, it is argued that there is a relation between investment into education and economic growth since higher level of education result in increased productivity and higher standard of living on both the individual and the aggregate level (Tinbergen, 1972). In particular, "rapid technological change would increase the demand for more educated workers at all levels. With increased demand for their services, the earnings of the more educated would rise relative to the less educated" (Goldin and Katz, 2009: 2). Furthermore, it is assumed that the gap between the earnings (as one of the possible measures of returns to education among others) would increase provided that the supply of educated works is stagnating. Given that the various educational groups were fixed in relative proportion, then the skill-biased technological progress would increase inequalities of rates of returns. However, in addition to technological progress, the educational expansion in terms of increasing quantity and quality of education could result in decreasing inequalities of these returns among the educational groups (Goldin and Katz, 2009: 3).

According to Goldin and Katz (2009: 4), the educational expansion is one of several key mechanisms for the correlation of technological change and inequalities of returns to human capital investment. Now, in the light of sustaining trends of both the educational expansion and the economic modernisation in West Germany during post-war periods, the question arises whether we observe a skill-biased technological change, particularly that involved in the increasing diffusion of computers as well as information and communication technology in the workplace (Krueger, 1993; Autor et al., 1998; Borghans and ter Weel, 2007) among other factors such as globalisation (Blossfeld et al. 2011) or automation and digitalisation of industrial production (Hirsch-Kreinsen, 2016) which has significant effects on the employees' returns to education in terms of favourable jobs opportunities related with high occupational prestige. Furthermore, it is asked whether the tertiarisation of the economic sectors and jobs—indicating another side of economic modernisation and including changing skill bias of technology—has resulted in the changing structure of rewards due to the polarisation of the job structure (e.g. growth of low-skill service jobs and rise of service proletariat vs. high-skill administrative manager jobs and rise of the ruling technocratic class) (Bell, 1973; Blossfeld et al., 1993; Autor et al., 2006; Oesch, 2013). In sum: Are there any "winner" and "loser" of economic modernisation in post-war West Germany?

In our empirical study, the focus is on first-time employees in several birth cohorts since general changes in the economic structures and labour market conditions are first apparent for them (Blossfeld, 1985, 1986). They are carrying out the structural changes in economy and labour markets which may affect their rewards at the start of their career. The goal of our study is, therefore, to reveal the effect of the long-term modernisation process since 1945 affected by the educational expansion, technological change, sectoral change and the changes in the labour market conditions on the returns to education at labour market entrance. In contrast to previous studies employing aggregated time series data we make use of event history data on individual level caught up in a cohort design and combine them with aggregated time series data on the macro level. That means that we measure the effect of technological change on rates of return directly. Covering a rather long historical period for West Germany (1945–2008), the return to education are indicated not by income, but by the magnitude prestige score (Wegener, 1988, 1992)—as a measure of the individuals' 'goodness

of jobs' (material and immaterial rewards in an occupational hierarchy)—attained by novices at the first job in their occupational career.

The remainder of the article is organised as follows: In the second section secular processes such as economic modernisation and educational expansion are described. After then, based on economic and sociological labour market theories, hypotheses are deduced for the multivariate analysis on returns to education at labour market entrance. Then, in the third section, the data, variables, and methods are described. Thereafter, empirical evidence will be presented in the fourth section, and conclusions about the rate of returns in the course of technological change are drawn finally in the fifth section.

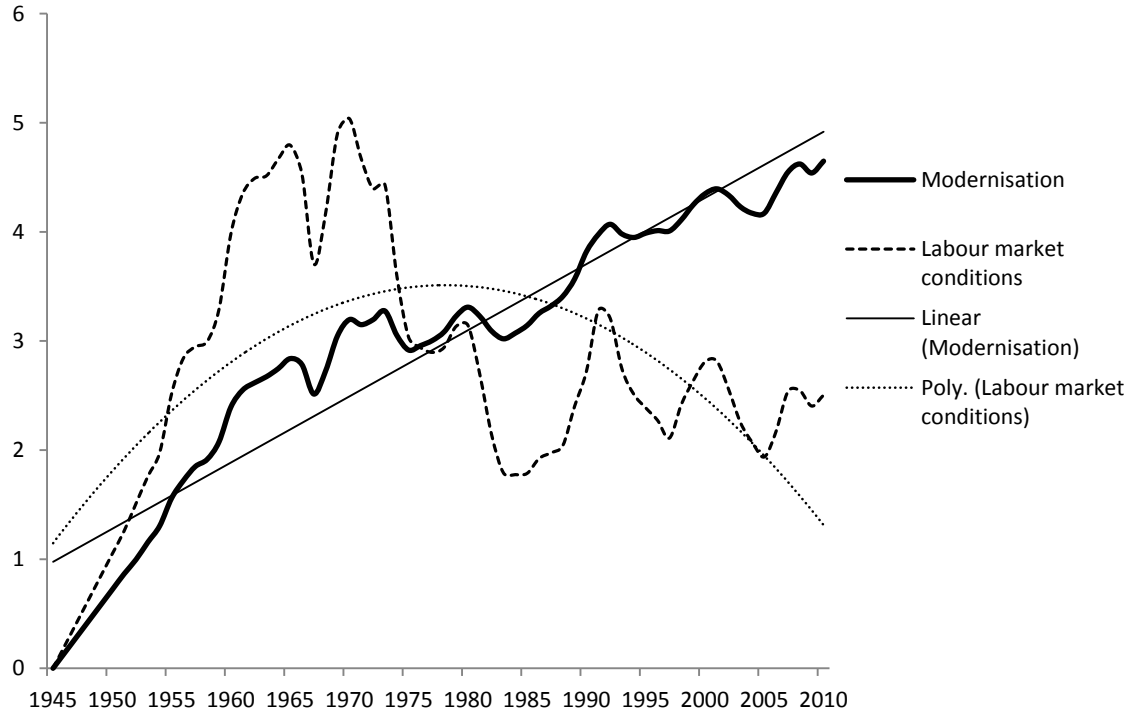
2 Theoretical background

Brief history of economic modernisation in West Germany

In times of the aftermath of WWII, in particular after foundation of the Federal Republic of Germany in 1949, there is a rapid economic recreation and significant economic expansion in the following two decades (Abelshauser, 2014; Berger, 2013). However, due to economic crisis in the 1960s and 1970s, the economic development slowed down. The end of the unique 'German economic miracle' became labelled as 'the short dream of perpetual prosperity' (Lutz, 1989). In the following decades, the development of the West German economy carried out unsteadily and has been characterised by cycles of economic upturns and cyclical downturn (e.g. low points in 1967, 1975, 1982 and 2003). In spite of this varied economic development, there are continuous increases in the economic welfare and living standard of the population (Zapf, 1994; Zapf and Habich, 1996) (see also: GDP per capita in *Figure A-1* in the Appendix), technological change in the economy and working processes, and change of economic sectors in terms of tertiarisation. The processes of technological change—i.e. rationalisation, automatisation, and increased productivity—are obvious in the primary sector of agriculture and in the secondary sector of industrial production (Goldin and Katz, 2009). In the tertiary sector of services, one witnessed technological change such as digitalisation due to increasing importance of information and communication technologies, too. In West Germany, as an European special case, the continuous shift of the labour forces to the service sector was not correlated with an extensive process of deindustrialisation like in the UK or in the USA (Berger, 2013) or with the 'death of the labour society' (Dahrendorf 1980, 1983; in contrast: Müller, 1983; Mayer and Müller, 1986, 1994). While in 1950 a quarter of the labour force was employed in the primary sector, 43 per cent of them were employed in the secondary sector and almost 33 per cent in the tertiary sector, in 2010, almost three-quarters of them were employed in the service sector, one-quarter in the industry, and 2 per cent in the agriculture and forestry (see *Figure A-1* in the Appendix). This sectoral change to tertiarisation is different for genders. In 1961, about 48 per cent of female employees and 32 of their male counterpart were placed in the service sector (Willms-Herget and Stockmann, 1982). Their shares has increased—rapidly for women compared to men, in particular—to 84 resp. 58 per cent in 2010 (Noll and Weick, 2016). Furthermore, the share of employed persons at the population in age 15-65 has increased from 68 per cent to 89 per cent in 1990, and remained constant on the level of 88 per cent (see *Figure A-1* in the Appendix). However, in the West German case, the development is different for men and women again. The male labour force supply (in age 15-65) has decreased from 94 to 82 per cent in the 1950-2010 period while women in the same age has increased their labour force supply from 44 to 69 per cent in the same periods (Rahlf, 2015, 2016). Finally, for West Germany, it is interesting to notice that the share of female labour force supply at the total population (1950: 31%; 2010: 45%) has rather converged to their male counterpart's share (1950: 64%; 2010: 56%).

