Career Complexity No Longer on the Rise

Comparing Early- and Mid-Career Complexity Across the 1930s thru 1980s Birth Cohorts in Sweden

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Abstract

There is a wide-spread idea that contemporary careers continue to become ever more complex. Pioneering research of full-career complexity has shown that work lives have indeed become more complex, yet at modest increasing pace. This paper examines whether career complexity continues to increase using Swedish registry data across an exceptionally long time period, including younger cohorts than in previous research: up to those born in 1983. The full early- and midcareers of selected birth cohorts cover several macroeconomic booms and downturns, a long period of upskilling of the Swedish labor force, as well as the convergence of working hours of women and men. The following conclusions are drawn using state-of-the-art methods of measuring career complexity. For early-careers, an increasing complexity trend is evident between the 1950s and 1960s birth cohorts, yet complexity fluctuates around a stable trend for the 1970s birth cohorts and onward. For mid-careers, which are considerably more stable on average, complexity has decreased among women born between the 1930s and the early-1950s.

However, the opposite trend holds true for men, resulting in gender convergence of complexity. We observe a standstill of the mid-career complexity trend across both genders, followed by a modest decline for the last observed cohorts. Subsequent analyses point to educational expansion as an important driver of the initial increase of early-career complexity. Taken together, our analysis affirms an initial shift to more career complexity in the 20th century, yet we find no unidirectional trend toward more career complexity over the last decades.

Introduction

Social scientists have argued that careers in today's labor market are more complex and less predictable than in the past. The shift toward growing career complexity is believed to have started in the 1970s, resulting from union decline, government deregulation, and restructuring by firms in response to global competition (e.g. Beck, 2008; Hollister, 2011; Kalleberg, 2009; Mills et al., 2006), among other processes. The growing career complexity thesis has a considerable impact on public debate and is informed by scholarly work of the last decade on features of modern insecure employment relations, such as the precariat (Standing, 2011), bad jobs (Kalleberg, 2011), precarious work (Kalleberg, 2012), flexibility (Cappelli and Neumark 2004), and the role of computerization in labor market turbulence (Kim et al., 2017). Despite evident structural change in high-income countries, research on trends in career complexity, as defined by the average duration within and transitions between labor market related states, remains rather scarce. Recent research however suggests that career complexity has only *moderately* increased in Europe ever since labor market entry of the 1930s birth cohorts and up to the birth cohorts of the late 1960s (Van Winkle & Fasang, 2017, 2021).

We revisit the question of career complexity trends by including many younger birth cohorts (1970s and 1980s) and measurements of complexity in the early- and mid-careers. The inclusion of younger birth cohorts, in tandem with separate analyses of early- and mid-careers, gives ample opportunities to detect if career complexity is *still* increasing. Following the growing career complexity thesis, we expect a progressing trend toward more complexity, including among the youngest generation of workers. The career complexity literature has remained silent about potential variation across different career phases, although some have argued that precariousness is likely to stick with individuals throughout their work lives (Kalleberg 2018). Aside from overall trends, analysis of both early- and mid-careers provides

an opportunity to examine these important sociodemographic dimensions of the growing career complexity thesis.

We use state-of-the-art methods developed by Gabadinho et al. (2010) and employed by Van Winkle and Fasang (2017, 2021) to accurately measure the complexity level of a career, which is a combined indicator of sequence stability and entropy *at the individual level*. The sequence of career refers to the order and timing of all kinds of nominal 'states' that can be attained across the work life, such as forms of employment, unemployment, inactivity, or education. More between-state transitions and more dispersion of states across the sequence (i.e., 'unpredictability') yield higher levels of career complexity. The complexity measure is therefore comprehensive and suitable for comparison across time. It however simplifies some aspects of the work life that are relevant to social stratification scholarship. For example, a career consisting of school leaving at age 20, followed by a transition into stable employment is equally non-/complex, as school leaving at the same age but ending up in permanent unemployment or inactivity. To address this ambiguity, we conduct an analysis analogous to decomposition by calculating the relative weight of states on career complexity and across different birth cohorts. This is important because rising career complexity that is driven by unemployment may be perceived as more socially problematic compared to rising complexity driven by increasing educational attainment.

This paper contributes first and foremost to accurate measurement of career complexity trends, in the case in Sweden, for an exceptional long time-period, covering birth cohorts between the 1930s and 1983. Compared to previous studies (i.e., Van Winkle and Fasang, 2017, 2021), we include many more and younger cohorts (e.g., those born between 1967 and 1983), and distinguish between the early- and mid-careers, and conduct separate analyses for women and men. These observation lengths also allow to link career complexity trends to fluctuations in the business cycle. Moreover, we use full-population registry-data which, in addition to

yielding exact estimates, do not have any recall errors as occurring in data from retrospective career biographies. We study Sweden, which is characterized by a relatively high level of career complexity compared to other high-income countries (Van Winkle and Fasang, 2017, 2021) and early trends toward upskilling and gender convergence in labor force participation. The study is restricted to key life course transitions as pertaining to 'the career,' such as from education to employment, from employment to unemployment or inactivity, and into and out of parental leave. We do not observe transitions between jobs, employers, or occupations.

Labor market trends and complexity

There are reasons to expect that large-scale global trends increase career complexity in high-income countries. Some influential scholarly work indirectly addresses triggers of rising career complexity, using concepts such as the risk society and individualization (Beck 2008), the precariat (Standing 2011), post-Fordism (see Amin 1994), and patchwork careers (see Mills et. Al., 2006). This stream of research generally argues that de-standardization (or instability) of economic life started in the 1970s (Kalleberg 2011) or even earlier (Widmer and Ritschard, 2009). Critical components of the de-standardization are job loss (resulting from globalization, offshoring, and automation), fewer internal labor markets and job ladders (resulting from of increased competition, downsizing, outsourcing, and de-unionization), and a rise of temporary jobs (resulting from labor market deregulation). De-industrialization also occurred simultaneously with a steady growth of the service sector and perhaps also with a shift in preferences and attitudes toward work life (reviewed by Hollister, 2011, and Vallas and Prener, 2012). Although the suggested causes vary between explicit structural or compositional dynamics and changes in individual preferences, the implication is that de-standardized

economic life has led to *careers* becoming continuously more unstable and complex in high-income countries (Kalleberg, 2018).

However, researchers have identified at least three trends that either counteract conditions of rising career complexity or could explain a much slower pace. First, educational expansion, and specifically the increase of the share of time spent in schooling as part of the life course (Brückner and Mayer, 2005), is ambiguously related to career complexity. Holding constant the age range of the early career, prolonged schooling could lead to less transitions (caused by occupational matching and job switching) and in turn less complexity. However, even if such transitions are pushed into the mid-career, an increasing number of transitions in and out of education (Pallas, 1993) could still increase early-career complexity. This pertains specifically to the nature of higher education attainment, which increasingly interacts with childrearing or childbearing spells, employment spells (i.e., between college and graduate school), or other forms of so-called 'stopouts' (Desjardins et al., 2006; Goldrick-Rab and Han, 2011). Modern school-to-work transitions should therefore be thought of as *trajectories*, consisting of education spells being blended into the early career phase (Witteveen, 2017). In addition, educational expansion means that workers with no higher education attainment become relatively less competitive in the labor market (Gesthuizen and Wolbers, 2010), and they may therefore be channeled into considerably more unstable careers over time.

Second, one dramatic change across 20th century birth cohorts in many countries, and not the least in Sweden, is the rapid gender convergence in labor force participation. From the 1960s onward, and coinciding with the early careers of the 1940s birth cohorts, women in Sweden increasingly continued to work in full-time jobs after childbirth, albeit with episodes in parental leave and part-time work. Also, there is a clear trend toward gender convergence of typical career patterns in several countries including Sweden (Brückner and Mayer, 2005; Härkönen and Bihagen, 2011; Härkönen et al., 2016; McMunn et al., 2015). In Sweden and other Nordic

countries, the increase in female labor force participation was paralleled by an overrepresentation of women in the public sector – generally regarded as providing employment stability (Hollister, 2011). Hence, our expectation is to find a trend towards less career complexity for women – at least for women born in the 1940s and onward. However, research from other countries indicates that women still face more career complexity than men (Widmer and Ritschard, 2009; Riekhoff et al., in press). If such a gender gap is found in Sweden, too, it may even be amplified because temporary employment contracts are overrepresented in parts of the public sector (Statistics Sweden, 2015).

Third, the business cycle may have a substantive impact on career complexity fluctuations, yet this is still understudied. As many careers are destabilized during economic downturns, through more unemployment spells, we may assume that the careers of some birth cohorts are more complex than others. Furthermore, cohorts who experienced an economic downturn during labor market entry may continue to experience more unstable careers (Gangl, 2006; Liu et al., 2014; Witteveen, 2017). In Sweden, unemployment rose quickly during the early 1990s recession and then stabilized at a historically high level (Gottfries, 2018), yet remained close to the OECD average. Youth unemployment also increased in the aftermath of the 2008-2011 Great Recession (Schoon and Bynner, 2019). Our analysis examines whether these macroeconomic shocks are resembled in career complexity of the early 1970s birth cohorts, who were coming of age at the time of the 1990s recession.

In summary, our analyses of trends will clarify whether career complexity continues to rise, has leveled off, or decreases. We examine early- and mid-careers separately and we split complexity trend analyses by gender. Although we are primarily concerned with accurate measurement of complexity trends in population data, a decomposition analysis sheds light on the driving forces of the observed trends.

Previous research on career complexity

Career complexity trends have been studied in various ways by for instance focusing on specific career aspects or events, such as time to the first (stable) job (e.g., Schizzerotto, 2001), job tenure and job mobility (Rodrigues and Guest, 2010), and selection into (a) typical career patterns (Anders and Dorsett, 2017; Brzinsky-Fay and Solga, 2016). Another stream of research analyzes trends in occupational mobility (e.g., Jarvis and Song, 2017) and occupational maneuvering (Witteveen and Westerman, in press). Recent scholarship has also gained interest in studying career sequences using a comprehensive measure of complexity – an indicator that combines the number of transitions and the dispersion of career states at the individual level. The most obvious advantage of this metric is its strict comparability across cohorts, in contrast to alternatives such as cluster analysis, which require various forms of induction. Furthermore, a career complexity measure retains information from the full career sequence, which is not the case for most unidimensional metrics (i.e., the duration in states, jobs, or occupations). Because the use of complexity measures is relatively new, we review a small number of career complexity studies, while contrasting their results with those conducted with unidimensional outcomes and cluster analysis.

