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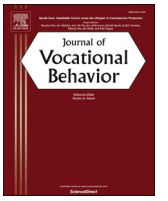

Careers and labor-market stability vs. dynamisms: Using big-data to optimize career trajectories for better outcomes

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ABSTRACT

In career and human resource management, long-standing questions about career dynamics, and more specifically, how to optimize career progress via dynamic moves or stable employment, remain unresolved. Challenging the myth of career stability in the modern labor market, this study leverages a unique, nation-wide big data set of approximately 3 million Bulgarian workers and 300,000 employers over an 11-year period to definitively answer the long-standing debate about career dynamism. We address conflicting arguments about the existence of substantial contemporary career dynamics. Theoretically, we expand both the boundaryless career and career ecosystem theories, subsequently providing new evidence for key scholarly debates regarding new careers' dynamics and practical advice for individuals. We employed linear probability analysis and sensitivity analysis to test our hypotheses. Our findings reveal a highly fluid environment where less than a third of the workforce experiences career stability. We identify eight distinct clusters of career boundary-crossings (job, employer, and sector changes) and demonstrate that, contrary to traditional views, frequent career moves are often associated with better financial outcomes. Notably, job and employer changes yield significant short-term wage growth and long-term wage increases, while sector changes often lag behind. We also uncover crucial temporal dynamics: the positive wage impact of career transitions amplifies over time, whereas the boost to wage growth is most pronounced immediately after a move. The implications for individual career management, organizational talent strategies, and national labor policies in navigating this dynamic landscape are substantial.

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1. Introduction

There are many reasons why individuals, organizations and nations would prefer a stable labor market. For individuals, it means job security and personal well-being. By promoting from within, organizations can rely on internal labor markets, thus minimizing recruitment and training costs, and nations can optimize benefits for their human capital (Feldman & Ng, 2007; Akkermans et al., 2024; Greenhaus & Callanan, 2013; Akerlof et al., 1988; Hatch & Dyer, 2004). For all three stakeholders, a stable labor market offers the ability to plan (Lim et al., 2018).

There is a long-standing debate about whether careers have become more boundaryless and individualist as suggested by contemporary career theories (Inkson, Gunz, Ganesh, & Roper, 2012). The debate about career stability versus career transitions remains unresolved (Akkermans, da Motta Veiga, Hirschi, & Marciniak, 2024), and much of the empirical data relies on specific and limited populations (e.g., Bidwell & Mollick, 2015). Two major issues are not determined: first, the level of dynamism in contemporary career systems, and how such dynamics unfold? Second, is it better for individuals to opt for a more stable or more dynamic career? Answering the latter will provide a solution to the acute question of what enables faster, more sustainable career progress.

The literature on new careers suggests increased dynamic careers (e.g., Baruch, 2022; O'Connor & Crowley-Henry, 2020; Xu, Liu, Li, Guan, & Zhou, 2021). However, there is a dearth of empirical evidence to substantiate such claims. Our line of inquiry has the potential to reveal the nature of boundary conditions, which by default, also challenges the notions of boundaryless careers (Akkermans et al., 2024; Inkson et al., 2012). We move beyond simply empirically validating dynamics careers towards investigating the nature of such dynamism as well as the impact of this dynamic behavior, herein career transitions. The above nature remains unclear in the career transitions literature (Akkermans et al., 2024) and the set of hypotheses accommodates to explore different outcomes (and the magnitude) regarding career changes, which subsequently can serve as criteria in career management and career decision-making as far as transitions are concerned (Bol, Ciocca Eller, van de Werfhorst, & DiPrete, 2019; Firfiray & Mayo, 2017; Kim, Aryee, Loi, & Kim, 2013; Lam, Ng, & Feldman, 2012; Mehta, Anderson, & Dubinsky, 2000). Collectively, we employ the theoretical underpinning of boundaryless careers (Arthur, 2014; Arthur & Rousseau, 1996) and career ecosystems (Baruch, 2015; Baruch & Rousseau, 2019) to gain a deeper understanding of the dynamics associated with contemporary careers.

