Long-run trends in the age of labor market entry

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Abstract

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Demographic aging causes substantial worker shortages. So far, policy debates neglect the aspect of age at labor market entry. We study the age at which young individuals first enter the labor market and how it has developed over the last four decades. Based on long-running administrative data, we describe birth cohorts from 1960 through 2000, and separately consider different types of employment entry. We investigate the entry age distribution and heterogeneities across demographic groups. We find that conditional on employment, the median age of first holding a stable full-time employment increased by almost 4 years between the birth cohorts 1960 and 1995. Our decomposition analysis yields that more than one quarter of this increase is explained by higher educational attainment and the rising share of non-German workers, which appear to be the main mechanisms behind the delay in labor market entry. Additionally accounting for changed occupations, industry composition, and relative entry-level earnings explains about 40 percent of the observed delay in labor market entry. The role of different mechanisms varies across the types of employment entry.

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1. Introduction

Demographic aging poses significant challenges to numerous countries around the world. Among the most pressing implications of demographic aging are the shrinking labor force and shortage of workers. This has motivated a substantial amount of policy analysis and elicited recommendations to incentivize labor force participation. Among the most popular measures are policies to enhance the participation of groups with lower levels of labor market attachment, such as older workers, females, and immigrants (see, e.g., OECD 2024, Table 2.1). The OECD also discusses incentives of the tax and benefit system and active labor market policies to integrate the unemployed. As additional labor supply can derive not only from an increase in the age of exit but also from a decrease in the age of entry, we focus on the labor market activity of young individuals and study the development of the age at labor force entry for the German birth cohorts since 1960. By studying these trends, we provide evidence on a previously neglected subgroup, thus adding a new perspective on the labor market effects of demographic shifts.

We take advantage of long-running administrative data at the individual level to reliably reflect young individuals' labor market activities. We define four indicators of labor market participation that vary in the intensity and stability of labor market involvement. For each birth cohort, we describe the average age of labor force entry for each indicator and depict the development of these average entry ages over several decades.

Interestingly, and in contrast to labor market exit behaviors among older workers, there is no established literature on the patterns of labor market entry behavior among the young. Instead, our work relates to three distinct lines of research. The first analyzes the causal effects of reforms affecting young individuals in the short and long run. A broad literature studies, e.g., consequences of changes in the duration of secondary schooling (for the German case see, e.g., Muehlemann et al. 2022, Marcus and Zambre 2019, Marcus et al. 2020, Büttner and Thomsen 2015, and studies cited there). Other contributions focus on reforms of tertiary education (Potestio 2014, Goehausen and Thomsen 2024, Malacrino et al. 2025), or look into the long-run consequences of reforms of the school starting age

(Frederiksson and Öckert 2013, Dobkin and Ferreira 2010, Cygan-Rehm and Westphal 2026, Görlitz et al. 2024).

A second line of research explains aggregate labor force participation patterns (e.g., Binder and Bound 2019, Abraham and Kearney 2020) and the cross-country relevance of institutions affecting aggregate youth labor market outcomes (Caroleo et al. 2017). Some authors focus on growth effects of changing age-group-specific labor supply (Kotschy and Bloom 2023, and Ochsner et al. 2024).

The third line of research directly addresses developments in labor market entry. However, we found only three German studies on this subject.[1] Börsch-Supan et al. (2020) use survey data to describe the development of age at first employment for the birth cohorts 1925-1990 in West Germany. They conclude that the age of labor market entry declined for their most recent birth cohorts. Becker and Blossfeld (2017) also use survey data to study labor market entry and subsequent job histories. They look at West German men born between 1929 and 1976. Based on a job quality measure ('magnitude prestige scale'), they find that over subsequent birth cohorts, the quality of entry-level jobs improved and individual mobility increased. Finally, Reinhold and Thomsen (2017) use long-running administrative data (1975-2010) to study labor market outcomes for young (age 25-35) vs. experienced (age 36-60) workers. They describe the development of educational attainment, wages, task composition, share of high wages, and wage growth over time for four education groups. Contrary to the more optimistic results of Becker and Blossfeld (2017), they find that job market entrants faced stagnating real wages since the mid-1990s and falling real wages since the mid-2000s. Also, the share of labor market entrants in jobs paying above the 70th percentile has been declining.

We address various gaps in the state of knowledge and contribute in three major ways to the state of the literature. First, contrary to Reinhold and Thomsen (2017), who compare labor market outcomes for given age groups over time, we study actual labor market entry. Specifically, we investigate individuals' first labor market activity, using alternative measures of labor market involvement

[1] Anxo et al. (2010, p. 18) compare median labor market entry ages across European countries for the year 2008. They find substantial variation between the lowest median entry age of 21 in Austria to the highest of 25 in Italy and Greece.

available in administrative data. This allows us to describe the development of average entry ages by birth cohort since 1960. Second, we add to the macro-literature by studying individual-level instead of aggregate outcomes. This offers a more nuanced reflection of behavioral choices and permits a detailed description of population subgroups. In contrast to the studies offering policy evaluations, we do not focus on the effect of specific reforms but instead describe the overall patterns of labor force entry over the last four decades. Thus, we do not aim at the identification of specific causal effects but instead use excellent data to offer new evidence on labor market entry over recent decades. Third and finally, we complement our precise description of labor market entry behavior over time with a decomposition of relevant underlying mechanisms, which is new to the literature. We distinguish mechanical factors, such as education expansion and labor force composition, occupational preferences, industry composition, and the role of relative entry earnings.

We find that the median age of (a) a first employment increased by almost 2 years, of (b) first regular full- or part-time employment increased by 3.2 years, of (c) first regular full-time employment went up by 3.5 years, and of (d) the first stable regular full-time employment increased by 3.91, i.e., almost by 4 years for the birth cohorts 1960 and 1995.[2] As these results are conditional on participation, and participation declined over time, they are lower bounds of the total shift. We show that upper bounds can be up to 3 years higher. Interestingly, we hardly see a difference in labor market entry ages by gender or by East vs. West German region of residence. In our decomposition analyses, we characterize potential underlying mechanisms; increased educational attainment and the rising share of non-German citizens in the German labor market are the main mechanisms behind the delay of labor market entry and explain about 28 percent of the increase in the median age at first regular employment, full-time, and stable full-time employment. Accounting for changes in occupational and industry composition of entry jobs increases the explained share of the entry age increase further. After considering changes in relative entry-level earnings, we can explain about 40 percent of the overall delay in labor market entry. This leaves most of the rising age of labor market entry unexplained. We can only

[2] The employment categories are defined in detail below.

speculate that changes in educational trajectories, of skill requirements in industries and occupations, or behavioral adjustments in response to reduced labor market pressure might contribute to these patterns.

Our analysis uses reliable administrative data and is the first to offer descriptive evidence on past labor force entry age developments. The age of labor force entry is an important dimension of labor supply during a labor shortage, and one that has typically been overlooked. While the political decision to raise retirement entry age by a few months generates substantial popular backlash, focusing on the age of entry may be more politically feasible. The delayed labor market entry observed since the 1960s birth cohort reduces lifetime labor supply substantially by up to 10 percent. Based on Coschignano et al. (2025), Isaak et al. (2026) find that bringing 4.7 million individuals below age 65 into full-time employment (40 hours per week) in addition to the labor force of 44 million workers might increase German GDP by up to 11 percent, with substantial additional revenues for the social insurances.[3] While young labor market entrants may be less productive, these results suggest that a 10 percent increase in their lifetime labor supply can generate substantial effects for aggregate economic outcomes. Therefore, our findings may be of interest to numerous national labor markets faced with the challenges of demographic aging.

We structure our paper as follows: In Section 2, we briefly survey relevant background factors that might affect labor market entry over time. Section 3 introduces our data. In Section 4, we present our main findings. We study the underlying mechanisms in Section 5, describe the relevance of labor force participation in Section 6, and conclude in Section 7.

2. Historical and Institutional Background

In this section, we discuss mechanisms that might affect the long-run development of our main outcome, the age at labor market entry. We consider the birth cohorts 1960-2000 who typically enter the

[3] The increase amounts to 9.8 percent if they work 35 hours per week and to 7.6 percent if they work 28 hours per week on average.

labor market aged 18-22 and review five relevant aspects: developments of the aggregate labor market over time, modifications of military and substitute services, reforms of the schooling system, changes in the tertiary education system, and reforms of transfer and subsidy programs that might affect workers' labor market entry outcomes. For each aspect, we discuss potential contributions to the overall age at labor market entry.

The aggregate labor market over time: Key determinants of the aggregate labor market situation in our observation period between 1975 and 2023 relate to demographic shifts, changes in unemployment, the influx of immigrants, and overall structural change in the economy. Overall, the number of individuals entering the labor market varied substantially. **Figure 1** shows the age distribution of the 2024 population in Germany. Clearly, this captures the effects of migration and German unification. However, it illustrates major demographic developments: While the birth cohorts of the early 1960s (about age 60 in 2024) comprised more than 1.2 million individuals each, the cohort size declined to less than 1.0 million for the 1975 birth cohort (about age 50 in 2024). For more recent birth cohorts, the numbers first increased to reach about 1.1 million (cohort 1990, age 34) and then declined throughout the cohorts of the early 2000s to below 0.8 million individuals per birth cohort. Based on demographics alone, it is not surprising that these birth cohorts faced heterogeneous competitive conditions when entering the labor market. **Figure 2** depicts the aggregate and youth unemployment rates since 1970. We see large changes over time with a first peak in overall and youth unemployment in 1984, i.e., when the baby boomer cohorts of the early 1960s entered the labor market. Unemployment rates rose further until 2005. Since the last of a package of labor market reforms (Hartz IV) was introduced in 2005, unemployment has been declining. In the literature, weak economic conditions have been shown to negatively affect labor market outcomes (Altonji et al., 2016; Oreopoulos et al., 2012). In particular, weak economic conditions are associated with higher rates of college enrolment and graduation (Hampf et al., 2020), which may delay labor market entry and consequently increase the age at which individuals enter employment for entire cohorts. It may also lead to behavioral changes,

with individuals shifting away from economically weaker sectors and investing more in education. This not only complements educational reforms but also contributes to educational expansion and rising levels of educational attainment.

Figure 3 shows the development of immigration, emigration, and net migration over time.[4] In the 1970s, we see net population inflows and outflows due to changing incentives and regulations of guest worker immigration (see Grobecker et al. 2024). Since the late 1980s, we observe substantial net immigration from Eastern European countries. Immigration peaked in 2015 with more than 1 million immigrants entering from Syria. Asylum seekers and refugees typically enter the labor market with some delay after they arrive in the host country (Brücker et al. 2024). Reasons for that are institutional barriers such as asylum procedures and employment bans that may hinder labor market integration at the start of their stay (Marbach et al. 2018). The average age at the start of vocational training differs substantially between individuals from asylum-seeking countries (22.9 years), non-German citizens (22.0 years), and German citizens (19.6 years) (Kroll and Uhly 2018). Vocational training graduation rates also differ for these population groups (44.4 percent for German citizens compared to 18.6 percent for non-German citizens) (Bundesinstitut für Berufsbildung 2023). In the years immediately after arrival, non-refugee migrants have higher employment rates than refugees (Jaschke et al. 2022). In general, the unemployment rate of non-German citizens is significantly higher than that of German citizens (Bundeszentrale für politische Bildung 2021). Since net migration has been mostly positive over time (see **Figure 3**), we expect it to contribute to the rise in the average age at labor market entry, as foreign citizens constitute a large population share and typically enter the labor market at a later age.

Moreover, in the period 1975-2023, the German economy underwent a substantial structural transformation. One notable development was the shift in employment from manufacturing to services (Dauth et al., 2017). For instance, while 6.6 percent of the workforce was employed in the primary

[4] Unfortunately, we do not have long-running data on the qualification structure of immigrants. Ette et al. (2026) offer an interesting analysis and show based on annual data from the German Mikrozensus for the years 2005-2023 that the qualification structure of immigrants has remained stable even though the absolute number and country of origin composition of new immigrants changed over time. About one third had a college degree, and about 38 percent had a vocational degree.

sector in 1975, this share had declined to only 1.2 percent by 2023 (Statistisches Bundesamt 2026b; see also **Figure 4**). Whereas the secondary and tertiary sectors accounted for similar shares of total employment in 1975 (42.4 and 51.0 percent, respectively), the tertiary sector had expanded considerably by 2023, accounting for 75.3 percent of all employed individuals. Clearly, shifts across industries, structural transformation, and automation modify the occupational composition of employment. Industry- and occupation-related shifts may affect the age at labor market entry, as qualification requirements can differ across industries and occupations. In particular, changing job tasks and increasing automation have been shown to induce adjustments in human capital investment and contribute to rising levels of educational attainment (Di Giacomo and Lerch, 2026; Spitz-Oener, 2006). Therefore, the structural transformation can act as a complementary mechanism alongside educational expansion and changing economic conditions, and contribute to an increase in the age at labor market entry.

Military conscription and civilian service: In Germany, mandatory service for young men existed between 1956 and 2011. Before the mandatory service was stopped, its duration had been steadily shortened from 18 months in the early 1960s to 6 months in 2011. Also, the share of young men officially considered fit for military service declined from about 70 percent in the early 1980s to about 24 percent in 1993 (Eberl et al. 2022). Puhani and Sterrenberg (2022, Figure 1) show participation rates of more than 70 percent for the male birth cohorts of the 1970s. For the cohorts of the late 1970s, participation rates started to decline and reached 40 percent for the birth cohort of 1983. Based on administrative data, Daelen (2025, Figure 2) describes the cohort share of men who did military or substitute service for the birth cohorts 1988 to 1994: early on, the participation rates of men with upper secondary school degrees were about 20 percentage points above those of men with lower secondary education degrees. For both groups, the participation rates dropped (from 42 and 23 percent, respectively) to reach less than 10 percent for both groups in the birth cohort of 1991. So, the relevance of military and substitute service for young men's careers declined over time, and we expect a reflection of this development in the age of labor market entry. While military service may cause

delayed labor market entry for males compared to females by about 18 months for the early birth cohorts, we expect this mechanism to decline over time and to fully disappear for the birth cohorts 1994 and later, who were no longer affected by the requirement.

Reforms of secondary education: Relevant reforms shifted the duration of upper secondary education between eight and nine years at the level of federal states (G8G9 reforms, see, e.g., Meyer et al. 2019), and expanded the provision of upper secondary school training. Research shows that the graduation age could be lowered by 10 months for pupils affected by the reform (Huebener and Marcus 2017). A lower school-leaving age allows graduates to enter the labor market earlier. This may counteract a delay in labor market entry induced by structural change and adverse labor market conditions at the time of graduation. Only a small share of students responds to the reform by taking gap years abroad or entering voluntary services before starting tertiary education (Meyer et al. 2019). Marcus and Zambre (2019) find that graduates are on average eight and a half months younger when they enter tertiary education after the reforms. They find a slight increase in the individual propensity to change degree programs. Meyer and Thomsen (2016) find delayed university enrollment of females. Apart from that, they find an increased probability of starting vocational education and a reduced probability of holding a master's degree before starting a professional career. While some of these findings suggest that the reforms contributed to a labor market entry at younger ages, Meyer and Thomsen (2016) do not find statistically significant effects on the timing of labor market entry.

In addition to specific secondary school reforms, Germany's secondary schooling system contributed to an education expansion. Traditionally, the secondary education system consists of three tracks. Over time and for some federal states, the tracking age has been adjusted, and generally, the share of students attending the highest track has been rising over time (Bach et al. 2024). If a higher share of pupils completes upper secondary school, this should increase the average age of labor market entry.

Reforms of tertiary education: The tertiary education system was similarly modified over time, mostly at the level of federal states. While German tertiary education is typically free of charge, between 2006 and 2014, some West German federal states introduced and then abolished tuition fees (Bruckmeier and Wigger 2014). Tuition fees in general and tuition fees for long-term students, in particular, may provide an incentive to complete studies faster, which then may reduce the age of labor market entry among college graduates (Bietenbeck et al. 2023). Heineck et al. (2006) show that the effects of tuition fees differ across fields of study. In some fields, students tend to complete their studies more quickly, while in others the probability of obtaining a degree at all decreases. The introduction of tuition fees is particularly relevant for the birth cohorts 1987-1995 and might cause an earlier entry to the labor market both for those who pursue academic studies and study quicker, and for those who forgo tertiary education due to the additional expenses.

Also, since the early 2000s, the tertiary education system has adopted the harmonization of European standards (Bologna reform). This implied that single-step study programs (e.g., leading to Diplomas or Magister degrees) were replaced by two-step programs leading to Bachelor and Master degrees. This allows for an earlier entry into the labor market after three years following the completion of a Bachelor degree. Providing empirical support for a reduced standardized study duration, Hahm and Kluve (2019) show that the introduction of Bachelor programs increased the probability of graduating within the standard period of study, i.e., faster than before. Even though almost half of all students (45 percent) continue with a Master's degree after completing a Bachelor's degree (Statistisches Bundesamt, 2023), the Bologna reform has been associated with a reduction in the duration of study: graduates of Master programs typically complete their degrees about one year earlier than students in Diplom programs (Bundeszentrale für politische Bildung 2012). Thus, the Bologna reform may reduce the delay in labor market entry among students compared to non-students.

Additionally, classical universities are increasingly complemented by Universities of Applied Sciences (former Polytechnicals or *Fachhochschulen*), private universities, and dual degree programs, which have been growing in number and size rapidly nationwide (Siegler 2012, Buschle and Haider

2016). Easier access to higher education is associated with a rising number of graduates of tertiary degree programs (Siegler 2012). Since 2007, the upward trend in student enrollment has strengthened (see **Figure 5**; Statistisches Bundesamt 2025b). Clearly, a rising share of graduates may lead to an increase in the overall age at labor market entry in the population. The effect of higher education expansion may balance the effect of other reforms, which reduce the age at labor market entry.

