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Intragenerational wage mobility and social disadvantage: A comparative study of West Germany and the United States

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ABSTRACT

This article studies wage mobility during the early career in West Germany and the United States. We examine the extent of intragenerational wage fluctuations, whether they structure into upward mobility trends or remain volatile variations, and whether mobility aligns with classical stratification dimensions (gender, social origin, and education). We highlight three main findings. First, intragenerational wage fluctuations are stronger in the United States than in West Germany. Second, wage fluctuations translate into steeper trends of upward mobility, lower trend heterogeneity, and lower year-to-year volatility in West Germany than in the United States. Last, there is persistent intragenerational wage inequality by gender, social origin, and education but no striking differences between the patterns in the two countries. These results point toward the idea that higher wage fluctuations in the United States do not reflect opportunities for upward mobility but, rather, uncertainty around the prospects of wage progression.

1. Introduction

The labor market is one of the central institutions channeling economic resources and determining who gets what in Western societies. Labor earnings (i.e., income from the labor market) represent the largest source of income for individuals and families and made up two thirds of total individual income at the turn of the 20th century in the largest economy of the Western world, that is, the United States (Ehrenberg and Smith 2016). Earnings are conventionally expressed by $E = w \times h$, where h represents the working hours and w is the wage rate, namely, the price of one hour of labor (Blau and Kahn, 2009). Variations in the wage rate (w) explain a major portion of variations in earnings in many countries. In the mid-90s, about 70 percent of earning inequality was attributable to variations in the wage rate in the United States (Blau and Kahn, 2009). If we equalize the wage rate in a thought experiment, U.S. earning inequality would drop to 30% of the amount actually observed at that time. Therefore, the wage rate is a central component of individual and family income, and variation of the wage rate in a society, that is, wage dispersion, is a key aspect of economic inequality.

Wage dispersion reflects a meritocratic principle of job allocation in classic economic accounts. Human capital theories predict that better-educated individuals, having higher skills and abilities, will be more productive on the job and will secure higher wages than lower-educated and skilled individuals. Wage dispersion also depends on the age profile of the working population because the wage rate is a function of workers' acquired tenure and labor market experience. However, wage dispersion does not reflect only meritocratic principles of market allocation. Sociological accounts have long stressed that ascriptive characteristics, such as gender, socioeconomic background, or race, help individuals secure advantages in the labor market irrespective of their own level of education and skills. What is more, such advantages may not be confined to labor market entry but persist throughout an occupational career. Finally, institutional characteristics of the labor market and education systems co-determine wage dispersion. Collective bargaining and agreements affect the variability of wages across individuals and delimit wage progression possibilities over the course of a career. Moreover, the linkage between the skills acquired in school and those demanded in the labor market impacts wage inequality throughout the working career via initial job-skill matches and subsequent labor market adjustments.

A plethora of economic and sociological scholarship has focused on wage variations between individuals in several countries and historical

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periods. However, wage variations over the working career (hereafter, wage fluctuations) and their alignment with classical stratification dimensions have received less attention. The existing longitudinal scholarship has mostly focused on other dimensions, such as occupational prestige (Härkönen and Bihagen, 2011; Lersch, Schulz, and Leckie, 2020; Manzoni, Härkönen, and Mayer 2014) or socioeconomic status (Barone, Lucchini, and Schizzerotto, 2011; Passaretta, Barbieri, Wolbers & Visser, 2018). Other studies have looked at compound income concepts, such as the yearly equivalent disposable income (Gangl, 2004), monthly earnings (Yaish and Gabay-Egozi, 2021), or weekly income (Yaish, Shiffer-Sebba, Gabay-Egozi & Park, 2021), that reflect a myriad of processes creating economic inequality. If differences in monthly earnings or annual disposable income increase with career progression, is this because of increasing differentiation in individuals' pay, working hours, or availability of other income sources? These questions are difficult to answer because compound measures mask underlying inequality processes. Against this backdrop, we look at a single income component that is a crucial and unambiguous parameter in economic theory, that is, the wage rate.

Few studies look at trajectories in the wage rate. For example, Fuller (2008) found that hourly wage trajectories flatten with job mobility in the United States, mainly as a result of involuntary job mobility. Connolly and Gottschalk (2006) observed educational inequality in hourly wages to increase over the course of a career and identified the main drivers in the different returns as general experience, tenure, sector experience, and improved job match. More importantly, Cheng (2014) established a general life-course trajectory (LCT) framework that links patterns of intra-cohort wage inequality in the United States to random variability and trajectory heterogeneity in wages. Cheng's proposal, however, has been largely inconsequential for recent studies in the social stratification literature in Europe, which has almost exclusively focused on between-group inequality trajectories and overlooked the concepts of individual heterogeneity in trajectories and random variability (Birkelund, Karlson, and Yaish, 2022; Hällsten and Yaish, 2022; Yaish et al., 2021).

Our study is one of the first to test empirically the implication of the LCT framework in a European country, that is, West Germany. Using the U.S. case as a benchmark, the study reconstructs the wage trajectories over the first ten years of the careers of individuals who entered the labor market in the period 1985–2005 in the United States and West Germany. We estimate the degree of intra-generational wage fluctuations and assess the extent to which wage fluctuations reflect opportunities for wage progression or uncertainty. Furthermore, we descriptively link the degree of intragenerational fluctuations in wages with patterns of between-group inequality (gender, social background, and education) in Western societies. Our research is guided by the following research questions: *(RQ1) Are intragenerational wage fluctuations stronger in West Germany or the United States? (RQ2) Do intragenerational wage fluctuations reflect opportunities for career progression or uncertainty in the two countries? (RQ3) Is intragenerational upward mobility structured along classical lines of social stratification in the two countries, and how?*

The United States and West Germany represent institutional opposites in the Western world. The United States embodies the *liberal market economy* (LME) that combines weak state interference in labor market dynamics, weak unionization, and education systems that offer general skills (Hall and Soskice, 2001). In contrast, West Germany represents a *coordinated market economy* (CME) whose coordination relies on the provision of specific skills, strong trade unionism, and centralized collective bargaining. As we will argue, these differences are likely to affect the nature and extent of intragenerational wage fluctuations and the chances that group-based inequality in the wage rate will change once individuals have entered the labor market.

The contribution of our article is twofold. First, it offers insights into the links between intragenerational wage fluctuations, upward mobility trends, and the evolution of between-group inequality over the early career. Therefore, the article goes some way to answering the call by Fasang and Mayer (2020) for more research on the stability and volatility of socioeconomic outcomes over the life course and is one of the few applications of the LCT proposed by Cheng (2014). Second, the article contrasts two countries characterized by sharply different institutional contexts and discusses several institutional characteristics that have been considered relevant for wage fluctuations and their relation with the intragenerational evolution of between-group inequality.

2. Wage fluctuations in Germany and the United States

Liberal and coordinated market economies represent two distinct institutional equilibria in the varieties of capitalism approach (Cusack et al., 2006; Estevez-Abe et al., 2001; Hall and Soskice, 2001; Iversen and Soskice 2001). The United States and West Germany only approximate these ideal-typical cases; however, their characterization as ideal-typical opposites provides a useful theoretical layer to frame expectations about the extent of wage fluctuations and patterns of intragenerational inequality in the two countries.

Coordination among economic actors depends mostly on market dynamics in LMEs as employee–employer relationships are little addressed by national law. Trade unionism is typically weak, and collective bargaining is highly decentralized. This arrangement makes it more profitable and rational for firms and workers to invest in general skills, which are transferable across employers and even employment sectors. In fact, LMEs typically combine academically oriented education systems, limited on-the-job training, and a production regime based on radical innovation. Coordination among economic actors does not rely exclusively on market dynamics in CMEs but also on non-market forms of bargaining and collaboration between the organization of companies, unions, and work councils. This mode of coordination incentivizes both workers and firms to invest in specific skills that are difficult to transfer among employers and sectors. In these contexts, educational systems provide specific and occupational skills that are easily recognizable by employers, and employment relationships enjoy stronger legal protection than in LMEs.