The development of the labour market situations varied like the economic cycles across the periods. The unemployment, for example, was high in the aftermath of the Second World War (11% in 1950), but has been degraded until the end of the 1960s (0.7% in 1966) (see *Figure A-1* in the Appendix). After the definitive end of the 'German economic miracle' in the early 1970s, the time of full employment of the labour supply was past. After then one witnessed a stepwise increase of unemployment from one economic cycle to the next one (Berger, 2013). In 1975, for example, 4.7 per cent of the labour supply was unemployed, and the employment has increased to 9.3 per cent in 1985, 10.8 per cent in 1997, and 10.2 per cent in 2006 (see *Figure A-1* in the Appendix). The cascade worsening of labour market conditions in these decades has not been compensated by the economic booms between economic recessions (see e.g. the changing ratio of notified vacancies and manpower or the decline in the number of firms since the early 1970s—after the first oil price shock—in *Figure A-1* in the Appendix).

Fig. 1: Trend of modernisation and changing labour market conditions in West Germany (1945–2010)*



* Modified factor scores (by adding the minima to the original factor scores)

In a recent article by Becker and Blossfeld (2017), these *latent dimensions of structural changes such as economic modernisation and labour market conditions* has been indicated by several long time series obtained from the official statistics (Zapf and Flora, 1971).[1] As already mentioned above, the *level of modernisation* indicates historical changes—initiated by technological change (Goldin and Katz, 2009) and affecting labour market and occupational structures as well as economic business cycles (i.e. volume of labour force; labour force participation rate; share of employees in the primary, secondary and tertiary sectors; gross domestic product (GDP); GDP per capita). Changes in *labour market conditions* have been indicated by the number of firms, negative unemployment rate and ratio of notified vacancies and manpower). In order to reduce complexity as well as to prevent the identification problem

[1] The utilised time series have been documented in the German social indicators monitor (SIMon) hosted by GESIS (https://histat.gesis.org/histat/en/data/themes/36). The data were completed and actualised with new statistical yearbooks published by the Federal Office of Statistics in Wiesbaden (see Becker and Blossfeld, 2017). The development of the key indicators in West Germany is documented in *Figure A-1* in the Appendix.

resulting from the highly correlated or invalid time series, these 10 time series has been modified by confirmatory factor analysis (Kolenikov, 2009; Harrington, 2009). The both factors—*economic modernisation* and *labour market conditions*—were the theory-driven result of the main component method and orthogonal factor rotation. Both factors explain 92 per cent of the variance in the 10 different time series (see *Table A-1* in the Appendix). However, there are missing factor scores for the 1945-49 periods which have been imputed by polynomial regression.

In *Figure 1*, the period-specific factor scores are documented for the historical period from 1945 to 2010 (Becker and Blossfeld, 2017). They are added with their minima in order to have positive factor scores only. Their course reflects the post-war economic history of the Federal Republic of Germany in terms of modernisation trend and the labour market conditions affected by the business cycles.[2] On the one hand, there is a monotonic (almost linear) trend of economic modernisation while—on the other hand—the development of labour market conditions is cyclical due to their strong dependencies on the business cycle. The waves of the business cycles have been becoming shorter with increasing globalisation and accelerated technological changes in the several industries (Berger, 2013). Across the observation window (1945-2010), latter development could be described polynomial as a nonlinear, but inversely U-shaped curve. Overall, this complex structural change illustrates that each of the several birth cohorts on the one hand as well as the graduates and first-time employees have been confronted with different levels of modernisation and labour market situations. These might affect their labour force entrance and related returns of education in a period-specific and cohort-differentiating way (Becker and Blossfeld, 2017).

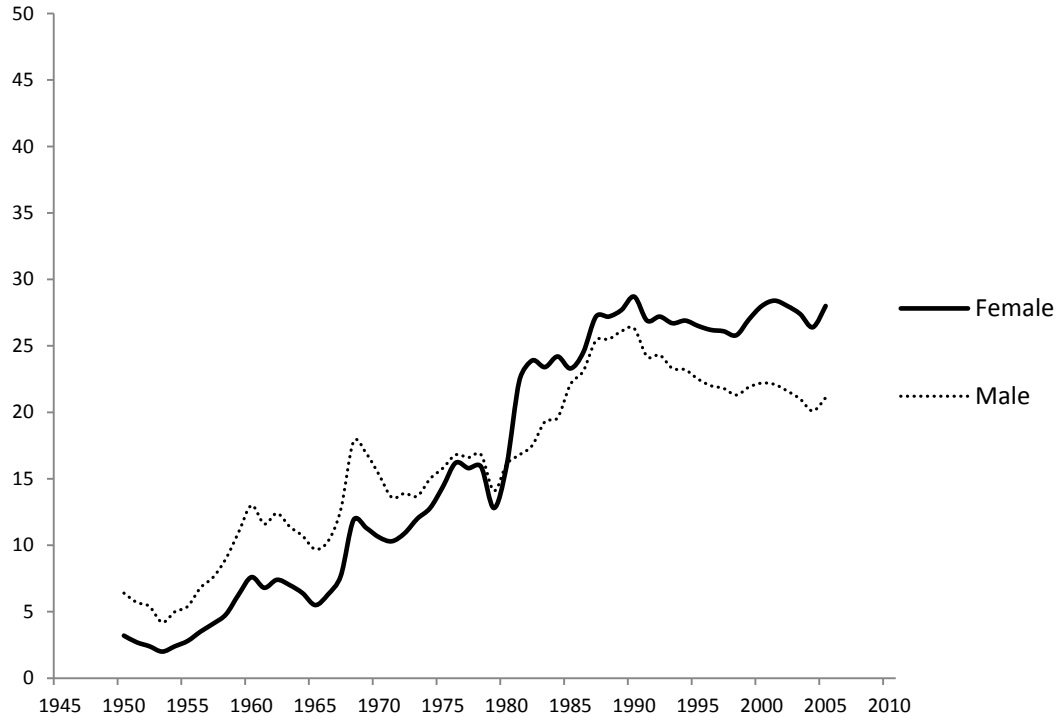
Educational expansion in West Germany

It is well-documented that the economic modernisation in terms of technological and sectoral change has resulted in the employers' increasing demand for qualified and highly qualified manpower (Blossfeld, 1985, 1986). In favour to women, in particular, this development has been strengthened by both the expansion of the welfare state and the increased importance of the public employment (Becker and Blossfeld, 1991). In West Germany, therefore, the trend of economic modernisation described above was a significant "motor" of educational expansion (Becker and Mayer, 2017). The findings are clear. The higher the levels of modernisation are since the 20th century, the higher was the enrolment in higher education as well as the higher was the populations' share attaining advanced degrees in schooling, vocational education and training, and university training.

Like the linear trend of modernisation affected by economic business cycles, there is a secular trend of upgrading of women and men—in terms of attaining the eligibility for enrolment in academic university (*Universität*) or university of applied sciences (*Fachhochschule*)—across birth cohorts and historical period in West Germany (*Figure 2*). While about 3 per cent of the women and 6 per cent of men (of the population in the same age) have become eligible for university training, 28 per cent of women and 21 per cent among the male graduates attained these degrees in 2005. In the early 1980s, the "gender reversal" in advantage to young women of the "baby boomer generations" and the younger birth cohorts has occurred belonging to one of the striking momentums in the West German educational expansion (Becker, 2014).

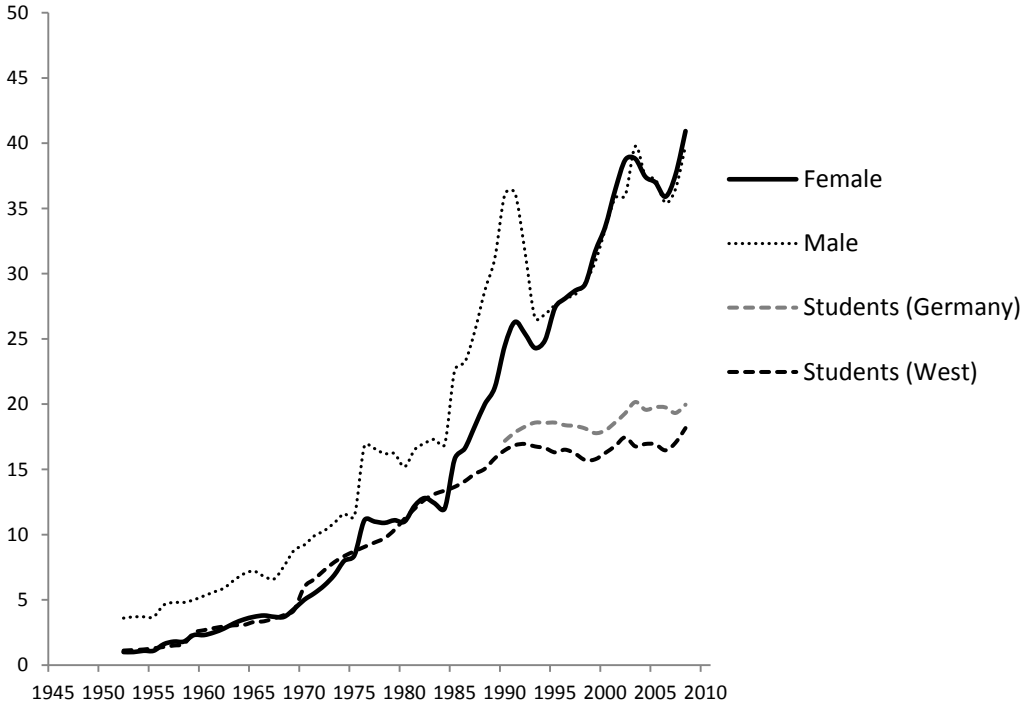
[2] The development of the labour market situations show a continuous positive trend, which is structured by the economic business cycles (e.g. the German economic miracle in the 1950s and 1960s or the economic boom after the German union in 1990) and recessions (e.g. economic crisis in 1967, oil price shocks in 1975 and 1982, and the recessions in 1993, 2003, and 2009). The labour market conditions are interrelated with job opportunities and their development corresponds to the historical trend of demand and supply of manpower (e.g. shortage of manpower in the post-war era or unemployment during periods of recession).