We offer the following contributions to literature. Using big data, we present a clear answer regarding the nature of current career systems in terms of transition versus stability. The use of big data to study career issues is in early stages but proved very beneficial to knowledge creation (Chang, Chin, & Lee, 2022). This contribution enhances our understanding of the state of the art in the management field. Furthermore, utilizing these data, we place dynamism at the forefront of our discovery, and we can point out whether, and under which conditions, it would be better for individuals to remain with stable employment or to explore career transitions in terms of career outcomes. We are not only able to test these relationships but also to compare a variety of boundary crossings and their impact on objective career outcomes. We suggest using the construct of boundary-crossing, which is measurable and reflects career dynamism, compared with the illusive and linguistically misleading label of 'boundaryless' career. This way we address recent critique regarding the theory of boundaryless career and its relevance and applicability (Akkermans et al., 2024; Inkson et al., 2012; Rodrigues & Guest, 2010). Thus, our findings contribute to expanding the theory and resolving the current debate using new insights into the ways that the career transitions unfold. Using big data of over 3,000,000 workers spread across 300,000 employers, the entire labor market of Bulgaria, the boundary-crossings we tested are job changes, organizational changes and sectoral changes. This line of inquiry moves far beyond prior attempts that are limited in time and scope of testing.

2. Theory and hypotheses development

The literature on careers has reported an interplay between the labor market's stability and dynamism at both individual and organizational levels (e.g., Akkermans et al., 2024). Environmental changes have revolutionized employment relationships (Callanan, Perri, & Tomkowicz, 2017). New career and labor market systems have emerged, reshaping the psychological contract (Holland & Scullion, 2021) and industrial relations (Baccaro & Howell, 2017)–for example, as a consequence of 'fundamental changes to the nature of the work context and the nature of employment (e.g., the growth of fixed term contracts, temporary agency employment, independent contractors and zero-hour contracts)' (Perkins, Gilmore, Guttormsen, & Taylor, 2021: 7). Having mutual commitment and loyalty enables employees and employers to strive and survive in a planned and consistent manner (Ballout, 2007) based on a positive psychological contract (Rousseau, 1995) and is a significant resource at all levels of society: individual, organizational and national (Ployhart & Moliterno, 2011). The ability to gain competitive advantage requires flexibility and dynamism in the labor markets. There are good reasons for this change of careers, in line with the promulgated new career theories (Dries & Verbruggen, 2012; Feldman & Ng, 2007). By changing their jobs, employers and/or careers, individuals gain diverse experience, sometimes following their career calling (Hall & Chandler, 2005; Petriglieri, Petriglieri, & Wood, 2018). Organizations can benefit from diversifying the informational pool and getting competitive advantage and from getting rid of the so-called dead wood. At the national level, human capital is a critical factor and can influence careers in many ways (Bagdadli et al., 2021; Smale et al., 2019). Moreover, public policy decision makers are rewarded with predictability and continuous improvement of the national economy, as human capital forms a substantial part of national wealth (Becker, 1964; Schultz, 1961).

However, there is a long-standing debate about whether careers have indeed become more boundaryless and individualist as suggested by contemporary career theories (Inkson et al., 2012). The boundaryless career theory (Arthur & Rousseau, 1996; DeFillippi & Arthur, 1994), suggests that individuals possess a higher degree of agency enabling them to accept and reject job-offers beyond a single employing organization, therein the career is perceived boundaryless due to the experienced independence from traditional boundaries such as of employer, sector and profession.

In particular, the nature and conditions of the dynamic facets relating to the said debate we argue remain underexplored, and as Spurk (2021) argued, future career studies should cover life span rather than a single point of time. Furthermore, according to Akkermans et al. (2024), Akerlof et al. (1988), there is "too little focus on boundary conditions" (p. 11) in extant career research, and until a decade or so ago, industry or sector type of career change was not focused on (focus placed on job, employer and occupational change) (Feldman & Ng, 2007).