Van Winkle and Fasang (2017, 2021) pioneered the study of career complexity trends and studied 30 European countries across birth cohorts from 1916 to 1966. Their studies are based on employment biographies that span 18-50 years and identify as states full-time employment, part-time employment, unemployment, inactivity, education, and retirement. They further treat each new employer as a distinct state for the individual. The conclusions are straightforward: complexity is moderately increasing across cohorts – most evidently presented in the extended analyses by Van Winkle and Fasang (2021) – but the variation across cohorts is small compared

to that between countries. Sweden and other Nordic countries, among a few others, display the highest levels of career complexity. Van Winkle and Fasang (2021) also conducted a decomposition analysis which indicates, first, that the increasing trend is more pronounced among women and, second, that the increase is associated with educational expansion, as well as increasing prevalence of unemployment.

Riekhoff et al. (in press) followed Finnish cohorts born between 1958 and 1972 across mid-career ages 30 to 45. They report stability across cohorts. Their analyses of employment sequences resemble the approach by Van Winkle and Fasang (2017, 2021). The analyses of career complexity display a slightly decreasing trend when including employment statuses only, and a slightly increasing trend when also including job transitions. Although complexity is a function of both transitions and the dispersion of spells across the career, it could be the case that the moderate increases in career complexity are driven by employer shifts rather than transitions between different labor market states. It should however also be noted that the patterns described by Riekhoff et al. (in press) can result from using a much narrower age range for younger cohorts, thereby suppressing their 'true level' of full-career complexity.

Two prominent studies of early careers using complexity measures come from Biemann et al. (2011), analyzing German data, and Struffolino and Raitano (2020), analyzing Italian data, where careers are followed for respectively 7 years and 8 years after first employment. Biemann et al.'s (2011) 'state alphabet' includes transitions between jobs, while Struffolino and Raitano's (2020) does not. Following the careers of birth cohorts 1929 thru 1971, Biemann et al. (2011) find a rise in complexity up to the birth cohorts of the mid-1950's and a slight downward trend among the younger cohorts. Struffolino and Raitano (2020) followed careers starting from 1974 to 2001, roughly corresponding to birth cohorts of the mid-1950s to the 1980s. The careers observed in the more recent time period experienced a higher level of career

complexity, especially those with lower levels of education, which the authors attribute to deregulation of the Italian labor market.

In contrast to these career complexity studies, studies analyzing unidimensional outcomes and career clusters derive fewer comprehensive conclusions. An exception is the school-to-work transition literature, which is reviewed by Raffe (2014). They conclude that first-time labor market entrants are increasingly older and that their early career trajectories have become less linear and less predictable over time. However, in line with the complexity studies, the magnitude of these trends appears to be small in comparison to the considerable cross-country variation. Studying long-term trends, Schizzerotto (2001), using data from Italy, Great Britain, and Sweden, concludes that there is an evident prolongation in the time between education and work for later born cohorts compared to those born up to the mid-1950s across all three countries. Analyzing English sequence data, Anders and Dorsett (2017) report a growth of the career pattern "potentially difficult transition" for the school-to-work transitions of those born in the 1980s, compared to earlier periods. Brzinsky-Fay and Solga (2016) use German data with cohorts born between the 1950s and the 1970s and report heterogeneous trends as evidenced by increases in *both* "linear" and "non-linear" school-to-work transitions.

Thus, school-to-work trajectories have been prolonged and more complex in recent years, although during cyclical business upturns, such as between the recessions of the early-1990s and the Great Recession of 2008-2011, the time between education and first job was shortened in a number of OECD-countries (Quintini et al., 2007, for Sweden see also Halldén and Hällsten, 2008). Nevertheless, using data from individuals born in the 1970s and the 1980s, whose careers covered different recessions, Witteveen (2021) argues that the connection between macroeconomic factors and the smoothness of school-to-work-transitions is relatively weaker in Sweden compared to Germany, the United Kingdom, and the United States.

Rodrigues and Guest (2010) review the literature on trends in average job tenure in the United States, Europe, and Japan. They argue that the available evidence, mainly covering the 1970s to the 1990s, are either mixed or point toward stable job tenure rates over time. However, Hollister (2011), summarizing a similar selection of literature, stresses that this pattern could largely be explained by the counteracting trends of increasing women's labor force participation and public sector expansion. Hollister emphasizes that average job tenure rates among men in the private sector in the United States have in fact shortened significantly and that this may be the case for the entire labor market when these counteracting trends have come to a halt. Research on Nordic countries shows small decreases in job tenure, such as in the public sector of Norway from the mid-1980s onward (Bratberg et al., 2010) and temporarily in Finland during the severe 1990s economic downturn (Rokkanen and Uusitalo, 2010). Thus, in contrast to the literature on career complexity trends and school-to-work trajectories, no firm conclusion is reported from the literature on changes in job tenure over time.

The literature on trends in occupational mobility is to sparse and disparate to draw any firm conclusions. Jarvis and Song (2017) use the Panel Study of Income Dynamics (United States) to calculate the rate of the year-to-year occupational shifts of household heads between 1968 and 1997. They report increasing rates of occupational shifts over time, especially after the early 1990s. However, Cheng and Park (2020), using a network approach to analyze transitions with the Current Population Survey (also United States), shows, in contrast, that mobility between *clusters* of occupations have been increasingly constrained between 1989 to 2015. For Sweden, Witteveen and Westerman (in press), use occupational biographies for cohorts born between the 1930s to the 1970s and observe that men enter a service-oriented and distinctively unstable mid-career occupational cluster to a higher extent over time, while the opposite holds true for women. The study thus indicates that trends in career complexity are gendered in the Swedish context.

Research questions

In sum, previous research suggest that career complexity moderately increases across several decades of the 20th century. However, there appears to be considerable variation across countries and not much is known about the current trends. Structural change continues to affect labor markets in high-income countries, such as the school-to-work transition becoming increasingly *complex*. We therefore examine to what extent career complexity has risen over time and whether it is still on the rise, in Sweden – a country that has high overall levels of career complexity. Our primary analyses include many more – and younger – cohorts than in previous research. Importantly, by using near full population registry data of several millions unique career trajectories we improve on sampling errors known to self-reported employment biographies in randomly drawn samples. As career complexity is likely to be heterogeneous, in particular among younger cohorts, we present analyses separately for the early- and the mid-career as well as men and women. Our second research aim pertains to the drivers of the observed career complexity trends, asking which components of the career sequence contributes most for which we use a reweighting technique. We identify employment, self-employment, unemployment, inactivity, education, and parental leave.

Method and data

The complexity measure

Recent research on career complexity contains more inductively oriented descriptions of typical career trajectories, i.e., sequence analysis. The method has proven highly useful to visualize and compare complex career patterns and measure selection pathways into different career pattern. However, for research aimed at determining exact trends over time or cohorts, use of stable and comparable metrics, while still incorporating various aspects of complexity

during the full career sequence (such as the duration in states and transitions between states), is prioritized (Pelletier et al., 2020).

A complex career is most often perceived as a career type that contains frequent shifts between different labor market *states*. Moreover, shifts between states over the entire career span is generally perceived as more complex than a similar number of shifts allocated to a particular career phase, for instance in the beginning of the career. A measure of career complexity should thus capture both the frequency of shifts between states *and* the dispersion of these shifts over the career span. The complexity measure developed by Gabadinho et al. (2010) combines these two traits in a single measure. Complexity, *C* for individual career sequence *x*, is defined as:

$$C(x) = \sqrt{\frac{NT(x)}{(L(x) - 1)} * H(x)} \qquad \text{[Equation 1]}$$

where *NT* is the number of transitions (i.e., number of spells – 1) and *L* is the total length of the sequence (a fixed number for all individuals). *H* is entropy (Shannon 1948), defined as:

$$H(x) = \sum_{i=1}^{K} \rho_{s_i} * Log(1/\rho_{s_i}) \qquad \text{[Equation 2]}$$

where ρ_{s_i} is the proportion of state s_i in sequence *x*.

Figure 1 abstractly illustrates sequences of varying complexity when using an alphabet with only two states (A and B), four time points, and either one or two transitions. Evidently, the 'simplest' career type possible (bottom-left corner) contains only one shift, located at either edge of the career span. Complexity can then increase in two ways, either through one additional transition (top-left corner) or through more equal dispersion of labor market states across the career (bottom-right corner). Following this logic, the most complex career type

using this setup (top-right corner) involves shifts between states over the full career span. The average complexity is the metric which is used to compare trends in career complexity across cohorts.

In addition to capturing the mentioned features at the individual level, average complexity has some interesting features that can be comprehended only at the aggregated level. Returning to Figure 1, given a fixed number of transitions and a fixed supply of labor market states in the economy, a movement to the right along the horizontal axis captures at the aggregated level – a tendency toward more *equal* distribution of labor market states *across* individuals. The entropy component of complexity can thus be thought of as 'disorder' in the allocation of states to individuals. There *is* 'order' (predictability) if states of a certain kind tend to be allocated to certain individuals, while there is 'disorder' (unpredictability) if, for instance, all individuals have similar propensities to experience unemployment spells.

[Figure 1 about here]

Data

This study uses and combines total population data from several Swedish administrative population registers. Each individual in Sweden has a unique identification number, which is universal for administrative processes and is also used to link several different registers together. The first source, Total Population Register includes information on date of birth, date of death, biological sex, individuals' residential area (*län*) at age 18 and country of birth for all individuals who ever resided in Sweden across the observed time span. A second source is the Migration Register, which contains the dates of all emigration and immigration registrations of individuals. Thus, we can proxy for whether individuals resided in Sweden during the career

phases examined.[1] A third source is the Administrative Tax Records (from 1968 onward), from which we use income data to build some employment states of the alphabet. A fourth source is the Educational Registry and the registry for University and higher Education, from which we derive educational trajectories based on individuals' examination and registration dates in higher and upper-secondary education.

We construct career sequences as early-careers (ages 18 thru 36) and mid-careers (ages 37 thru 54) phases. The study populations are defined as all individuals dwelling in Sweden over the course of the selected career phases, conditional on having some labor market attachment: positive earnings for at least one year. This selection omits immigrants and emigrants who entered or left Sweden during the respective career phase. However, we include a robustness check varying start and end-points of the career that still includes many migrants.

Analyses make use of two state alphabets, which we labelled the "long series" and the "short series." Although we present results of *both* alphabets, the trade-off is one between including more historical cohorts and the specificity of the state alphabet, as more detailed information in the administrative records becomes available over time. Figure 2 illustrates the observed analytical population per birth cohort for the two state alphabets: early- and mid-career. The analytical population varies between approximately 80,000 to 125,000 individuals per birth cohort.