Fig. 2.1: Educational expansion – Eligibility for training at academic university (*Abitur*) or at university of applied sciences (*Fachhochschulreife*) in West Germany, 1950–2005



Data source: Köhler, Helmut and Peter Lundgreen, 2014: Allgemeinbildende Schulen in der Bundesrepublik Deutschland 1949–2010. Göttingen: Vandenhoeck & Ruprecht. (GESIS: ZA8570 Datafile) – own compilation and presentation

Fig. 2.2: Educational expansion – freshmen in universities in West Germany (1952–1993) and in unified Germany (1994–2008) as well as absolute numbers of students (in 100.000)

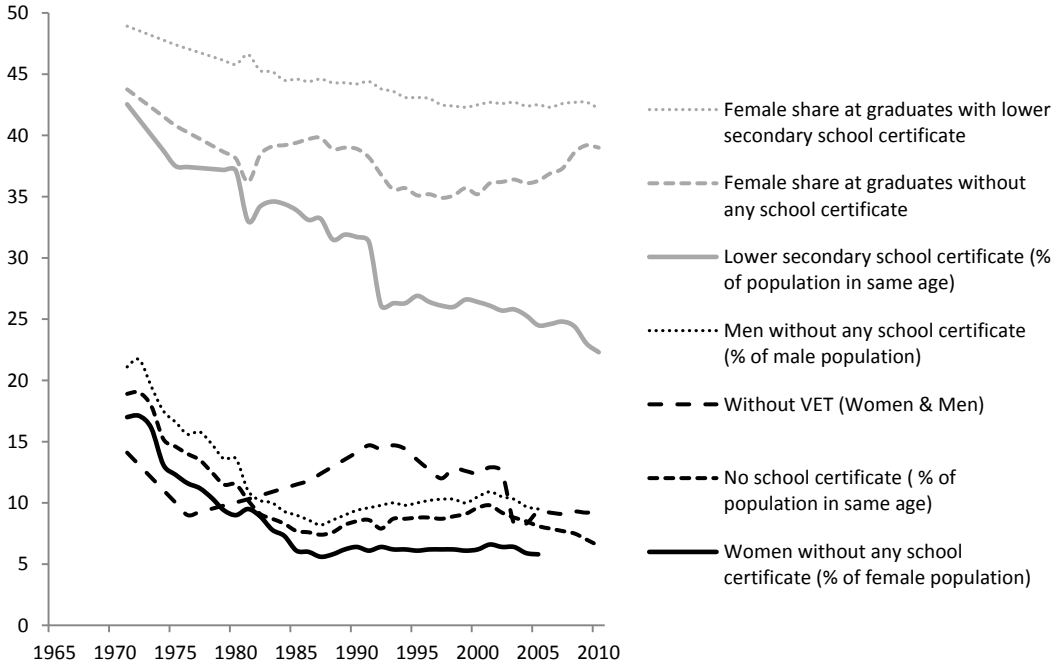


Sources: a) 1952–1984 (enrolment at age 22): Köhler, Helmut. (1978 [2008]). Der relative Schul- und Hochschulbesuch in der Bundesrepublik Deutschland 1952 bis 1987. Berlin: Max-Planck-Institut für Bildungsforschung (GESIS: ZA8326 Datenfile); b) 1985–2008 (first enrolment): Bildungsberichte 2006–2016 (https://www.bildungsbericht.de/); d) Number of students in 100.000: Statistical yearbooks (www.destatis.de) – own compilation and presentation

A similar trend in the course of educational expansion has been taken place for enrolment in university training (*Figure 2.2*). In West Germany, the total number of students enrolled at universities has increased from 111.000 students in 1952 to 1.8 million in 2008. After the German unification in 1990, 1.7 million students were enrolled and about 2 million in 2008. In 2017, their enrolment has risen to 2.8 million students. While about 4 per cent of men in age 22 and 1 per cent of women in the same age started their university training in 1950, 12 percent of the women and 17 per cent of the men became freshmen. Five years after the German unification in 1995, the age-related enrolment was similar for both genders (27.5%). In the years to 2008, the enrolment remained rather constant (women: 41%; men: 40%).

For the period 1971-2005, in contrast to the unsteady trend of unqualified graduates without vocational training degree, it has to be noticed that educational expansion resulted in a decreasing share of younger birth cohorts with less education (e.g. lower secondary school qualification: *Hauptschulabschluss*) or without any graduation (*Figure 2.3*). In particular, the female share is decreasing since the women have profited more likely than their male counterpart from the educational expansion.

Fig. 2.3: Educational expansion – Graduates without any school graduation or without VET in West Germany, 1971–2005



Sources: a) Köhler, Helmut, and Peter Lundgreen, 2014: Allgemeinbildende Schulen in der Bundesrepublik Deutschland 1949–2010. Göttingen: Vandenhoeck & Ruprecht. (GESIS: ZA8570 Datafile Version 1.0.0) – for female and male graduates without any school certificate; b) The Standing Conference of the Ministers of Education and Cultural Affairs (www.kmk.org/dokumentation-und-statistik/statistik/schulstatistik.html) – for population and female share without any school certificate as well as population and female share with lower secondary school certificate; c) Federal Ministry of Education and Resesarch (www.datenportal.bmbf.de/portal/en/K233.html) – for population and female share without any school certificate as well as population and female share with lower secondary school certificate and the development of attainment of vocational education and training degrees (VET); d) Note: missing values in the time series were interpolated; own calculation and presentation

It is also obvious that women are underrepresented among the graduates without any school certificate. The ratio of graduates with no school certificates among the population in the same age has decreased from 19 per cent in 1971 to 8 per cent in 2005 and 6.5 per cent in 2010. This quota is lower for women than for men. In 1971, 21 per cent of men and 17 per cent of women in the same birth cohorts leave the school without any degree. These ratios have decreased to about 10 per cent for men and 6 per cent for women in 2005.

Theoretical background and hypotheses

According to several economic and sociological theories—such as human capital approach (Mincer, 1974; Becker, 1975), signal and filter theory (Spence, 1973; Stiglitz, 1975), job competition theory and labour queue model (Thurow, 1975), as well as theory of segmented labour markets (Doeringer and Priore, 1971; Blossfeld and Mayer, 1988)—formal general education, vocational training and university degrees are expected to have a positive effect on the status attainment and the related benefits at entry into the labour market. The higher the occupational beginners' educational level, the higher are their returns to education at first entrance into the labour market (*hypothesis 1*).

Although this hypothesis is generally confirmed empirically in a huge number of studies focusing on the determinants of the supply side of the labour market, there is a rather low number of empirical evidence considering the demand side—namely structural changes in terms of modernisation (in, particular technological change) and labour market conditions (increased unemployment risks, in particular) (Blossfeld, 1985; Hannan et al., 1990). If these monotonic trends of educational expansion and economic modernisation might have an impact on graduates' rewards at labour force entrance, it is assumed that there is cohort differentiation of the returns which result in increasing occupational prestige across younger cohorts (Becker and Blossfeld, 2017: 122) (*hypothesis 2.1*). Since the development of labour market conditions are nonlinear and became worsen after the end of the 'German economic miracle', the rates are declining for the first-time employees born after 1960s (*hypothesis 2.2*).

Due to the steady technological change in the course of monotonically increasing modernisation levels, the sustaining educational expansion, and the cyclical labour market conditions, the patterns of labour market entrance become more dynamic and the novices' return to education less predictable. Job positions and related rewards have become more volatile because product markets are increasingly influenced by random shocks and contingent events in the interdependent global economy (Blossfeld et al., 2005; Blossfeld and Hofmeister, 2006). Thus, less predictable economic cycles and accelerated technological modernisation are two important macro factors impacting the West German labour market since the late 1960s resp. early 1970s. However, it seems to be obvious that the beginners' returns to education become higher the higher the modernisation level is at the point in time of their first job (*hypothesis 3*). The more favourable the labour market conditions are at their labour market entry, the higher are their occupational prestige in the first job (*hypothesis 4*).