The institutional arrangement in LMEs and CMEs has important consequences for the extent of intragenerational wage fluctuations. Tight school-to-work linkages and the strong protection of employment relationships should reduce job turnover in a CME such as West Germany. Employers have little reason to fire workers after the provision of in-house training; nor can they easily lay off workers due to strict rules on firing practices. Neither do workers have incentives to change jobs after they receive tailored training because their specific skills are not easily transferable across firms or sectors. Conversely, loose school-to-work linkages and weak employment protection increase job turnover in LMEs, such as the United States. Because job turnover is often accompanied by a wage change, we would expect larger and more frequent intragenerational fluctuations of the wage rate in the United States than in West Germany.

The level of (de)centralization of collective bargaining and union strength are other fundamental pieces of the puzzle. Wage settings in CMEs are rather centralized and dependent on collective agreements. These agreements usually set the pay scale and wage progression in different occupations or industries. Moreover, strong unions, which are typically found in CMEs, contribute to lower wage dispersion not only across individuals but also over the lifecycle by boosting the bottom of the wage distribution (Card 1996; Card, Lemieux, and Riddell 2004, 2020). Wage settings are centralized, and collective bargaining takes place at the industry level or even at the economy level in West Germany. Conversely, wage settings are highly decentralized in the United States, which allows for larger discretion over the wage rate as workers acquire tenure and labor market experience. Centralized bargaining processes and stronger unionization in West Germany should contribute further to lowered intragenerational fluctuations in the wage rate than in the United States.

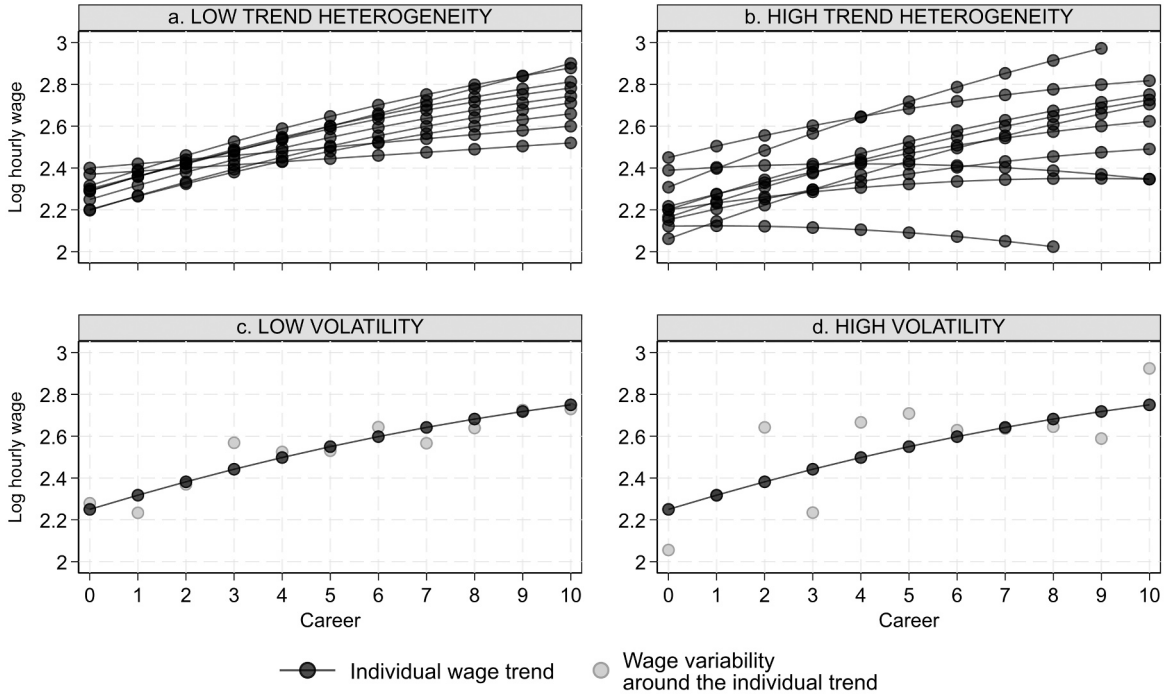

Fig. 1. Wage trend heterogeneity (upper panel, a–b) and wage volatility (lower panel, c-d). Expectation for West Germany: a. low trend heterogeneity and c. low volatility. Expectation for the US: b. high trend heterogeneity and d. high volatility. Notes: in the upper panel (a, b), the black line represents the wage trends of different individuals in the population. In the lower panel (c, d), the black line represents an individual's wage trend and the grey dots the wage rate at different points over the life cycle for the same individual.

3. Opportunity and uncertainty

Do intragenerational wage fluctuations reflect opportunities for career progression or uncertainty in the two countries? Do they reflect long-term trends of upward mobility or transient changes? The LCT framework (Cheng, 2014) provides a resource to frame these questions. It distinguishes two basic sources of wage variation. The first is *trajectory heterogeneity*, that is, that wage trajectories start at different levels and grow at different rates across individuals. The second is *random variability*, that is, that wages vary around the individual trajectory due to shocks from employment, family, and health transitions, among other factors. The LCT framework systematizes popular concepts in the literature on income development, in which income fluctuations are often separated over the life course into two components: fluctuations that follow a directional – either upward or downward – trajectory (often referred to as the individual "income trend") and fluctuations that are transient income changes around the trajectory ("income volatility") (Gangl, 2005; Latner, 2018). This study builds on the LCT framework but adopts the most popular terminology from the income development literature. Therefore, we distinguish between *wage trend* and *wage volatility* as the two main components of wage fluctuations over the life course (see Fig. 1).

Human capital theory predicts positive wage trends over occupational careers as the wage rate increases with years of working experience (Mincer, 1958). Upward mobility trends usually flatten when individuals are in their mid-thirties, the point at which they reach occupational maturity. Flattening trends of upward mobility are consistent with human capital accounts postulating decreasing returns to specific skills over tenure (Mincer 1974) and with the idea that promotions in internal labor markets are concentrated among young employees (Kerckhoff 1995; Marsden and Ryan 1995). Nonetheless, human capital accounts fall short when it comes to explaining the heterogeneity of wage trends between individuals and the volatility of wage rates around the individual trends of progression.

Wage trend heterogeneity and *volatility* are not only important from an economic standpoint but have important consequences for the real-life experiences of workers in a society. On the one hand, strong heterogeneity in wage trends reflects the idea that school leavers will have more uncertainty about their prospects of income progression in the long term. On the other hand, strong volatility around individual wage trends reflects the idea that individuals will experience more uncertainty in terms of year-to-year wage changes in the short term. Therefore, both wage-trend heterogeneity and wage volatility are meaningful pieces of information to qualify wage fluctuations as reflecting opportunity for upward progression and uncertainty about wage prospects in a country.

Institutional explanations may help where human capital theories fall short. The strictness of school-to-work linkages, the protection of employment relationships, and the (de-)centralization of collective bargaining in CMEs and LMEs may have consequences for both *heterogeneities* of individual wage trends and the *volatility* around these trends. Strong school-to-work linkages in West Germany should facilitate the job-matching process and put most workers on a clear-cut and predictable career path. Moreover, comparatively higher levels of employment protection and centralized bargaining should reduce the uncertainty around career progression by limiting job turnover and possible year-to-year changes in the wage rate. This is the scenario of comparatively low trend heterogeneity (Fig. 1a) and volatility (Fig. 1c) that we expect in West Germany: overall, a scenario where wage fluctuations reflect the opportunity for a predictable progression both in the short and the long term. Conversely, poor school-to-work linkages, weak restrictions over firing practices, and decentralized bargaining at the occupation or even the firm level in the United States may favor both year-to-year wage changes and stronger heterogeneity in the trends of upward progression between individuals. This is the scenario of comparatively high wage trend heterogeneity (Fig. 1b) and volatility (Fig. 1d) that we expect in the United States: overall, a scenario where wage fluctuations reflect uncertainty around the short- and long-term prospect of progression.