[Figure 2 about here]

Labor market statuses are derived from annual observations. Our approach to career sequences further implies that the states are mutually exclusive in any observation year. The long series contain four labor market states as observed between 1968 and 2015. First, *self-employment* is measured as any (positive) income from one's own firm or farm (and some rare forms of property from 1991 onward). We use a low threshold because some self-employed individuals

may choose to not take out any salary from the own firm and instead rely on capital income. Second, *employment* is defined as earning at least 100,000 Swedish kronor (SEK) in salary (indexed to 2018), which does not contain various taxable benefits attached to employment, e.g., pensions or unemployment benefits. The salary variable comes from the Longitudinal integrated database for health insurance and labour market studies and is standardized from 1991 onward. For 1968-1991, a similar variable is derived from the Administrative Tax registers, using a standardization procedure as documented by Hjalmarsson et al. (2015). The threshold of 100,000 SEK to define employment is in line with previous research on Swedish register data (Antelius and Björklund, 2000, see also Roth and Ekberg, 2003, and Hällsten, 2011). Antelius and Björklund (2000) results suggest that annual earnings are close to a wage measure when excluding those with such low earnings, and, hence, it can be argued that individuals with earnings above this level are likely to have full-time employment. Still, the limit is arbitrary and there may exist all types of combinations of low pay, part-time work and work episodes shorter than a year below the threshold. However, very few with employment across a full year, even including those with part-time work should end up below 100.000 in earnings. Third, *inactivity* is the default category if no form of employment or self-employment was recorded, yet is replaced with the *education* state for the ages 18-21 if the individual registered in upper-secondary school (1973-2018)[2] or if the individual has a registered degree from a tertiary education in the years following the period of inactivity (1968-2018).[3] Complexity in the long series ranges from 0 (a single state throughout the sequence) to 1.08 for the early-career and to 1.03 for the mid-career.

The short series contains six states and ranges from 1983 to 2018. It contains an improved measure of tertiary education and other post-secondary education. Furthermore, *parental leave* is defined as having considerable income from parental leave insurance – exceeding the 20th percentile of annual salaries. The threshold was set quite low because parents often choose to

have a prolonged period of leave on less than full benefits, yet not too low since it is fairly common to use excess days of parental leave several years after the main leave period. We let the parental leave state replace any other state in the alphabet. *Unemployment* is defined as any income from any non-means-tested unemployment benefit program ("A-kassa" or similar). The threshold was set low to also capture shorter unemployment spells.[4] *Education* is defined as registration in higher education (university/högskola) during any of the semesters in a given year, or receiving non-taxable student grants (loans and benefits) from the Swedish Board of Student Finance (CSN).[5] Complexity in the short series ranges from 0 to 1.25 for the early-career and to 1.21 for the mid-career.

State composition of complexity

One technique employed to understand which states contribute most to career complexity, over time, is reweighting complexity by the duration in specific sequence states (Van Winkle, 2018, 2020). The reweighted complexity (C_w) effectively normalizes the standard complexity measure [Equation 1] by the duration of one state (d_{s_i}) spent in the selected career sequence:

$$C_{w_i}(x) = C(x) * \sqrt{(d_{s_i} + 1)} \qquad \text{[Equation 3]}$$

Practically, this is done by calculating career complexity by durations spent in each alphabet state. Hence, in an alphabet that consists of six states, we reweight complexity by state and separately for each birth cohort. In other words, for any specific birth cohort and career phase, we plot four or six versions of complexity, each reweighted by one of the alphabet states. This will tell us the relative contribution of each state to career complexity. We plot the state-reweighted complexities of all selected birth cohorts to examine the extent to which inactivity,

unemployment, employment, self-employment, education, and parental leave have contributed to the career complexity *trend*.

Results

Descriptive statistics

The cumulative share in each state for the early-career (long and short series) and per birth cohort is shown in Figure 3. The majority of individual years is spent in the employment state (50 to 60 percent). In the long series, inactivity occupies around 30 percent of all observed states. When including unemployment and parental leave in the short alphabet, inactivity is observed in about 10 percent of all states. The share of education across all states increases substantially after 1975, indicative of higher education expansion, which is best visible when using the short series alphabet. The share of unemployment declines substantially from the 1972 cohort onward, indicative of significantly improved labor market conditions during the late 1990s, as compared to the recession years in the beginning of the decade.

Figure 4 presents the cumulative share of states in the mid-career, for both alphabet solutions. Here, a more uniform pattern is visible compared to the early-career – the employment state occupies about 70 to 80 percent, while education and parental leave are observed in about 5 percent of all states. These are expected distributions as individuals are less likely to be enrolled in education and to have young children in their 40s and 50s. Share in unemployment increases from the 1940s cohorts up to the 1955 cohort, entering the midcareer phase in 1991 when the recession years started, and then declines.

[Figure 3 about here]

[Figure 4 about here]

Complexity trends in the early career

Figure 5 presents the trend in career complexity in the early-career (ages 18 thru 36) for both the long series (panel A), calculated with four states, and the short series (panel B), calculated with six states. The long series (panel A) displays a steady rise in early career complexity between the 1950 birth cohort and the 1964 birth cohort. This upward trend is the same for both genders, albeit at a consistently higher level of complexity for women. However, the gap in early-career complexity between men and women is notably larger for younger birth cohorts compared to older (pre-1965) birth cohorts. We further note a bump in the level of early-career complexity for individuals born in the early- to mid-1970s, which coincides with these cohorts entering the Swedish labor market during the severe recession of the early-1990s.

The shorter birth cohort range (1965 thru 1983) allows us to include two additional states (unemployment and parental leave), as well as younger cohorts. The rightmost graph (B) of Figure 5 resembles the trend analysis shown in in Figure 1, using the long series alphabet. The more or less flat trend lines (except for the bump for the early-1970s cohorts mentioned above) confirms that early career complexity remains stable. Hence, inclusion of more detailed forms of inactivity does not appear to alter the career complexity trend. Note the different end-points in panels A and B. A slight downward trend in career complexity for younger cohorts is also visible in panel B.

[Figure 5 about here]

The apparent stability of the early career complexity trend since the mid-1960s cohorts is the most striking finding in this set of analysis. Moreover, in a robustness check that includes even younger cohorts (and thus slightly shorter career spans) (see Appendices F and G), cohorts born around 1990 display similar or even slightly lower levels of early-career complexity as compared to mid-1960s cohorts. In other words, early-career complexity may be high, but it has not been rising for several decades.

Complexity trends in the mid-career

As shown in the leftmost graph of the Figure 6 (panel A), mid-career complexity (ages 37 thru 54) steadily *decreases* for women between birth cohorts 1931 thru 1949. It is followed by a brief and modest upward trend, experienced by the early-1950s birth cohorts, and by stability in mid-career complexity thru the 1961 birth cohort. The same figure indicates a mirrored trend among men. That is, aside from a brief dip in mid-career complexity among the early-1930s birth cohorts, we observe *increasing* complexity thru the mid-1950s birth cohorts, followed by a stable level complexity. Taken together, these findings suggest a convergence of mid-career complexity between men and women.

The rightmost graph (panel B) of Figure 6 plots the mid-career complexity trend using a shorter cohort time span and more elaborate state alphabet (the "short series"), which also includes the full-length mid-careers of the youngest cohorts available in the registry data. Similar to the same exercise conducted for the early-career, these birth cohort-margins 'zoom in' on the flattening mid-career complexity trend on the righthand side of the "long series" (A) – again, note the difference in end-points between panels A and B. In other words, in spite of inclusion of younger cohorts and the unemployment and parental leave as labor market states, mid-career complexity appears to have stabilized in recent decades.

[Figure 6 about here]

Complexity composition

We next examine the relative contribution of each state to the observed over-time changes in career complexity – i.e., the state composition in the complexity trend. Note that given equation 3, these state specific weighted complexities do not add up to the overall unweighted complexities. The reweighted complexities can thus only be compared to one another (Van Winkle, 2018, 2020). Shown in both graphs (the short and long series) of Figure 7 (men) and Figure 8 (women), we observe a steady increasing relevance of education spells for early-career complexity. The relative impact of self-employment remains stable across all birth cohorts (1950 thru 1983) and for both genders.

Furthermore, similar to the overall trend in early-career complexity coinciding with the business cycle, the relative weights of both employment and inactivity in early-career complexity becomes larger for birth cohorts who entered the labor market during macroeconomic downturns. These trends are also pronounced in the panel A trends ("long series") of Figures 4 and 5. Moreover, the B panels of both figures reveal the high relative impact of unemployment for early-career career complexity of birth cohorts who entered the labor market in the early-1990s – a recessionary period in Sweden. We see that the weight of unemployment states on the early-career complexity reduces among birth cohorts who entered the labor market after the early 1990s. This may be related to macroeconomic conditions temporarily increasing careers' 'disorderliness' during the early-1990s recessionary period.

[Figure 7 about here]

[Figure 8 about here]

As shown in Figures 5 and 6, mid-careers are subject to lower overall complexity and much less change in the over-time trends. We ran the same state composition exercise for the mid-career phase, which is included in Appendix A. Noteworthy, for women's mid-careers, is that the sharp decline in complexity up to the 1950s birth cohorts is explained by the rapidly reduced weight of inactivity – i.e., reflecting more stable careers of women in the labor market.

Additional analyses

A series of additional analyses were conducted to confirm the reported trends in career complexity. First, to control for compositional changes due to changing global and regional migration patterns, we controlled for individuals' region of birth (24 *län* or counties) and migration background (9 global regions, including one for Sweden). The combination of these control variables did not alter any of the reported over-time trends in early- and mid-career complexity (Appendix B and C).

Second, the 100,000 SEK threshold is fairly established but some variation exists (Hällsten 2011). However, an alternative cut-off set to 125,000 SEK does not substantially change the trend reported for the long series (results available upon request).

Third, we conducted a dynamic analysis with varying start-/and end-points of the career (Pelletier et al., 2020), which is more inclusive of migrants and extend the analysis with cohorts born between 1984 and 1995, and between 1920 and 1929. The analyses are presented in Appendix D (with varying end-points and fixed start at age 18) and Appendix E (with varying start-points and fixed end at age 54). They point in the same direction as the main analysis: increasing early-career complexity between cohorts born between 1950 and 1964, and fluctuations around a stable trend among subsequent cohorts.

Conclusion

Our findings suggest that the long-term trend of increasing career complexity is in line with previous research for the lion share of the historical period covered, i.e. between about 1970 to mid-1990s (Van Winkle and Fasang, 2017, 2021). An additional finding is that this trend of increasing career complexity is largely driven by an increase in complexity during early-careers (cohorts born between 1950 and 1964). Analyses separated by gender revealed some increase in mid-career complexity over the same historical time period for men, yet a counteracting trend for the mid-career complexity for women; with a decreasing trend of complexity from a relatively high level. Our decomposition analyses suggest that a growing number of episodes of education is the main factor behind the initial increase in early career complexity, while episodes of unemployment drive a temporary increase of career complexity for birth cohorts affected by the recession in the early 1990s. In general, the results suggest that diverging and gendered trends for the different career phases sheds light on previously unknown features in career complexity trends, which may be useful also for solving some inconsistencies in research on trends in employment relations and occupational mobility.