Finally, the impact of skill-biased technological change has to be taken into account by considering the interaction of the novices' qualification on the individual level and the structural changes on the macro level. If modernisation in terms of skill-biased technological change provide advanced entry job opportunities, in particular, this might be true for better qualified manpower provided that the technological change is correlating with educational expansion in the post-war period. Because advanced qualification becomes a key factor in the trend of modernisation with rapid technological change and tertiarisation, it is particularly the qualified and highly qualified young labour market entrants who are expected to get access to the newly created skilled jobs with high job prestige, whereas the unskilled job starters are penalised by the modernisation process (*hypothesis 5*).

For periods of boom in which jobs are created, unemployment declines and rate of returns increase it could be assumed that less educated job starters could realise more likely a premium occupational status than highly qualified graduates. In recession periods, i.e. in times of worse labour market conditions however, better qualified beginners are more likely to realise premium returns than the less qualified one (*hypothesis 6*).

3 Data, variables, design, and statistical procedure

Data sources

For the empirical analyses, two compiled longitudinal datasets has been employed. The first data set comprises event-history data obtained from the German Life History Study (GLHS) at the Max Planck Institute for Human Development in Berlin and the Centre for Research on Inequalities and the Life Course (CIQLE) at Yale University (Mayer, 2015). This dataset at least provides information on the educational trajectories and occupational careers of women and men born in 1929–31, 1939–41, 1949–51, 1954–56, 1959–61, 1964 and 1971 (Mayer, 2009; Hillmert and Mayer, 2004).[3] The cohorts born around 1930, 1940, and 1950 comprise 2,171 West German men and women interviewed between October 1981 and March 1983 (Brückner and Mayer, 1998). More than 2,000 West Germans born around 1955 were interviewed between October 1988 and November 1989 (Brückner and Mayer, 1995). Finally, the data of 2,909 women and men born between 1964 and 1971 were collected between June 1998 and February 1999 (Hillmert, 2004). For these birth cohorts, it is possible to analyse the returns to education at labour force entrance in the historical period 1945–1999. For considering the periods after 1999, the event-history data set from the "Working and Learning in a Changing World" (ALWA: *Arbeiten und Lernen im Wandel*) project at the Institute for Employment Research in Nuremberg has been employed, too (Kleinert et al., 2011). The data comprises information on 10,404 individuals born between 1956 and 1988 interviewed between August 2007 and April 2008 regarding their social origin, schooling, vocational and academic training as well as occupational career. Due to reasons of analogous cohort design, only natives in the birth cohorts 1959–61, 1964–66, 1969–71, and 1974–76 are considered.

Finally, the *complete case analysis* on labour force entrance is restricted to 8,813 West German citizens (female: 4,310; male: 4,503) while foreigners and migrants have been excluded since these groups has been not considered for individuals in the GLHS born around 1930, 1940, and 1950. Hereby, only those occupational beginners are considered who were older than 14 years in regard to collecting real employment episodes (duration of more than six months in a contractual job since their entry into the labour market) after the end of the Second World War in May 1945.

Apart from other areas of their life-course, the respondents' information on their educational trajectory and occupational careers were collected retrospectively (Mayer, 2008). The respondents were asked to reconstruct their training and occupational careers with exact time references for the start and end of each of the episodes in their work history. In order to minimise memory-related problems, special techniques were used to support the memory process of the interviewees. After careful preparation for the interviews and data collection (Matthes et al., 2007), systematic inquiries, intensive editing, and close inspections of the information on life-course, in regard to chronological consistency, has been conducted in order to vouch for the quality of the data (Brückner and Mayer, 1998; Hillmert, 2004; Reimer, 2005; Mayer, 2008; Matthes et al., 2012).

Statistical analysis, dependent and independent variables

The dependent variable is the job *prestige* on entering the labour market at first time (first job). The job prestige indicating for returns to education of young professionals was measured by the magnitude prestige scores (MPS) developed by Wegener (1988, 1992).[4] The MPS is

[3] These data sets are available at GESIS (https://dbk.gesis.org/dbksearch/gdesc2.asp?no=0033&db=e). Please take notice of their digital object identifiers (doi:10.4232/1.2645; doi:10.4232/1.2646; doi:10.4232/1.2647; doi:10.4232/1.2648; doi:10.4232/1.3927).

[4] For the GLHS cohorts born between 1929 and 1961, the jobs were coded using ISCO-68 (International Standard Classification of Occupations). This code can be transferred to the MPS-86 classification. For the

based on the ISCO (International Standard Classification of Occupations) codes of jobs and is a well-known as well as often applied standard and empirically proven measure in sociology in order to describe the "quality of jobs" in an occupational hierarchy. In relation to the social position of the jobs depending on the required qualification, the MPS is a metric scale of subjective social reputation of occupations (Wegener, 1985: 229). In this respect, MPS represent social closure of jobs. Compared to income or wages, MPS scores can be considered as a much broader measure of the quality of jobs and their benefits since they do not only capture aspects of earnings quality, but also aspects of labour market security (economic security related to the risks of job losses in certain occupations) and quality of the working environment (non-economic aspects of jobs, including the nature and content of the work performed as well as workplace relationships). As an additional advantage, MPS is multidimensional since it considers the social rating of jobs and is a universal measure of returns of education enclosing wages as well as living standard at least in Germany.

An important independent variable is the respondents' *educational attainment*. According to human capital as well as signal and filter theories (Arrow, 1973; Spence 1973; Becker 1975; Stiglitz 1975), the degree of schooling and vocational training was measured using a rank order indicating an individual's productivity or trainability. For the secondary school qualification, the level of schooling was categorised as follows: (1) no school graduation, (2) lower secondary school graduation ('*Volks- resp. Hauptschulabschluss*'), (3) intermediate secondary school graduation ('*Realschulabschluss*' resp. '*Mittlere Reife*') and (4) higher education entrance qualification (i.e. eligibility for university training ['*Abitur*'] or training at a university of applied sciences ['*Fachhochschulreife*']). For vocational and tertiary training, the levels were (1) no training graduation, (2) general vocational education and training ('*Lehre*', '*Fachschule*'), (3) advanced vocational training (e.g. master, technician) and (4) university degree (Diploma, PhD). These degrees in schooling and vocational resp. academic training were combined multiplicatively. Using this combination of degrees, the higher qualifications and accumulated skills were more likely to indicate the occupational beginners' higher productivity and trainability than lower or missing degrees (e.g. lower secondary school resp. intermediate secondary school without vocational education and training).

Table 1: Descriptive Statistics

	Men (N = 4,503)				*Women (N = 4,310)*			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Individual characteristics								
Magnitude Prestige scores	58.57	25.93	20.0	186.8	63.69	25.23	20.0	186.8
Thereof: Cohort (Men/Women)								
1929-31 (n = 286 / 233)	47.94	18.55	20.0	167.0	45.90	20.90	20.0	167.0
1939-41 (n = 339 / 297)	52.14	20.36	20.0	186.7	51.09	21.23	20.0	186.7
1949-51 (n = 326 / 313)	59.33	24.84	20.0	186.7	58.36	21.89	20.0	154.5
1954-56 (n = 516 / 471)	59.14	24.41	20.0	186.8	62.15	21.84	20.0	186.8
1959-61 (n = 956 / 959)	60.38	26.25	20.0	186.8	63.81	23.82	20.0	186.8
1964-66 (n = 1,097 / 1,078)	59.97	28.21	20.0	186.8	67.28	26.19	20.0	186.8
1969-71 (n = 864 / 820)	59.27	26.27	20.0	186.8	69.40	25.07	20.0	186.8
1974-76 (n = 122 / 139)	65.48	28.53	20.0	163.3	75.39	32.61	20.0	186.8

younger cohorts in GLHS and ALWA, the jobs have been coded according to the occupational classification developed by the Federal Employment Agency (*Bundesagentur für Arbeit*). Therefore, it was necessary to convert this special code to ISCO-68 (three digits). Through this approach, it was possible to use the MPS for all jobs of all the birth cohorts. We cordially thank Britta Matthes and Bernhard Christoph from the Institute of Employment Research in Nuremberg for their professional advice and generous support. We also thank Christof Wolf (GESIS in Mannheim) and Steffen Hillmert, Steffen Kröhnert, and Karola Rockmann for the source code.