Bidwell (2013) identifies a decline in the mean length of time spent with each employer (tenure) among US workers. He attributes this reduction to the changing nature of employment relationships–in line with new careers (Greenhaus & Callanan, 2013; Akerlof et al., 1988; Sullivan & Baruch, 2009)–and the decrease in unionization. Most of the literature on new careers suggests a period of increased dynamism with various career changes (Petriglieri, Ashford, & Wrzesniewski, 2019; Tams, Kennedy, Arthur, & Chan, 2020; Xu et al., 2021), including global careers (O'Connor & Crowley-Henry, 2020), but not offering empirical evidence for such statements.

Counterarguments also exist. Conceptually, Inkson et al. (2012) suggested that careers are not truly boundaryless, which, while factual, fails to recognize the limits of symbolic perspectives as well as the taken-for-granted void of boundaries. Copeland (2015) and Rodrigues, Guest, and Budjanovcanin (2016) offered empirical evidence to support this claim, suggesting that the labor market is stable in terms of the length of time workers tend to spend with employers. According to Copeland (2015), in the US, the overall median workers' job tenure in 2014 was 5.5 years, compared with the 5.0-year average identified in 1983. Further, the outcomes of career mobility need further investigation, with initial studies identifying the various benefits of career advancement from within and outside the organization (Bidwell & Mollick, 2015; Makarius, Dachner, Paluch, & Pedde, 2024).

The debate about career stability versus career transitions remains unresolved (Akkermans et al., 2024), and much of the empirical data relies on specific and limited populations, like MBA alumni (Bidwell & Mollick, 2015). Two unresolved major issues are the level of dynamism in contemporary careers, and whether a more stable or more dynamic career will work better for individuals. Answering the latter will provide a solution to the acute question of what enables faster, more sustainable career progress. Arguably, answers to these questions could be helpful for Human Resource managers/departments and executives when strategizing human capital, talent management, recruitment and career development of employees. Developing human capital is of particular relevance; the higher level of accumulated human capital and its pertinence to the job role, employer or industry a person wants to move to, the more career agency is possessed by the individual and thus better positioned to achieve the desired career transition (Ng, Song, & Lievens, 2023). Evidence and data are fragmented (Collin & Young, 2000; Lee, Felps, & Baruch, 2014); findings seem to be limited, sometimes conflicting, and biased by the scholars' perception and methodology (Murphy & Tosti-Kharas, 2021).

We acknowledge that the main determinant of career boundary crossings is job satisfaction. As a significant predictor of quits (Akerlof et al., 1988), job satisfaction is not only influenced by wages or wage growth, but, among other factors, also by autonomy and control, opportunities for advancement, work-life balance and relationship with supervisors and colleagues (Altaş, Gündüz Çekmecelioğlu, Konakay, & Günsel, 2024). Equity and social status considerations, as well as altruistic preferences towards co-workers and inequality aversion, may also be important considerations of future opportunities or career progression (Mohrenweiser & Pfeifer, 2023).

In terms of conceptual writing, the dominant view is that career and labor markets are more dynamic and volatile, and the change in management culture means that job insecurity and lack of mutual commitment have prevailed since the 1990s (Bidwell & Mollick, 2015; Robinson, 1996), yet others contested the idea that careers are more boundaryless than in the past (Rodrigues et al., 2016). In addition, there exist competing theories regarding what forms the structural change that drives occupational mobility; one emphasizes that younger cohorts of workers replace older ones through attaining education, whereas others stress that workers in declining to growing occupations during the trajectory of his or her career (Witteveen & Westerman, 2023). Both perspectives have in common that they are empirically bounded to high-income countries. In terms of labor economics scholarship, there is a long literature in economics linking human capital formation to firm-specific characteristics (Lazear, 2009), tenure in an industry (Neal, 1995) or occupation (Kambourov & Manovskii, 2009). Human capital accumulates within an occupation and can get destroyed upon an occupation switch. The speed at which human capital accumulates depends on firm characteristics (Abowd, Kramarz, & Margolis, 1999), training in new skills (Kambourov, Manovskii, & Plesca, 2020), and the distance between the skills before and after an occupation switch (Robinson, 2018). Since there is a direct link between human capital, productivity and wages, increased human capital and better matches between workers and firms result in higher wages. The economics literature has important implications for aggregate productivity and wage inequality, but it pays less attention to worker careers and the types of career boundary crossings and their intersectionality.