Taken together, our analyses affirm a shift to more career complexity in the 20th century, but there are important exceptions to this trend. First, there is a counter-acting trend for women in the mid-career, and second, there is a flattening out of the trend in the last decades. Regarding the first exception, the role of the historical gender convergence in labor force participation in shaping career patterns has been discussed in previous research. Increasing female labor market participation and public sector expansion have been suggested as explanations of stability over historical time in the duration of employment relations in the labor market taken as a whole (Hollister, 2011). Notably in the present study, trends for women and men are almost parallel for the early career, although there is a widening gender gap, presumably due to young

women's higher rates of participation in higher education. After an initial period of convergence with a decreasing trend for women and an increasing trend for men, trends for women and men are also parallel for mid-career complexity from the 1950s cohort onwards.

It is worth noting that women constantly have higher rates of complexity than men. The expansion of the public sector, in which women are overrepresented, has thus not mitigated the career complexity of women to the level of men. This is important in light of previous discussions about the tempering role of public sector employment on career complexity from a comparative perspective (Van Winkle and Fasang, 2017). As noted in previous research, the public sector of Sweden is likely to be an exception to this general pattern (Witteveen and Westerman, in press).

The second exception is more challenging to explain because it appears to go against the perception of the contemporary labor market becoming ever more insecure and precarious. So why did the long-term trend of increasing complexity come to an end? Both the decomposition analysis and previous research (Van Winkle and Fasang, 2021; Witteveen, 2017) – highlights the role of educational expansion as an important driver of the initial increase in career complexity. Hence, it would be reasonable to investigate whether the end of increasing complexity had something to do with shifts in the nature of educational expansion. First, the last decades may have seen an increase in the proportion of young people with a 'standardized' higher education pathway, consisting of three years of upper-secondary school followed by a longer tertiary education program, and eventually followed by a smooth transition to employment. The 1991 educational reform in Sweden, which made all upper-secondary programs three years, compared to a division between two-year vocational programs and three-year theoretical programs, could also have contributed to a lower level of complexity for some young Swedes in almost an artificial way. Second, the pattern could also be consistent with rising dualization in school-to-work transitions (cf. Brzinsky-Fay and Solga, 2016), i.e. a

parallel growth in standardized transitions and growing shares of young individuals experiencing relative career 'stability' within the inactive state. Third, there may be a very simple reason for the end of increase which could be that educational expansion came to a standstill. It would be of great interest to shed more light on these potential explanations in future research.

A similar trend of flattening out of complexity was also observed in a recent study from Finland (Riekhoff et al., in press), but this trend appears to be upwards if job shifts are included in the operationalization of career complexity. Hence, future research could also further investigate the importance of shifts between employers for the trends of complexity. Still, previous research does not indicate a general trend toward higher rates of employment shifts, yet, most of this research is based on data covering the last decades of the 20th century (Rodrigues and Guest, 2010), i.e. not the later developments discussed here.

Nonetheless, it should be emphasized that the career states in our analyses, which also include parental leave, unemployment, education, and inactivity, are the key components of the comprehensive work life cycle and well worth a study of its own. In such a perspective, there is arguably a perception of a standard trajectory from education to work, and often with one or two periods of parental leave (less often for men), while transitions from job to job are not an obvious characteristic of such a standard trajectory. Hence, all disorderliness of states, such as recurrent episodes of education or even unemployment, will contribute to career complexity and the other way around: the fewer the states and the less disorderliness the less complexity. Thus, analyses of careers based on key states have the potential to indicate historically significant trends.

Finally, our study also contributes to this new research on complexity by showing that the increasing complexity trend, reported in earlier studies, is corroborated by analyses using

registry data and, thus, not driven by recall errors occurring in data from retrospective career biographies. Our analyses also indicate that it is of potential use to conduct separate analyses for women and men as well as for early and mid-careers to disentangle heterogeneity in trends as well to capture more recent developments of career complexity. It will be of great interest to see if the flattening out of this trend also will be seen in other countries than Sweden and Finland and, also, if this trend will continue.

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[1] It is worth noting that the Migration Register slightly underestimates short-term emigration because Swedish residents can briefly live in neighboring countries without have to record their emigration.

[2] For cohorts born before 1953, upper-secondary education is underestimated in the long series due to missing registered degrees before a major school reform in 1971.

[3] The length of this period is set using the typical lengths of educational degrees – an approximation developed by Swedish Statistics ('Sun2000'). Degrees are usually registered in the semester following the last semester in education. Thus, if a 3-year degree is registered in the Spring term of 1999 and the individual is 'inactive' in years 1996-1998, years 1996-1998 are defined as 'in education'. In contrast, years 1996-1999 are registered as 'in education' if a 3-year degree is registered in the Fall term of 1999.

[4] A brief qualifying period during which no grants are paid out, which covers about a week for involuntary lay-offs and up to several months for voluntary quits, is excluded however.

[5] The inclusion of some grants used to identify labor market statuses under the CSN-umbrella varies over time. For comparability, all student grants (regardless of source) are consistently defined as 'in education'.

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Figure 1. Examples of career types with varying levels of complexity.

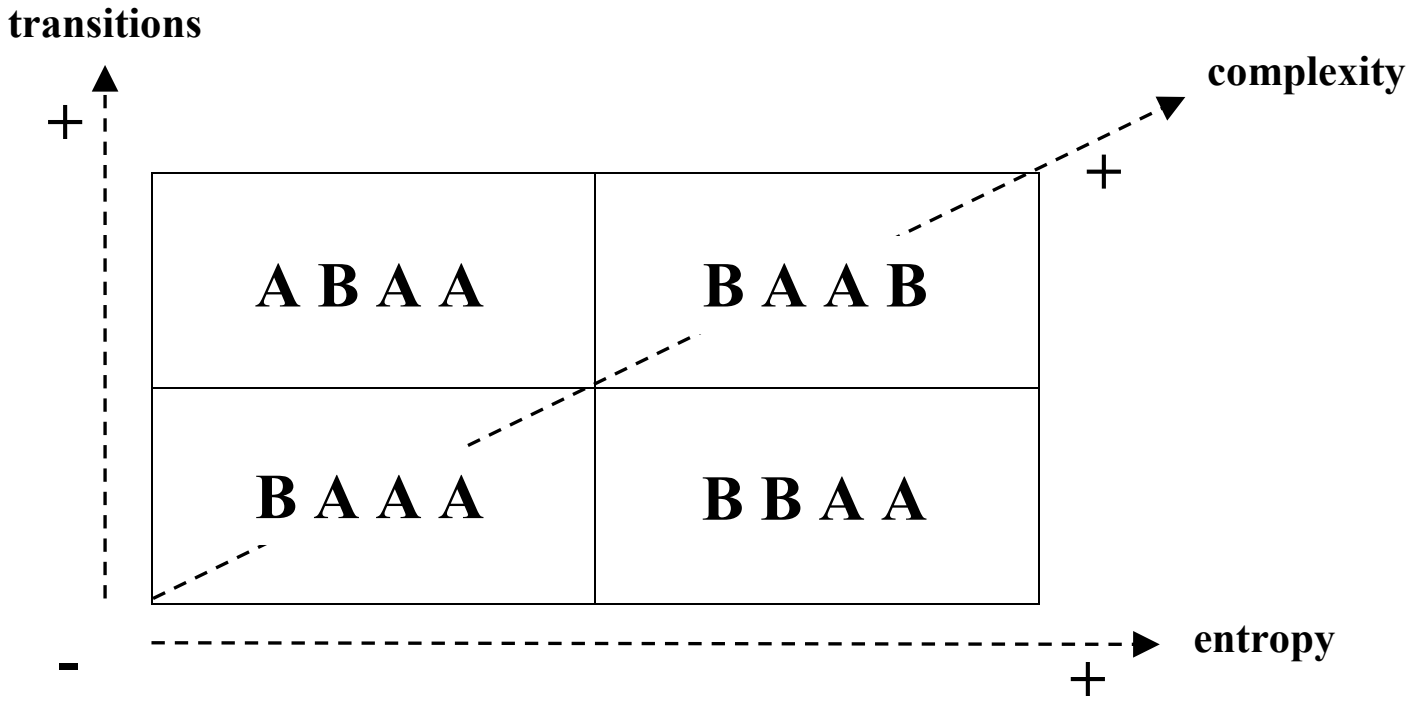
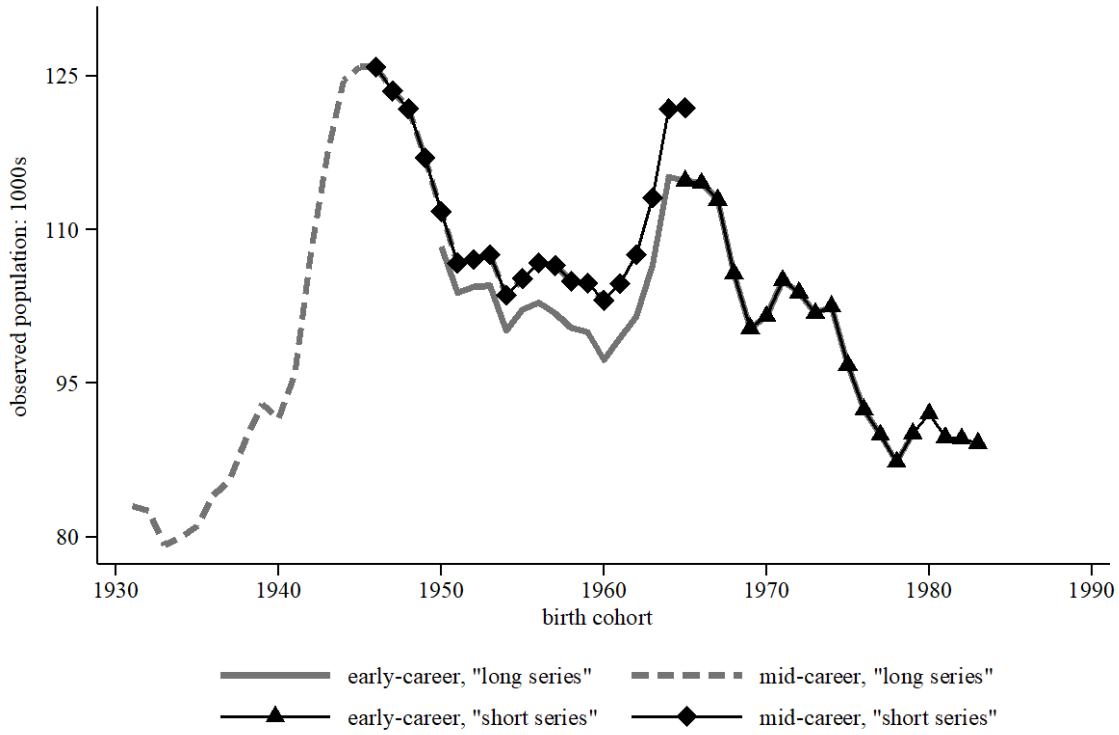
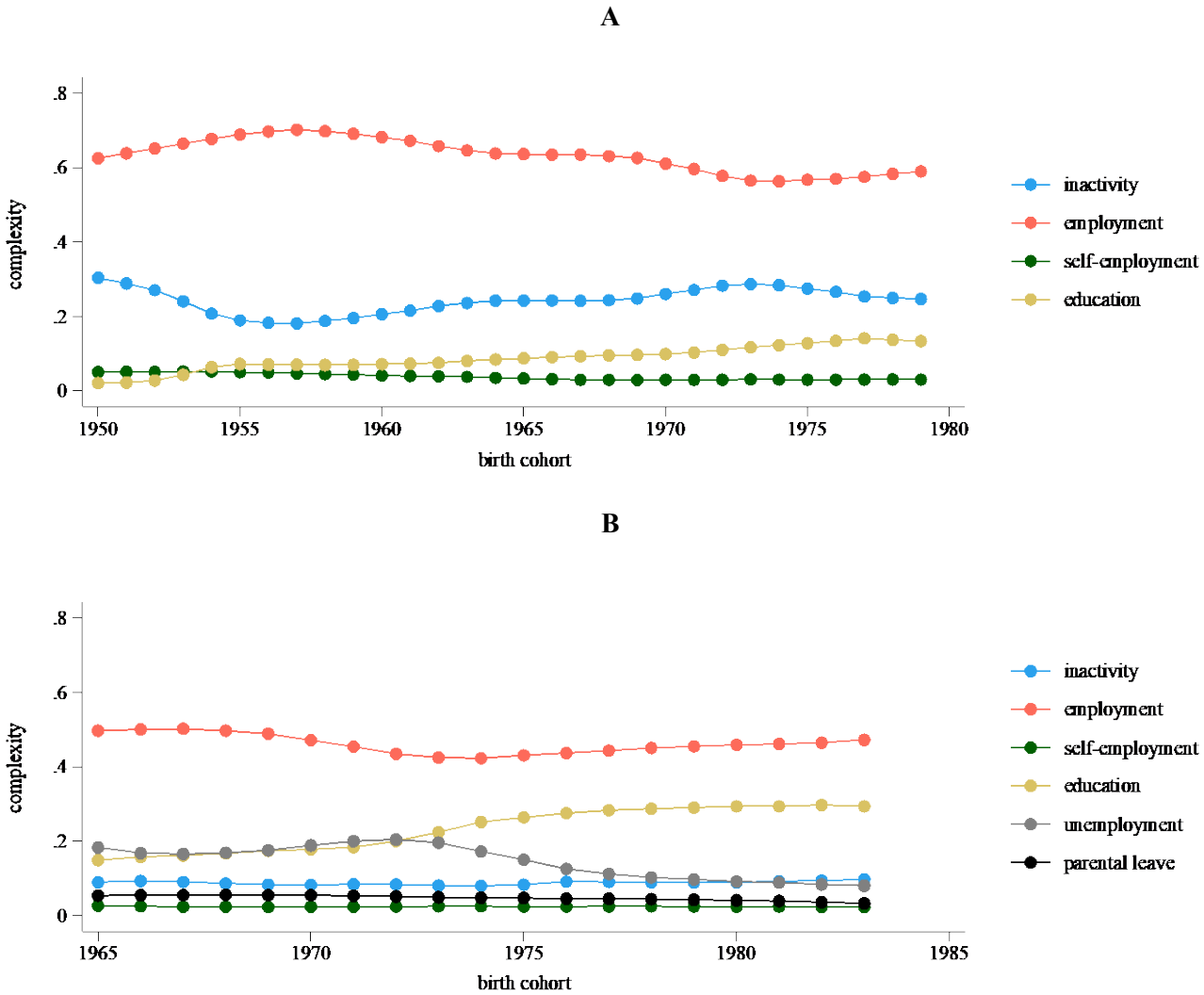