Table 1 continued

Education (general, vocational)	7.42	4.55	1	16	7.05	4.38	1	16
Thereof: Cohort (Men/Women)								
1929-31 (n = 286 / 233)	4.67	3.23	1	16	3.66	3.05	1	16
1939-41 (n = 339 / 297)	5.12	3.30	1	16	4.08	3.31	1	16
1949-51 (n = 326 / 313)	6.19	4.18	1	16	5.03	3.93	1	16
1954-56 (n = 516 / 471)	6.88	4.46	1	16	6.04	4.38	1	16
1959-61 (n = 956 / 959)	8.14	4.84	1	16	7.41	4.33	1	16
1964-66 (n = 1,097 / 1,078)	8.22	4.61	1	16	8.01	4.05	1	16
1969-71 (n = 864 / 820)	7.89	4.25	2	16	8.32	4.14	2	16
1974-76 (n = 122 / 139)	9.47	4.69	4	16	9.78	4.77	2	16
Structural characteristics								
Modernisation level	3.31	0.85	0.23	4.78	3.33	0.82	0.23	4.78
Labour market conditions	2.93	0.95	0.28	5.32	2.96	0.96	0.28	5.32
Interaction: Education and…								
Modernisation level	25.91	18.56	0.23	74.07	24.98	17.89	0.23	76.53
Thereof: Cohort (Men/Women)								
1929-31 (n = 286 / 233)	4.39	6.71	0.23	43.97	3.51	5.90	0.23	52.52
1939-41 (n = 339 / 297)	12.33	10.33	1.10	54.89	9.74	10.39	1.39	54.89
1949-51 (n = 326 / 313)	19.93	14.36	2.74	56.72	15.99	13.37	2.74	56.72
1954-56 (n = 516 / 471)	22.96	14.97	3.15	58.29	20.36	14.95	3.28	60.85
1959-61 (n = 956 / 959)	28.14	17.22	3.23	69.52	25.44	15.26	3.15	74.07
1964-66 (n = 1,097 / 1,078)	29.73	18.91	3.32	73.34	28.58	16.32	3.31	71.71
1969-71 (n = 864 / 820)	32.86	18.29	7.28	74.07	34.44	17.84	7.29	74.07
1974-76 (n = 122 / 139)	41.25	21.24	16.21	74.07	42.67	21.66	8.45	76.53
Labour market conditions	21.53	14.21	0.28	85.14	20.40	13.22	0.28	85.14
Thereof: Cohort (Men/Women)								
1929-31 (n = 286 / 233)	6.33	10.37	0.28	68.22	5.04	9.04	0.28	83.00
1939-41 (n = 339 / 297)	19.28	16.22	1.54	85.14	15.29	16.57	2.04	85.14
1949-51 (n = 326 / 313)	26.95	16.05	3.98	85.14	22.51	16.02	3.99	85.14
1954-56 (n = 516 / 471)	23.85	13.07	3.31	75.43	22.04	13.28	2.32	75.43
1959-61 (n = 956 / 959)	23.03	12.96	3.17	57.03	21.16	10.95	3.22	57.03
1964-66 (n = 1,097 / 1,078)	20.15	14.17	2.42	57.03	19.16	11.96	2.06	57.03
1969-71 (n = 864 / 820)	23.49	12.14	4.64	57.03	24.49	11.48	4.65	57.03
1974-76 (n = 122 / 139)	25.78	13.13	9.57	49.57	27.13	13.63	5.11	49.53

Sources: GLHS and ALWA – own calculations

The descriptive statistics of the variables are documented in *Table 1* separately for genders. They already reflect some of the interesting developments which have to be analysed in detail. Across the birth cohorts, due to the process of technological change to be more pronounced in the service sector than in the industrial sector, the increase of the occupational beginners' average prestige is more likely to be obvious for women than for men. This process might be interrelated with the human capital specific for each of the cohorts since the women have overhauled and overtaken the male novices in the course of educational expansion. The interaction of education with modernisation across birth cohorts confirms this assumption.

4 Empirical results

Cohort specific pattern of returns of education

In a previous study on West German men's labour market entrance, Becker and Blossfeld (2017) found an increase of the average prestige score across birth cohorts. By employing multivariate regression estimation (ordinary least squares), their univariate finding is replicated for men (model 1 in *Table 2*). The results for women are similar (model 3). On the one hand, in line with hypothesis 2.1, it is obvious that the job prestige is increasing in the sequence of birth cohorts entering the first job between 1945 and 2005. On the other hand, the standardized coefficients (beta) show that—compared to the oldest cohort born around 1930––the prestige score has increased until beginners born around 1965. For the younger births born around 1970 or 1975 the job prestige is relative lower than for the cohort 1964-66 (see models 2 and 4). This result confirms hypothesis 2.2.

However, if the general education and vocational resp. university training of the first-time employees is taken into account the cohort differentiation for male entrants becomes largely statistically insignificant (model 2). In regard to their returns, it could be assumed for the young men that the educational expansion mainly "explains" the cohort differentiation.

Table 2: Job prestige at the time of entry into the labour market (first job) across birth cohorts

	Men				Women			
Model	1		2		3		4	
Coefficient	β	beta	β	beta	β	beta	β	beta
Human capital								
Education			3.104 (0.074)***	.547			3.020 (0.078)***	.524
Cohorts								
1939-41	4.204 (2.064)*	.042	2.801 (1.750)	.028	5.190 (2.132)*	.052	3.912 (1.837)*	.039
1949-51	11.390 (2.082)***	.114	6.686 (1.769)***	.067	12.469 (2.108)***	.128	8.329 (1.819)***	.085
1954-56	11.199 (1.895)***	.138	4.324 (1.615)**	.053	16.251 (1.951)***	.201	9.041 (1.691)***	.112
1959-61	12.437 (1.732)***	.196	1.667 (1.491)	.026	17.910 (1.779)***	.295	6.574 (1.561)***	.108
1964-66	12.035 (1.706)***	.199	1.004 (1.470)	.017	21.386 (1.760)***	.367	8.239 (1.554)***	.141
1969-71	11.330 (1.753)***	.172	1.321 (1.505)	.020	23.509 (1.809)***	.366	9.438 (1.600)***	.147
1974-76	17.547 (2.779)***	.109	2.646 (2.383)	.017	29.488 (2.611)***	.206	10.998 (2.300)***	.077
Intercept	47.940 (1.520)***		33.429 (1.334)***		45.901 (1.596)***		34.846 (1.404)***	
R^2	0.0192		0.2953		0.0695		0.3095	
N	4,503		4,503		4,310		4,310	

* $p<0.05$; ** $p<0.01$; *** $p<0.001$; OLS regression
Source: GLHS and ALWA – own calculations

For women, the cohort pattern remains significantly even after control for their human capital. Probably, other trends such as sectoral and technological change dominate their rates of return (model 4). In general, for West German female and male entrants, hypothesis 1 is confirmed stressing the positive effect of human capital investment on returns to education.

Now, the impact of structural changes such as modernisation and labour market conditions on the prestige at labour market entrance are taken into account (*Table 3*). For both gender, positive effects of general schooling, VET, and university training are revealed even after control for structural change (models 1 and 4). This finding is in line with hypothesis 1 again. Formal education is essential for the status attainment of first jobs in West Germany. The amounts of the returns to education are similar for women and men if just main effects are taken into account (models 2 and 5). For women, the effects of labour market conditions are rather negligible for the rewards in the first job (model 5). However, for men, it is obvious that periods of economic boom have positive effects on their status attainment (model 2). This means—in contrast to our theoretical outline—that hypothesis 4 is confirmed for men only.

In correspondence with hypothesis 3, the main effect of modernisation is significantly dominant for the young women and men: The higher the modernisation levels at the point in time of their first job, the higher are their prestige scores. The impact of modernisation on the novices' prestige is higher for women than for men.[5] This finding on increasing inequality of

[5] This claim is proved by the calculation of the prestige score for each point in time between 1945 and 2008 on the base of regression estimates. In *Figure A–2* in the Appendix, the results for men (model 3 in *Table 3*) and for women (model 6) are documented. There is a monotonic increase of novices' occupational prestige, and again it becomes obvious for the period after the 1960s that the effects of labour market conditions are evident for men.

the women's return could be explained ad hoc by the demand for (highly) qualified women related to the process of tertiarisation and, in particular, the expansion of public employment areas such as educational system, health sector, and welfare work (Becker and Blossfeld, 1991).