Reforms of national and state-wide transfer and subsidy programs: The national subsidy for young individuals in training (Bundesausbildungsförderungsgesetz, BAföG, or federal law on the promotion of education and training) was modified several times. It offers means-tested financial support for pupils and students. Originally, in 1971, it was designed as a grant. Between 1983 and 1990, it was provided as a loan, and since then, it is 50 percent loan and 50 percent grant (Meier et al. 2024). In the early 1980s, the share of BAföG recipients fell by more than half compared to the 1970s (Statistisches Bundesamt 2021). Subsequently, the share of recipients increased again. Glocker (2011) finds that BAföG recipients finish their education faster than comparable students who are supported by private transfers. Possibly, the declining BAföG rate of the 1960s cohorts leads to longer study durations and, consequently, to a later entry into the labor market, whereas the increasing BAföG recipient rates starting with the cohorts of the 1980s may result in an earlier age of labor market entry. However, since these reforms affect only a subset of students, the overall effects on the median age at labor market entry are likely to be small.

Labor market reforms that garnered substantial attention were the four sets of so-called 'Hartz-Reforms', which were implemented between 2002 and 2005 (Eichhorst and Marx 2011). The reforms changed the unemployment benefit system and modified subsidy programs for small jobs (Minijobs), which are often used by young individuals. Minijobs are defined by their upper earnings limit. Since 1999, employers had to pay social insurance contributions on Minijobs. In 2003, the

monthly earnings limit increased from 325 to 400 Euro.[5] If the availability of flexible employment benefited students, the reform may have supported the educational expansion by ameliorating liquidity constraints. This can contribute to earlier Minijob employment but delayed regular full-time employment.

In this paper, we study aggregate developments and do not focus on a rigorous evaluation of any specific policy measure or reform. The institutional features listed above jointly shape the outcomes that we describe below. First, we are interested in the overall development of the age of labor market entry over time and its potential connection to aggregate labor market trends. In addition, we investigate more specifically whether the empirical evidence matches the hypothesized patterns based on changes in military and substitute service, reforms in the secondary and tertiary education system, demographic patterns rooted in shifting immigration patterns, and regional and sectoral heterogeneities over time.

3. Data description

We use administrative data from the Federal Employment Agency, provided by the Institute of Employment Research (IAB), for the period 1975-2023. The Sample of Integrated Labour Market Biographies (SIAB) is a 2 percent random sample drawn from the full administrative records. It describes the labor market history of individuals since 1975 with daily precision (Schmucker and vom Berge 2025).[6]

Since 1975, individuals appear in the data if they are regularly employed with mandatory social insurance contributions or registered as unemployed. Minijob employment is provided in the data since 1999, welfare benefit receipt is recorded since 2005, and information on being registered as job-

[5] In addition, Midijobs were introduced, which are small jobs that earn more than Minijobs and subsidize the social insurance contributions of workers (Herget and Riphahn 2022).
[6] Due to late reporting, there may be minor measurement issues in 2023. However, given our setup this slightly affects at most the last birth cohort of 1995.

seeking or participating in programs of active labor market policies is available since 2000.[7] As we are interested in a long-run perspective, we focus on information that has been consistently provided since 1975.[8] The data are precise, reliable, and offer a large number of observations. They provide an excellent representation of the German labor market and generally cover more than 85 percent of the labor force, as only the self-employed and civil servants are not covered.[9]

Our sample comprises the West German birth cohorts from 1960 to 2000. Information on East German individuals is available only since 1993. Therefore, we use East German birth cohorts starting in 1975.[10] Individuals are assigned to East vs. West Germany based on their first observed state of residence; if this information is unavailable, we use the first observed place of work. We drop observations from the sample if there is missing information on gender (0.01 percent) or if the federal state of residence (or work) cannot be determined (6.07 percent).

To harmonize the maximum observable age across birth cohorts, we consider labor market entry information until an individual reaches the age of 28. Without such a homogeneous upper age limit, the longer observation windows for older cohorts who potentially enter the labor market at an age above 40 would upward bias their mean entry age compared to more recent birth cohorts who are only in the data through their mid-20s by the end of our observation window in 2023.[11] After this harmonization, our sample comprises 777,859 observations.

Sample sizes vary substantially across birth cohorts and reflect the demographics of Germany. **Figure 6** describes the number of observations by cohort and gender, and shows the added East German observations since 1975. The figure reflects the demographic situation in West Germany with the large baby boomer cohorts of the early 1960s. The largest birth cohort in our sample is that of 1990,

[7] We use the weakly anonymous SIAB Version for the years 1975-2023 (10.5164/IAB.SIAB7523.de.en.v1).
[8] This information is provided in the Employee History Data File (*Beschäftigtenhistorik*).
[9] If young labor market entrants do not enter civil service or self-employment as their first labor market contact our coverage rates should be even higher.
[10] Since it is not possible to distinguish between East and West German Berliners, residents of Berlin enter the data only with the East German birth cohorts in 1975.
[11] We investigated whether choosing a different age cutoff affects our results (e.g., allowing information only until age 25 or up until age 30). The main results are robust to these choices.

with 22,900 observations from East and West Germans combined. The breakdown by gender shows a rising share of male observations over time; while there was about gender parity in the birth cohorts 1960-1981, more recently males made up about 54 percent of the sample. This might be due to a combination of rising participation of females in formal education (Riphahn and Schwientek 2015) and gender imbalances among immigrants.

To describe labor market entry behavior across subsequent birth cohorts, we consider four indicators of labor market involvement that differ in stability and intensity. Our first indicator (Y1, any employment) comprises any work activity, including Minijobs, apprenticeships, and regular employment.[12] The second indicator (Y2, regular employment) considers individuals in regular full-time or part-time employment; compared to Y1, Y2 omits individuals who work in Minijobs or in apprenticeship training. The third indicator (Y3, full-time employment) considers individuals in full-time employment; compared to Y2, Y3 omits individuals in part-time employment. Finally, indicator four (Y4, stable full-time employment) considers individuals who hold a stable full-time job for at least 365 consecutive days; compared to Y3, Y4 omits individuals in shorter full-time employment spells.[13]

Our outcome of interest is the age at which individuals from a given birth cohort first reached each of the four labor market states, conditional on reaching that state at all. We can measure age precisely as we know the year and month of birth; we randomly assign the day of birth in a given month. This allows us to calculate the individual age at a given first labor market involvement. To describe how these average entry age measures developed over subsequent birth cohorts, we present median ages; results are very similar when we apply the mean instead. **Table 1** offers descriptive statistics that indicate increasing ages at labor market entry across the four measures for our sample.

[12] As of 1999, the measurement of the individual employment status was changed in the data. At that point, ex post revisions were made for the years before 1999 to harmonize prior codings with the new measurement. This can affect our measurements of outcome Y1 but not the outcomes Y2-Y4 (Schmucker and vom Berge 2025, p. 53).

[13] It would have been interesting to additionally describe unemployment as a first labor market involvement. However, labor market entrants cannot claim unemployment benefits, and job seekers without benefit claims are not measured consistently over time. As a reliable long-run comparison is not possible, we do not cover this outcome in our analyses.

In **Table 2,** we present additional descriptive statistics for those individuals for whom we observe the first outcome, any employment (Y1), across all cohorts and for the first (1960) and last (1995) birth cohorts. Overall, the sample comprises about 48 percent females and 17.5 percent non-German citizens; the share of non-German citizens increased vastly from 5.8 to 31.2 percent between the first and last birth cohorts. The regional distribution reflects the larger number and size of birth cohorts observed for West Germany: East German states only joined the sample with the 1975 cohort, and East German observations account for 10.2 percent of the total. 6 percent of the sample observations reside in the three city-states (Bremen, Hamburg, Berlin). On average, 44 percent of our observations hold an upper secondary education (*Abitur* or *Fachabitur*) degree, of which the majority additionally holds a vocational degree; the expansion of secondary education is reflected in the declining share of observations without an upper secondary school degree: it dropped from 71.8 to 37.7 percent over 35 cohorts. Also, those without an upper secondary degree may hold vocational degrees. The share of tertiary degree holders is at 22.3 percent. This rather low share is related to measurement problems in the data.[14] The expansion of tertiary education is reflected in the declining share of observations without a tertiary degree: it dropped from 84.7 to 63.6 percent between our first and last birth cohort.

4. Results

4.1 Overall Trends and Robustness

Figure 7 presents the long-run trends in labor market entry; it describes the median age at which the birth cohorts 1960-1995 entered each of the four labor market states over time.[15] The overall trend in all four outcomes shows an increasing median age of entry. It increases by up to four years between

[14] The education information is provided by employers and is at times incomplete. We consider tertiary education if a tertiary degree is coded in the variable 'ausbildung' or 'ausbildung_imp' (Schmucker and vom Berge, 2025).

[15] **Figure A.1** in the appendix additionally shows the development for the more recent birth cohorts through birth cohort 2000. The vertical line at cohort 1995 indicates that observations born later (i.e., to the right) had not yet reached our cutoff age of 28 years. Mechanically, their median entry age is lower than that of individuals born earlier, because given the end of our observation window in 2023, we cannot observe them at an older age.

birth cohorts 1960 and 1995, and increases particularly for the most stable employment types. Specifically, the median entry ages developed as follows: Y1 from 16.8 to 18.8 (+2 years), Y2 from 18.8 to 22.0 (+3.2 years), Y3 from 18.8 to 22.3 (+3.5 years), and Y4 from 19.2 to 23.2 (+4 years). The Y2 and Y3 outcomes develop similarly. Over time, the share of initial part-time employment in all regular employment increased from 4.4 percent to 30.8 percent; however, the entry age development is very similar for full-time and part-time employment. While the outcomes for Y2-Y4 developed smoothly over time, we observe a substantial dip in the line for Y1 (employment) that affects birth cohorts in the early 1980s. This dip can be connected to the introduction of the Minijob status to the data in 1999: As Minijobs are popular with pupils and students, the newly introduced coding of this labor market status in the administrative data generated a drop in entry ages (see Section 2).[16] In Appendix **Figure A.2**, we show the original development of Y1 and the one that results after omitting Minijobs from the labor market states considered in outcome Y1. For the latter, the development clearly flattened. Considering the weak economic conditions faced by the cohorts of the mid 1960s and the late 1970s at their age of labor market entry, we expect delayed entry patterns for these groups (see Section 2). However, the long-run trends do not confirm such developments. Similarly, we would have expected reduced age at labor market entry for the birth cohorts of the early 1970s, which were relatively small in numbers. Again, **Figure 7** does not offer supporting evidence for such patterns. Instead, the median age at labor market entry appears to be robust to demographics and does not respond to differences in economic conditions.

Figure 7 employs a cutoff age of 28 and shows the median labor force entry age. To evaluate the robustness of the findings, **Figure A.3** presents the developments when age 25 or 30 is used as the cutoff age (**Figures A.3.1** and **A.3.2**) and when the mean is presented instead of the median (**Figure A.3.3**). In **Figures A.3.1** and **A.3.2,** we also adjust the youngest considered birth cohorts to 1998 and 1993 instead of 1995. Not surprisingly, the trends are similar to those in **Figure 7**. The median entry

[16] The majority of those born in 1995 start their first employment in a Minijob (33.2 percent). 13.1 percent enter the labor market in vocational training, and 10.5 percent in employment.

ages are lower when the admissible maximum is 25 and higher when it is 30. However, we still observe strong increases in entry ages over time. Comparing birth cohorts 1960 and 1995, the median age of reaching a first stable full-time employment increases by 3.04 years with the age 25 cutoff and by 3.76 years with the age 30 cutoff.

Comparing **Figures 7** and **A.3.3** confirms the robustness of our conclusions with respect to the choice of the median versus the mean value. While the overall trends are identical, the first entry age to the most general outcome (Y1, any employment) is higher when the mean is used. This relates to the relevance of outliers; while the median statistic is robust to outliers, they cause an upward bias for arithmetic means.

4.2 Heterogeneities and Distribution

Based on the potential mechanisms behind changes in the age of labor market entry as discussed in Section 2, this section describes relevant heterogeneities in labor market entry behavior. We inspect the patterns along the dimensions of gender, education, citizenship, as well as regional and sectoral differences. In addition, we briefly discuss the distribution of the age of entry.

The panels of **Figure 8** present the median age for different subgroups. In **Figure 8.1**, we find only small differences in the age at the first stable full-time employment between males and females; for the birth cohorts 1960 to 1980, females entered the labor market about 6 months earlier than males. Afterwards, the difference disappeared. This agrees well with our hypotheses on the impact of reforms of military and substitute service over time (see Section 2): we expect later labor market entry for men until the birth cohorts of the 1980s. Afterwards, the relevance of military and substitute service should decline and disappear which is what we observe. However, such patterns would also agree with hypotheses derived from changes in the gender education gap: while women in the earlier cohorts had lower educational attainment (e.g., less upper secondary school or tertiary education) than men, this has reversed since the 1980 cohort (Riphahn and Schwientek 2015).

Figure 8.2 presents the evidence on heterogeneities by educational attainment. Individuals without upper secondary education are the youngest group entering stable full-time employment (see bottom line). Among those with upper secondary degrees, those who completed a tertiary degree had median entry ages that exceeded the other two groups by 2 and 4 years, respectively (see top line). However, the trajectories over time are upward sloping for all three groups. The upward trend weakens among younger cohorts. This agrees with the age-reducing effects of the G8G9 reform, which we expect for cohorts born starting in the 1990s among individuals with upper secondary education (middle and top lines). Based on the reform of the BAföG support, we expect an increase in the duration of studies and delayed labor market entry for the birth cohorts of the early 1980s, which we observe in the top line of **Figure 8.2**. The flattened age at entry trend for the most recent birth cohorts also agrees with the expectations based on the introduction of tuition fees for tertiary education and the Bologna reform (see Section 2). These complementary mechanisms are particularly relevant for individuals with tertiary education (top line).

For individuals with upper secondary education (middle line), the median age of labor market entry among younger cohorts is about constant, while the age of labor market entry for the comparison group of individuals without upper secondary degrees (bottom line) continues to rise. This is consistent with the expected effects of reforms that reduced the duration of secondary education (e.g., G8G9 reforms). However, there is no evidence of a substantial decline in the median age of labor market entry; therefore, we do not observe a convergence in the age of entry across educational groups.

A separate perspective is offered by **Figure 8.3.1**, which splits the sample based on German citizenship. Unfortunately, the data do not inform about migration status. So, while certainly not all non-German individuals immigrated, non-German citizenship may approximate at least a migration background. We expect that due to immigration itself, actual immigrants enter the labor market at a later age than those who grow up in Germany. The modal age of immigrant arrival in Germany is 25 years (Statistisches Bundesamt, 2026a), which is already above the median age at labor market entry in the population. In line with this, we see that generally, individuals without German citizenship enter

stable full-time employment substantially later than Germans. Unfortunately, we cannot determine to what extent this age difference is affected by an advanced age at arrival in Germany.

For cohorts of German citizens whose labor market entry was affected by large refugee inflows in the mid-1980s and from the 2010s onward (i.e., cohorts born in the mid-1960s and late 1980s), we observe delayed labor market entry possibly due to labor supply shocks (see **Figure 8.3.1**). In addition to the general expectation that non-German citizens enter the labor market later, there might be differences within the group of non-German citizens (see Section 2). **Figure 8.3.2** examines this relationship by country of origin groups. It shows that individuals with citizenship from typical guest-worker countries (e.g., Turkey, Italy, Greece, Spain, Portugal) enter the labor market at a similar age as Germans. In contrast, individuals from conflict-affected (e.g., Yugoslavia, Syria, Afghanistan, Iraq, Iran, Lebanon, Palestinian territories) and other countries have substantially higher median ages at labor market entry.

Figure 8.4 allows a regional perspective on age at labor market entry. We differentiate individuals in East and West Germany and separately report on the population of the German federal states that are cities (Berlin, Bremen, Hamburg). As these city-states have higher cohort shares with upper secondary education degrees (KMK 2026), we expect to see the pattern of **Figure 8.2** repeated here. This is indeed the case, as the age at first stable full-time employment is at least one year higher in the city-states. Individuals from East Germany enter our sample with the birth cohort of 1975. Their entry age hardly differs from that of their West German peers. Given the heterogeneous macroeconomic situation and some institutional differences in the education system, this is somewhat surprising.[17]

Finally, **Figures 8.5** and **8.6** show the median age at entry to stable full-time employment by industry and occupation groups.[18] We find increasing entry ages across cohorts from 1960 to 1995 in

[17] We do not present alternative groups of federal states, e.g., based on economic indicators, because it is difficult to empirically identify the relevance of specific economic mechanisms such as unemployment or GDP growth. Instead, such regional groups would reflect a range of state-specific characteristics, rendering group differences difficult to interpret.

[18] Our data offered more than 200 industry and more than 100 occupation categories, which we combined further. Occupations are grouped based on their main tasks.

all groups, which indicates that the trend is not determined by single sectors of the economy. The heterogeneity between industries (e.g., the difference between Administration & Social Services and Crafts & Constructions) increases from approximately one year to two years between the 1960 and 1995 cohorts (see **Figure 8.5**). We find differences in the average entry age between the industrial and occupational groups, with Administration & Social Services showing the highest median entry age for all cohorts. These permanent level differences are consistent with the hypothesis that industries and occupations differ in their qualification requirements.

Overall, we find the rising age at labor market entry across birth cohorts confirmed for all subsamples. While the gender difference is slim, education and citizenship appear to be strongly correlated with the age of labor market entry, and the median entry ages differ across industries. In Section 5, we investigate the extent to which changes in sample composition can explain the aggregate developments.

The four panels of **Figure A.4** characterize the distribution of the age at entry to the four labor market states (Y1-Y4). Almost all percentiles of the age of entry development show a positive slope. The only exception is outcome Y1 (any employment) for which the bottom entries, i.e., the 10th and 25th percentiles, remained at a very young age over time; here the downward shift after birth cohort 1982 may be related to the consideration of Minijobs as a registered employment outcome after 1999 (see **Figure A.2**). Relatedly, across the four labor market outcomes, Y1 (any employment) has the widest range between the 10th and 90th percentile. For all outcomes, the bottom half of the distribution is less dispersed than the top half of the distribution; e.g. in **Figure A.4.4**, the distance in age at entry to stable full-time employment between the 10th and the 50th percentile is 2.4 (3.2) years, whereas the distance between the 50th and the 90th percentile is 4.9 (3.6) years for birth cohorts 1960 (and

1995). The longitudinal patterns are rather stable. Except for outcome Y1, the 90-10 distance did not change very much from the 1960 to the 1995 birth cohorts.[19]

5. Decomposition Analysis

5.1 Discussion

The vast increase in the age of labor market entry over time can be due to various mechanisms, such as composition effects or behavioral changes. In Section 4.2, we followed up on the synthesis at the end of Section 2 and investigated heterogeneities in the patterns of the labor market entry age across the dimensions of gender, education, citizenship, as well as regional and sectoral differences. In this section, we offer a decomposition analysis based on these characteristics and their changes over time. We study whether changes in the composition and characteristics of the German population between the 1960 and 1995 birth cohorts are connected to the aging of labor market entrants over time.