Figure 2. Population Size by Birth Cohort.



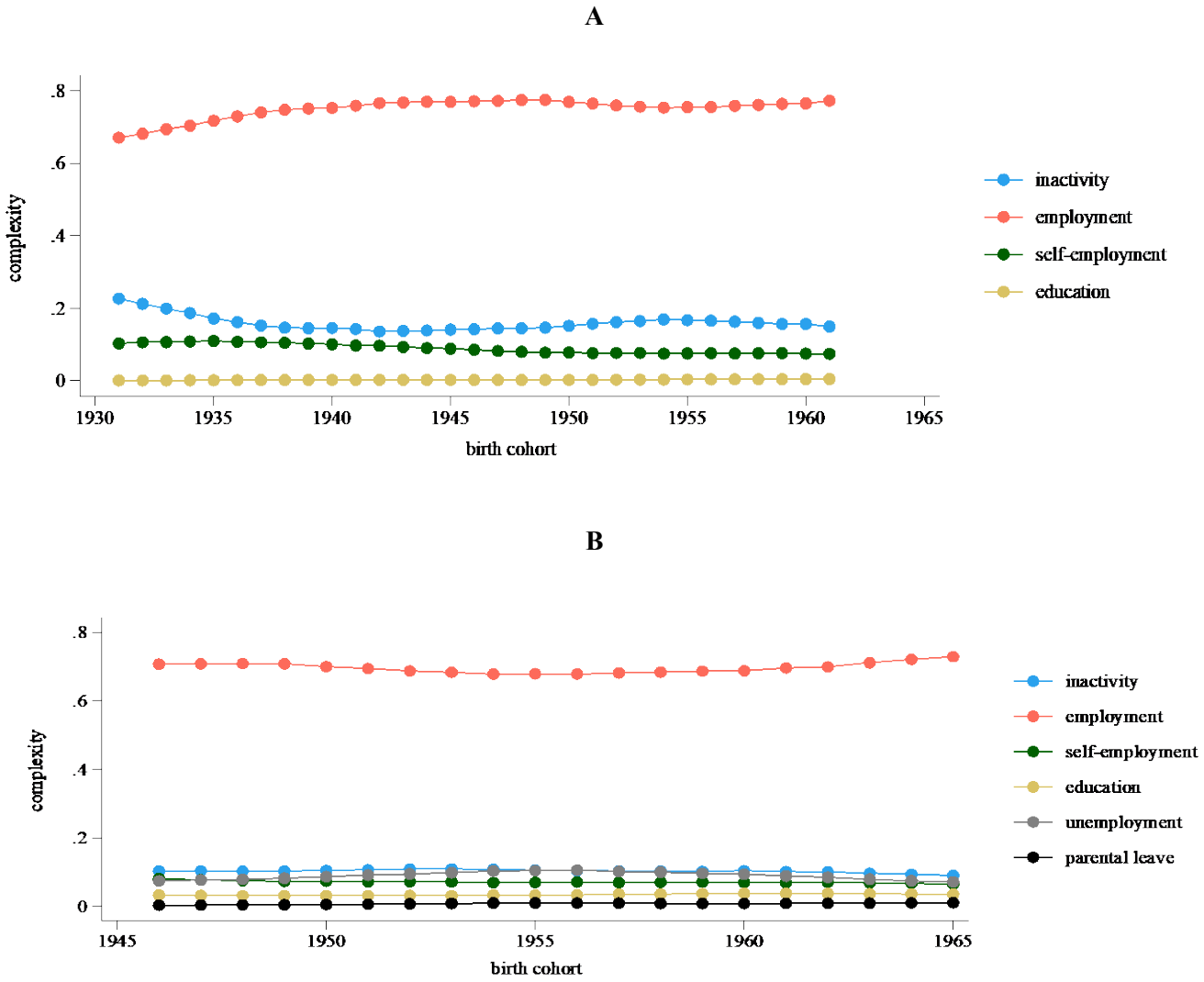
Notes. "long series" = simpler state alphabet, older birth cohorts included. "short series" = more elaborate state alphabet, younger birth cohorts only.
Source. Swedish Registers (1968-2018).

Figure 3. Cumulative Share in States during the Early-Career (Ages 18 thru 36).



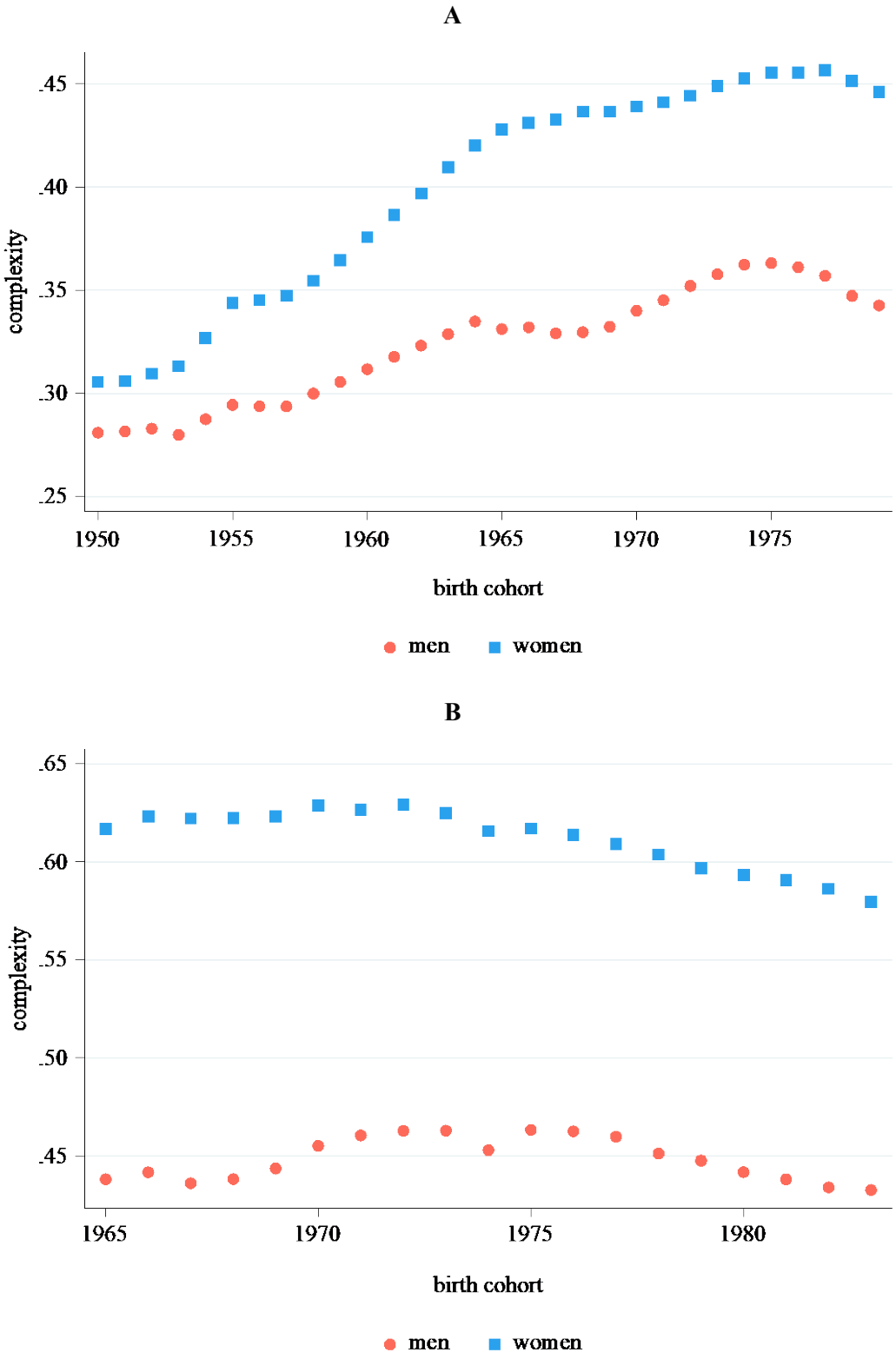
Notes. A = simpler state alphabet, older birth cohorts included. B = more elaborate state alphabet, younger birth cohorts only.
Source. Swedish Registers (1968-2018).