4. Between-group inequality over the early career

Is intragenerational upward mobility structured along classical lines of social stratification, and how? In the following, we outline some considerations regarding the intragenerational evolution of wage inequality by gender, social origin, and education in Western societies. Then, we derive a general expectation regarding the association between the extent of wage fluctuations in a country and the evolution of group-based inequality over the early career.

4.1. Does group-based inequality increase or decrease?

Gender inequality in wages is well ascertained in the literature and linked to many individual- and occupation-level mechanisms (Becker, Gary, 1985). One important mechanism is segregation into female-dominated occupations. Female-dominated occupations pay lower wages and offer fewer chances of upward mobility than male-dominated occupations (Bayard, Hellerstein, Neumark, & Troske, 2003; del Río and Alonso-Villar, 2015). Career interruptions due to childbirth and childrearing responsibilities are another important mechanism explaining women's penalties. Career interruptions are associated with human capital decay and the accumulation of shorter tenure that slow down wage growth over the working career (Becker, Gary, 1985; Gupta and Smith, 2002; Ruhm, 1998). These considerations suggest that women experience higher gender penalties at labor market entry and slower wage growth over the course of their careers than men. Hence, the gender penalty at career onset is likely to increase over the early life course.

One of the most robust associations in the social sciences is that between own level of education and labor market returns. Human capital and signaling theories trace back this positive association to the higher productivity of better-educated individuals (Becker 1967; Spence 1974). Credentialism and control theories point towards education as a signal of status membership that serves status reproduction (Bowles and Gintis 1976; Collins 1979). Regardless of the underlying mechanisms, both sets of theories predict that wage premiums linked to education will increase over the occupational career. Workers with low productivity on the job and/or lacking signals of high-status membership are more at risk of involuntary work interruptions and experience comparatively long unemployment spells, both of which have negative implications for wage growth. Existing research has confirmed these expectations and shown that the larger wage growth of highly-educated individuals than of the low educated stems both from within-job dynamics, reflecting higher returns on working experience, and between-jobs dynamics, reflecting the adjustment of initial mismatches (Connolly and Gottschalk, 2006). These considerations suggest that the initial wage gap between low and highly-educated individuals may increase over the early occupational career.

Social origin is another crucial social stratification dimension in Western societies. Social mobility research repeatedly stresses that social origin influences occupational destinations and that much of this gross association is mediated by educational attainment (Blau and Duncan 1967; Breen 2004; Erikson and Goldthorpe 1992). Moreover, many studies have pointed out that social origin plays a role above and beyond educational credentials because of direct inheritance of family businesses, social networks, and the development of (non)cognitive skills and occupational aspirations (Erikson and Jonsson 1998; Breen and Luijkx 2004). But how does the direct effect of social origin evolve in the course of a career? On the one hand, the initial direct effect may weaken during a career because as an individual ages, their own networks and resources become increasingly important compared to those of the family (Mare 1980). On the other hand, processes of cumulative advantage and countermobility may lead to the opposite scenario, namely, of a strengthening direct effect over the course of the career (Cheng, 2014; Wolbers 2011; Goldthorpe, Llewellyn, and Payne 1987). Recent literature has suggested that the direct effect of social origin on various occupational outcomes is visible at career onset and tends to persist and even increase over the lifecycle (e.g., Manzoni, Härkönen, & Mayer et al., 2014; Yaish et al., 2021; Passaretta et al., 2018). Hence, we expect the effect of direct social origin on wages to persist or even increase over the early career.

4.2. Where is group-based inequality likely to increase most?

Existing research supports the idea that intragenerational upward mobility is structured along the classical lines of social stratification in Western societies, thus resulting in persistent or even increasing between-group inequality over the early career. But is between-group inequality more likely to increase in the United States or West Germany?

Institutional characteristics constrain wage fluctuations in West Germany. The lowered levels of wage fluctuations limit the degree of upward and downward mobility over the course of a career. In this scenario, the amount of between-group wage inequality settled at career onset will likely persist and increase only slightly over the lifecycle. For example, if there is little room for wage mobility during one's career, gaps between men and women at career onset will likely remain constant or increase to a limited extent. The institutional configuration of the United States favors intragenerational wage fluctuations. Although there is no guarantee that such fluctuations will be structured along patterns of upward (or downward) mobility at the individual level, strong fluctuations increase the likelihood of changing patterns of between-group inequalities over the course of a career. Returning to the gender example, when institutional conditions favor intragenerational wage fluctuations, women may lose even more ground than men after the first job placement, thus causing initial gender wage gaps to increase sharply during the career. (It should be noted, however, that gaps may even remain constant if wage fluctuations do not align with gender lines). All in all, we expect that stronger wage fluctuations in the United States than in Germany will translate into stronger increases in between-group inequality over the career.

5. Data and variables

We used data from two of the largest and most reliable household panel studies in the Western world: the German "Socio-Economic Panel" (SOEP) and the U.S. "Panel Study of Income Dynamics" (PSID). Both datasets collected prospectively a wide variety of demographic, educational, and occupational information on representative samples of households from 1968 (PSID) and 1984 (SOEP) onwards. The two datasets are largely similar in overall aim and design. Information was gathered annually in the SOEP and, until 1997, in the PSID, after which date it was collected biannually. The prospective nature of the surveys prevents problems of recall bias, which are common in widely used retrospective surveys.

Our target population includes individuals who, after having achieved their highest level of education, entered the labor market between 1985 and 2005. For these individuals, we reconstructed in detail their (bi)annual earnings trajectories up to 10 years after the year of labor market entry. Workers are observed up to 2015, amounting to an overall observation window of 30 years in both countries (from 1985 to 2015). We retained only those individuals for whom we could observe the "last exit" from the education system and most of the 10 years thereafter. On average, we observe individuals up to eight (in West Germany) and nine (in the United States) years after they entered the labor market (see Table A1 in the Appendix). It is worth noting that observing a longer career span would come at the expense of either excluding recent cohorts of entrants (with right-censored careers) or extrapolating their group-based trajectories at the right-hand side of the observation window.

Career duration refers to the number of years since the first labor market entry after the last exit from the education system. We limit the sample to those individuals who began their careers at a minimum of 18

Table 1
Descriptive statistics for all variables included in the analyses, by country.

	West Germany[a]			United States[b]		
	Mean – %	Median	S.d.	Mean – %	Median	S.d.
Log-hourly wage	2.55	2.58	0.62	2.62	2.62	0.77
Hourly wage	13.71	11.96	9.33	19.02	13.76	22.74
Career	8.07	10.00	2.52	9.10	10.00	1.69
Sex						
Men	54.67			48.63		
Women	45.33			51.37		
Education (years)	12.91	12.00	2.81	13.18	13.00	1.95
Social origin (ISEI)	44.34	40.00	15.11	42.72	37.00	14.86
LM entry cohort						
1985–1990	21.66			45.67		
1991–1996	22.20			23.42		
1997–2001	32.92			15.29		
2002–2005	23.22			15.62		
Race						
White				57.59		
Non-white				42.41		

Notes:
[a] N = 18,917 yearly observations – 2377 subjects.
[b] N = 24,244 observations – 3387 subjects.

to a maximum of 35 years of age. Annual episodes of non-employment are removed from the sample; thus, our longitudinal data might have gaps. After list-wise deletion of missing variables, we are left with an overall sample of 24,244 yearly observations from 3387 individuals in the United States and 18,917 yearly observations from 2377 individuals in West Germany.