Education: As outlined above, the expansion of higher education, together with reforms that modified the duration of upper secondary schooling, may have increased the share of individuals attaining upper secondary and tertiary education. Given the substantial differences in labor market entry ages across educational attainment groups (see Section 4.2), the shares of individuals with upper secondary and tertiary education are included in the decomposition analysis. **Figure 9** depicts the development of the cohort share of individuals with upper secondary education and with tertiary education degrees. In our data, the share of individuals with upper secondary education degrees increased substantially from 28.0 to 52.3 percent for the birth cohorts 1960 to 1995. The share of individuals with tertiary degrees also increased from 15.1 to 28.3 percent between the 1960 and 1988 birth cohorts and then declined slightly. Unfortunately, our information on tertiary education is not precise; the share of observations with missing values on tertiary degrees increased in recent years from 0.3

[19] The four outcome-specific panels of **Figure A.4** show a surprising volatility of age at entry at the 90th percentile. We speculate that this may be related to particularly high youth unemployment which affected only selected birth cohorts at their labor market entry (see **Figure 2**). Alternatively, early east-west migration waves may have caused individuals of certain birth cohorts to enter the West German labor market at a relatively advanced age.

percent for the 1960s cohorts to 12.1 percent for the 1995 cohort. As the information on *not* having a tertiary degree follows aggregate statistics more plausibly (Autor:innengruppe Bildungsberichterstattung 2024), we will use this indicator in the decomposition analyses below.

Citizenship: **Figure 9** also shows the development of the share of non-German citizens in our data. Starting from 5.8 percent, the share rose to 31.2 percent for the 1995 cohort. The non-linear development parallels net immigration developments as described above (see **Figure 3**). Since a rising share of individuals with non-German citizenship may contribute to an increase in the age at labor market entry of the population, citizenship is included as an indicator in the decomposition analysis.

Structural change and earnings: As discussed in Section 2, structural changes in the economy over time (see **Figure 4**) may contribute to an increase in the average age at labor market entry. To investigate the relevance of these developments for the age of labor market entry, we include industry and occupation shares in the decomposition analysis.

In addition to these patterns, our data allow us to investigate the development of entry earnings, which we observe at an individual's first employment in each of our four outcomes.[20] Several mechanisms may affect the connection between entry earnings and entry ages. Clearly, longer human capital investments can increase both earnings and entry ages. In addition, labor market conditions such as high unemployment may reduce entry earnings and increase the age until stable employment can be found. We observe individual entry earnings in our data. To allow for long-run comparisons and account for shifts in currency and inflation, we normalize individual earnings by the annual average gross earnings of all individuals subject to social insurance contributions. These values are provided by the retirement insurance (e.g., DRV 2025).[21]

[20] For the period 1975-1983, the data provide observed earnings excluding bonus payments, for the period 1984-2012, bonus payments are included, and since 2013, both representations are available. We found that for our sample, the bonus payments hardly affect earnings. We use earnings information without bonus payments when available, and consider earnings information including bonus payments for the interim period.

[21] The average earnings data provide an adjustment factor for East German earnings, which we apply to determine the relevant average annual earnings separately for East and West German earnings.

Figure 10 presents the development of median relative entry earnings for our employment categories (Y1-Y4) over time.[22] A comparison of cohorts 1960 and 1995 yields increases in the median relative entry earnings: for the 1960 birth cohort, median initial earnings in the employment (Y1) status reached 21.8 percent of average earnings, while median initial earnings in stable full-time employment (Y4) account for 61 percent of average earnings. These shares increased between the 1960 and 1995 birth cohorts for all outcomes: median relative earnings increased by 9.5 percentage points (44.9 percent) for outcome Y1 and by 16.2 percentage points (21 percent) for outcome Y4. To describe the correlation between rising relative earnings and entry ages, we offer an additional decomposition exercise. It characterizes the hypothetical age at labor market entry that would result if the relative earnings position in each employment category had remained at the level observed for the 1960 cohorts, accounting for changes in the mean (but not the variance) of relative earnings over time.

5.2 Method

In our decomposition analysis, we examine how the age at labor-market entry would have changed between the 1960 and 1995 birth cohorts if the distribution of certain characteristics (X) had stayed as in the 1960 cohort. To construct this counterfactual, we use the reweighting approach introduced by DiNardo et al. (1996). The method begins by pooling individuals from both cohorts and estimating a probit model that predicts the probability of belonging to the 1960 cohort rather than the 1995 cohort. The predictors in this model are those characteristics X that we want to hold constant, e.g., educational attainment. Based on the estimated model, we predict for each individual i the probability of being part of the 1960 cohort, denoted $prob1960_i$. For individuals in the 1995 cohort, we then construct a weight $W_i = prob1960_i / (1-prob1960_i)$, which adjusts the 1995 distribution such that the distribution of characteristics X matches that of the 1960 cohort. Using these weights, we calculate the weighted

[22] We measure individual earnings at the daily level as observed in the year when the person first enters a given labor market status. Our denominator uses annual average gross earnings, which we divide by 365 days. The information is provided by the retirement insurance (Statistik der Deutschen Rentenversicherung 2025).

median age at labor-market entry for the 1995 cohort. This provides the 1995 cohort's median entry age that would obtain if its characteristics X (e.g., educational attainment) had been distributed just as for the 1960 cohort.

5.3 Results

Table 3 shows the results of our decomposition exercises. Panel 1 presents the observed median entry ages for the four labor market outcomes of birth cohorts 1960 and 1995 and their differences. The latter vary between 1.9 years for any employment (Y1) and 3.9 years for stable full-time employment (Y4).[23]

Panel 2 describes the explanatory power of three indicators, separately for the four labor market outcomes. First, we consider education indicators and hold the population share with upper secondary degrees (i.e., *Abitur* or *Fachabitur*) constant. We find that the simulated entry age for the 1995 birth cohort would decline for all labor market outcomes compared to the observed entry age, as shown in Panel 1. Holding secondary education constant, the cohort difference in entry ages declines from 1.9-3.9 to 1.8-3.3 (see column "Diff. sim."). Thus, we can explain between 5.7 and 16.4 percent of the total change in entry ages across cohorts based on upper secondary education (see column "Share explained"). Interestingly, the explanatory power of secondary schooling is largest for stable full-time employment. This suggests that an extended secondary education postpones labor market entry not only by the additional years of secondary schooling, but it may also induce additional educational investments. Second, we present the effect of tertiary education, which similarly explains

[23] Our interpretation of **Table 3** focuses on the median entry ages for the four labor market states of birth cohorts 1960 and 1995 and their difference. Appendix **Figure A.5** shows the full counterfactual development for each outcome and decomposition across all birth cohorts. Here, the weights were determined separately for each birth cohort. While the counterfactual developments do not offer constant explanatory power across all birth cohorts, the depictions show no surprising results. Almost all decompositions contribute to explaining the increase in the age of labor market entry. Only in Figures **A.5.4-6**, the development of occupations, industries, and relative daily wages for outcome Y1 would have generated an even larger increase in the median age of first employment (Y1) than actually resulted (as also seen in **Table 3**).

between 11.5 and 16.1 percent of the overall differences. It is surprising that the explanatory power of 'no tertiary education' is largest for the 'any employment' outcome (Y1).

Third, holding the share of the non-German population constant at the value for the 1960 birth cohort explains between 6.1 and 26.6 percent of the total change in entry ages over cohorts. The non-German population appears to be most relevant for the "any employment" outcome (Y1), which includes apprenticeship training and Minijobs. The surprisingly large association of the share of non-German citizens in the population with the age of entry to Y1 (explaining 26.6 percent of the overall difference) may be connected to foreigners' reduced propensity to pursue vocational degrees in Germany (Kroll and Uhly 2018) jointly with delayed labor market entry if immigration leads to an arrival at an advanced age. Overall, the combination of an increasing share of non-German citizens and expanded educational attainment over time accounts for at least one quarter of the increase in the labor market entry age (see column "All three constant").

Panel 3 accounts for the impact of occupation preferences and industry choices. We grouped occupations and industries into 21 and 23 consistent categories over time, respectively. We find that both categories separately explain about 10 percent of the overall change in age at entry differences.[24] When we add occupation and industry choices to the three indicators inspected in Panel 2, we can explain at least about one third of the overall change in employment entry age (see column "All five constant").

Panel 4 of **Table 3** shows that relative entry earnings do not explain rising entry ages for the Y1 outcome. However, they appear to account for about 9 percent of the increase in full-time (Y3) and stable full-time (Y4) labor market entry ages, which might be due to human capital investments. When we add entry earnings to the previous decomposition exercise and consider all six elements jointly, we find that entry earnings contribute additional explanatory power after accounting for the other

[24] The negative value for the Y1 outcome indicates that with constant occupation and industry choices, the age at labor market entry would be even higher (rather than lower) for the 1995 cohort. In this case, the characteristic does not contribute to the explanation of the difference.

indicators. Overall, our decomposition accounts for about forty percent of the entry age increase between birth cohorts 1960 and 1995 and leaves about sixty percent unexplained.

5.4 Potential Mechanisms behind Unexplained Developments

We can only speculate about the potential mechanisms behind the unexplained part of the increase in the median age of entry to the labor market. In addition to the mechanisms discussed so far, institutional changes over time (e.g., changes in the education system or the labor market) may have played a role in the (unexplained) increase in the age at labor market entry.

In our decomposition analysis, we account for educational expansion by holding the cohort shares attending upper secondary and tertiary education constant. However, this does not capture changes in the timing and sequencing of educational trajectories. We cannot investigate the effects of more diverse pathways to higher educational qualifications (Blossfeld et al., 2015) and whether they take longer to complete, for example, through alternative routes to higher educational qualifications,[25] interruptions between educational stages,[26] or more investment in additional skills.[27] Because our data do not provide consistent information on participation in voluntary work programs, internships, or the duration of education over the entire observation period, we were unable to account for these mechanisms. Consequently, we can only speculate that they may have contributed to the unexplained increase in the age at labor market entry.

Our decomposition analysis showed that shifts across industries and occupations contributed to the increase in the age at labor market entry. However, we were unable to account for changes in skill requirements within industries and occupations resulting from technological change, automation,

[25] The opportunities for acquiring eligibility for higher education have been expanded over time (e.g., Berufsoberschule, Meister; see Kultusministerkonferenz, 2026).

[26] Jacob and Weiss (2010) find that more than one-third of their sample re-enter education after an interruption. The transition to two-step university programs (Bologna reform) may have created additional opportunities for gap years between educational stages.

[27] Additional signals might have gained importance over time (Bone et al., 2025; OECD, 2025), potentially reflecting increased competition at labor market entry due to the growing supply of high-skilled labor (Goehausen and Thomsen, 2024). As a result, young people may spend more time acquiring international and work experience before entering the labor market.

and robotization. Previous research has shown that the tasks associated with the same occupation have changed over time and that some occupations now require higher or different qualifications than in the past (Autor et al. 2003). For example, the occupation of midwives, which was traditionally based on vocational training, now requires a tertiary academic degree in Germany (Bundesministerium für Gesundheit 2025). If and to what extent these developments contribute to the unexplained component of the increase in the age at labor market entry cannot be assessed with our methodological approach and the available data.

Furthermore, the age of the twenties is a period of orientation and identity-formation (Arnett 2000). However, we were unable to account for behavioral changes associated with this period of orientation, as our data do not contain information on educational pathways for individuals. We therefore cannot examine if educational trajectories have become more individualized over time (e.g., more changes of study programs or transitions from higher education to vocational training and vice versa) or if school-to-work transitions are more often postponed to allow for personal development. At the same time, the pressure to enter the labor market early may have declined due to greater social acceptance of prolonged transitions and the availability of alternative financial resources, including increased parental support (Manzoni 2015), expanded social benefits (e.g., increased amounts of student support (BAFöG)); see Statistisches Bundesamt 2021), support for international mobility (e.g., easier access through Erasmus+; see European Commission 2013), the introduction of the minimum wage (Ahlfeldt et al. 2018), and employment opportunities such as student assistant positions or Minijobs.[28] These developments may account for part of the unexplained increase in the age at labor market entry. As our data do not allow us to analyze these aspects, further research is needed to identify the full range of mechanisms underlying the increase in the age at labor market entry.

6. Selection into employment

[28] Eurostat (2026) shows that a high share of young people in Germany combine formal education with employment.

So far, we studied the age at labor market entry for those individuals who entered the labor market with different employment statuses (Y1-Y4). By conditioning the analysis on labor market entry, we neglect one dimension of potential behavioral changes over time, i.e., the share of individuals who we do not observe entering the labor market. If the extensive margin of labor force participation changed over time, this may add to the developments described so far.

We can inspect the change in labor force participation based on **Figure 11,** which describes the time trend in the share of observations that are observed in the data in employment (Y1) and reach the labor market states of regular employment (Y2), full-time regular employment (Y3), or stable full-time employment (Y4) by age 28.[29] For the 1960 birth cohort, about 96 percent of those observed in employment (Y1) reached full-time employment (Y3) and less than 90 percent reached stable full-time employment (Y4) before reaching age 28. Importantly, the share of young adults reaching regular and stable employment by age 28 declined substantially over subsequent cohorts: the share reaching stable full-time employment (Y4) by age 28 dropped to below 60 percent for the 1995 cohort. Similarly, the share of individuals reaching full-time employment (Y3) after entering employment (Y1) fell from about 96 percent for the 1960 birth cohort to about 75 percent for the 1995 birth cohort.

This declining participation rate adds to the development of the age at labor market entry studied so far. To estimate an upper bound of this effect on median entry ages, we modified the presentation used in **Figure 7**, which describes the median age of labor market entry conditional on entering each employment status: in **Figure 12**, we consider all individuals who reach at least the initial employment status (Y1) by age 28; for those who do not enter the labor market in Y2-Y4 by age 28 we assume a labor market entry age of 28, i.e., we newly add them to the sample with a high entry age. This adjusts for changes in the selection into the labor market and mechanically raises the median entry age. The procedure may generate an overestimation of the entry age effect because not everybody who is observed in Y1 will eventually enter the other labor market statuses. Therefore, we consider the result as an upper bound of the entry age effect of reduced labor force participation over

[29] **Figure 11** presents the developments conditional on reaching Y1.

time. The development of the age at labor market entry, as presented in **Figure 12**, is even steeper than that in **Figure 7**. The difference between birth cohorts increases from between 1.9 (Y1) and 3.9 (Y4) years, as in **Figure 7,** to between 1.9 (Y1) and 6.9 (Y4) years in **Figure 12**. Thus, our analysis so far, which conditioned on labor market entry, was a conservative estimate of the actual increase in the median age at entry.

Table 4 presents a decomposition analysis of the median age increase for the sample used in **Figure 12**. As some of these observations are not in regular or full-time employment, we cannot use information on occupation, industry, and relative entry earnings. However, the results for education and non-German citizenship variables are very similar to those for the sample studied in **Table 3**: education expansion and non-German citizen share account for at least one quarter of the observed increase in median age at entry, which confirms prior results.

7. Conclusions

Demographic developments in aging societies cause labor shortages. Typical policy measures addressing these issues increase labor supply through immigration, activate those out of the labor force, increase the hours worked of part-time employees, or postpone retirement. In this study, we focus on an aspect that has been neglected in most of the literature, so far, i.e., the labor market entry age of young workers.

We exploit long-running administrative data to compare labor market entry behavior over almost four decades. We define four indicators of labor market activity and describe median entry ages for the birth cohorts 1960 to 2000. We find that the median entry age to the labor market increased strongly for labor market entrants, for some outcomes by almost four years, for these birth cohorts. These findings are robust to alternative measurement choices. We find hardly any gender or East-West differences, but substantial differences by educational attainment and citizenship. In a decomposition analysis, we show that the rising share of individuals with foreign citizenship and the education expansion can explain more than one quarter of the total increase in the labor market entry age. Also,

occupational choice, industry of employment, and the rise in relative entry-level earnings are associated with delayed labor market entry.

Conditional on employment, the median age at which individuals first work in stable full-time jobs increased from 19 to 23, i.e., by four years between the 1960 and 1995 birth cohorts. If average workers face a labor market career of 45 years, this amounts to almost 10 percent of their potential labor supply. As a consequence of delayed labor market entry, the number of young, innovative, physically and technologically strong and productive employees in the labor force declines. The magnitude and activity level of the labor force are of central importance for aggregate economic output (Isaak et al. 2026). Given demographically induced labor shortages, it seems worthwhile to direct additional policy attention to processes affecting labor market entry and the attractiveness of employment for young workers. It is for future research to investigate whether institutional reforms can reduce labor market entry ages.