Figure 4. Cumulative Share in States during the Mid-Career (Ages 37 thru 54).



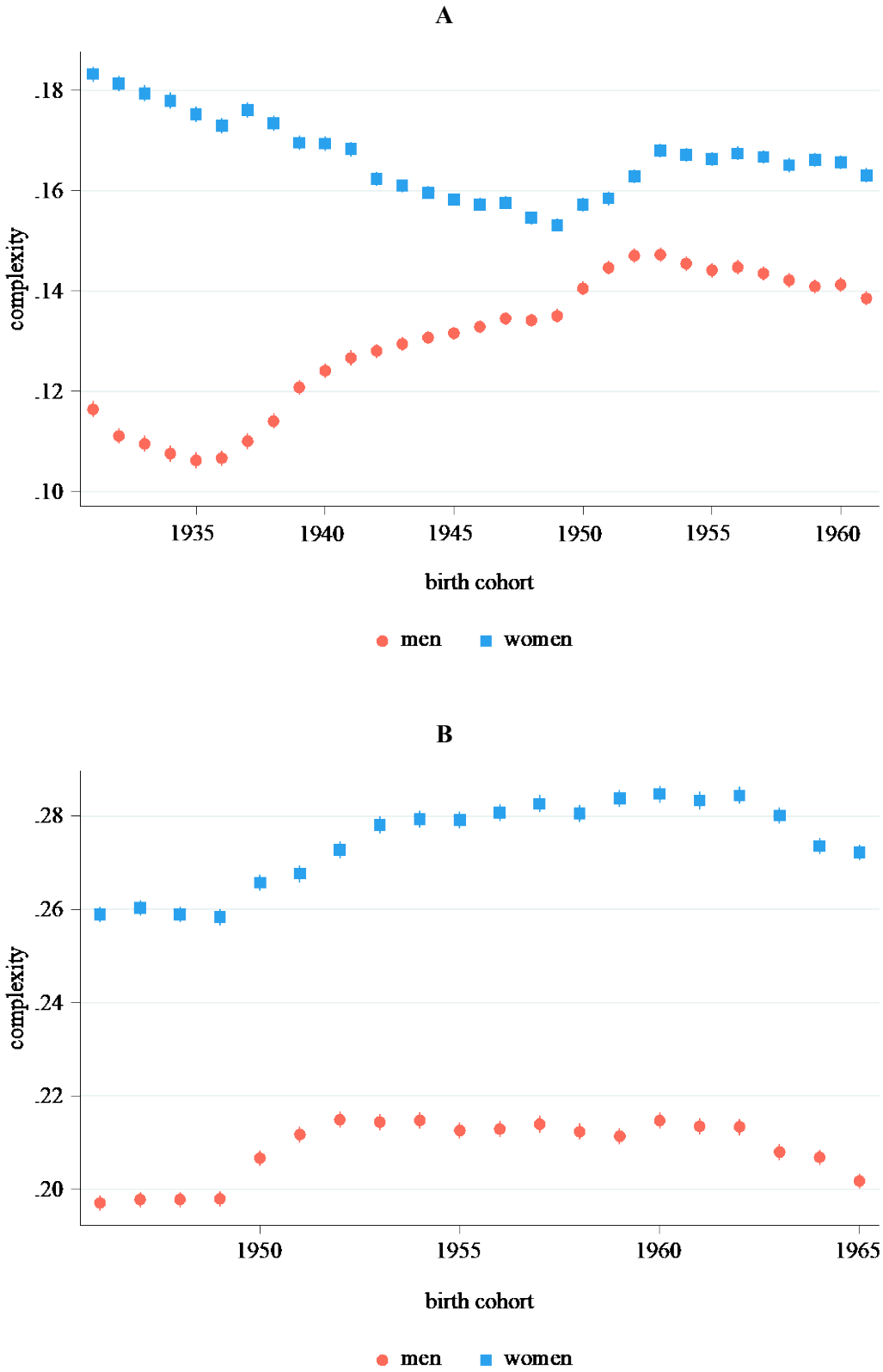
Notes. A = simpler state alphabet, older birth cohorts included. B = more elaborate state alphabet, younger birth cohorts only.
Source. Swedish Registers (1968-2018).

Figure 5. Early Career Complexity Trend by Gender (Ages 18 thru 36).



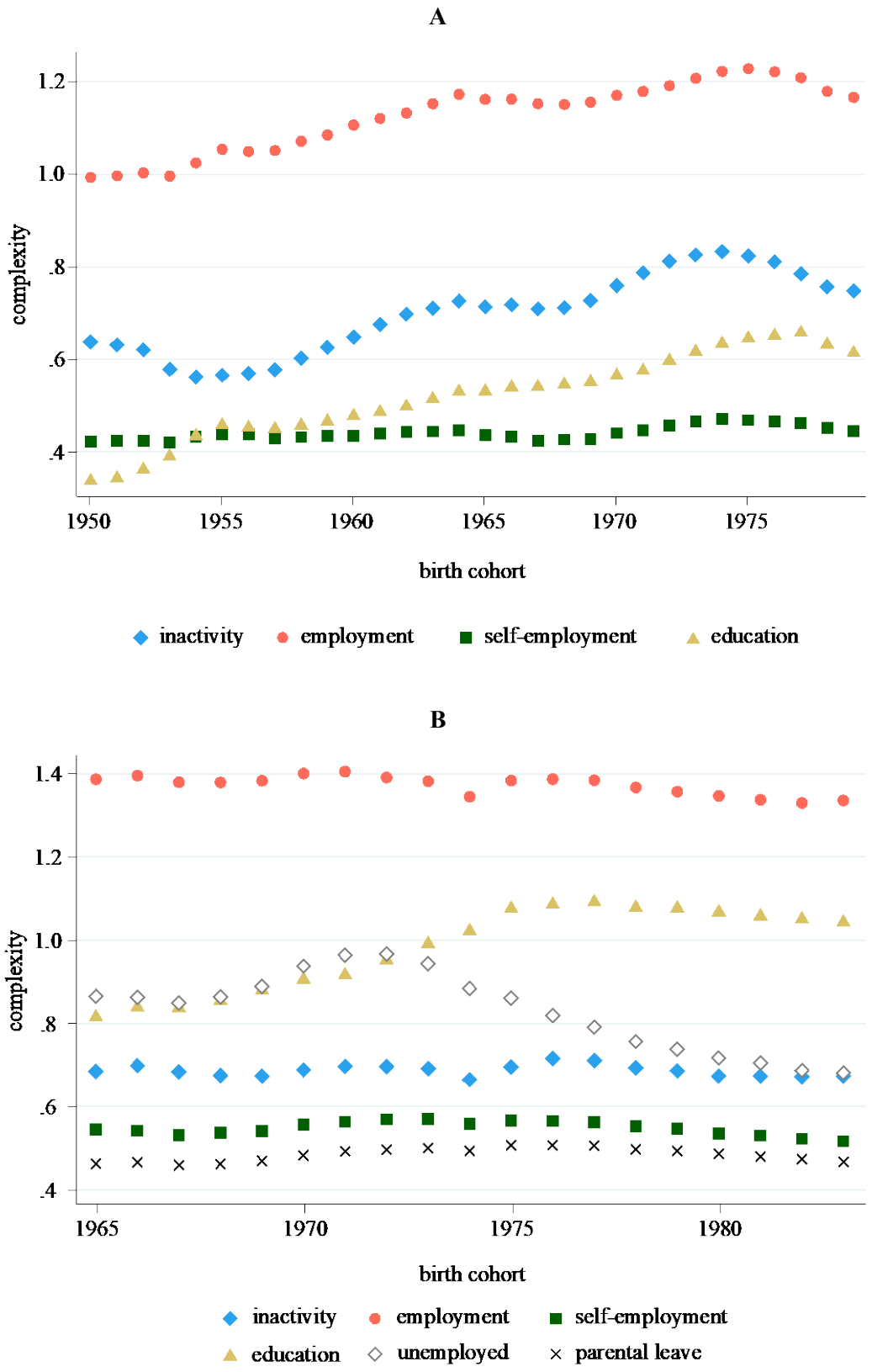
Notes. A = simpler state alphabet, older birth cohorts included. B = more elaborate state alphabet, younger birth cohorts only. 95-confidence intervals applied (often smaller than the marker). Controls for migration background and geographic region slightly reduce overall levels of estimated complexity, yet trends remain the same (Appendix B). *Source*. Swedish Registers (1968-2018).

Figure 6. Mid-Career Complexity Trend by Gender (Ages 37 thru 54).