Information on individual earnings comes from the Cross-National Equivalent File (CNEF) supplement of each panel. The CNEF was prepared at Ohio State University in collaboration with national institutions from participating countries with the specific aim of providing comparable information across national contexts (Frick et al., 2007). The United States and West Germany contributed to the CNEF through the PSID and the SOEP, thus allowing us to rely on pre-harmonized information on numerous definitions of individual income. Individual labor earnings are perhaps the most appropriate measure for studying the stratification of individuals' economic resources over the early life course. Alternative measures, such as equalized or disposable household income, would capture the redistributive role of the family or the state, which are not the focus of this study. We focus on hourly wages to get as close as possible to a measure of individual productivity and earning potential. Hourly wage is computed based on comparable information provided by the CNEF supplements on both individual labor earnings and the number of hours worked on a yearly basis.[2] Our final measure is the average annual *logged hourly wage* adjusted for inflation (reference: dollars in 2010) and purchase power parity.

Social origin is proxied by the highest parental socioeconomic status when respondents were 15 years of age in West Germany and when respondents were growing up in the United States, measured by the International Socioeconomic Index (ISEI) developed by Ganzeboom and Treiman (1996).[3] Parental ISEI represents a good compound indicator of the resources available in the family of origin, and its principal advantage is that it is comparable across both historical time and countries.

Individual *education level* is measured by the number of years of completed education and retrieved from pre-harmonized information reported in the CNEF supplements. The variable ranges from a minimum of seven to a maximum of 18 (17 in the United States) and is coded based on the highest grade level and type of education achieved in the respective national education systems. For example, in West Germany, individuals with a school-leaving degree are assigned from a minimum of nine to a maximum of 12 years based on the type of institution attended. From two to 3.5 years are added for a subsequent vocational degree and four for a technical college degree up to a total of 18 years of completed education for a university degree (see Couch (1994) for more information on the coding). Hence, while parsimoniously considering differences in the level of education, the CNEF variable also reflects major horizontal lines of differentiation within the two national education systems.

All analyses control for respondents' *racial background* (United States only) and *labor market entry cohorts*. Table 1 presents summary statistics for all variables included in the analyses (Table A2 in the Appendix shows summary statistics at career onset and 5 and 10 years after labor market entry).

6. Methods

We apply growth curve models with annual observations of hourly wages nested within individuals separately in each country (Halaby, 2003). This strategy represents a parsimonious solution to model wage variations across individuals and over the occupational career in a single-equation framework. The most complex specifications used in the analyses have the following general form:

$$lnwage_{it} = \beta_0 + \beta_1 CAR_{it} + \beta_2 CAR_{it}^2 + \sum_{k=1}^{5}\left[\beta_{3k}X_{ki} + \beta_{4k}(CAR_{it} \times X_{ki}) + \beta_{5k}(CAR_{it}^2 \times X_{ki})\right] + (U_{0i} + U_{1i} + e_{it});$$

where the logged hourly wages at time t of the individual i are regressed on a linear and quadratic term for career duration, $K = 5$ time-fixed characteristics X_i – which are gender, education level, social origin, race (United States only), and labor market entry cohort – and the multiplicative terms between the individual characteristics X_i and the linear and quadratic term for career duration. In this way, we assess the separate contribution of our stratifying dimensions to earning differentials at career onset and the evolution of the differentials over early work lives.

The model decomposes the total variance in the logged hourly wages in a between component that quantifies variations between individuals and a within component that quantifies variations over the occupational career. The within component from the null model reflects the concept of *wage fluctuations* outlined in the theory section. The random part of the equation includes a random component for the intercept (U_{0i}) and a random component for the linear term for career duration (U_{1i}). Hence, the model assumes individual-specific intercepts – that is, different average levels of earnings during the career – and individual-specific slopes for the rates of linear career progression – that is, different linear rates of change in wages. Individual intercepts and slopes define the individual wage trend. Therefore, the variance of the intercepts (U_{0i})

[2] Labor earnings in Germany include wages and salary from all employment including training, primary and secondary jobs, and self-employment, plus income from bonuses, overtime, and profit-sharing (Grabka 2017). Labor earnings in the United States include wages and salary from all employment including self-employment, professional practice or trade, and bonuses, overtime, and commissions (Lillard 2015). Working hours in Germany are retrieved by the SOEP team based on employment status in the survey year, average number of hours worked per week, and number of months worked in the previous year (reported in the activity calendar) (Grabka 2017). In the United States, information on working hours refers to the sum of annual hours worked on the main job, annual hours worked on extra jobs, and annual hours of overtime in the previous year. For family members other than the head and her partner, this information was derived from the number of weeks worked in the previous year and the number of hours usually worked per week (Lillard 2015).

[3] Occupational information in the United States is retrieved from the 1970 and 2000 *Census of Population and Housing*. This classification was first converted into the ISCO-88 classification of occupation and then to ISEI scores.

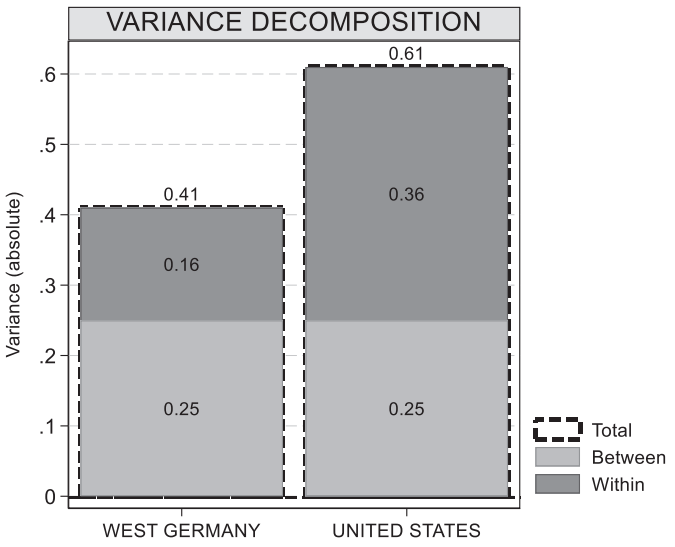

Fig. 2. Variance decomposition: Total, between (across individuals), and within (along the career) components (Model 1 in Table 2). Notes: Intra-class correlation (ICC) is 61% and 41% for Germany and the US, respectively.

and the variance of the slopes (U_{1i}) reflect the concept of *wage trend heterogeneity* outlined in the theory section. Instead, the residual within-level variation, once conditioned on the linear and quadratic terms for career duration, conveys information on the variability around the individual trend of progression, that is, *wage volatility*.

We assume similar curvilinear terms of progression across individuals in line with the many previous studies using a similar approach (Cheng, 2014). Deciding which functional form to use to model career duration is critical in our approach. We experimented with many functional forms; specifically, we i) augmented the model by a cubic term for career duration and ii) split career duration into two, three, and four splines according to various cut-off points (and included stepwise the splines in the random part of the equation). However, these less parsimonious alternatives added little value to the simpler curvilinear trend, which we therefore retained. We will also show how the most complex specification of the functional form, that is, adding yearly career dummies, resulted in a very similar pattern of wage progression to that of the curvilinear trend.

7. Results

7.1. Wage variability between individuals and over the course of the career

We start by decomposing the total variance in the logged hourly wages into the between- and within-individual components in West

Table 2
Null model and curvilinear trend for career duration, by country.