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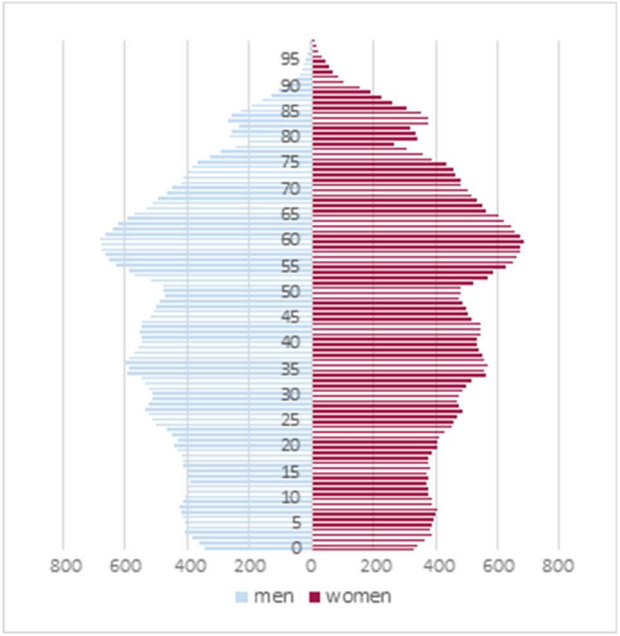
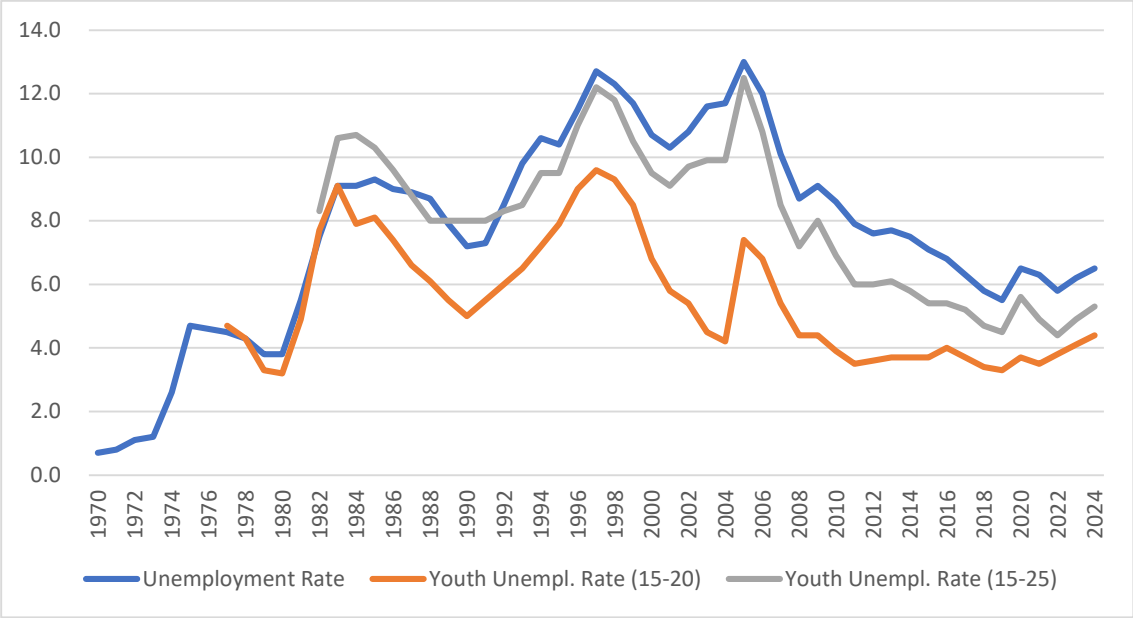
Figure 1 Population in Germany as of 2024



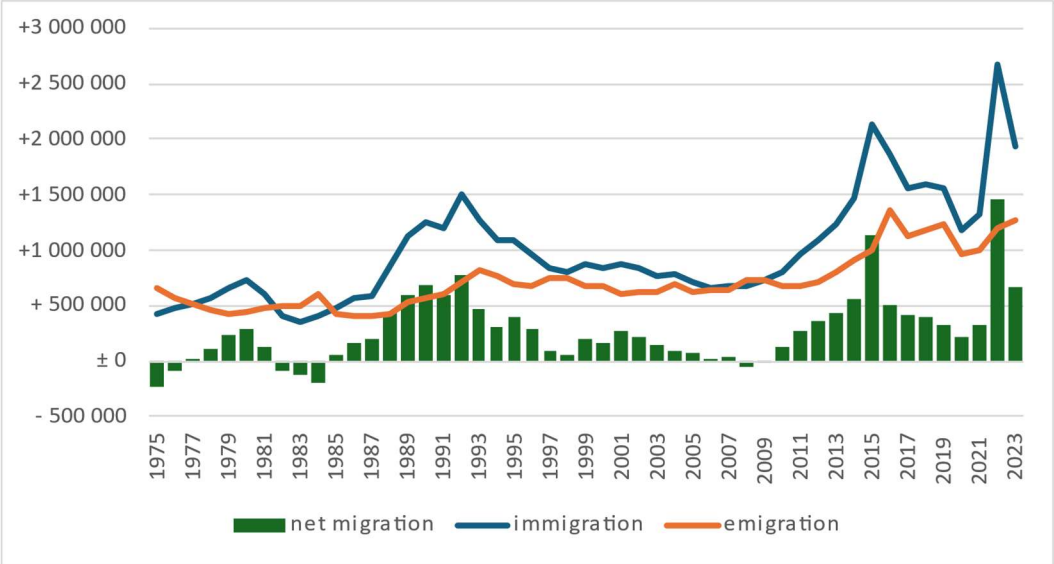
Note: The blue area on the left indicates the number of males, and the red area on the right indicates the number of females at each age in 2024. The numbers in the middle indicate the relevant ages. The x-axis shows the number of individuals in each age year to the left for men and to the right for women (in thousands).
Source: Statistisches Bundesamt (2026c), Bevölkerungspyramide, own illustration.

Figure 2 Overall and Youth Unemployment Rate (1970-2024) over time



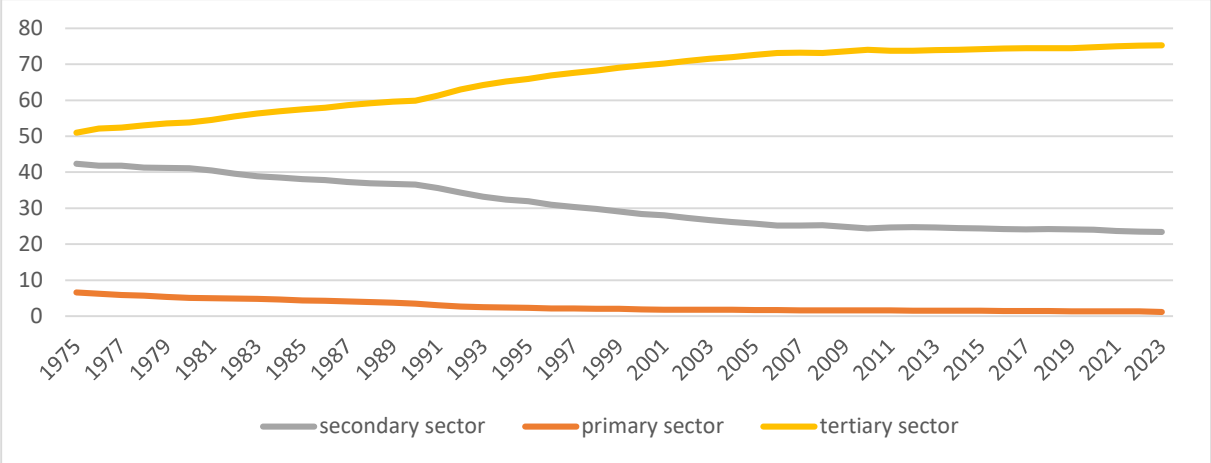
Note: The entries for 1970-1990 represent only West Germany. Starting 1991, West plus East Germany are presented jointly. The rates are calculated as the number of the registered unemployed relative to the dependent civil labor force (abhängige, zivile Erwerbspersonen).
Source: BA (2025) Statistik der Bundesagentur für Arbeit, Arbeitslosigkeit im Zeitverlauf.

Figure 3 Development of international migration over time



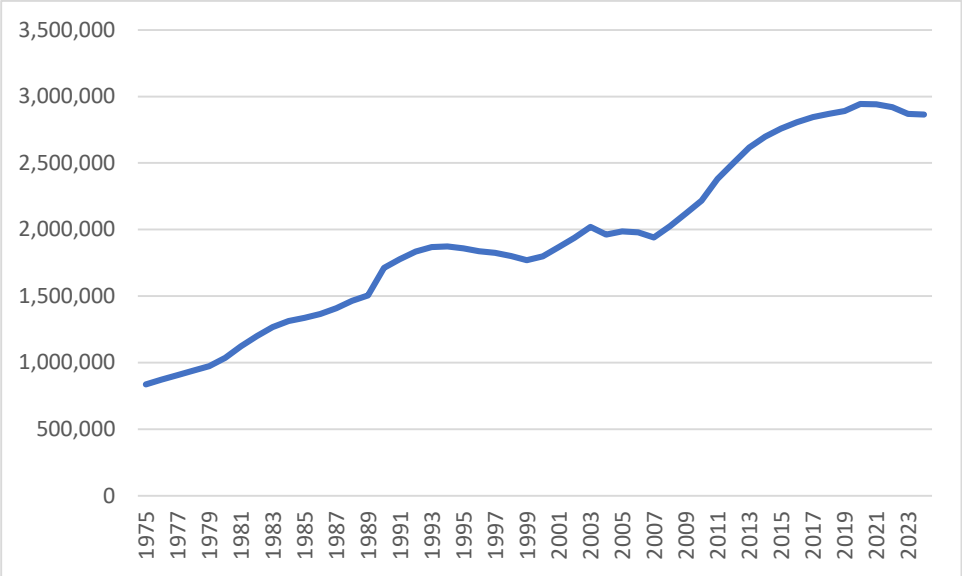
Source: Statistisches Bundesamt (2025a), Statistischer Bericht, own illustration.

Figure 4 Development of employment shares by sector over time



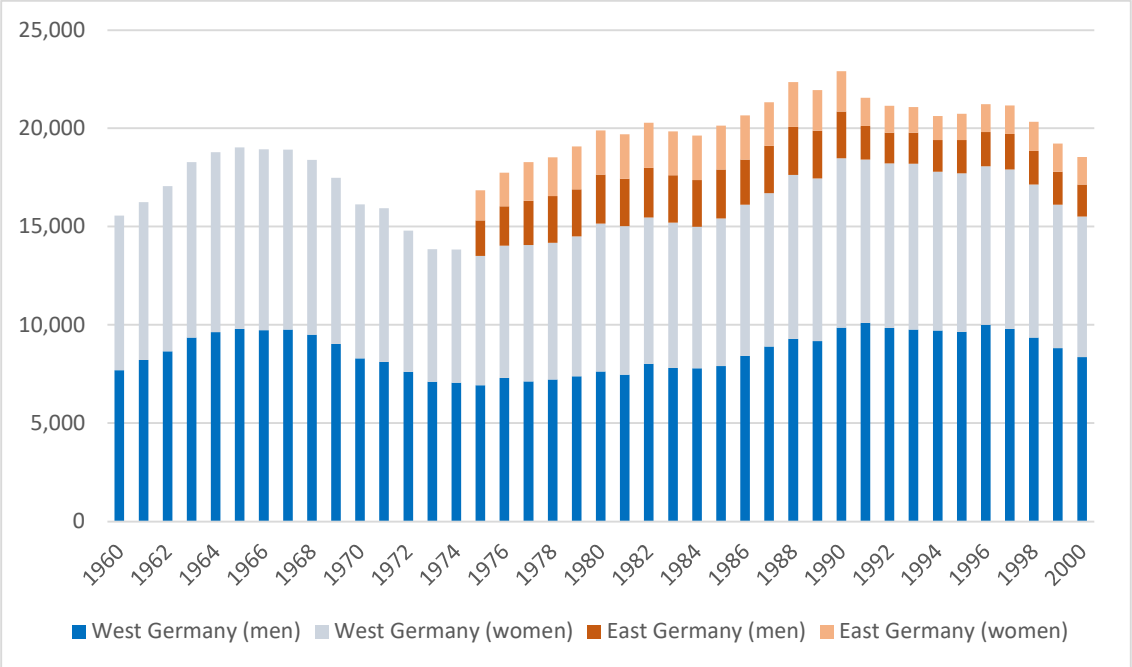
Source: Statistisches Bundesamt (2026b), Statistischer Bericht, own illustration.

Figure 5 Development of the number of enrolled students over time



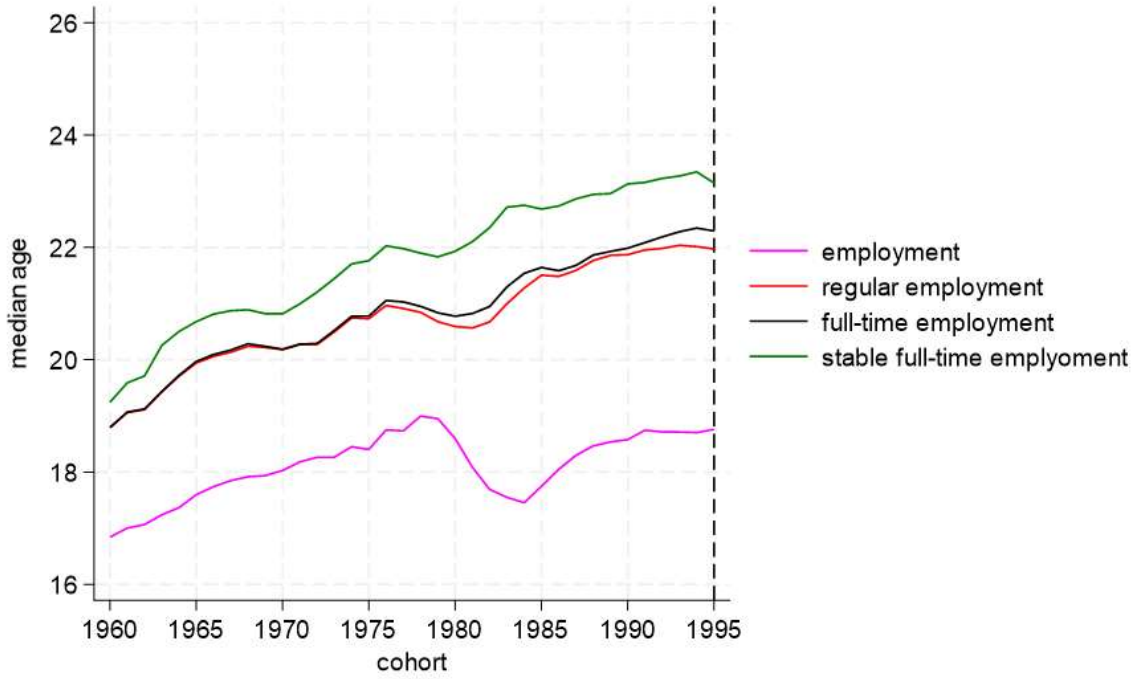
Source: Statistisches Bundesamt (2025b), Statistischer Bericht, own illustration.

Figure 6 Number of observations by birth cohort, gender, and region of origin



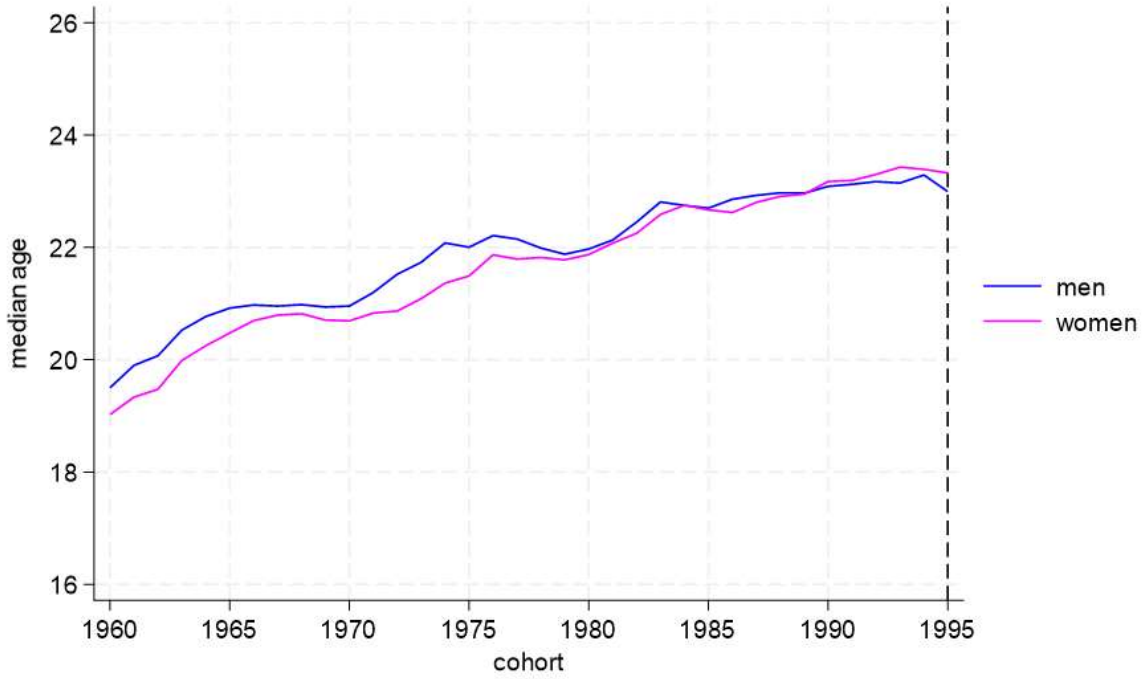
Source: SIAB (1975-2023) and own calculations.

Figure 7 Age at First Labor Market Entry – Birth Cohorts 1960-1995 (Median)



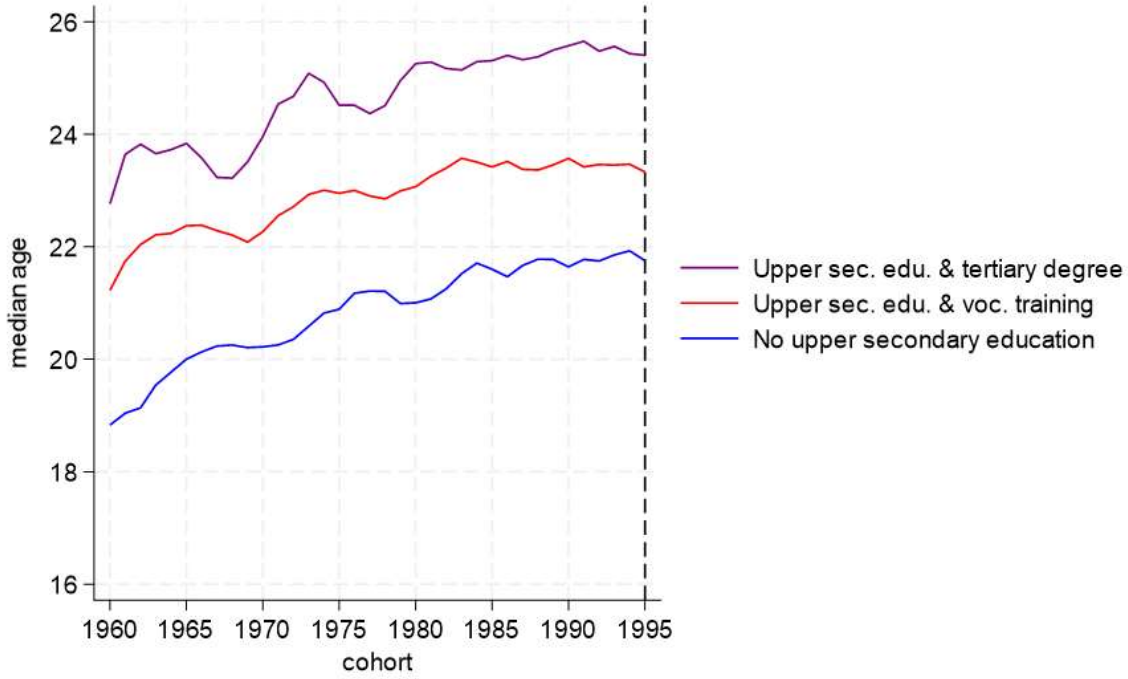
Source: SIAB (1975-2023) and own calculations.