Early modern career studies have already identified the relationship between individual and organizational agency (Hughes, 1937) yet individual agency remains underexplored (Van Hooft, Van Hoye, & van den Hee, 2022), especially in unpredictable new careers (Hirschi, 2018). More recent studies have focused on the interaction between the needs and motives of the participants in the system, as different actors take actions to improve their use of human capital (Hall, 2002): individuals looking to gain career success (Seibert, Akkermans, & Liu, 2024; Spurk, Hirschi, & Dries, 2019) and well-being (Campion, Campion, & Campion, 2022) whereas organizations applying HRM strategies and practices to best utilize their people (Bagdadli & Gianecchini, 2019; Sonnenfeld & Peiperl, 1988). However, pockets of career research have also linked strategizing to the individual level (e.g., Van den Hee, van Hooft, & van Vianen, 2020).

When voluntary career mobility occurs, it involves individuals who are proactively managing their careers, aiming to gain personal benefits (Eby, Butts, & Lockwood, 2003; Ibarra, 2023; Lam et al., 2012; Wu & Chi, 2020), or simply looking for a job (Amior & Manning, 2018). Frequent job changes cost employers' significant loss due to the need to invest in new recruitment, socialization and training for replacement employees. These changes also deprive the employers of accumulated knowledge and practical know-how. Increasingly, people are changing their jobs more frequently (Graham, 2018), and this phenomenon costs economies substantial sums (Gallup, 2016). Employers prefer to avoid hiring those whom they consider job hoppers (Fan & DeVaro, 2020; Thurasamy, Lo,

Yang Amri, & Noor, 2011) or other types of career transitions (George, Wittman, & Rockmann, 2022). Conversely, when employees are being promoted from within, what is considered an HRM, including careers' best practice, external mobility is reduced (Stumpf, 2014). Through job changes, including moves across organizational and occupational boundaries, individuals aim to progress in their careers and traditionally do so by crossing the boundaries of jobs, employers and occupations (Akkermans et al., 2024; Hall, 2002; Rosenbaum, 1979). It should be noted that changing jobs could mean an upward, lateral or downward move (e.g., Burbano, Mamer, & Snyder, 2018). To sum up, voluntary career transitions that benefit the individual challenge their employers due to replacement costs (Griffeth, Hom, & Gaertner, 2000). Job mobility may also be involuntary, reflecting the organization's lack of a requirement for those employees' service–for example, during redundancy, as we have frequently witnessed during the ongoing COVID-19 pandemic (Akkermans, Richardson, & Kraimer, 2020; Hirschi, Schläpfer, Spurk, & Akkermans, 2024).

The 1990s reflected a major change in the nature of the employment relationship–and HR management more broadly, resulting in economic pressures and competitiveness as well as changes in the traditional psychological contract (Rousseau, 1995). The literature suggests that new careers that are dynamic are replacing traditional linear careers (Arthur, Inkson, & Pringle, 1999; De Vos, Jacobs, & Verbruggen, 2021; Greco & Kraimer, 2020), and lifelong employment has become less prevalent (Chudzikowski, 2012). Being career proactive leads to better career outcomes (see Akkermans et al., 2024; Hulshof, Demerouti, & Le Blanc, 2020; Seibert, Kraimer, & Crant, 2001). Careers were assumed to be in transition to a state of VUCA–volatility, uncertainty, complexity and ambiguity–reflecting the VUCA state of the wider business environment (Bennett & Lemoine, 2014) as well as the public sector (Hart & Baruch, 2022). Even traditionally stable careers such as teaching have become flexible and fragmented (Mathou, Sarazin, & Dumay, 2023).