	West Germany		United States	
	Model 1 Null	Model 2 + Curvilinear	Model 1 Null	Model 2 + Curvilinear
Career		0.066***		0.057***
		(0.003)		(0.004)
Career^2		-0.002***		-0.002***
		(0.000)		(0.000)
Intercept	2.489***	2.271***	2.603***	2.417***
	(0.011)	(0.012)	(0.010)	(0.012)
Variance components				
Between (intercept)	0.247	0.243	0.251	0.309
Within (residual)	0.157	0.116	0.357	0.310
Slope (career)		0.002		0.003
Cov. intercept–slope		-0.005		-0.013

Standard errors in parentheses: *** p < 0.001, ** p < 0.01, * p < 0.05

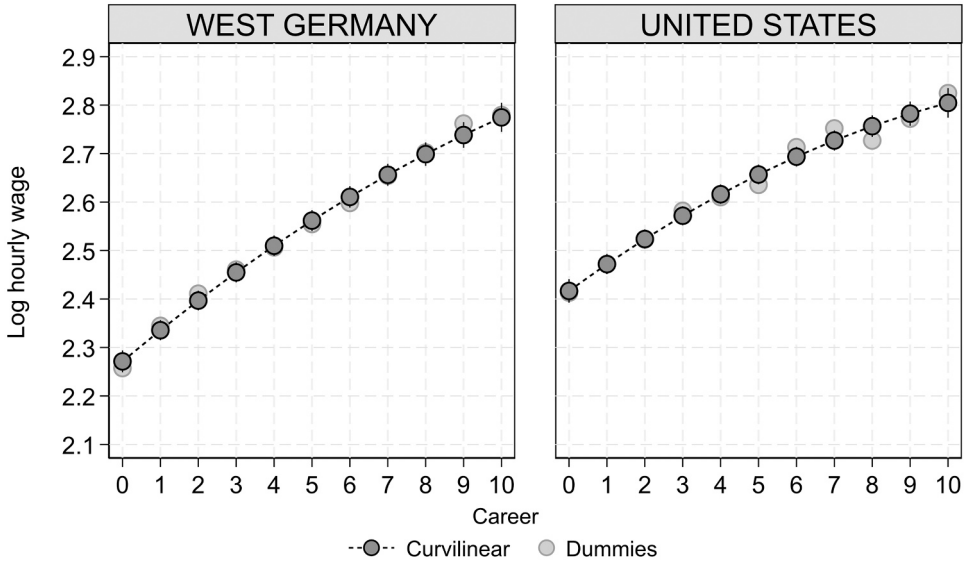

Fig. 3. Curvilinear-trend model for career duration (Model 2 in Table 2). Notes: Shade grey dots are prediction from a growth model including eleven career-dummies (fixed part only).

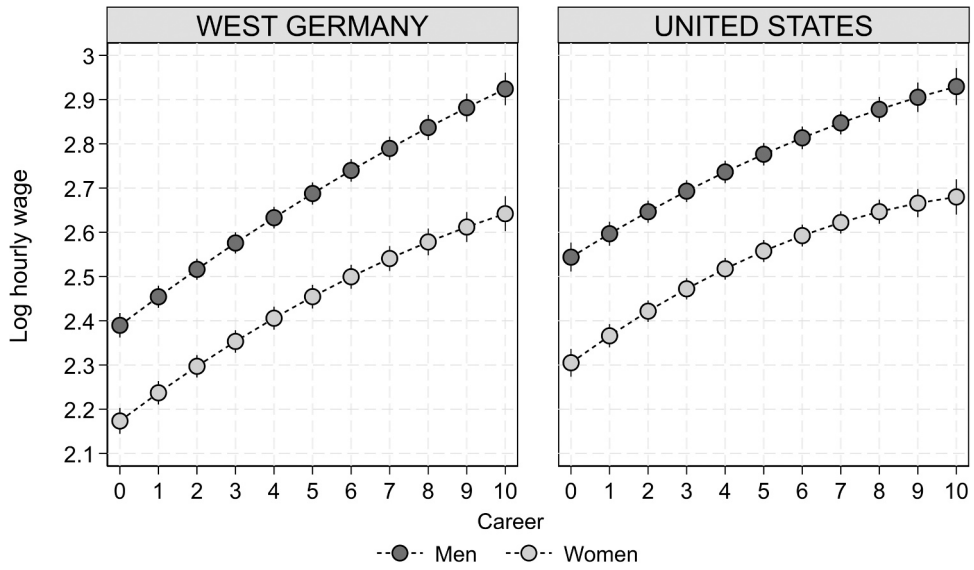

Fig. 4. Gender wage gap at labour market entry and along the first ten years of the occupational career.

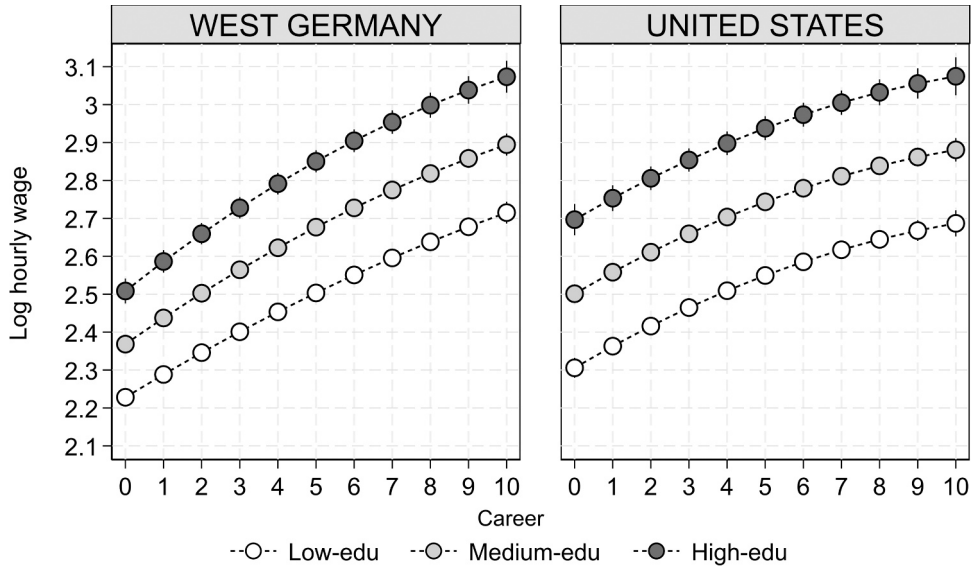

Fig. 5. Wage premiums to education at labour market entry and along the first ten years of the occupational career. Notes: Prediction for 12 (low), 14 (medium), and 16 (high) years of completed education.

Germany and the United States. Fig. 2 reports results from the variance decomposition based on the null model in Table 2. Wage variability (Total) is higher in the United States than in West Germany (0.61 and 0.41, respectively).

However, the stronger variability in the United States seems mainly attributable to variations occurring during the occupational career, that is, to wage fluctuations, rather than to variations occurring between individuals. While differences between individuals are similar in the two countries (0.25), wage fluctuations in the United States are more than double (.36) those in West Germany (.16). As suggested by intra-class correlations (ICC) – computed as the ratio of the between and total variance – the lion's share of wage variability in West Germany originates from differences between individuals (ICC = 61%). Conversely, most of the wage variability is attributable to wage changes occurring over the course of the career in the United States (1 – ICC = 59%).

Model 2 augments the null model with a curvilinear trend to inspect whether and to what extent wage fluctuations over the course of the career reflect patterns of wage progression in the two countries. We present the predicted average wage trends in Fig. 3 for ease of interpretation. Hourly wages follow a monotonic upward trend over the course of the career in both countries. The coefficients in Table 2 reveal that wages grow faster in the first years of the career (positive coefficient for the linear term) and tend to flatten thereafter (negative coefficient for the squared term). The shape of the average wage trend is similar in the two institutional contexts. However, wages seem to increase at a faster rate in West Germany than in the United States. While U.S. workers enjoy better entry wages, German workers seem to catch up after 10 years of work. All in all, the larger wage variability that U.S. workers experience during their early careers seems not to translate into a stronger pattern of upward wage progression.