Table 3: Job prestige at the time of entry into the labour market (first job) in West Germany, 1945–2008

	Men			Women		
Model	1	2	3	4	5	6
Individual characteristics						
Education	3.074	2.967	0.150	3.160	2.825	1.436
	(0.071)***	(0.077)***	(0.422)	(0.073)***	(0.083)***	(0.435)***
Structural characteristics						
Modernisation level		1.843	–3.451		4.474	3.552
		(0.442)***	(0.759)***		(0.465)***	(0.705)***
Labour market conditions		0.630	2.273		0.051	–0.788
		(0.378)†	(0.695)**		(0.368)	(0.627)
Interaction: Education and…						
Modernisation level			0.945			0.243
			(0.109)***			(0.110)*
Labour market conditions			–0.192			0.177
			(0.094)*			(0.092)
Intercept	35.764	28.600	41.887	41.391	28.681	34.383
	(0.622)***	(1.433)***	(2.468)***	(0.609)***	(1.450)***	(2.262)***
R^2	0.2910	0.2962	0.3078	0.3012	0.3195	0.3212
N	4,503	4,503	4,503	4,310	4,310	4,310

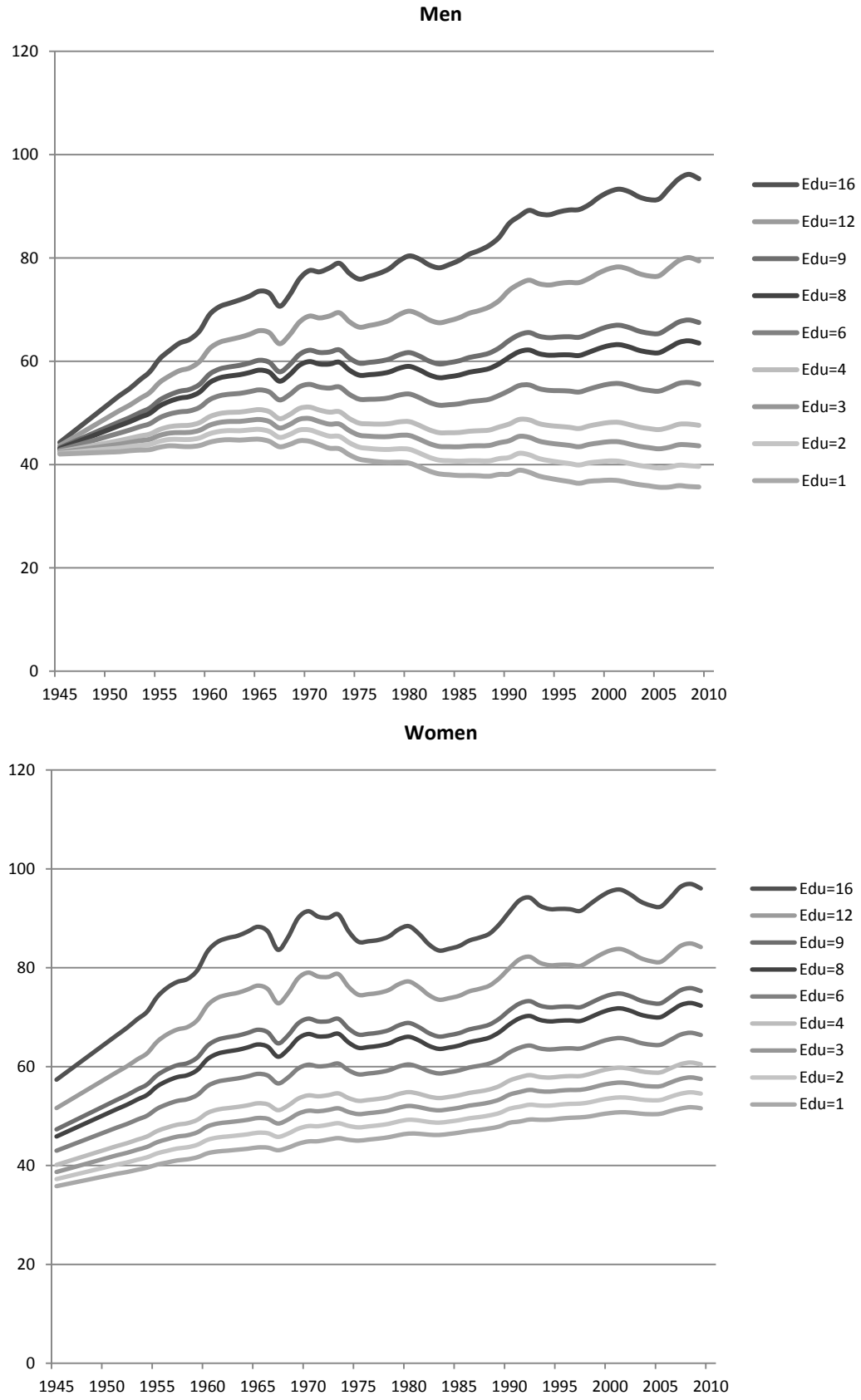
† $p<0.1$; * $p<0.05$; ** $p<0.01$; *** $p<0.001$; β-coefficients estimated by OLS regression
Source: GLHS and ALWA – own calculations

If the interactions of human capital with modernisation levels and labour market conditions are taken into account, it is obvious that highly qualified beginners, in particular, has gained from the modernisation process. In other words, the continuous trend of modernisation—the post-war technological and sectoral change—and the educational expansion have improved the young employees' occupational success at the time of entry into the labour market only for the highly qualified men (models 3 and 6). This result confirms hypothesis 5 stressing that advanced qualification becomes a key factor in the trend of modernisation related to rapid technological and sectoral change. The (highly) qualified young labour market entrants have therefore access to prestigious jobs while less skilled and unskilled entrants are penalised by the modernisation process. Only for men, and just partially in line with hypothesis 6, we find that periods of economic boom are in favour for less qualified workers compared to highly qualified graduates. However, in times of worse labour market conditions, better qualified beginners are more likely to realise premium returns than less qualified job starters.

This finding is validated by calculating the rates of return for each of the educational groups across historical time (*Figure 3*). For each of the genders, the base of the calculation is the full model. On the one hand, by control for changing labour market conditions, it is found that women and men with an academic degree (Educ=16) impressively has profited from technological change while entrants without any vocational training (Educ ≤ 3) are the 'loser of modernisation' in regard to the status attainment. For less qualified men, it is indeed observed that their returns have decreased over time significantly after the end of the 'German economic miracle' at the end of the 1960s.

Women with lower skills have fewer increases in returns than their better qualified counterparts. However, it has to be noticed that there is no devaluation of intermediate educational degrees (Educ ≥ 6 and ≤ 9). While the graduates with lower secondary school and VET certificate (Educ=4) have witnessed no increase in the course of modernisation, the graduates advanced vocational training (Educ=12) are also 'winners of modernisation'.

Fig. 3: Trend of returns of education (MPS) at entrance into the first job across periods (predicted values of the full model: model 3 in table 3 for men and model 6 in table 3 for women)



The previous estimations provide indications that the inequalities of returns of education have increased in the course of skill-biased technological change and tertiarisation. In particular, the first-time employees with academic degree witnessed an increase in prestige across

historical time and birth cohorts. This assumption has been proved by the standard error of the prestige calculated separately for women and men at labour force entry (upper panel in *Figure 4*). Indeed, the inequality of the first-time employees' returns has increased substantially for male graduates while the increase has been moderately for women. This finding is validated by the Gini coefficients (see *Figure A–3* in the Appendix). The inequality observed at labour force entry did not be mitigated or dissolved in the course of upward or downward mobility during the occupational career (lower panel).