Some scholars have questioned whether this is a true reflection of reality (Inkson et al., 2012; Rodrigues & Guest, 2010). Copeland (2015) and Rodrigues et al. (2016) pursued empirical support to this counterargument, namely challenging the view of high dynamism in contemporary careers. This is a debate that is still unresolved between those who suggest that careers and labor markets are very dynamic, in that they feature a high level of boundary crossing (boundaryless career theory), and those who challenge this notion. Until now, the lack of clear definitions and studies based on small samples has constrained valid testing of the state of labor markets (see Akkermans et al., 2024). Based on the sheer volume of the career literature, we assume a real change in the nature of the relationships in the labor markets (Baruch & Rousseau, 2019)–for example, the emergence of idiosyncratic deals (De Vos, Van der Heijden, & Akkermans, 2020; Rousseau, 2015). Coupling the above debate and our efforts in designing eight clusters of boundary crossings, we seek to investigate the prevalence of boundary crossing. We hypothesize the following:

Hypothesis 1. The labor market is characterized by boundary crossings for the majority of the workforce.

Seibert, Crant, and Kraimer (1999) pointed out individual proactivity as a primary factor in reaching career success, in line with individualistic career theories, such as the protean career, where individuals are in charge of their own careers and can change accordingly (Bol et al., 2019; Hall, 2004; Wang & Shi, 2014). Individual agency took over in a time of change (Tams & Arthur, 2010; Van Hooft et al., 2022), and people opted for career changes, crossing various boundaries to improve their careers and lives in general (Mainiero & Sullivan, 2006). Indeed, career success was identified as an antecedent to other career and life outcomes in a comprehensive review of the literature (Spurk et al., 2019). Using two cohorts of university graduates, Chudzikowski (2012) found that career transitions have become more complex in the new career era. It is not merely the job that provides a wage premium: while certain jobs command larger premiums than others, job change is another factor. Jobs that benefit from high wages are typically those at the top of the promotion ladder, with access to influence, typically requiring organization-specific skills (Cappelli & Cascio, 1991). However, the career change reflected by the job can bring premium gains (Seibert et al., 2001). People move to gain an advantage, including improved human capital as well as financial benefits, and initiate career changes to improve their career outcomes, such as wages or earnings. However, Akkermans et al. (2024) identified that most quantitative studies regarding career outcomes from career transitions have been limited to contextual conditions and personal attributes. Nevertheless, we surmise from Zwettler, Straub, and Spurk (2024) that a study like ours in terms of focusing on the effects of the actual transitions beyond individual agency, and further, that are coupled with objective measures of success (wages) as opposed to individual ones (e.g., job satisfaction), albeit applying to dynamic careers, is a setting not much covered in new career theory such as protean careers. We therefore hypothesize the following:

Hypothesis 2. An increased level of boundary crossing will be associated with a higher level of financial benefit for individuals.

Not all career moves are alike. Employees might move to another organization due to expectations of higher income (Chudzikowski, 2012) or to a new occupation to follow a career calling (Hall & Chandler, 2005), for which they might be ready and willing to compromise their financial benefits in exchange for the fulfillment of such career aspirations. Career boundarylessness and career success relationships are complex and not always consistent, possibly due to various factors' moderating effects (Guan, Arthur, Khapova, Hall, & Lord, 2019). Akkermans et al. (2024) found that the nature of boundary conditions remains unclear in the career transition literature. We expect specific changes, such as a change in job or employer, to lead to improved objective success measures (Lam et al., 2012). In contrast, others, such as a change in industry or sector, would not yield a significant financial improvement following the move.