The variance of the slope of the linear term for career duration and the variance of the intercept in Model 2 (Table 2) inform us about the extent of wage trend heterogeneities in the two countries (for ease of interpretation, Figure A1 and A2 in the Appendix report the distribution of individual intercept and individual slope). Both the average initial wages (.31 vs .24) and the linear trends of progression (.003 vs .002) are

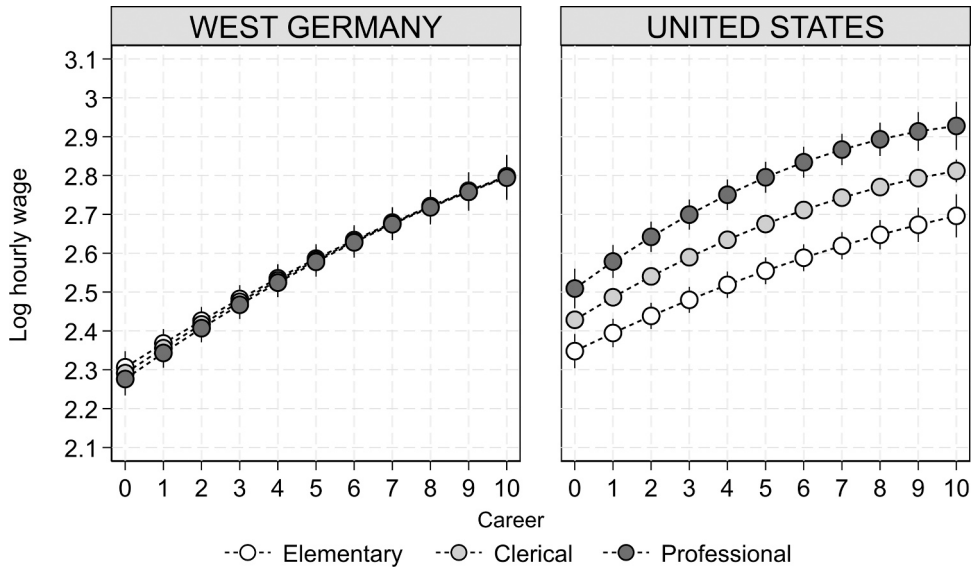

Fig. 6. The direct effect of social origin on wages at labour market entry and along the first ten years of the occupational career. Notes: Prediction for ISEI 20 (elementary occupation), ISEI 45 (clerical occupations), and ISEI 70 (professional occupations).

Table 3
Total and direct effects of social origin along the career.

	West Germany		United States	
	Model 3 Total	Model 4 Direct	Model 3 Total	Model 4 Direct
Social background (ISEI ÷ 10)	0.044***	-0.006	0.067***	0.032***
	(0.007)	(0.007)	(0.009)	(0.009)
Social background × Career	0.005*	0.001	0.005	0.005
	(0.002)	(0.002)	(0.003)	(0.003)
Social background × Career^2	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Education	NO	YES	NO	YES

Notes: Parental ISEI is divided by 10 to ease interpretation. Model 3 includes all terms in Equation 1 except for own education and its multiplicative terms with career duration. Model 4 includes all terms in Equation 1. Full models available in Table A3 in the Appendix. Standard errors in parentheses *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

more heterogeneous in the United States than in West Germany. These results speak in favor of larger wage trend heterogeneity in the United States than in West Germany and are in line with the ideas expressed by Fig. 1b and Fig. 1a, respectively. These results suggest that, as expected, U.S. school leavers experience larger uncertainty in their long-term prospects of wage progression during their early career.

The amount of 'within variance' that remains unexplained by the curvilinear trend of upward mobility (see Models 1 and 2 in Table 2) provides insights into wage volatility in the two countries. In West Germany, the curvilinear trend explains almost 26% of the wage changes that workers experience over the course of their careers (the within variance drops from 0.157 to 0.116). In the United States, this share is halved, to around 13% (from 0.357 to 0.310). These figures imply that around 74% and 87% of wage variations over the course of a career in West Germany and the United States, respectively, are year-to-year fluctuations around individual wage trends. These patterns are in line with the ideas presented in panels Fig. 1d and Fig. 1c and imply that U.S. workers experience larger uncertainty about their wages in the short term than West Germans.

It is important to stress that unexplained within variance may reflect the imperfect specification of the functional form used to model wage mobility. An utterly biased specification of the functional form artificially inflates the residual within variation and overestimates volatility. The misspecification may even bias the cross-country comparison if it is stronger in either of the two countries. However, it does not seem that country differences in volatility can be traced back to the misspecification of the functional form used to model wage mobility. As shown in Fig. 3, predictions based on the curvilinear trend (dark gray dots) perfectly overlap with predictions obtained by modeling career progression non-parametrically via single yearly dummies (light gray dots).

All in all, the higher variability of wages during occupational careers in the United States does not translate into steeper wage profiles, on average, and comes with more heterogeneity in individual wage trends and higher volatility. These findings point toward the idea that lower institutional barriers to wage fluctuations in the United States translate into higher uncertainty around the long as well as the year-to-year prospects of upward wage mobility rather than to opportunities for wage progression.

7.2. Do group-based inequalities in wages increase or decrease during the early career?

We now focus on the heterogeneities in the patterns of wage progression along three of the main stratification dimensions in Western societies: gender, social origin, and education. Group-based differences at labor market entry and their evolution during the occupational career are shown in graphical form for ease of interpretation. All figures hail from a single model including all stratification dimensions and their multiplicative terms with the curvilinear trend for career duration. Hence, group-based differences must be interpreted net of the other characteristics.

Fig. 4 plots the predicted average trajectory in the hourly wage of men and women from career onset up to 10 years after labor market entry. A gender wage gap already exists at the beginning of working life in both countries. On average, women's hourly wages in the first job after educational attainment (at career onset equal to 0) are approximately 19% and 21% lower than those of men in West Germany and the United States, respectively (see Table A3 in the Appendix). The magnitude of women's penalty is remarkable if we consider that our estimates originate from a comparison of men and women with the same educational attainment. Moreover, men's wages seem to grow faster than women's wages. After 10 years in the labor market, women's penalty has increased in both the West German and the U.S. samples. However, the differential wage growth for men and women is within the range of

estimation error in both countries, allowing us to conclude that there is no evidence that this gap grows during the course of the career (see Table A4 in the Appendix).

Fig. 5 contrasts estimated wage trajectories for individuals with low (12 years), medium (14 years), and high (16 years) educational attainment. We deliberately avoided contrasting extreme values; rather, the values used for the predictions correspond to typical education levels – compulsory, upper secondary, and postsecondary schooling – in both West Germany and the United States.[4] At labor market entry, the educational gradient is higher in the United States than in West Germany. However, the initial gap increases with career progression only in West Germany (see Table A4 in the Appendix). Hence, while lower at career onset, the education premium in West Germany almost approaches U.S. levels after 10 years of career.

Finally, Fig. 6 plots the estimated wage trajectories for individuals whose parents had elementary (ISEI 20), clerical (ISEI 45), and professional (ISEI 70) occupations. In sociological terms, differences in those trajectories represent the direct effect of social origin, that is, the residual origin-wage association once controlled for own's education level. The figure shows stark differences in West Germany and the United States. When comparing similarly educated individuals at career onset, there is no wage premium to social background in West Germany. Nor does such a premium emerge during the course of the occupational career. In the United States, in contrast, substantive social differences remain when accounting for own education. This social gap increases over the course of the career, although the increase does not reach statistical significance (see Table A4 in the Appendix). While part of the direct effect of social origin in the United States may be explained by an imperfect measurement of own educational attainment, it is unlikely that measurement error entirely explains the large residual gap we found. First, previous studies using administrative data were in a position to account for the entire range of educational differentiation and still found substantive social disparities in occupational destinies (Erikson and Jonsson 1998). Second, our education measurement considers both level and horizontal differentiation of educational degrees. Third, although West Germany has one of the most differentiated and stratified education systems in the Western world, we used the same measurement logic and found no residual social differences.

The absence of a direct effect of social origin on hourly wages does not imply that social background plays no role in occupational success in West Germany. There are strong social disparities in educational attainment that translate into considerable social differences in hourly wages. Table 3 shows the results of models including social origin and own education level (and its multiplicative terms with the curvilinear trend for career duration) stepwise. Model 3 (Total) shows that wage inequality aligning along social lines is already apparent at career onset in both countires and tends to increase over the course of an occupational career in West Germany (in the U.S., the increase is not statistically significant). However, comparing estimates with Model 4 (Direct) makes it apparent that social advantages are fully mediated by educational attainment in West Germany. In contrast, own education only mediates around half of the overall association between social origin and wages in the United States.