Fig. 4: Inequality of returns to education (MPS) in West Germany, 1945-2005

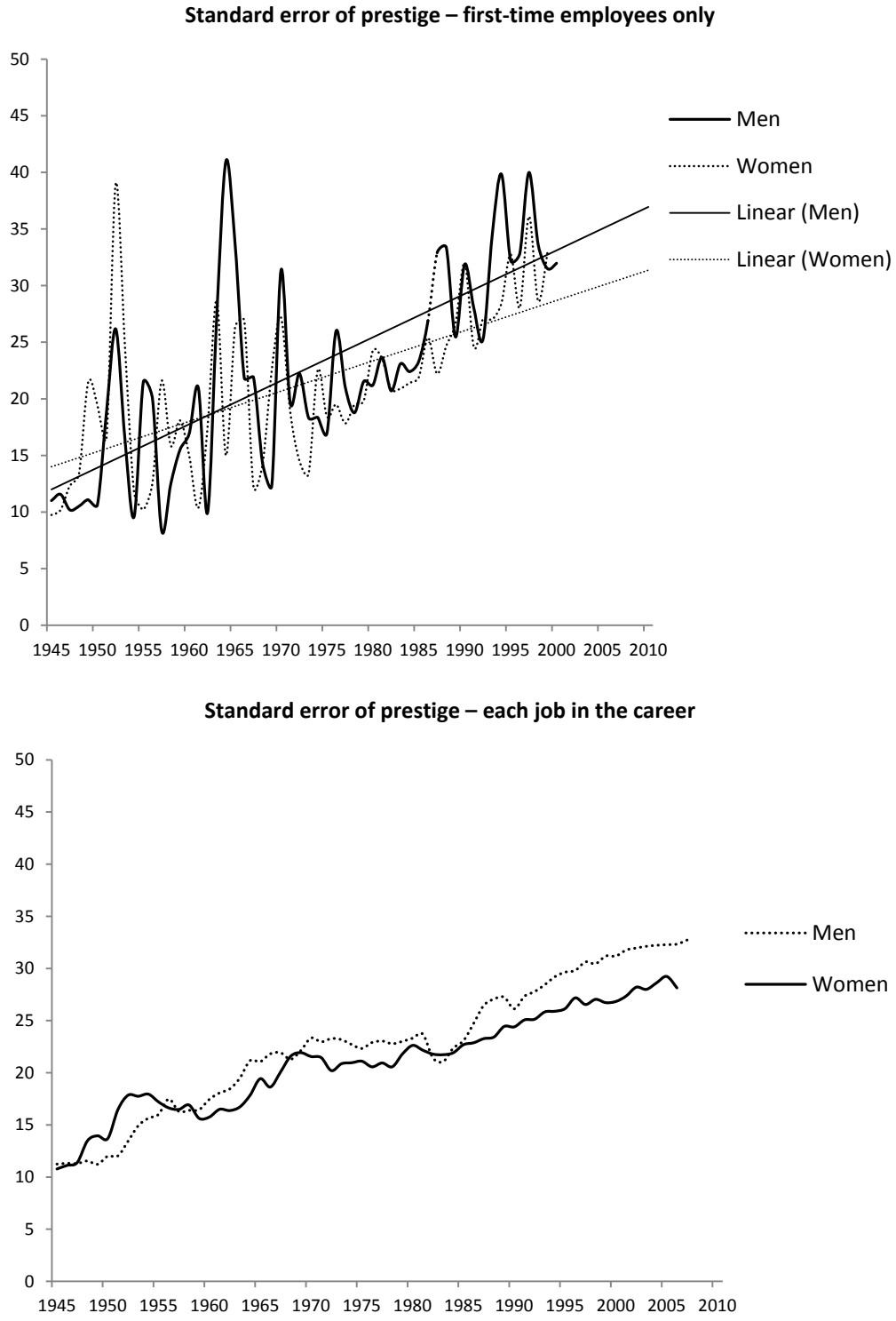
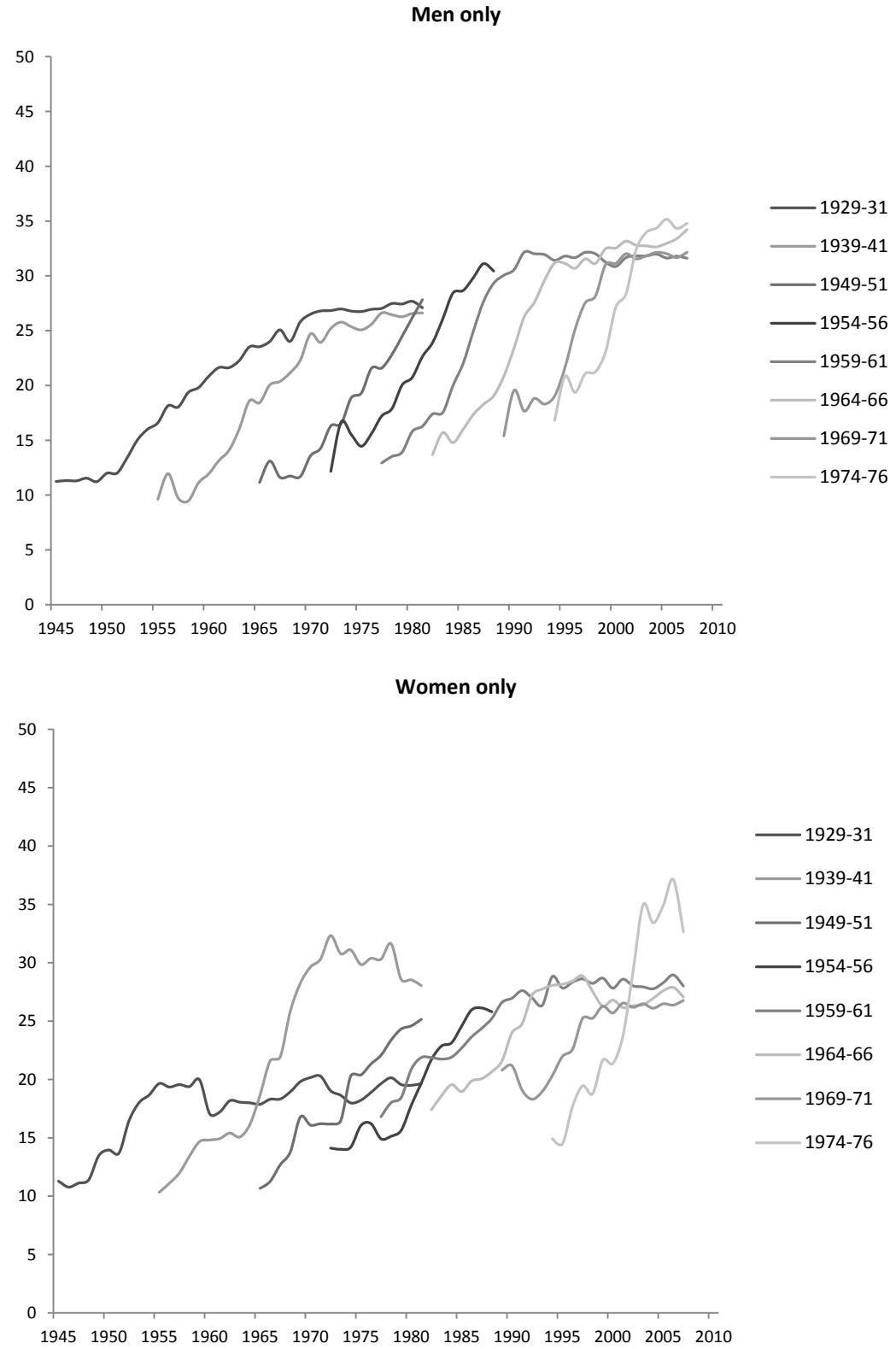


Fig. 5: **Standard error of prestige (each job in the career across cohorts)**



For men and women, the development of inequality is investigated across consecutive birth cohorts (*Figure 5*). It is obvious that the inequality of the returns has increased across birth cohorts, historical periods, and labour force experience. Especially for men, this is valid. Finally, for later stages of the occupational career, the level of inequality is stagnating since the early 1990s. The exception is observed for women in the youngest birth cohort.

5 Conclusions

Starting from the seminal work by Goldin and Katz (2009) on the race between education and technology, the aim of this study was to contribute to an advanced understanding of how the post-war economic modernisation as well as the supply and demands of the labour markets in the course of technological and sectoral change in the 1945-2008 periods have affected the prestige of women and men at their entry into the labour market in West Germany (Mayer, 2004). In particular, in the light of educational expansion, it has to be investigated if and how processes such as skill-biased technological change, expansion of the service sector, and business cycles have shaped the status attainment of first-time employees. The analytical focus is on young professionals in several birth cohorts since general changes in the economic structures and labour market conditions are firstly apparent for them. As seen in previous studies for West Germany, it is obvious that the graduates' success at the entrance into their first job have long-term effects on their rates of return in terms of mobility in the career, earnings, family formation, and living standard in the life course (Blossfeld, 1985, 1986; Blossfeld and Mayer, 1988; Hannan et al., 1990; Mayer and Blossfeld, 1990; Blossfeld and Huinink, 1991; Mayer et al., 2010).

In the empirical analysis, the entrance patterns of women and men from successive birth cohorts have been reconstructed on the individual level and linked with the most important changes in the economy, the labour markets, and the educational system on the macro level. The longitudinal analysis shows that the impact of both the skilled-biased technology and the educational expansion are different for the birth cohorts. The multilevel analysis provides an advanced understanding if and how such long-term macroeconomic of modernisation have influenced the start of career mobility and changing inequality of status attainment in West Germany across several generations.

Two longitudinal event-history datasets (from the GLHS and the ALWA study) as well as aggregate data of official statistics have been utilised. These datasets provide the dynamic link of the individual data on career patterns with time series indicating long-term developments on the macro level. Assuming that the generational replacement of labour market entrants is an important mechanism for the modernisation of the labour market and the rise of inequality, the estimations of the returns of education is focused on first-time employees in consecutive birth cohort who have profited from the ongoing educational expansion.