Hypothesis 3. The type of career move will moderate the financial benefits so that changing jobs and employer will have a more substantial impact on salary than other changes would.

A career change may mean that one is ready to sacrifice the short-term gains to achieve the change they aspire to. For example, employees may look for organizations that offer them better well-being (Bol et al., 2019; Firfiray & Mayo, 2017). We surmise this interplay of factors is important for HR managers to appreciate the implications on individual careers, and could inform their strategic decision-making, for example, relating to retaining and developing existing staff. In time, the ability to flourish in the desired work

environment would lead to improved outcomes (Kim et al., 2013). For instance, we suggested above that changing the industry or sector would not yield a significant financial improvement following the move. However, in the longer term, this can change (see Boswell, Shipp, Payne, & Culbertson, 2009). Earlier work has suggested a short-term impact of career stage; for example, early career stage mobility improved earnings (Lam et al., 2012). Overall advancement can be the result of the long-lasting impact of working in an environment that better fits a person's psychological needs (Baruch & Rousseau, 2019; Sullivan & Arthur, 2006). We expect different magnitudes of improved income for actual wage and wage growth levels, as preference for incentives may vary across career stages (Mehta et al., 2000). Time moderation means that the impact of career change will not generate improved earnings initially but, in the long term, will yield positive benefits in terms of income. Human capital theory may also suggest that, immediately following a switch, some workers may have destroyed some of the specific human capital, and it may take some time until they accumulate human capital in their new job/employer/sector (Kambourov et al., 2020). We hypothesize the following:

Hypothesis 4a. The positive impact of career changes on wages will be moderated by time so that the impact will be small soon after the boundary crossing, and it will be amplified as careers progress.

Hypothesis 4b. The positive impact of the career changes on wage growth will be moderated by time so that the impact will be major after the boundary crossing but will be tempered as careers progress.

Lastly, two of the main controls in this analysis are gender and firm size. Disparities in wages and promotion opportunities within and across firms contribute significantly to decisions to change careers that may differ between men and women. Women often experience slower wage growth and limited advancement opportunities, particularly in larger firms (OECD, 2021). These disparities often lead women to disproportionately exit high-paying careers or switch occupations in pursuit of better work-life balance, upward mobility or pay equity (Bertrand, Goldin, & Katz, 2010). These patterns are particularly pronounced in large firms, where rigid hierarchies and less flexible work structures may affect career boundary crossings differently for men and women (Barth, Bryson, Davis, & Freeman, 2016). Although men and women may start careers at similar salaries, women experience slower progression often due to career interruptions related to family or to limited flexibility in corporate roles (Bertrand et al., 2010).

3. Methods

3.1. Data

The data were collected from the entire population of workers and employers in Bulgaria, a European Union (EU), NATO member state, and a prospective OECD member. The data is covering the period from 2009 to 2019. The database comprises administrative tax records of workers as submitted by every employer to the Bulgarian National Revenue Agency (BNRA). Overall, we have about 21,000,000 observation points, corresponding to about 3,000,000 workers with average tenure in the data of 7 years during the study period. Each year, a worker's record has information on that worker's unique national identifier (ID), wage, year and country of birth, sex, occupation and industry. Occupations are recorded by the employer according to the International Standard Classification of Occupations ISCO codes (major category, 1-digit), and industry is encoded by the European NACE system (nomenclature statistique des activités économiques dans la Communauté européenne) at the 2-digit level. Besides the worker's ID, the tax record also includes the unique ID of the employer, allowing us to link workers longitudinally between 2009 and 2019 and to group all workers associated with a particular employer year by year, generating what is called "matched employer–employee longitudinal data". Figure Appendix 1 provides a pictogram of how the longitudinal linkage between workers and employers is constructed. It also refers to the two types of career changes we investigate: over the entire length of career available in the data, to study long turn effects of career changes, as well as year-to-year, for an immediate effect of career changes. The matched employer-employee structure also allows us to construct firm characteristics not immediately present in the tax record in the following way (also depicted in Figure Appendix 1).