All in all, these results are only partly consistent with our expectations. Gender- and education-based gaps in hourly wages are well established at labor market entry and persist during early occupational careers in both countries. However, we found no compelling evidence for increasing group-based inequality over the early career in either West Germany or the United States. Moreover, we did not find any evidence for a direct social origin effect in West Germany, while in the United States, the direct advantage of workers from better-off families is well established at the start of their careers and does not increase but, rather, persists over the course of their labor market career. These results speak against the idea that stronger wage fluctuations in the United States translate into rising between-group inequality during the early career years.

8. Discussion and conclusions

This paper investigated wage variations during the early occupational career (wage fluctuations) and their alignment with classic stratification dimensions in West Germany and the United States. Contrary to most of the existing studies, we paid particular attention to intragenerational wage fluctuations and the extent to which they translate into intragenerational patterns of between-group inequality.

Our results show stronger wage fluctuations in the United States than in West Germany. Wage fluctuations over the course of the career, as opposed to variations across individuals, represent the most important source of variability in wages in the United States but not in West Germany. Interestingly, we find that country differences in wage variability are entirely due to country differences in wage fluctuations during the course of a career. Wage fluctuations structure into trends of upward wage mobility in both countries, in line with human capital theories. However, larger wage fluctuations in the United States do not translate into stronger patterns of wage progression than in West Germany but, rather, result in flatter wage profiles during the first ten years of work.

While reflecting opportunities for upward mobility, wage fluctuations also reflect uncertainty around individuals' long-term prospects of wage progression (wage trend heterogeneity) and short-term year-to-year wage changes (wage volatility). In line with our expectations, our results show that both heterogeneity in individual wage trends and wage volatility around these trends are stronger in the United States. Hence, it seems that the lower institutional and structural barriers to wage fluctuations in the United States translate into higher uncertainty rather than opportunities for wage progression. In fact, U.S. workers start their careers with better wages, on average, but their advantage over Germans erodes almost entirely after ten years in the labor market.

Our study also found stark differences in the opportunities for wage progression across groups in both institutional contexts. First, we found large and persistent (but not growing) gender inequality in wages. Second, we found that strong wage inequality due to social origin is already visible at career onset in both countries and, in West Germany, even increases thereafter. However, while we found a stable direct effect of social origin during the early career in the United States, the social origin effect seems fully mediated by educational attainment in West Germany. This result is consistent with the idea that strong school-to-work linkages in Germany may leave little room for discretion, discrimination, and the role of social contacts in the hiring process. The strong ability sorting in German secondary schools may also leave less room for social origin differentials in cognitive abilities among individuals with the same level of education. Our analyses also confirm own education level as a crucial dimension of wage inequality. On average, we found large initial gaps between low and highly-educated workers that remain constant over the course of the career in the United States and even increases in West Germany. While some of these findings are well-established in the economic and sociological literature, it is worth noting that we could not find any evidence for the idea that stronger intragenerational variations in wages in the United States translate into (even more) rising between-group inequality in wages over the occupational career.

With respect to between-group inequality, our findings may also bear implications beyond wages. We highlighted that the wage rate is a central component of individual and family income and that wage variations play a major role in the overall level of inequality in a society (Blau and Kahn, 2009). However, hourly wages are only one piece of the broader picture. Wages measure earning potential but not the actual

[4] In Germany, 12 years of education correspond to upper secondary education, 14 years to a vocational degree, and 16 years to tertiary education. In the United States, 12 years of education correspond to high school degrees, 14 years to some college, and 16 years to a bachelor's degree

economic resources available from labor. The amount of labor, in addition to the price paid to labor, is another key aspect of inequality. Individuals and groups who are not able to fully participate in the labor market will be economically disadvantaged, hourly wages being equal. Moreover, low wages and weak labor market attachment often combine and exacerbate between-group inequality in labor earnings. This is certainly the situation experienced by many women across most societies, as family constraints and other demand and supply side factors impair their labor market participation.

This paper focused on some overlooked dimensions of wage inequality that have important consequences for the real-life experiences of workers in a society. The uncertainty around the prospects of wage progression (*wage trend heterogeneity* and *wage volatility*) may impact individuals' standards of living. Wage trend heterogeneity captures the uncertainty of wage prospects that workers face at labor market entry. Wage volatility captures the uncertainty implied by year-to-year changes in wages. Economic theory postulates that individuals seek stability in living conditions and average their consumption to smooth fluctuations in their expected income (Friedman 1957). Contexts characterized by high heterogeneity in wage trends are thus characterized by little predictability of the extent to which individual wages will increase over the course of a career. Hence, individuals face great difficulties in anticipating their expected income and thus in smoothing their consumption. In such contexts, individuals and families are exposed to a higher risk of living either below or above their means. While living below one's means boosts savings, exceeding one's spending capacity heightens the likelihood of indebtedness and may have serious economic, social, and even health consequences for individuals and their families. Our article suggests that the risks connected to the uncertainty of wage prospects particularly apply to the United States, where high wage volatility and wage trend heterogeneity co-exist with lower to no buffers from the welfare state.

Declaration of Competing Interest

The authors have no conflict of interest to declare.

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Appendix

Table A1
Average and median number of years individuals are followed since entering the labour market by gender, education, social origin, and race in West Germany and the United States.

	West Germany		United States	
	Mean	Median	Mean	Median
Overall	8.07	10	9.10	10
Sex				
Men	7.97	10	9.02	10
Women	8.18	10	9.17	10
Education (years)				
Low (12)	8.25	10	9.03	10
Medium (14)	8.44	10	9.14	10
High (16)	8.57	10	9.27	10
Origin (ISEI)				
Elementary (15–25)	7.95	10	9.57	10
Clerical (40–50)	7.90	10	9.21	10
Professional (65–75)	8.18	10	9.59	10
Race				
White			9.02	10
Non-white			9.26	10

Table A2
Hourly wages (0, 5, and 10 years after labour market entry) by gender, education, social origin, and race in West Germany and the United States.

	West Germany						United States					
	Career = 0		Career = 5		Career = 10		Career = 0		Career = 5		Career = 10	
	Mean	S.d.	Mean	S.d.	Mean	S.d.	Mean	S.d.	Mean	S.d.	Mean	S.d.
Log-hourly wage	2.26	0.62	2.61	0.60	2.84	0.63	2.41	0.81	2.63	0.76	2.86	0.76
Hourly wage	10.75	9.12	14.21	8.29	17.46	13.67	16.71	25.05	18.43	18.99	23.43	23.09
Sex												
Men	11.80	9.68	15.47	8.29	19.93	16.37	17.91	22.92	19.93	19.44	27.94	27.82
Women	9.59	8.31	12.64	8.04	14.57	8.75	15.64	26.79	16.98	18.44	19.31	16.68
Education (years)												
Low (12)	11.13	15.76	12.65	6.73	15.39	9.85	15.38	26.92	16.04	21.58	18.55	19.75
Medium (14)	12.57	6.35	15.35	6.04	20.68	8.60	17.07	19.05	18.85	11.23	24.14	24.44
High (16)	14.04	7.89	20.03	10.58	22.99	13.07	20.34	25.99	24.62	21.76	31.12	19.27
Origin (ISEI)												
Elementary (15–25)	9.94	9.71	12.29	5.61	13.94	7.30	18.14	33.86	18.24	26.46	21.3	27.38
Clerical (40–50)	9.51	4.69	13.46	7.49	16.42	10.63	17.87	28.24	20.51	20.28	22.98	19.86
Professional (65–75)	12.40	8.36	17.57	10.78	20.97	12.56	19.92	29.24	21.33	19.12	28.84	19.31
Race												
White							17.09	21.1	20.24	18.81	26.59	23.76
Non-white							16.24	29.18	15.78	18.96	18.9	21.31
N. individuals	2377		1714		1146		3387		1820		1514	

Table A3
Growth curve models (full models) predicting hourly wages in West Germany and the United States.