Figure 8.1 Heterogeneity of Age at First Stable Full-Time Employment by Gender



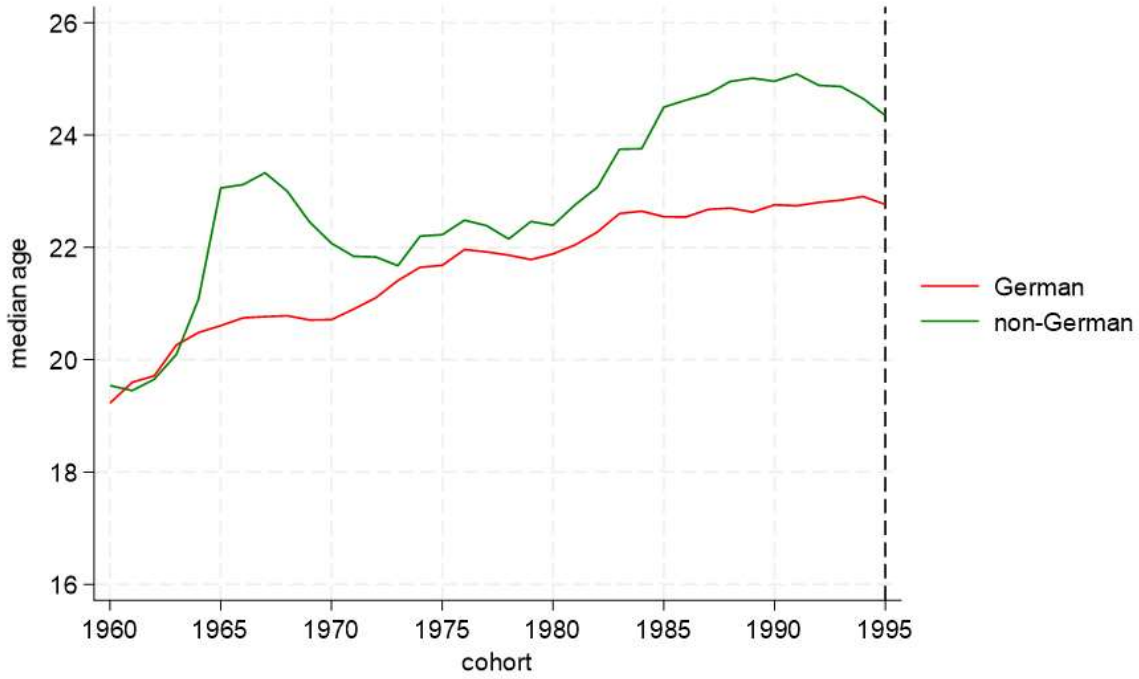
Source: SIAB (1975-2023) and own calculations.

Figure 8.2 Heterogeneity of Age at First Stable Full-Time Employment by Education



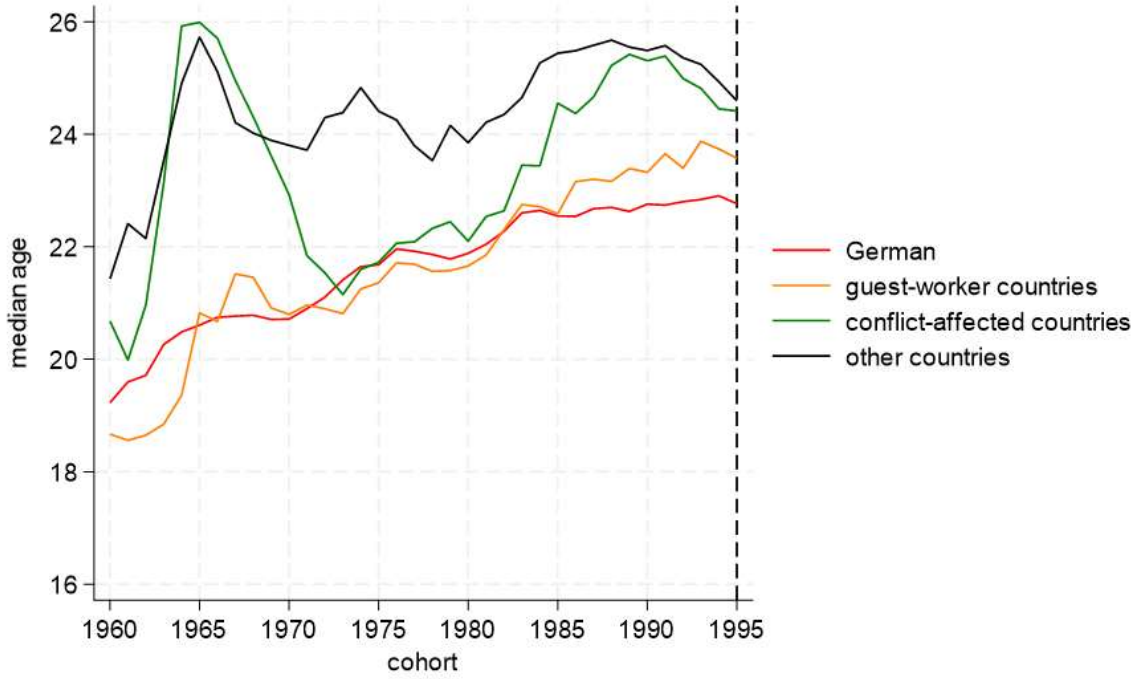
Source: SIAB (1975-2023) and own calculations.

Figure 8.3.1 Heterogeneity of Age at First Stable Full-Time Employment by Citizenship



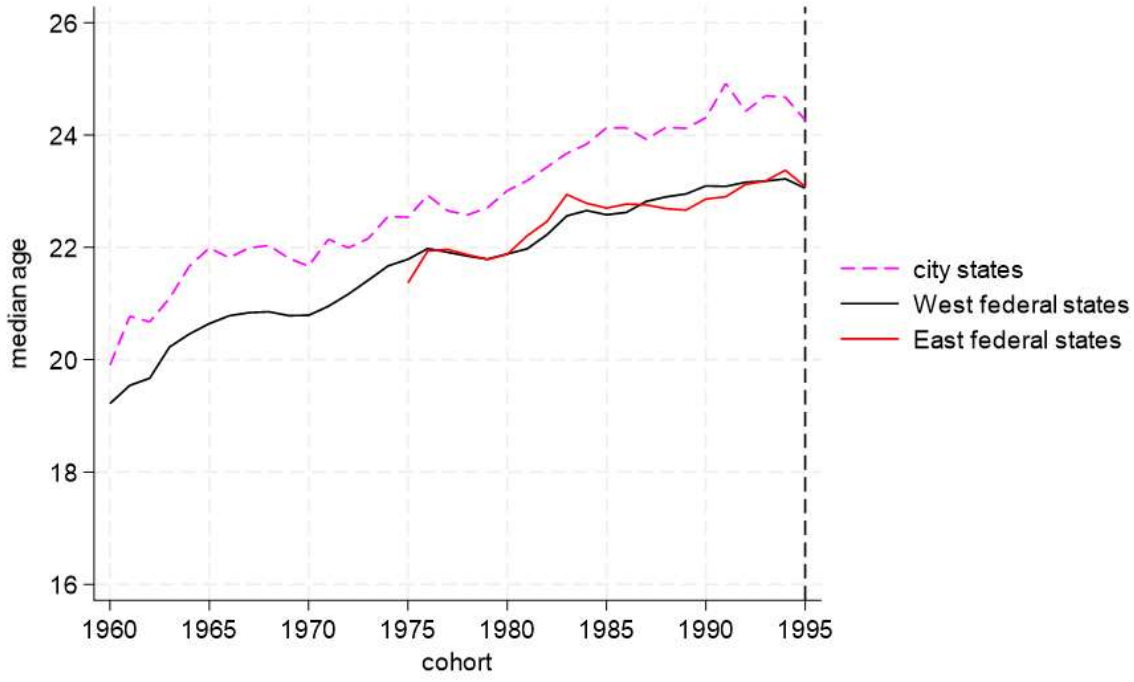
Source: SIAB (1975-2023) and own calculations.

Figure 8.3.2 Heterogeneity of Age at First Stable Full-Time Employment by Citizenship Group



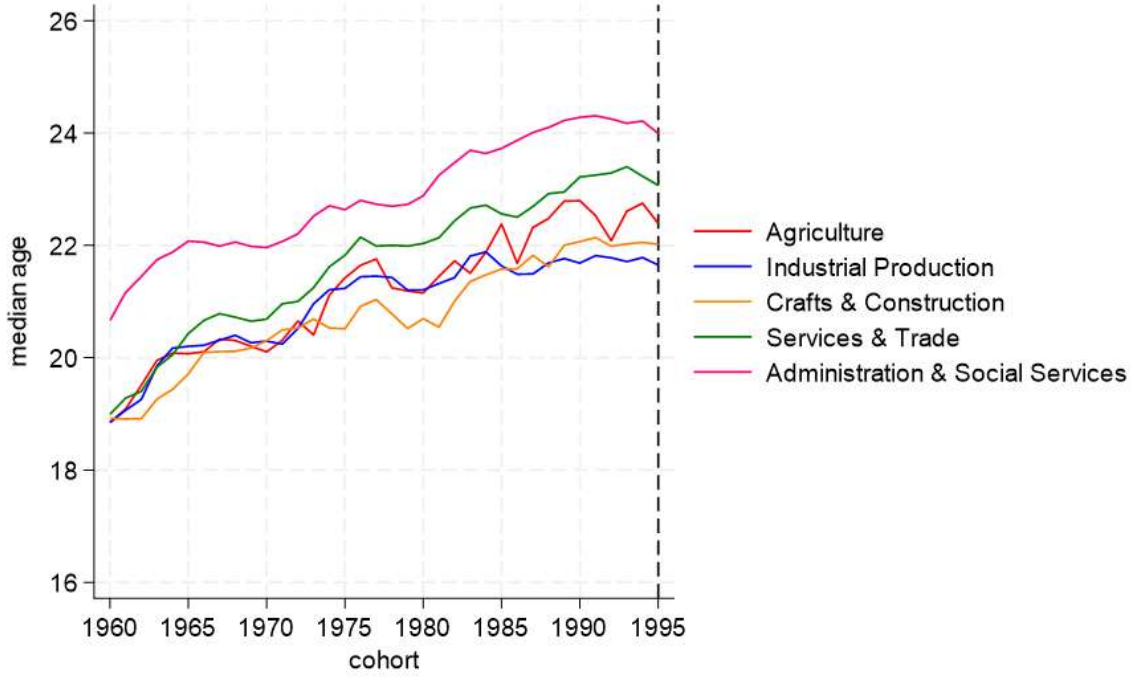
Source: SIAB (1975-2023) and own calculations

Figure 8.4 Heterogeneity of Age at First Stable Full-Time Employment by Region



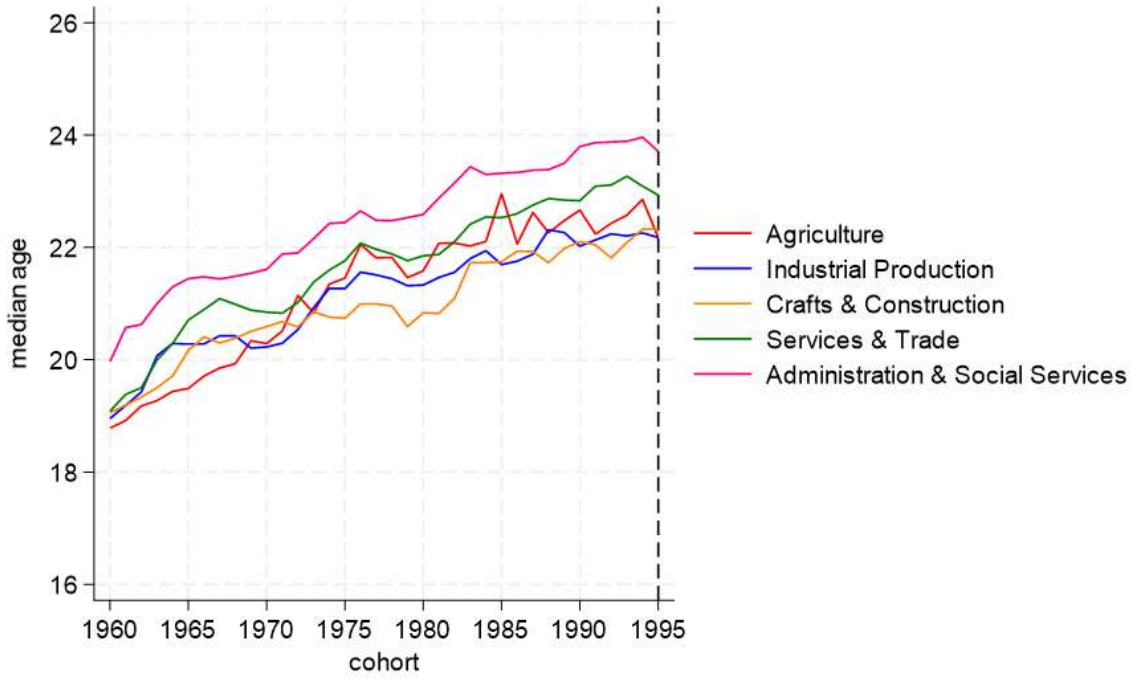
Note: Observations from Berlin enter the sample starting with the 1975 cohort.
Source: SIAB (1975-2023) and own calculations.

Figure 8.5 Heterogeneity of Age at First Stable Full-Time Employment by Industry Group



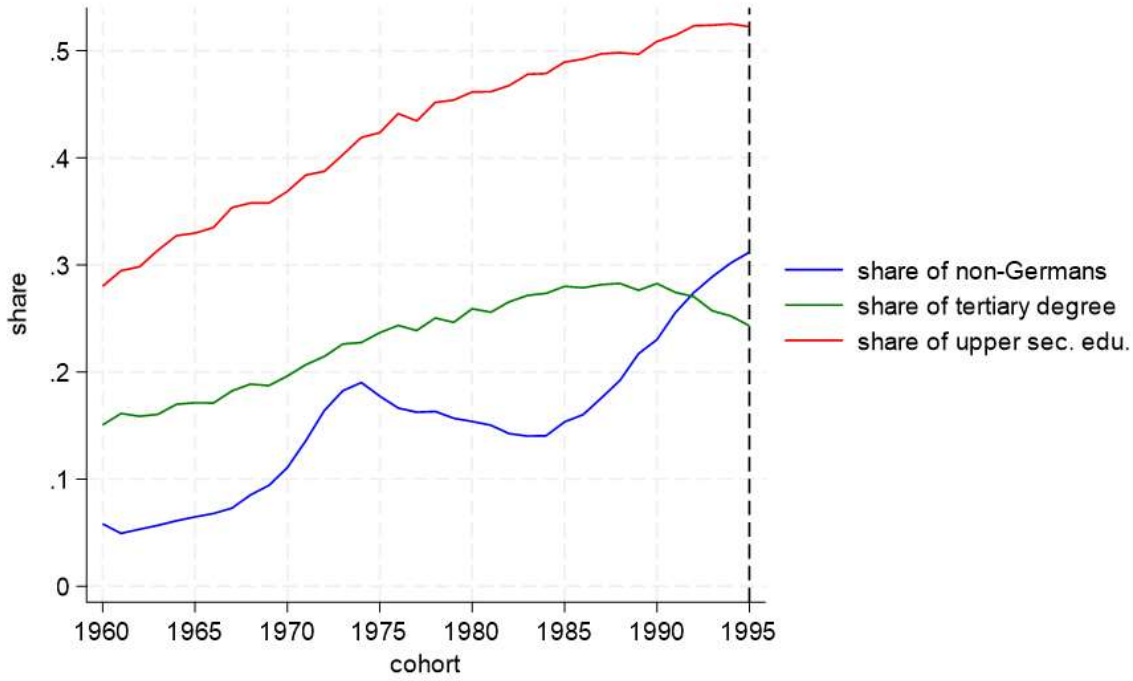
Source: SIAB (1975-2023) and own calculations.