With the employer as the unit of analysis, every year we calculate for each employer their total number of workers, the fraction of workers in the top three ISCO occupations (managerial and professional), and turnover within the firm, computed as the fraction of stayers and the fraction of leavers for each employer. We also construct a measure of each worker's wage position in their employer's wage distribution as the ratio of the worker's wage to the total wage expenditure per worker within each firm. Adding to the analysis the turnover and ISCO occupations of the previous employer, as well as the worker's position in the wage distribution, serves two purposes: first, it enables us to examine the moderating effects of the previous job on career boundary crossings, along dimensions that might be related to job satisfaction (which is not something included explicitly in the tax record). Second, accounting for factors related to the decision to switch careers mitigates issues relating to causality and individuals' self-selection into career boundary crossings.

We construct the following indicators for career boundary crossings, which we call "clusters":

(1) No boundary crossings
(2) Changing employer (employer boundary crossing)
(3) Changing occupation (occupational boundary crossing)
(4) Changing both employer and occupation (job and employer boundary crossing)
(5) Changing industry/sector (industry/sector boundary crossing)
(6) Changing employer and industry (employer and sector boundary crossing)
(7) Changing occupation and industry/sector (job and industry/sector boundary crossing)

(8) Changing occupation, employer, and industry (job, employer, and sector crossing).

The main contribution of our research into the dynamics of contemporary careers is (i) to investigate the dynamics and determinants of career boundary crossings and (ii) to evaluate the resulting wage effects of career boundary crossings over the entire career, as well as on an annual basis, immediately following any boundary crossing.

While in our administrative data we do not have access to subjective measures of job satisfaction, from the matched employer-employee structure we can construct the position of workers in their firm's wage distribution. Extant literature has shown that job satisfaction is influenced not only by worker's wages, but also by worker's position within the firm's wage distribution, with relative comparisons playing a significant role (Card, Mas, Moretti, & Saez, 2012). If a worker's pay is higher than their reference group, they are more likely to report higher satisfaction; conversely, if workers feel their pay is lower than it should be based on their perceived worth or the pay of others, their satisfaction may decrease (Clark, 1998; Senik, 2021). To this extent, we use as a moderator the position of each worker in the wage distribution of their employer in the previous time period. As a measure of the climate in each firm, we also consider previous period's turnover in the firm (job leavers vs. job stayers). While these measures will proxy to some extent career satisfaction, there are other subjective career satisfaction measures that may remain unaccounted for and that may influence the decision of career boundary crossings.

3.2. Procedure

We start by providing evidence on the incidence of boundary crossings as illustrated by the proportions in each of the eight clusters of boundary crossings. Within Hypothesis 1, we perform two kinds of statistical tests about cluster frequencies: (i) tests that each cluster proportion p_j is statistically zero, H_0: $p_j = 0$ for each cluster j from 1 to 8, both for career clusters and for year-by-year clusters; and (ii) tests for the equality of all pairwise cluster proportions H_0: $p_j = p_k$. The z-score for testing the null hypothesis H_0: $p_j = 0$ is $z = \frac{\widehat{p_j}}{\widehat{\sigma_{pj}}}$ and the z-scores for testing H_0: $p_j = p_k$ are computed as $\frac{\widehat{p_j} - \widehat{p_K}}{\sqrt{\widehat{\sigma_{pj}^2} + \widehat{\sigma_{pk}^2}}}$, where $\widehat{\sigma_p} = \sqrt{\frac{\widehat{p(1-p)}}{N}}$ are estimated standard errors. We acknowledge here that, as an artefact of big data, all estimation is very precise, with very small standard errors and large statistics.