	West Germany				United States			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Career		0.066***	0.070***	0.027		0.057***	0.057**	0.053
		(0.003)	(0.011)	(0.015)		(0.004)	(0.021)	(0.032)
Career^2		-0.002***	-0.003***	-0.000		-0.002***	-0.001	-0.001
		(0.000)	(0.001)	(0.002)		(0.000)	(0.002)	(0.003)
Gender (ref. Male)								
Female			-0.208***	-0.216***			-0.213***	-0.239***
			(0.022)	(0.021)			(0.024)	(0.023)
Female× Career			0.000	-0.000			0.008	0.009
			(0.006)	(0.006)			(0.008)	(0.008)
Female× Career^2			-0.001	-0.001			-0.001	-0.001
			(0.001)	(0.001)			(0.001)	(0.001)
LM entry cohort (ref. 1985–1990)								
1991–1996			0.094**	0.057			-0.052	0.010
			(0.033)	(0.031)			(0.031)	(0.030)
1997–2001			0.307***	0.264***			0.092**	0.161***
			(0.031)	(0.029)			(0.034)	(0.033)
2002–2005			0.351***	0.293***			0.137***	0.197***
			(0.033)	(0.031)			(0.033)	(0.032)
1991–1996 × Career			-0.019*	-0.023*			-0.033***	-0.033**
			(0.009)	(0.009)			(0.011)	(0.011)
1997–2001 × Career			-0.037***	-0.040***			-0.033**	-0.031*
			(0.008)	(0.008)			(0.012)	(0.013)
2002–2005 × Career			-0.038***	-0.043***			-0.016	-0.011
			(0.009)	(0.009)			(0.012)	(0.012)
1991–1996 × Career^2			0.003***	0.003***			0.004***	0.004***
			(0.001)	(0.001)			(0.001)	(0.001)
1997–2001 × Career^2			0.004***	0.004***			0.003*	0.003*
			(0.001)	(0.001)			(0.001)	(0.001)
2002–2005 × Career^2			0.004***	0.004***			0.001	0.000
			(0.001)	(0.001)			(0.001)	(0.001)
Social background (parental ISEI ÷ 10)			0.044***	-0.006			0.067***	0.032***
			(0.007)	(0.007)			(0.009)	(0.009)
Social background × Career			0.005*	0.001			0.005	0.005
			(0.002)	(0.002)			(0.003)	(0.003)
Social background × Career^2			-0.000	-0.000			-0.000	-0.000
			(0.000)	(0.000)			(0.000)	(0.000)
Education				0.070***				0.098***
				(0.004)				(0.006)
Education × Career				0.005***				-0.000
				(0.001)				(0.002)
Education × Career^2				-0.000*				0.000
				(0.000)				(0.000)
Race (ref. White American)								
Non-white American							-0.137***	-0.115***
							(0.025)	(0.024)
Non-white × Career							-0.006	-0.007
							(0.009)	(0.009)
Non-white × Career^2							-0.000	-0.000
							(0.001)	(0.001)
Intercept	2.489***	2.271***	1.973***	1.345***	2.603***	2.417***	2.412***	1.110***
	(0.011)	(0.012)	(0.040)	(0.052)	(0.010)	(0.012)	(0.062)	(0.085)
Variance components								
Between (level 2)	0.247	0.243	0.211	0.177	0.251	0.309	0.272	0.228
Within (level 1)	0.157	0.116	0.115	0.115	0.357	0.310	0.310	0.312
Slope (career)		0.002	0.002	0.002		0.003	0.003	0.003
Cov. intercept–slope		-0.005	-0.005	-0.006		-0.013	-0.014	-0.014
Observations	18,917	18,917	18,917	18,917	24,244	24,244	24,244	24,244
Number of individuals	2377	2377	2377	2377	3387	3387	3387	3387

Standard errors in parentheses *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table A4
Test of the joint significance of the difference of the liner and quadratic terms for career duration by sex, social origin, education, and race.

	West Germany			United States		
	Coef.	s.e.	p-value	Coef.	s.e.	p-value
Sex (Women – Men)	0.0008	0.0055	0.881	0.0080	0.0077	0.299
Social origin (ISEI)	0.0012	0.0020	0.562	0.0046	0.0028	0.102
Education (years)	0.0044	0.0011	0.001	-0.0002	0.0021	0.937
Race (Non-white – White)				-0.0073	0.0082	0.373

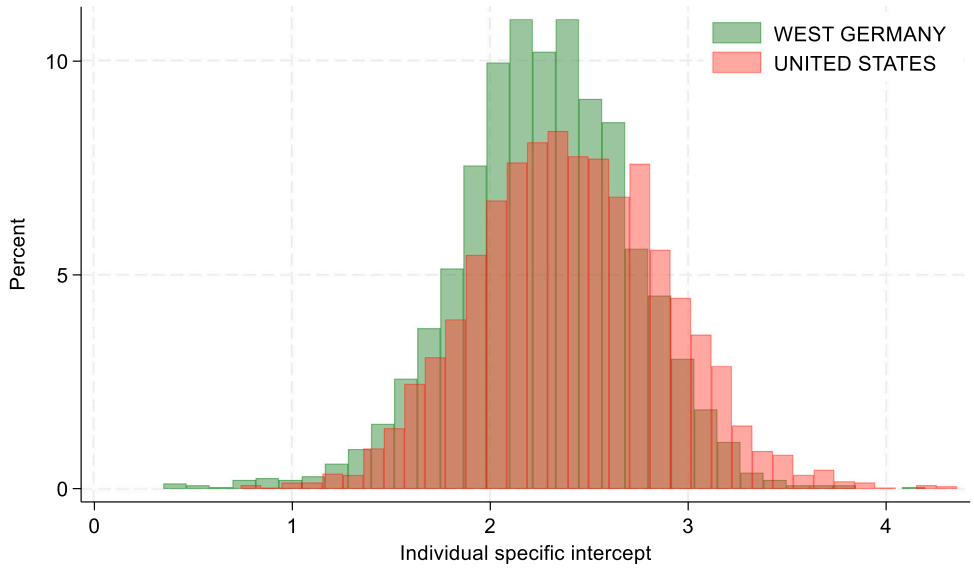

Fig. A1. Distribution of individual intercepts.

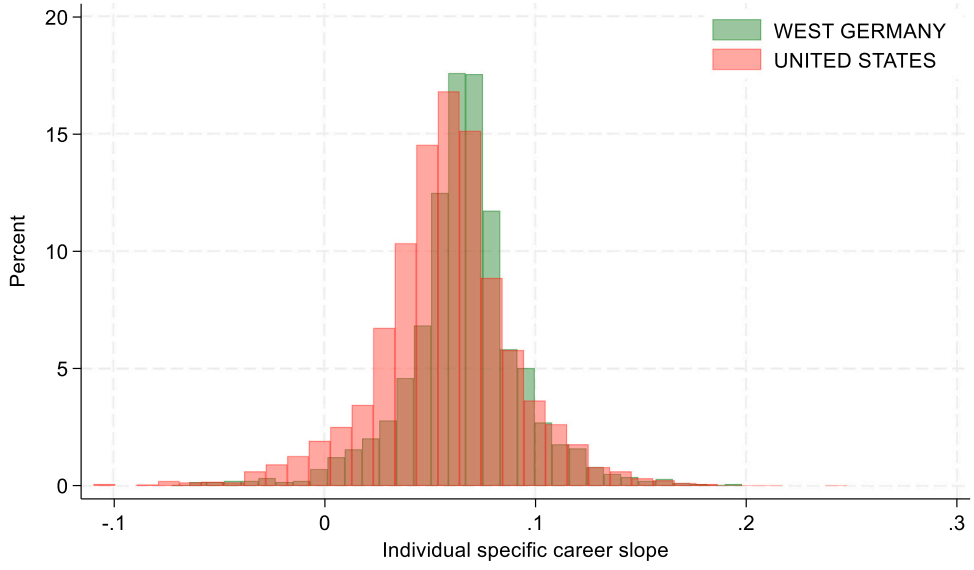

Fig. A2. Distribution of individual slopes.

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