Figure 8.6 Heterogeneity of Age at First Stable Full-Time Employment by Occupation Group



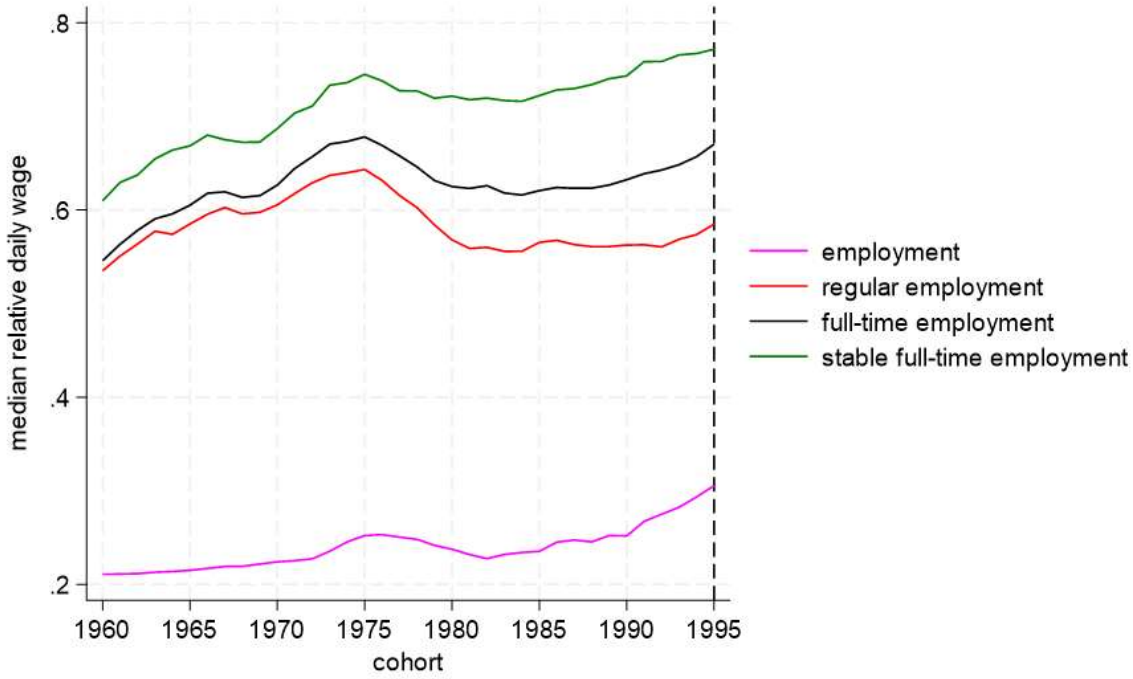
Source: SIAB (1975-2023) and own calculations.

Figure 9 Selected Cohort Shares (Non-German, With Upper Sec. and Tertiary Degrees)



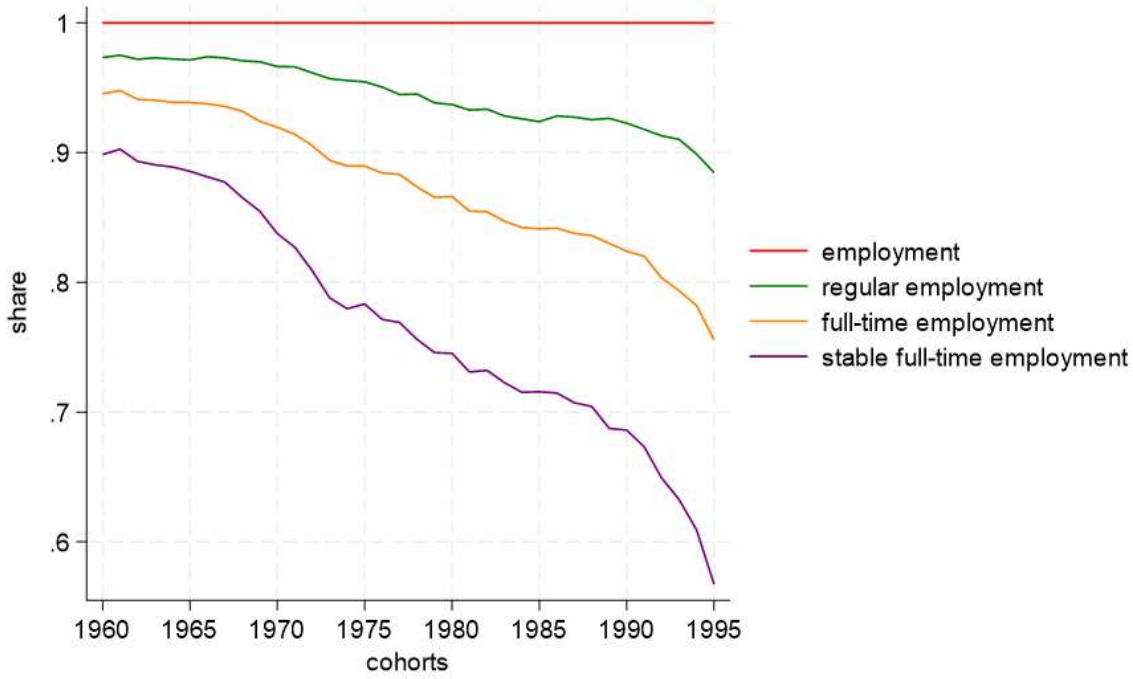
Source: SIAB (1975-2023) and own calculations.

Figure 10 Development of Median Initial Earnings Relative to Aggregate Average



Source: SIAB (1975-2023) and own calculations.

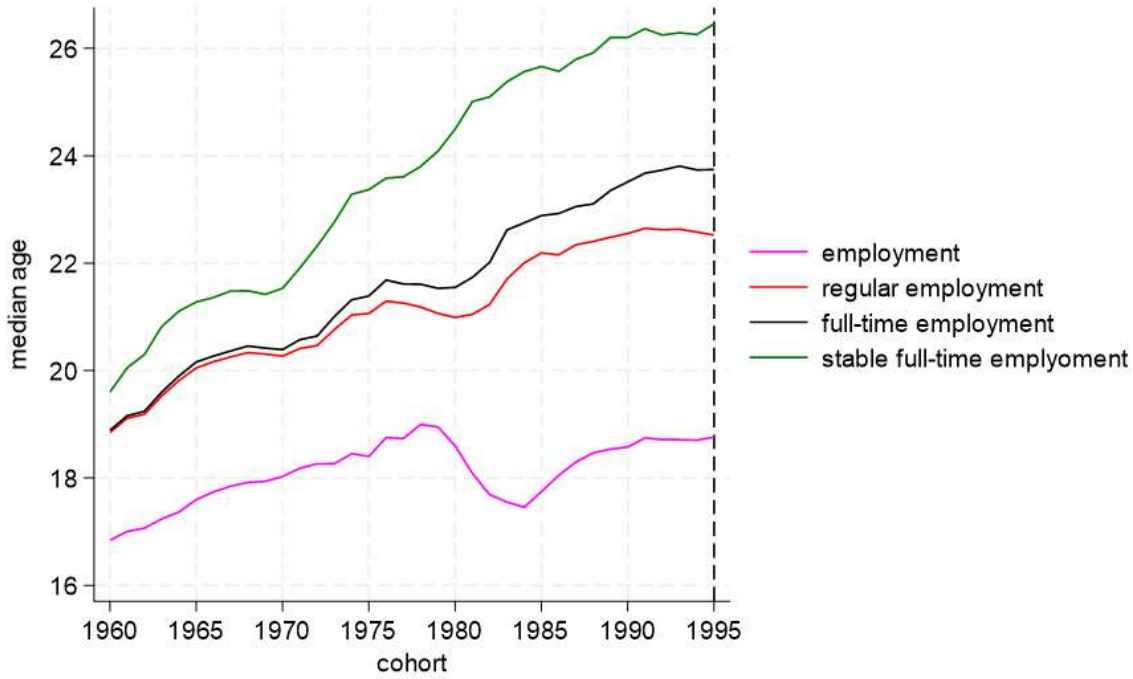
Figure 11 Share of Individuals Reaching Advanced Labor Market Statuses



Source: SIAB (1975-2023) and own calculations.

Figure 12 Age at First Labor Market Entry – Birth Cohorts 1960-1995 (Median)

including missing observations



Source: SIAB (1975-2023) and own calculations.

Table 1 Descriptive Statistics: Age at Reaching a Labor Market Status

	Median	Mean	SD	N
Age (Y1)	18.16	19.04	3.12	777,858
Age (Y2)	20.79	21.33	2.78	696,089
Age (Y3)	20.88	21.39	2.78	636,390
Age (Y4)	21.76	22.09	2.79	525,683

Source: SIAB (1975-2023) and own calculations.

Table 2 Descriptive Statistics: Further Characteristics

Characteristic	Share Total	Share 1960	Share 1995
Female	47.6%	50.6%	45.3%
Non-German citizenship	17.5%	5.8%	31.2%
Regional distribution			
West German state	83.8%	96.7%	10.1%
East German state	10.2%	-	82.3%
City state (Bremen, Hamburg, Berlin)	5.9%	3.3%	7.6%
Secondary education			
Information missing	4.1%	0.2%	10.1%
No upper secondary education	51.8%	71.8%	37.7%
Upper secondary education & no vocational training	15.7%	3.8%	29.5%
Upper secondary education & vocational training	28.4%	24.2%	22.7%
Tertiary education			
Information missing	4.8%	0.3%	12.1%
No tertiary degree	72.9%	84.7%	63.6%
Tertiary degree	22.3%	15.1%	24.3%

Note: The table describes the sample of N=777,858 observations that is available for the first outcome Y1 in column one and N=15,560 and N=20,035 for the birth cohorts 1960 and 1995, respectively.

Source: SIAB (1975-2023) and own calculations.

Table 3 Decomposition Results

Panel 1	Observed entry age		
	1960	1995	Diff.
Y1 - any employment	16.8	18.8	1.9
Y2 - regular employm.	18.8	22.0	3.2
Y3 - full-time employm.	18.8	22.3	3.5
Y4 - stable full-time emp.	19.2	23.1	3.9

Panel 2	1 Constant share upper sec. degree			2 Constant share no tertiary educ.			3 Constant share non-German			All three constant		
	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained
Y1 - any employment	18.7	1.8	5.7%	18.5	1.6	16.1%	18.3	1.4	26.6%	17.9	1.0	46.9%
Y2 - regular employm.	21.6	2.8	12.3%	21.6	2.8	12.3%	21.7	2.9	9.4%	21.1	2.3	28.9%
Y3 - full-time employm.	21.8	3.0	13.1%	21.9	3.1	11.4%	22.0	3.2	9.1%	21.3	2.5	28.9%
Y4 - stable full-time emp.	22.5	3.3	15.3%	22.7	3.5	10.4%	22.9	3.7	4.9%	22.1	2.8	26.4%

Panel 3	4 Constant share occupation			5 Constant share industry			All five constant		
	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained
Y1 - any employment	19.0	2.1	-10.4%	18.8	2.0	-3.1%	17.9	1.0	45.8%
Y2 - regular employm.	21.6	2.8	11.3%	21.6	2.8	11.3%	20.9	2.1	34.6%
Y3 - full-time employm.	21.9	3.1	11.7%	21.9	3.1	10.3%	21.1	2.3	34.6%
Y4 - stable full-time emp.	22.7	3.5	10.1%	22.9	3.6	6.5%	21.9	2.6	31.9%

Panel 4	6 Constant share relative daily wage			All six constant		
	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained
Y1 - any employment	19.2	2.3	-20.8%	17.8	1.0	49.5%
Y2 - regular employm.	21.9	3.1	3.5%	20.6	1.9	41.8%
Y3 - full-time employm.	22.0	3.2	9.1%	20.8	2.0	43.1%
Y4 - stable full-time emp.	22.8	3.6	7.5%	21.7	2.5	35.5%

Note: "sim." stands for simulated values, which result from the decomposition analysis.
Source: SIAB (1975-2023) and own calculations.

Table 4 Decomposition Results – Unconditional Analysis

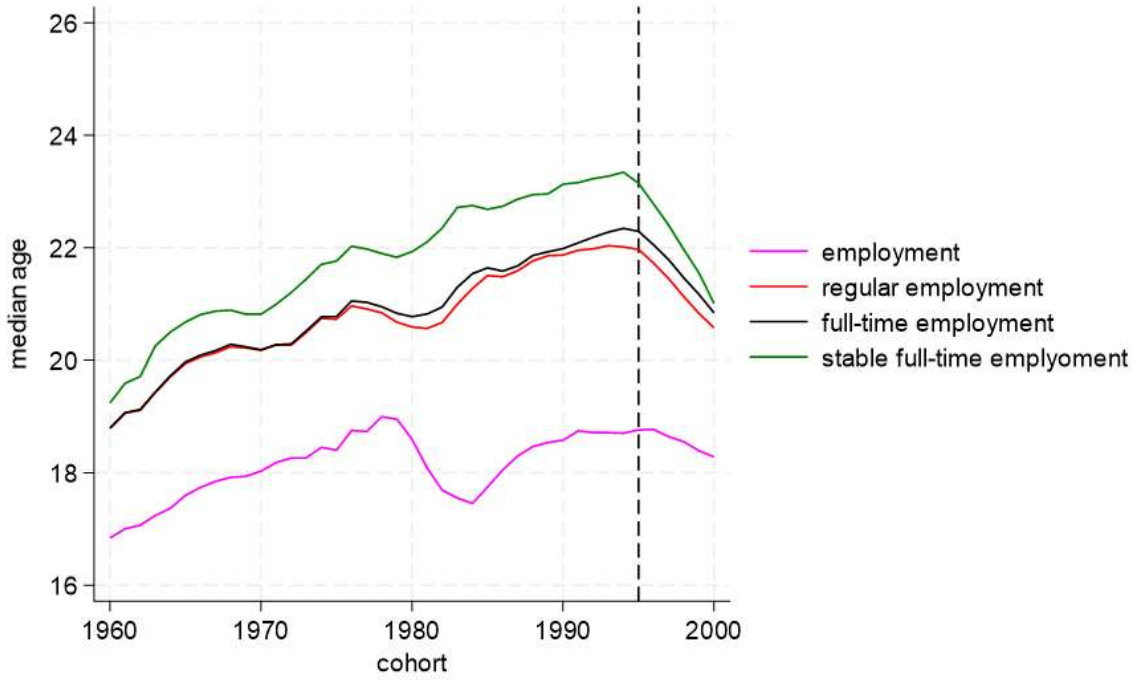
Panel 1	Observed entry age		
	1960	1995	Diff.
Y1 - any employment	16.8	18.8	1.9
Y2 - regular employm.	18.9	22.5	3.7
Y3 - full-time employm.	18.9	23.8	4.9
Y4 - stable full-time emp.	19.6	26.5	6.9

Panel 2	1 Constant share upper sec. degree			2 Constant share no tertiary educ.			3 Constant share non-German			All three constant		
	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained	1995 sim.	Diff. sim.	Share explained
Y1 - any employment	18.7	1.8	5.7%	18.5	1.6	16.1%	18.3	1.4	26.6%	17.9	1.0	46.9%
Y2 - regular employm.	22.1	3.3	10.9%	22.0	3.2	13.4%	22.2	3.3	9.8%	21.5	2.6	28.6%
Y3 - full-time employm.	23.2	4.3	10.7%	23.1	4.2	13.4%	23.3	4.4	9.5%	22.3	3.4	29.6%
Y4 - stable full-time emp.	26.2	6.6	4.2%	25.6	6.0	13.0%	25.8	6.2	9.6%	24.5	4.9	29.3%

Note: "sim." stands for simulated values, which result from the decomposition analysis.
Source: SIAB (1975-2023) and own calculations.

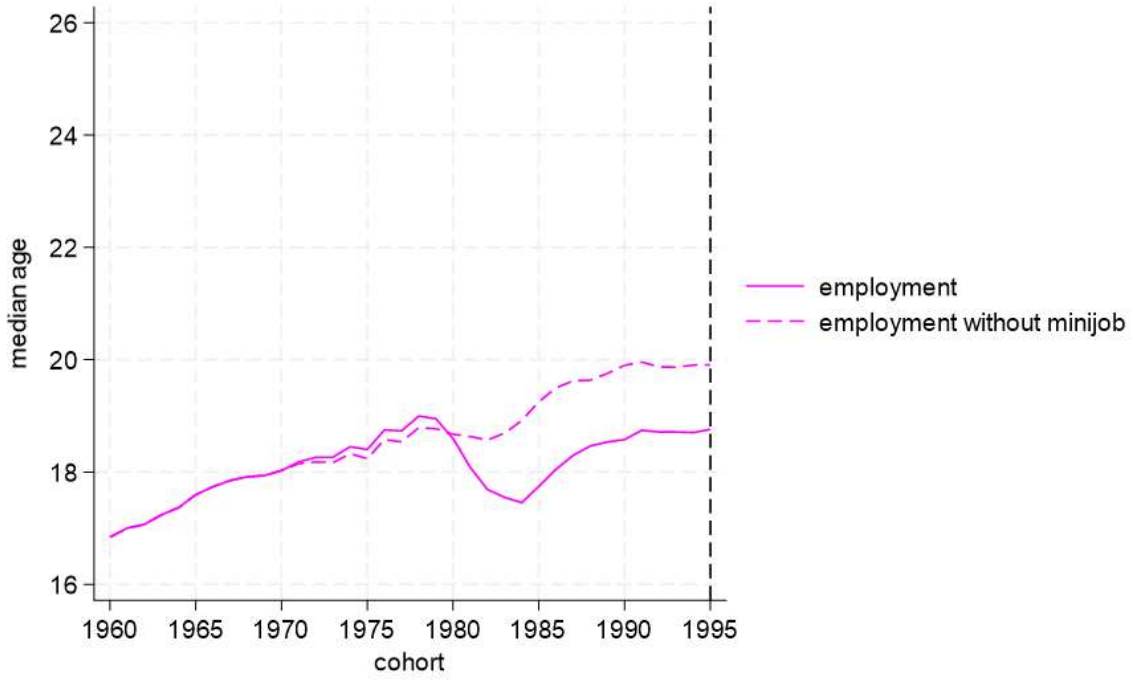
Appendix

Figure A.1 Age at First Labor Market Entry – Birth Cohorts 1960-2000 (Median)



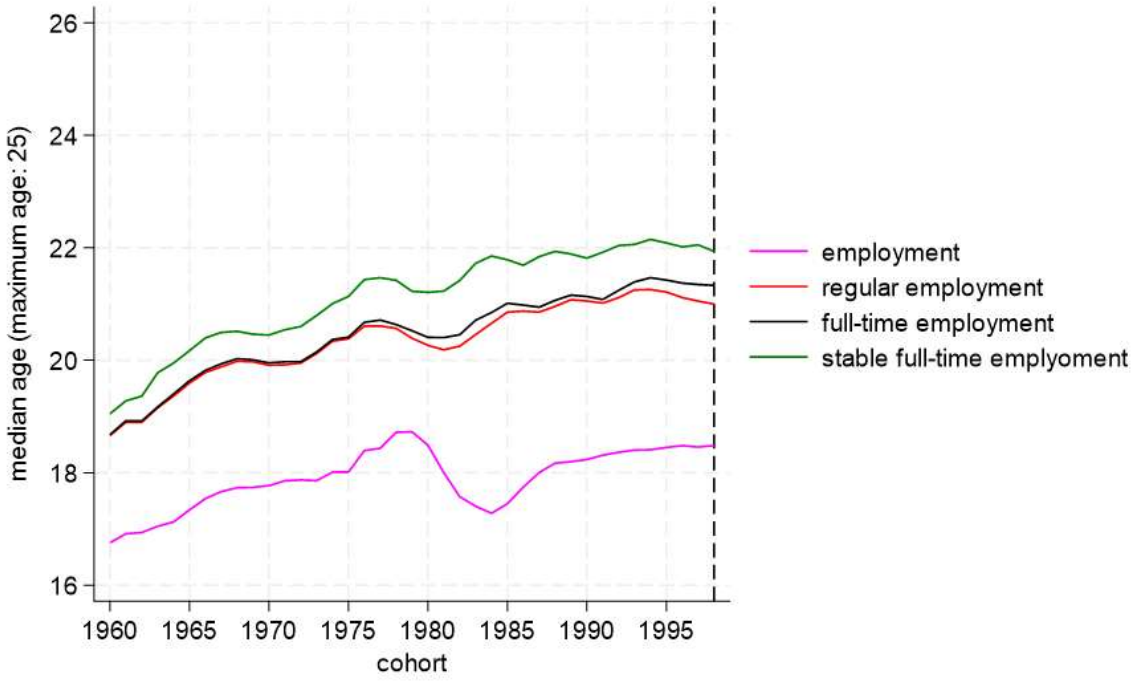
Source: SIAB (1975-2023) and own calculations.