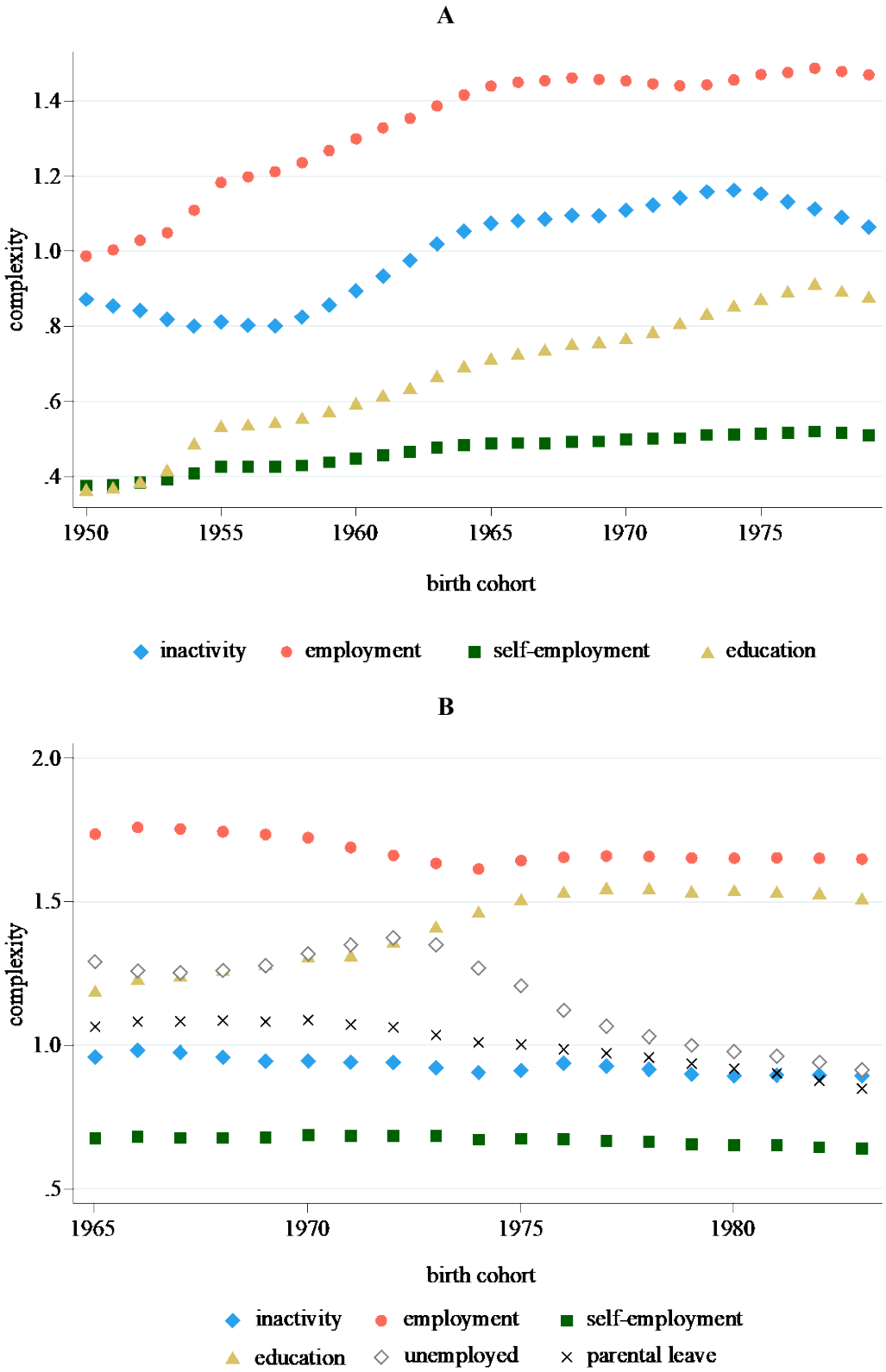
Notes. A = simpler state alphabet, older birth cohorts included. B = more elaborate state alphabet, younger birth cohorts only. 95-confidence intervals applied (often smaller than the marker). Controls for migration background and geographic region slightly reduce overall levels of estimated complexity, yet trends remain the same (Appendix C). *Source*. Swedish Registers (1968-2018).

Figure 7. State Composition of the Early Career Complexity Trend (Ages 18 thru 36): Men.



Notes. A = simpler state alphabet, older birth cohorts included. B = more elaborate state alphabet, younger birth cohorts only.
Source. Swedish Registers (1968-2018).

Figure 8. State Composition of the Early Career Complexity Trend (Ages 18 thru 36): Women.



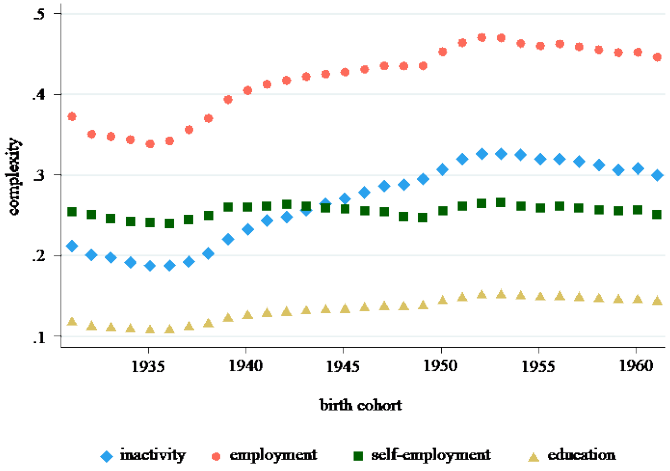
Notes. A = simpler state alphabet, older birth cohorts included. B = more elaborate state alphabet, younger birth cohorts only.
Source. Swedish Registers (1968-2018).

Appendix A.

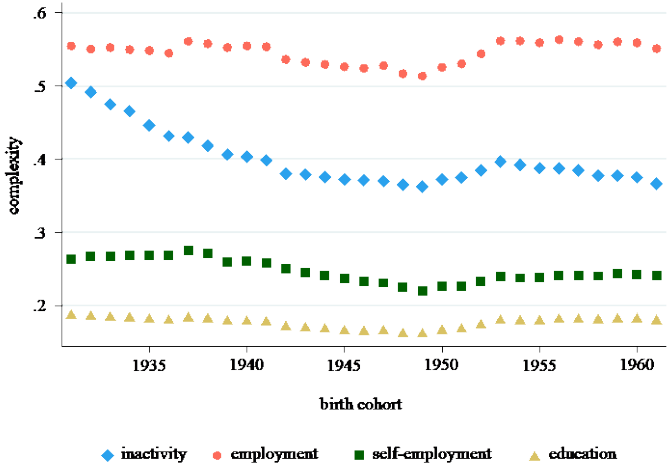
State Composition of the Mid-Career Complexity Trend (Ages 37 thru 54).

A (long series)

Men

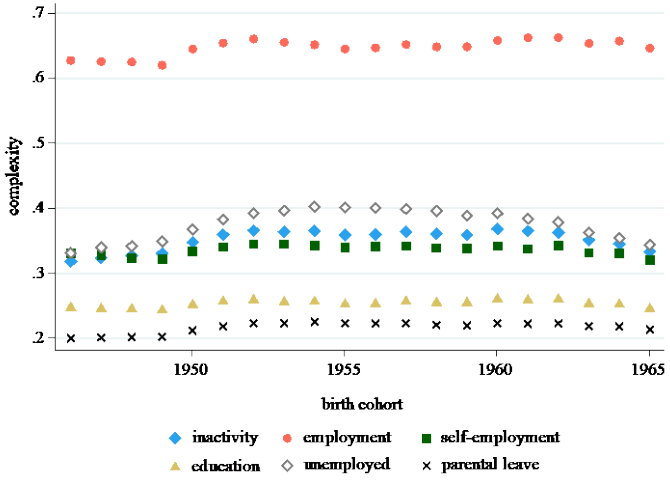


Women

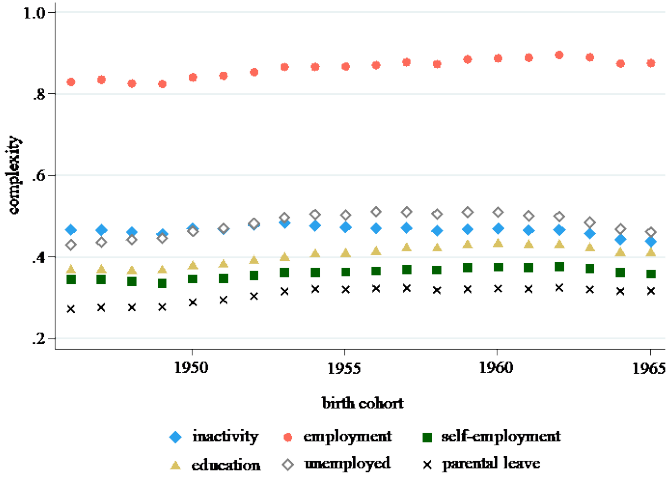


B (short series)

Men



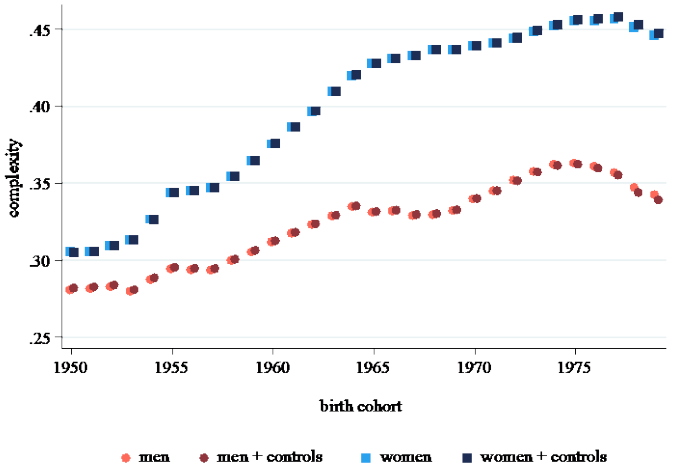
Women



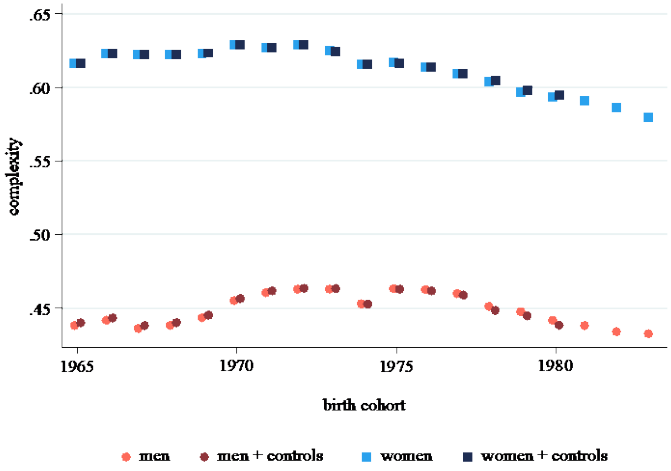
Appendix B.

Early-Career Complexity Trend by Gender + Controls.