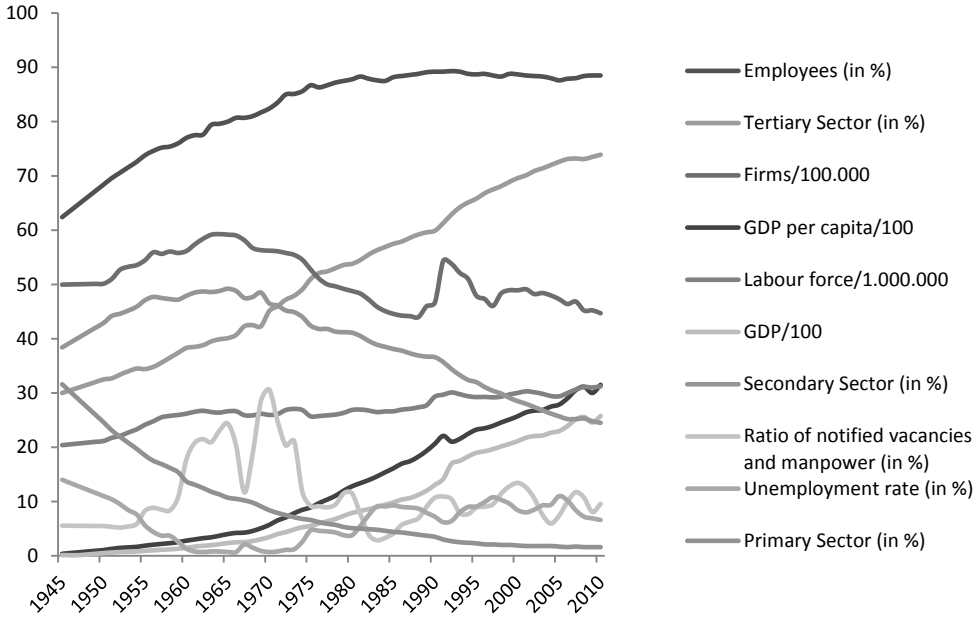
The empirical analysis provides evidence for our theoretical assumptions. In West Germany, long-term trends of modernisation in terms of technological change, sectoral tertiarisation and educational expansion have increasingly structured the distribution of returns of education at labour market entry. However, their impact is skill-biased. Since upgraded skills and qualification is the key to getting jobs with increasing qualification requirements in the course of skilled-biased modernisation, the highly qualified young labour market entrants became the profiteer in the modernisation trend, while the unskilled school leavers has been penalised. In particular, the situation of (especially male) school leavers who left without any educational certificate or further vocational training has been worsened extremely. Therefore, the inequality of the graduates' rewards has increased after the end of the 'German economic miracle' in the late 1960s. However, it could be assumed that the degree of inequality is underestimated since immigrants and refugees not be naturalised are excluded from the analysis. For West Germany overall, we found strong evidence that the interplay of structural changes with the sustainable educational expansion has lead neither in educational inflation in terms of increasing numbers of graduates with advanced certificates which are not absorbed by the labour market nor in devaluation of higher education in terms of decreasing rates of return. Also, there are no erosion of the individuals attaining intermediate general, vocational,

and higher education at both the labour market entry and the career (Becker and Blossfeld, 2017).

On the one hand, our empirical analysis teaches us again that investment in human capital (i.e. skills and credentials) still remains one of the most important decisions in the life course of individuals in regard to being prepared for employment and life in the rapidly changing world. On the other side, it is obvious that the circumstances such as economic modernisation and social change belongs to the most important preconditions shaping the returns of human capital investments making the difference of individuals' status attainment and welfare as well as determining the fate of younger generations.

Appendix

Fig. A-1: Development of key indicators in West Germany, 1945–2010



(Note: Missing values of some time series for the period 1945–1949 have been extrapolated)

Fig. A–2: The effect of occupational beginners' average educational level on their return of education (MPS) at entrance into the first job across periods (predicted values: models 3 [men] & 6 [women] in table 3)

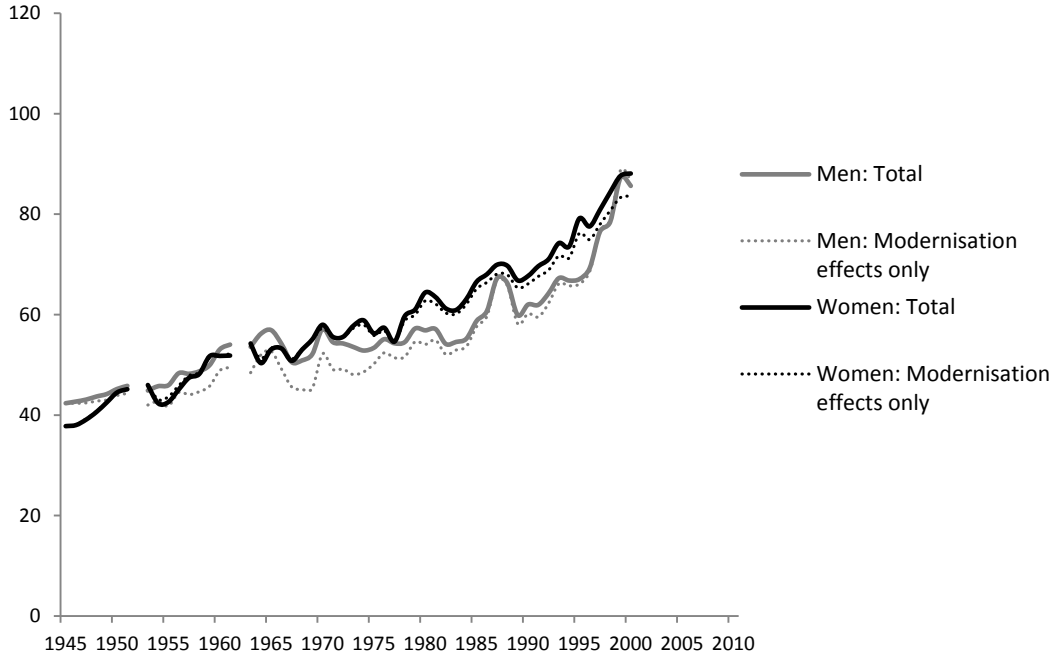


Fig. A-3: Inequality of returns to education (MPS) in West Germany, 1945-2005 (Gini coefficients)

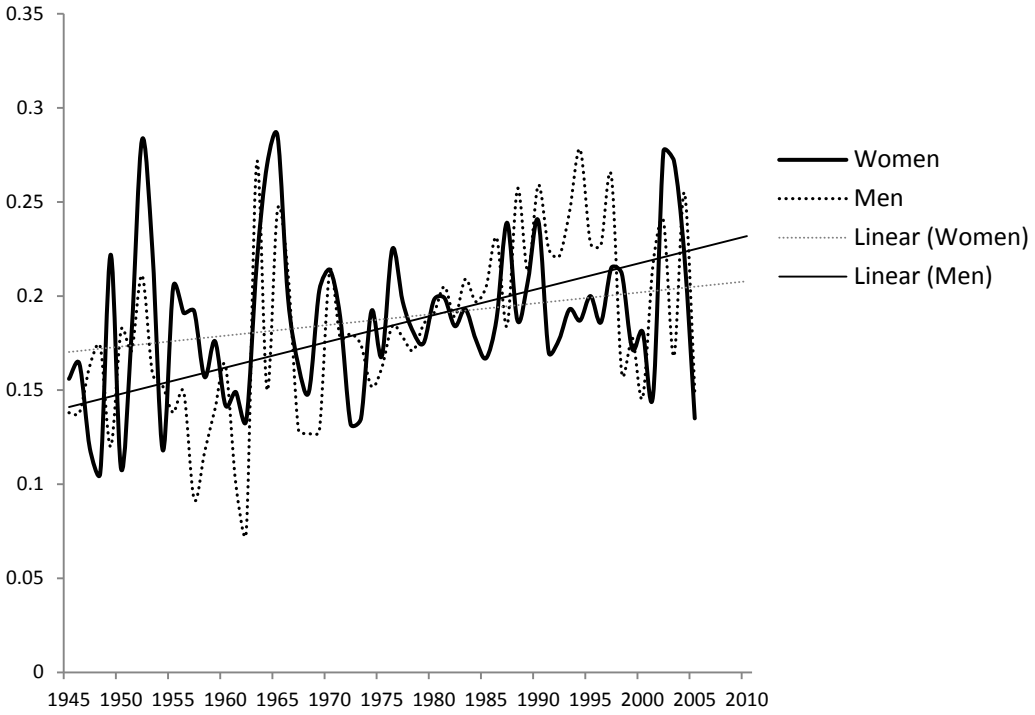


Table A-1: Factor loadings (pattern matrix) and unique variances

Variables	Factor 1: Modernisation level	Factor 2: Labour market conditions	Uniqueness	Kaiser-Meyer-Olkin scores
Volume of labour force	***0.9644***	–0.0015	0.0699	0.7861
Labour force participation rate	***0.9111***	–0.0931	0.1611	0.9064
Share of employees in the primary sector	***–0.9619***	0.0542	0.0719	0.6975
Share of employees in the secondary sector	***–0.8080***	0.5319	0.0642	0.7391
Share of employees in the tertiary sector	***0.9360***	–0.3459	0.0042	0.7442
Economic performance (GDP)	***0.8879***	–0.3858	0.0628	0.8933
Economic performance per capita	***0.9050***	–0.4035	0.0181	0.8593
(Negative) Unemployment rate	0.2658	***–0.9229***	0.0776	0.7986
Ratio of notified vacancies and manpower	0.0331	***0.9300***	0.1340	0.6239
Number of firms	–0.5119	***0.7654***	0.1521	0.8777
Overall				0.7958
Eigenvalue	7.2959	1.8881		
Variance	0.6156	0.3028		

Sources: German Federal Office of Statistics (Statistical yearbooks; time series of official statistics; www.DESTATIS.de: Genesis online); GESIS: Social Indicators Monitor 1950–2013 (https://histat.gesis.org/histat/de/data/themes/36); Thomas Ralph. (2015). Germany in Numbers (1834–2012). Bonn: BEP. (See also: Becker and Blossfeld, 2017).

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