Figure A.2 Age at First Labor Market Entry – Y1 Outcome with and without Minijobs



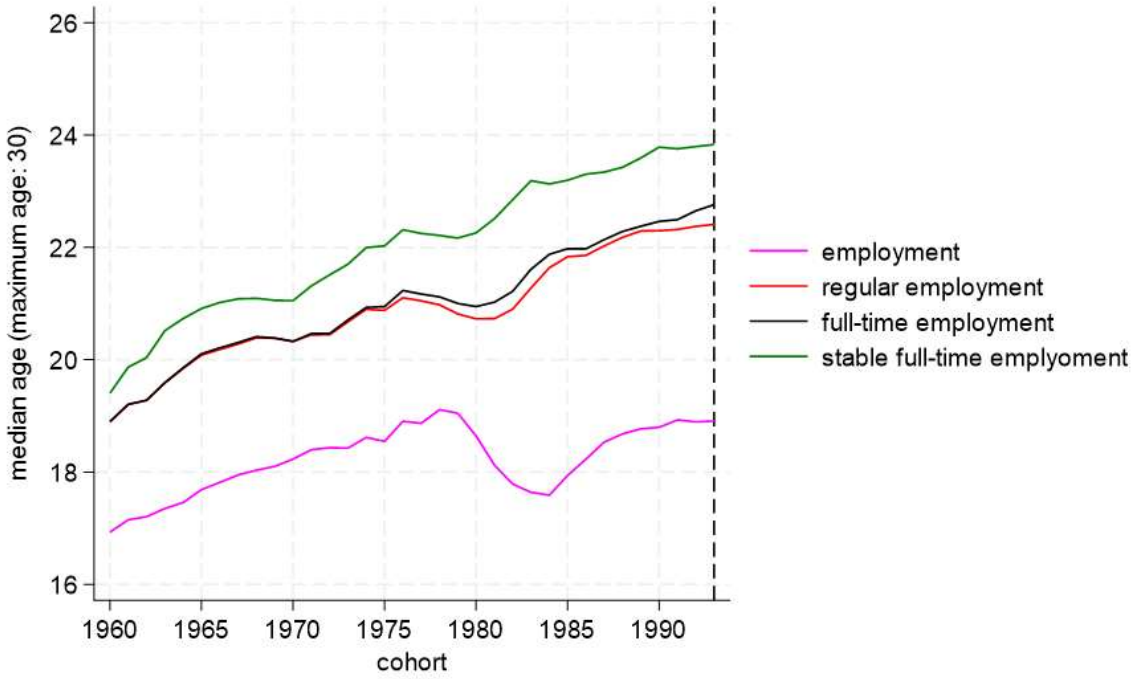
Source: SIAB (1975-2023) and own calculations.

Figure A.3.1 Robustness of Age at First Labor Market Entry – Cutoff Age 25 (Median)



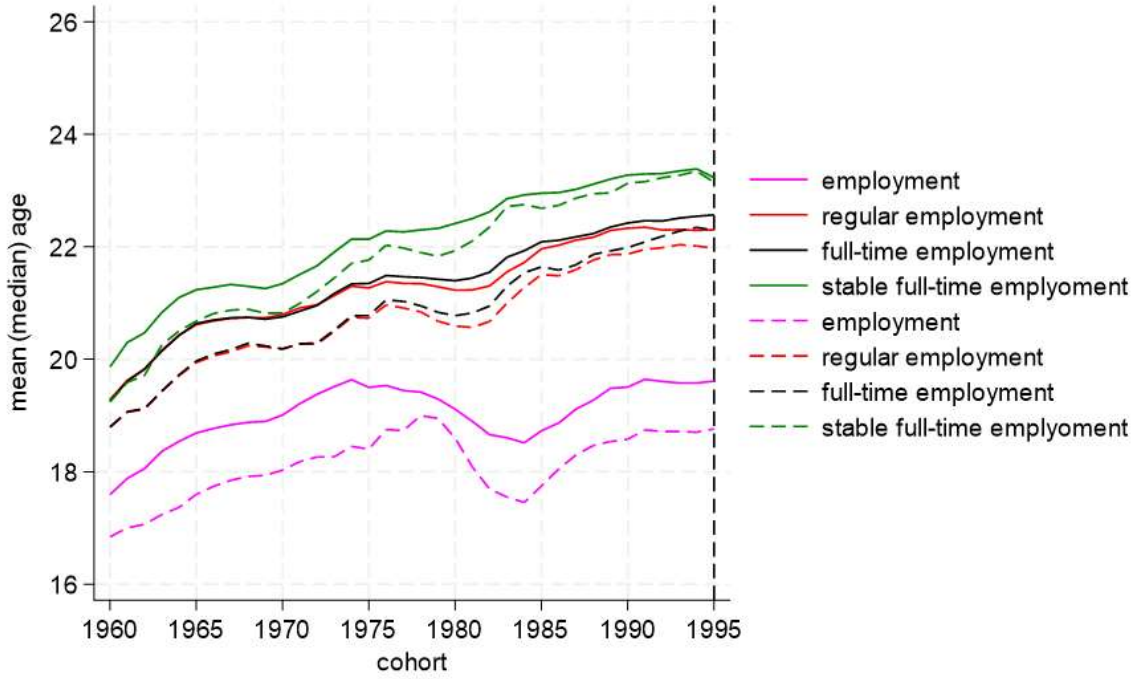
Source: SIAB (1975-2023) and own calculations.

Figure A.3.2 Robustness of Age at First Labor Market Entry – Cutoff Age 30 (Median)



Source: SIAB (1975-2023) and own calculations.

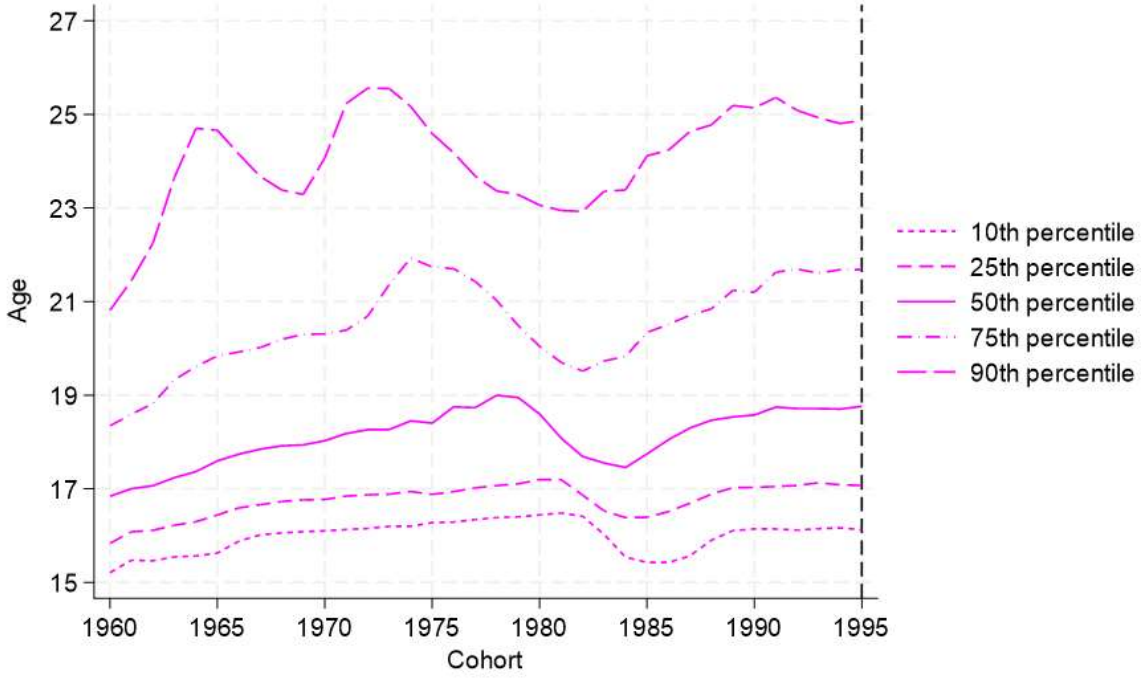
Figure A.3.3 Robustness of Age at First Labor Market Entry – Mean



Note: The straight line shows mean entry ages, the dashed lines are the baseline median entry ages.

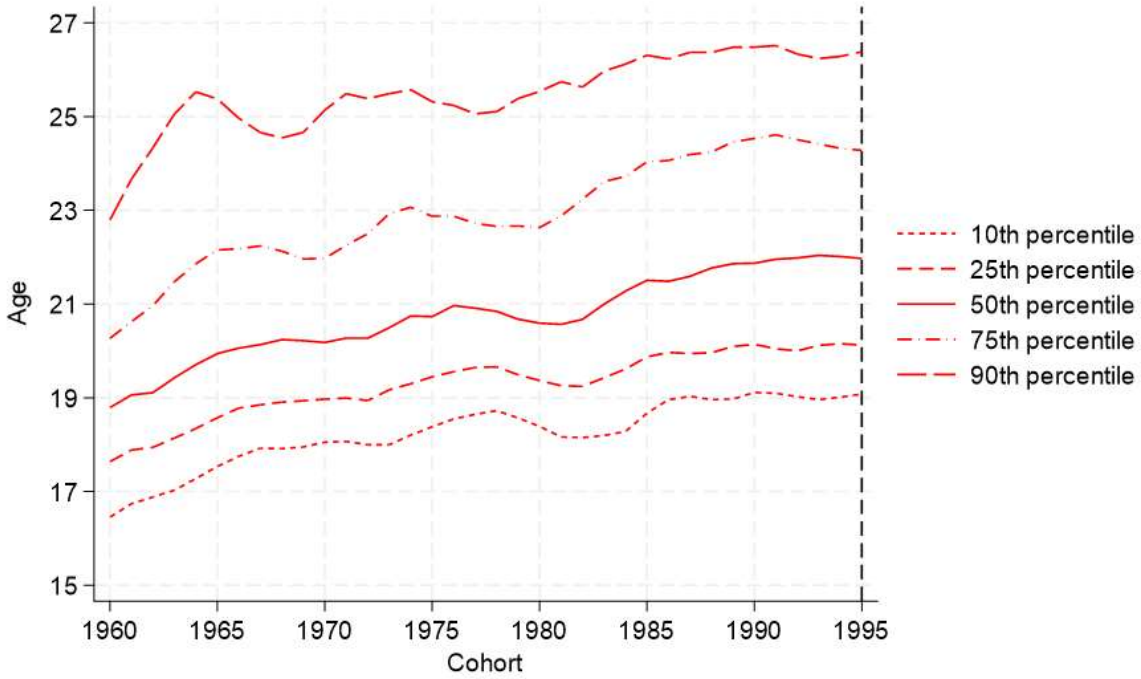
Source: SIAB (1975-2023) and own calculations.

Figure A.4.1 Distribution of Age at First Employment (Y1)



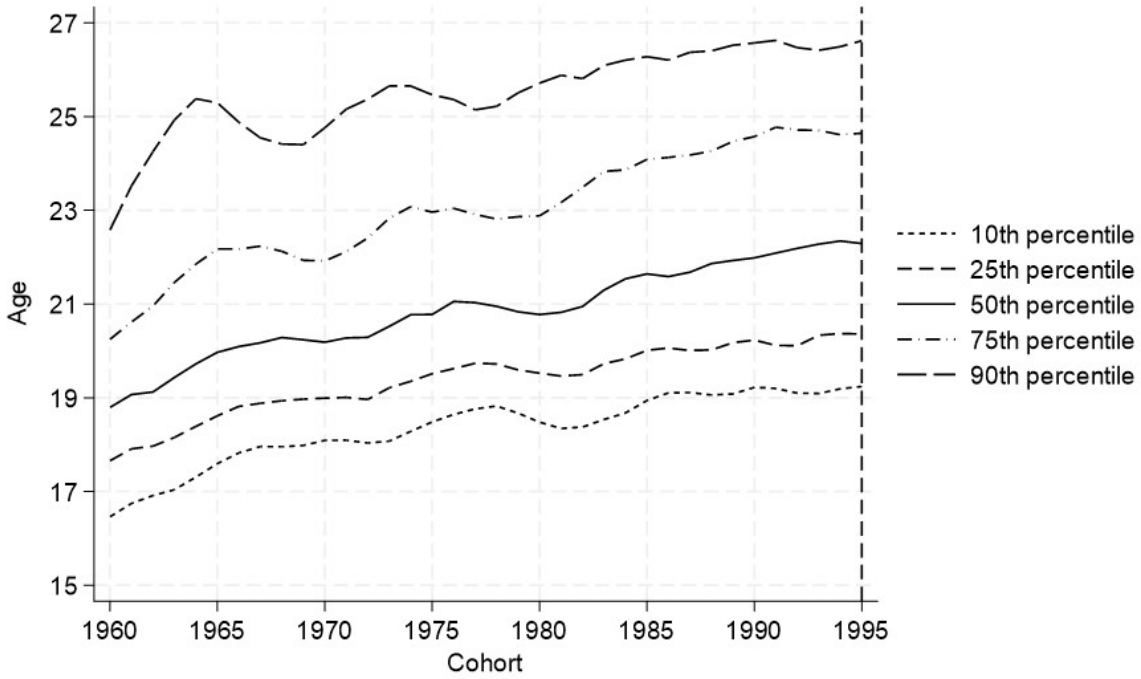
Source: SIAB (1975-2023) and own calculations.

Figure A.4.2 Distribution of Age at First Regular Employment (Y2)



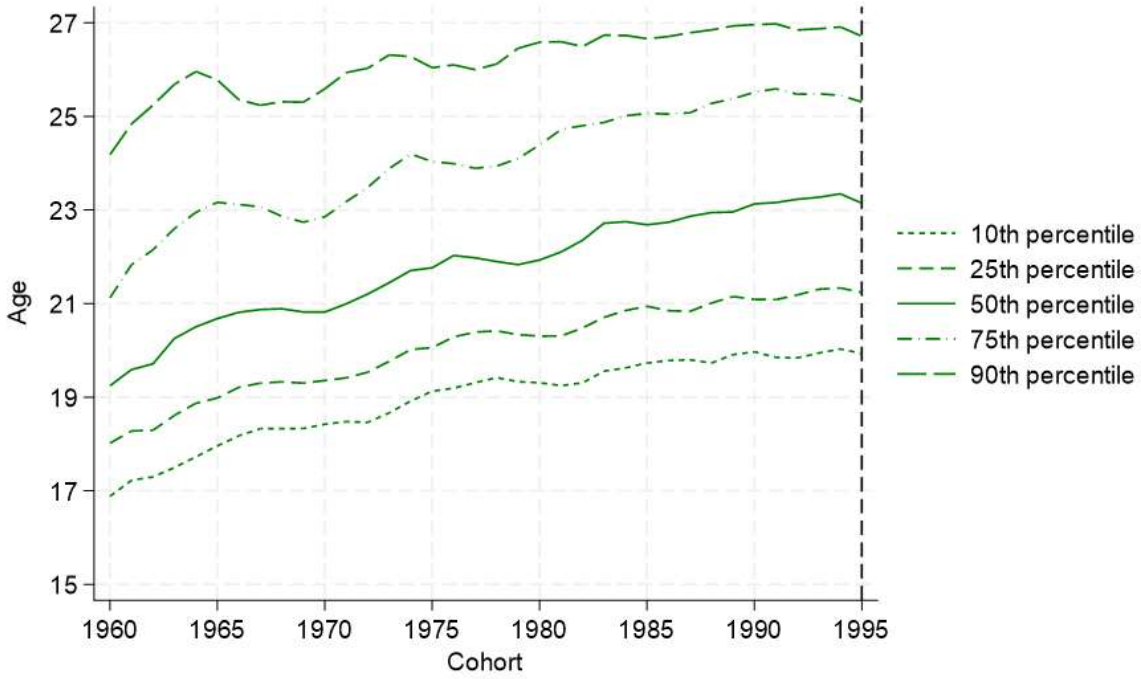
Source: SIAB (1975-2023) and own calculations.