A



B

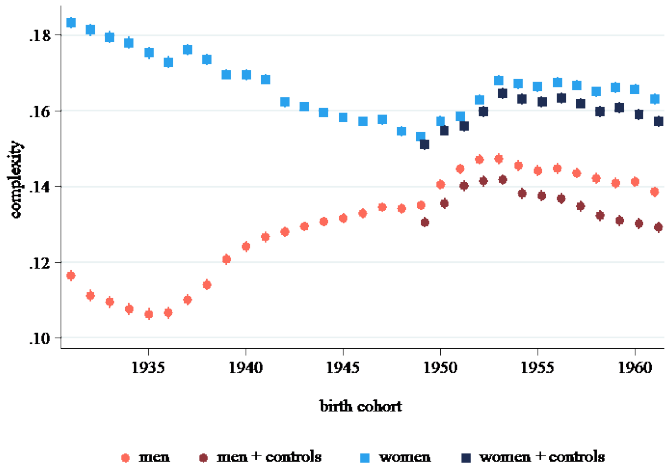


Notes. A = simpler state alphabet, older birth cohorts included. B = more elaborate state alphabet, younger birth cohorts only. 95-confidence intervals applied (often smaller than the marker). Controls include migration background (born in [1] Sweden, [2] other Nordic country, [3] Western Europe, [4] Eastern Europe, former socialist, [5] Middle East, [6] Africa, [7] Asia, [8] South America, [9] North America, other Anglo-Saxon, Israel) and geographic region (24 counties [län]).
Source. Swedish Registers (1968-2018).

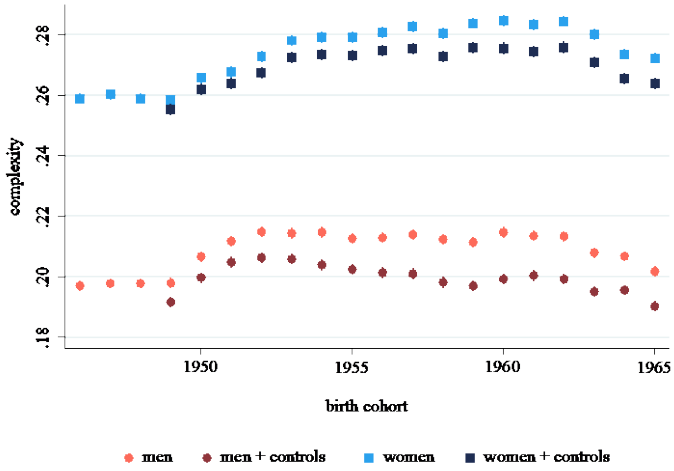
Appendix C.

Mid-Career Complexity Trend by Gender + Controls.

A



B



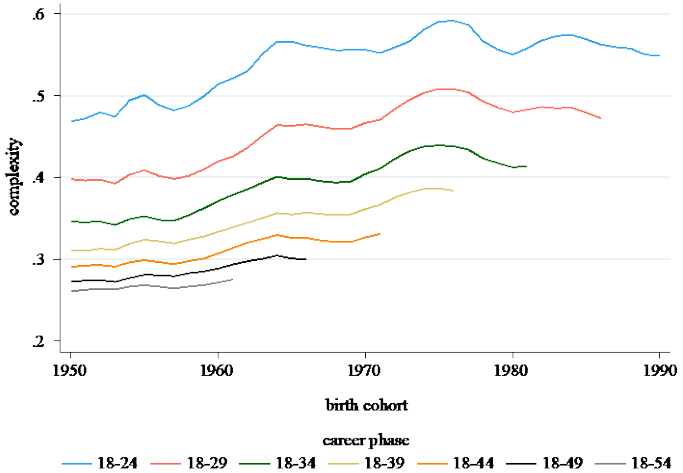
Notes. A = simpler state alphabet, older birth cohorts included. B = more elaborate state alphabet, younger birth cohorts only. 95-confidence intervals applied (often smaller than the marker). Controls include migration background (born in [1] Sweden, [2] other Nordic country, [3] Western Europe, [4] Eastern Europe, former socialist, [5] Middle East, [6] Africa, [7] Asia, [8] South America, [9] North America, other Anglo-Saxon, Israel) and geographic region (24 counties [län]).
Source. Swedish Registers (1968-2018).

Appendix D.

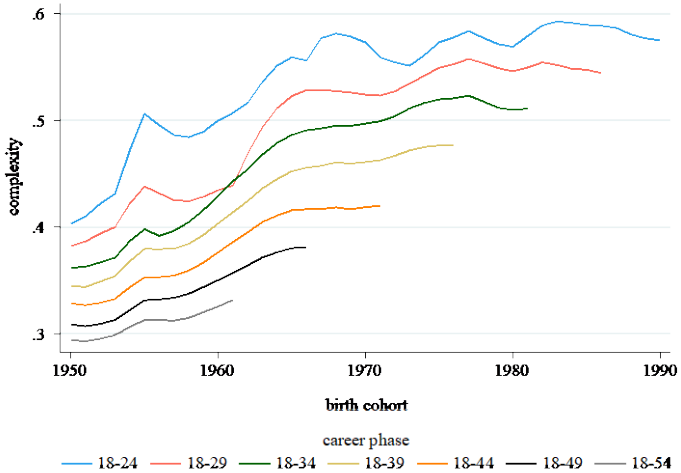
Career Complexity Trends for Different Observed Career Lengths (End of Career).

A (long series)

Men

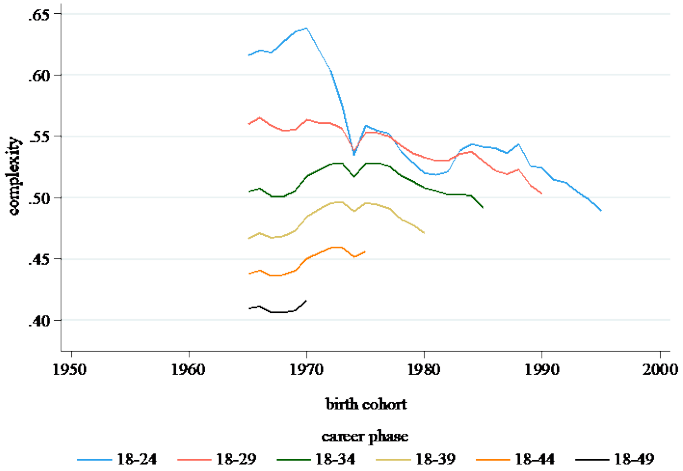


Women

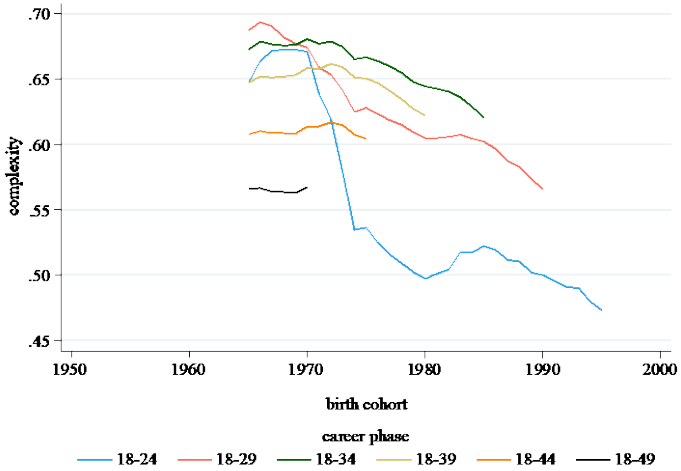


B (short series)

Men



Women

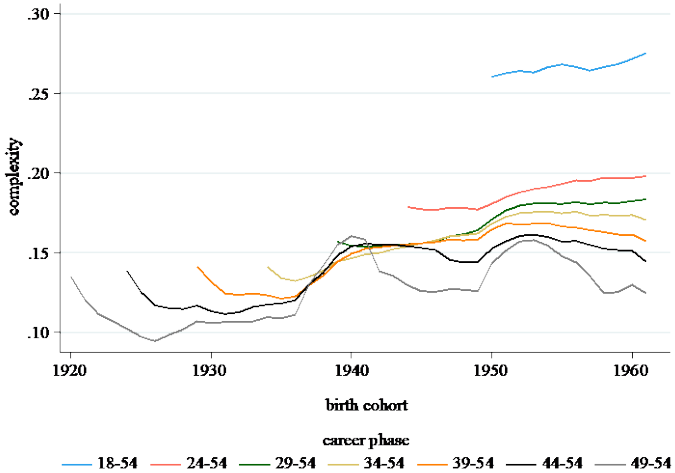


Appendix E.

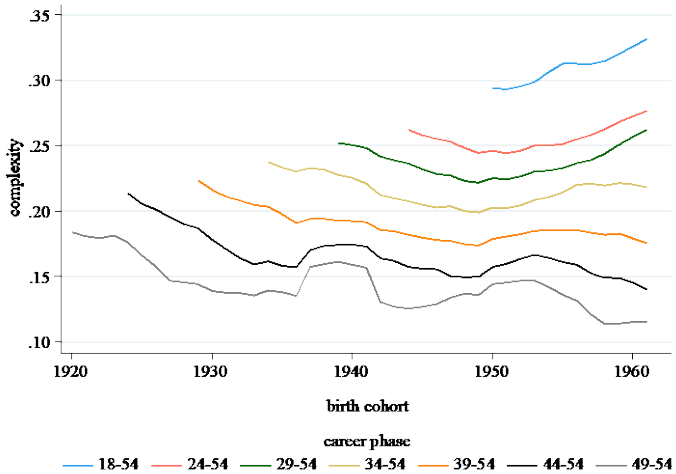
Career Complexity Trends for Different Observed Career Lengths (Start of Career).

A (long series)

Men

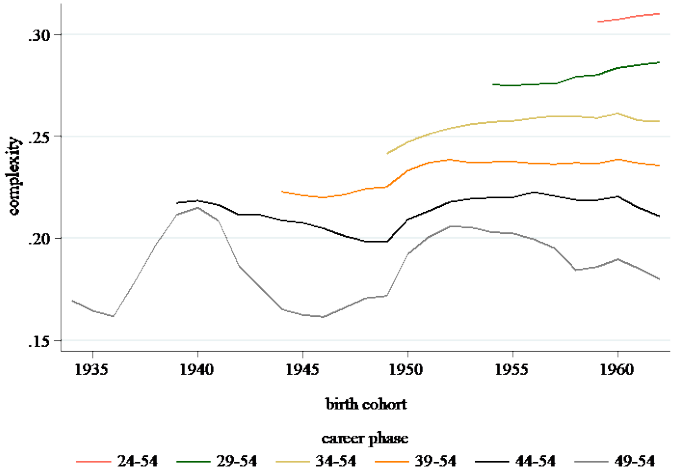


Women



B (short series)

Men



Women