Figure A.4.3 Distribution of Age at First Full-Time Employment (Y3)



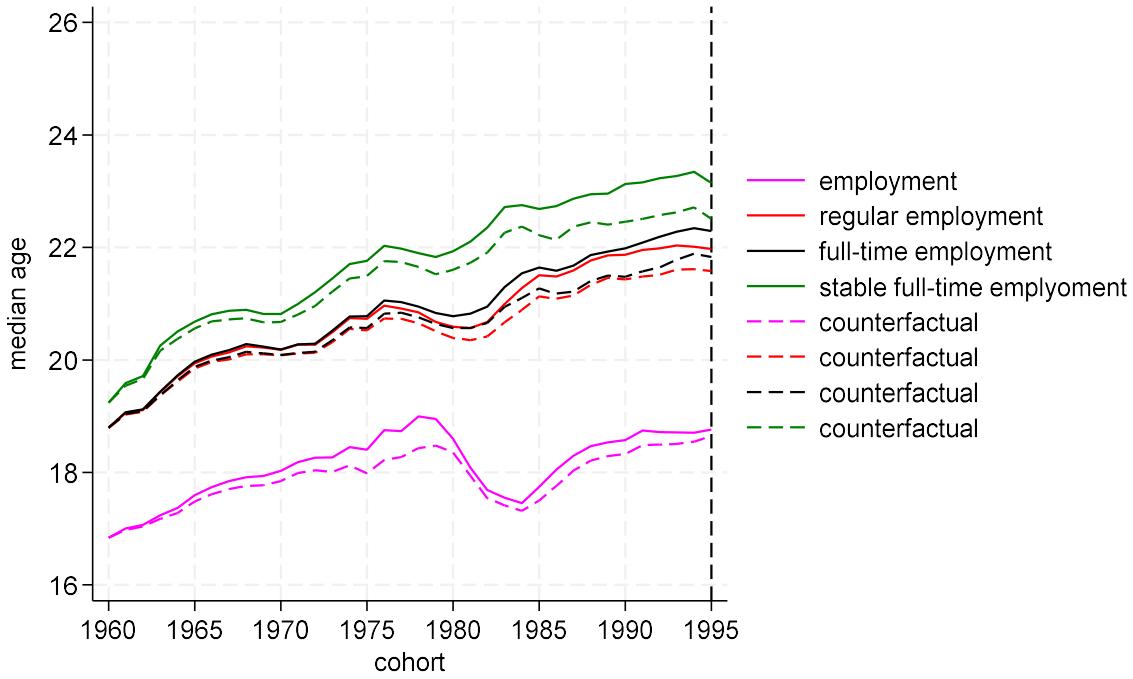
Source: SIAB (1975-2023) and own calculations.

Figure A.4.4 Distribution of Age at First Stable Full-Time Employment (Y4)



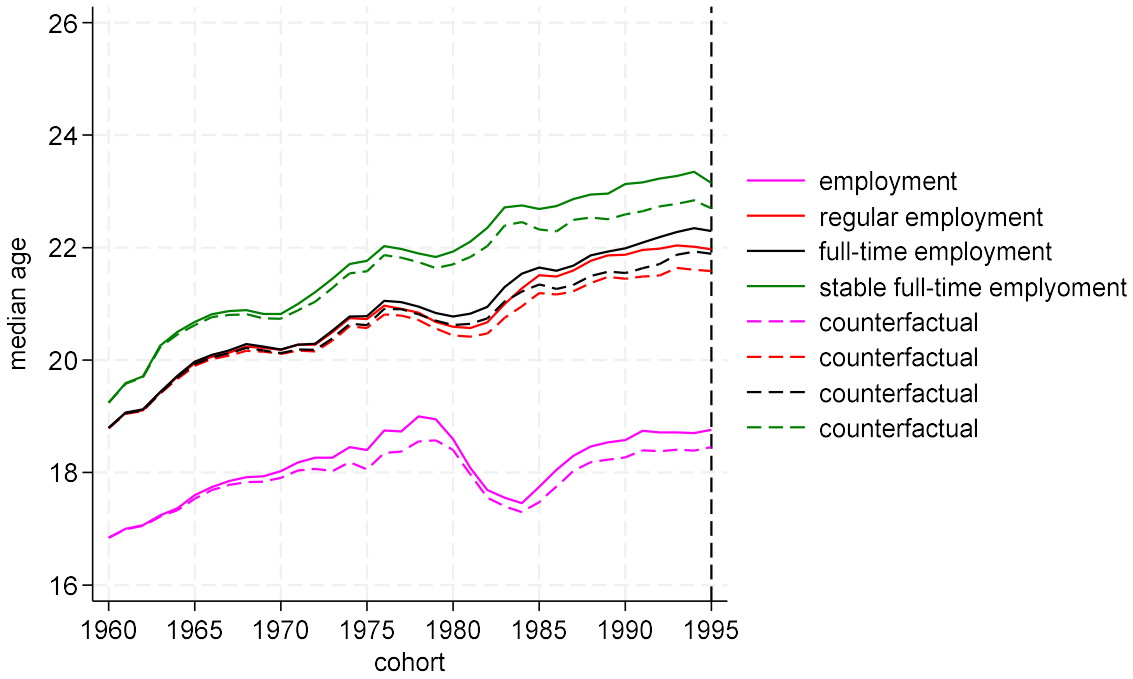
Source: SIAB (1975-2023) and own calculations.

Figure A.5.1 Decomposition analysis – Constant Share of Upper Secondary Education



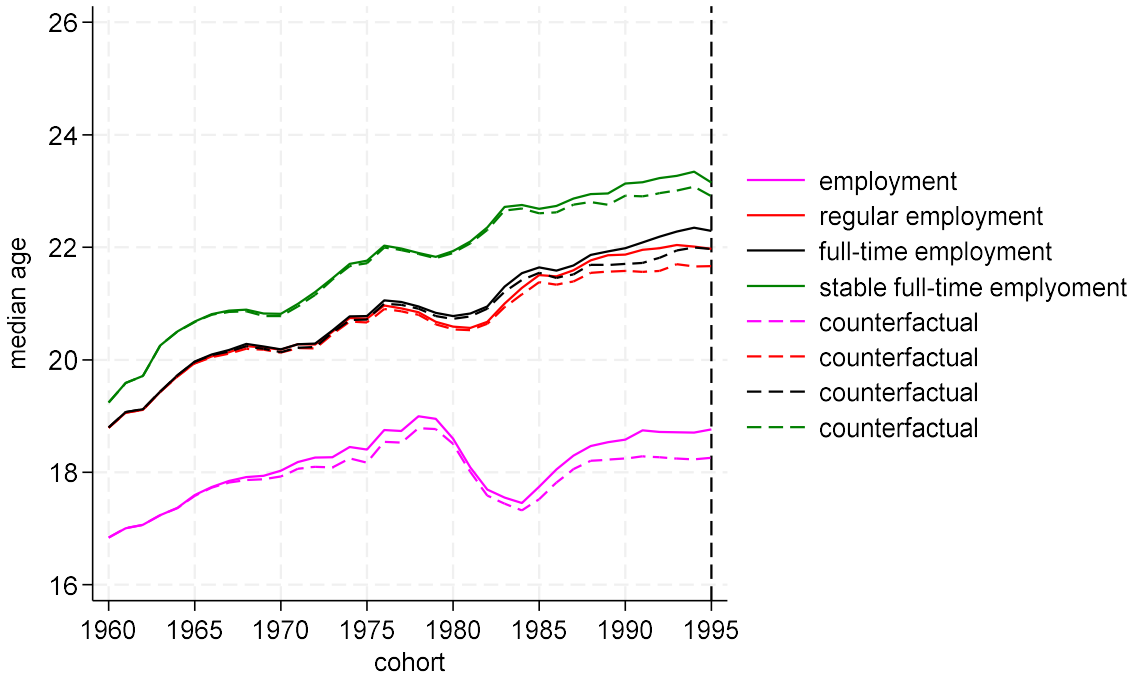
Source: SIAB (1975-2023) and own calculations.

Figure A.5.2 Decomposition analysis – Constant Share no Tertiary Education



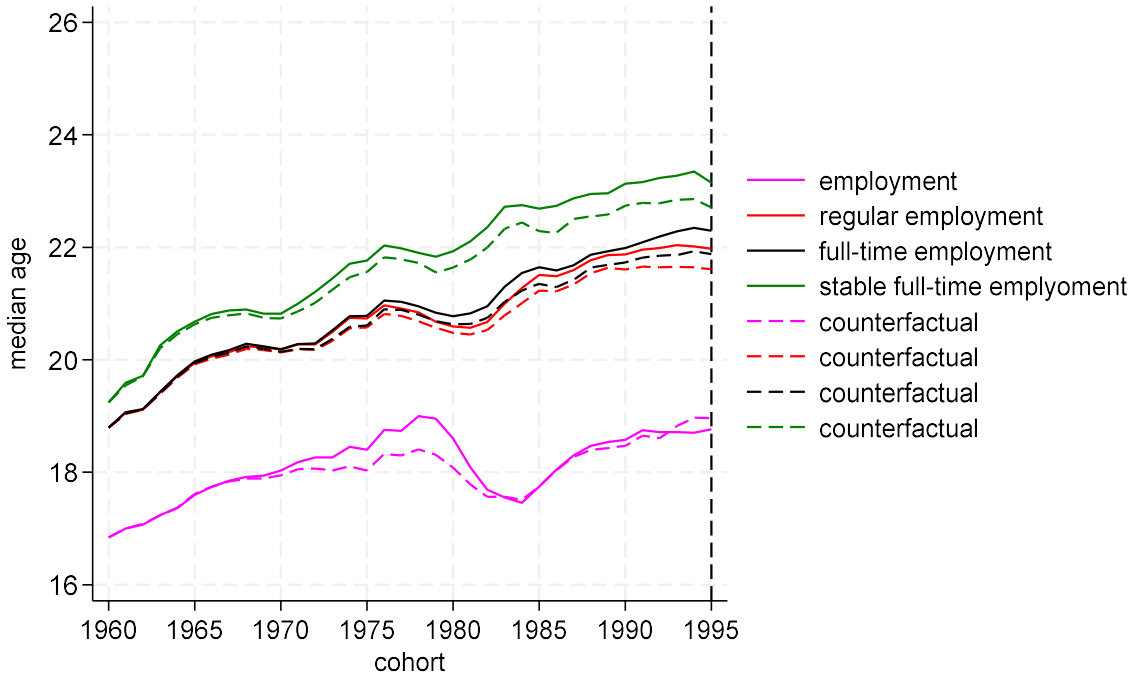
Source: SIAB (1975-2023) and own calculations.

Figure A.5.3 Decomposition analysis – Constant Share Non-German Citizenship



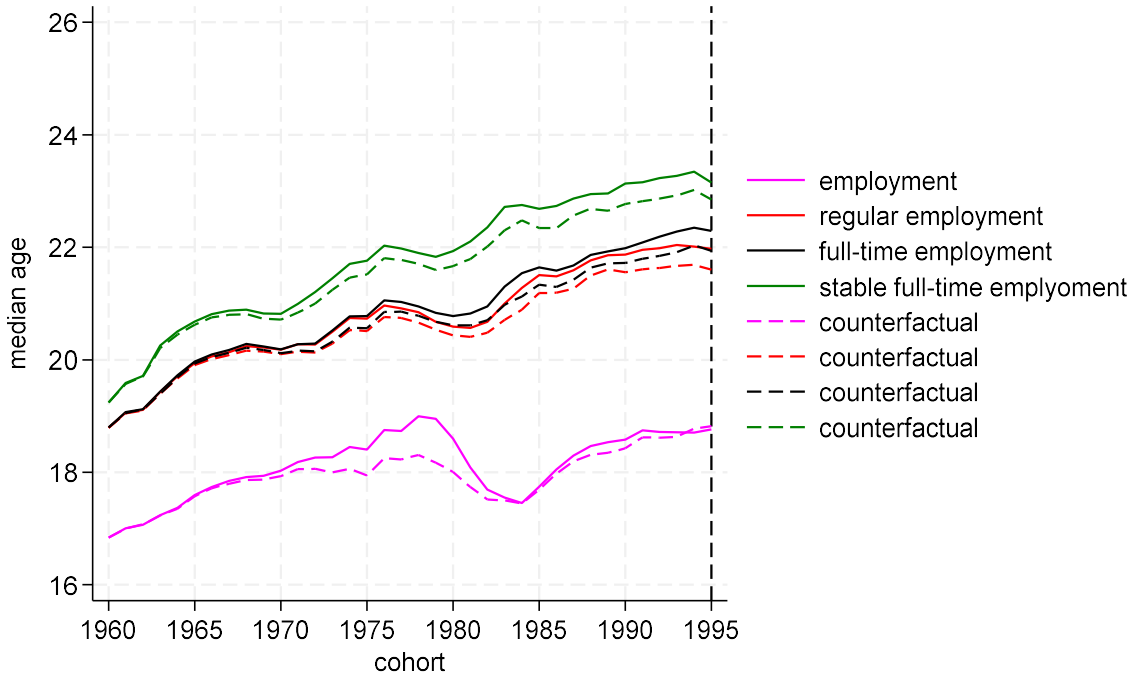
Source: SIAB (1975-2023) and own calculations.

Figure A.5.4 Decomposition analysis – Constant Share Occupations



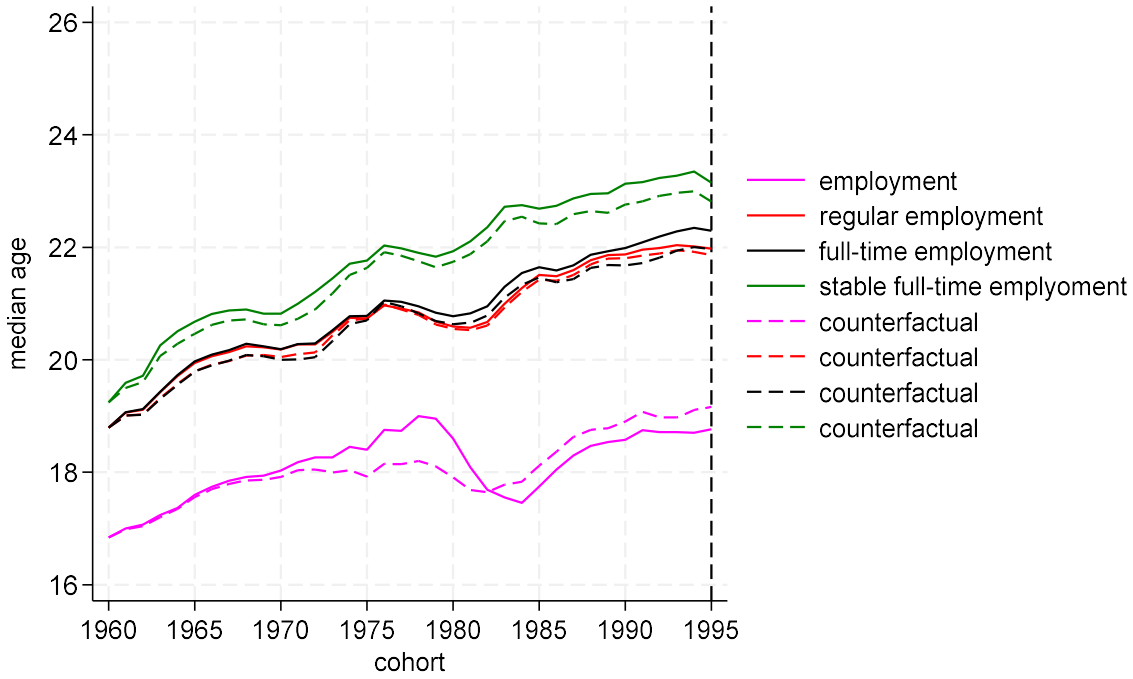
Source: SIAB (1975-2023) and own calculations.

Figure A.5.5 Decomposition analysis – Constant Share Industries



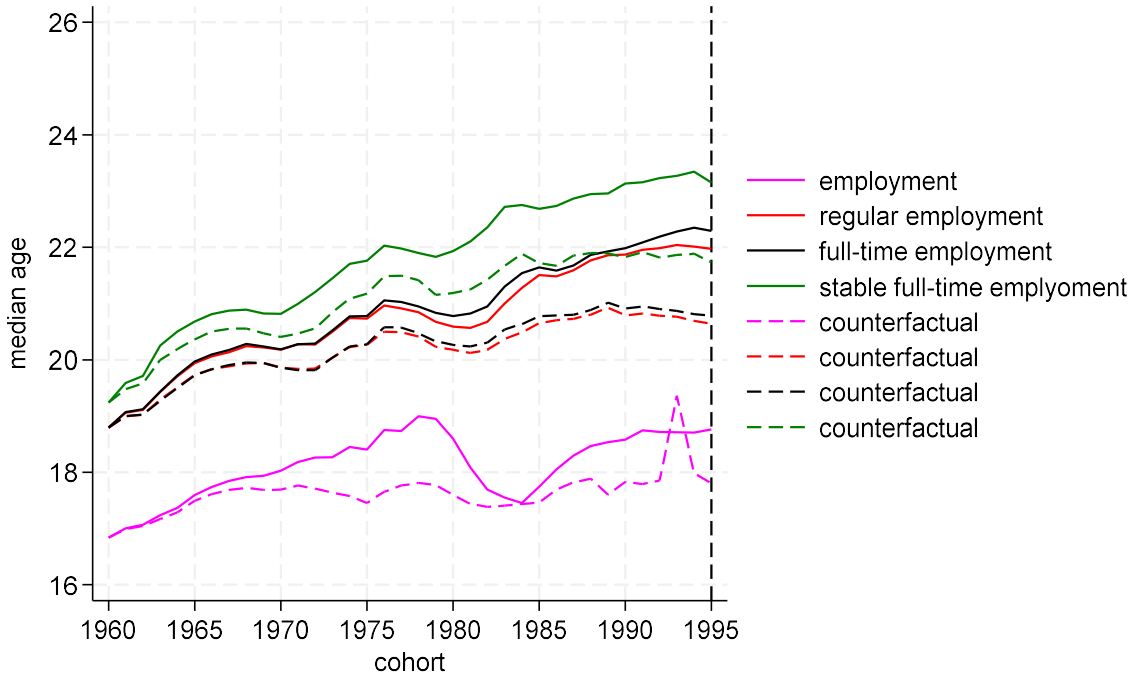
Source: SIAB (1975-2023) and own calculations.

Figure A.5.6 Decomposition analysis – Constant Relative Daily Wage



Source: SIAB (1975-2023) and own calculations.

Figure A.5.7 Decomposition analysis – Holding all Six Factors constant



Source: SIAB (1975-2023) and own calculations.