The determinants of career switches are formally quantified in a linear probability model framework. We consider each pairwise career boundary crossing relative to no crossings separately.[2] We condition the probability of a switch on worker characteristics, including birth cohort, overall tenure in the sample, gender, occupation and wage decile within the occupation. We also include the features of the employer in the initial year that a worker appears in the sample (or, in the previous year for annual clusters), such as employer size, the share of employees who leave or stay and the position of the workers in the wage distribution of their employer. The coefficients estimated in the linear probability models represent each of those characteristics' marginal effects on the probability of the career boundary crossings and therefore are immediately interpretable as the sizes of those effects without any further normalization being necessary.

For the hypotheses where we investigate the wage effects of boundary crossings by cluster, we use a multivariate regression framework. With wages as the dependent variable, we take a logarithmic transformation for two main reasons: first, wages are skewed to the right, and taking logs reduces skewness. Second, and even more important from a practical point, in a model with a log-transformed dependent variable the estimated coefficients are interpreted as a percentage change in the outcome. Especially since our main predictors are factors (clusters 2 to 8 relative to baseline cluster 1, which is "no career boundary crossing"), the main coefficients of interest tell us right away that each career boundary crossing, relative to no crossing, will result in a β percent change in wages, where β is the estimated coefficient for that cluster. For each outcome: log wages and wage growth, and separately for career and annual clusters, we consider two specifications: (i) a "basic" one where we only account for the type of boundary crossing (cluster indicators) to simply replicate summary statistics, and (ii) a "main" specification that adds for each worker personal characteristics: birth cohort, tenure in the sample, gender, and whether the boundary crossings involved multiple switches, as well as characteristics of the first employer in the sample (for career clusters) or of last year's employer (for annual clusters): occupation, decile of wage within occupation, firm size, position in the firm wage distribution and firm turnover, measured as the share of workers who stayed with the employer and fraction of workers who left the employer as well as time-fixed effects. Finally, since the longitudinal data lends itself to a hierarchical analysis with lower-level workers clustered in higher-level firms, we account for this structure in a hierarchical approach that accounts for firm fixed effects in analyzing the effect of career boundary crossings.

4. Results

In Table 1, we present the correlation table, and in Table 2, evidence of the dynamics of careers and incidence of boundary

[2] Another possible route would be to estimate a multivariate probability model such as multinomial logit and compute marginal probabilities of each type of career boundary crossing relative to the base of no crossing. As long as the multinomial logit model is consistent, so are the marginal probability models that can be estimated separately from bivariate regressions. Moreover, we opted for the linear probability model rather than, say, logit or probit for similar reasons: if logit is consistent, then so is the linear probability model, and the latter has the added advantage that coefficients are readily interpretable as marginal effects.

crossings. The top panel of Table 2 reports statistics about career changes over the entire duration of worker observation in the data, up to a maximum of 11 years, followed by statistics on career changes computed on a year-on-year basis. Out of the 3,132,434 workers we followed over time, 26.7 % did not cross any career boundaries over the entire sample period (Cluster 1). However, the highest percentage of workers, 34.8 %, are those who, at some point in their careers, have changed all three categories: job, employer and sector of activity (Cluster 8). The third highest percentage of workers, 13.3 %, are those who have changed their employer and sector but not their job (Cluster 6). A visualization of the eight clusters, representing characteristics and size of the various boundary crossings can be found Appendix Fig. 2.

In Table 2, we report statistics related to switching job, employer or sector from one year to the next, rather than over the full career span. The sample size is about seven times larger than the total number of workers, as each worker is on average about 7 years in the sample. As expected, a much larger fraction does not switch either job, employer or sector when measured from one year to the next; this percentage is 63 % or even 74 % if new entrants, who do not belong to a cluster because it is their first year in the sample, are not considered when computing cluster percentages.

The large percentage of workers in clusters other than Cluster 1 reflects a variety of boundary crossings and a dynamic career system, strongly supporting Hypothesis 1. Given the size of data, all these tests will indicate that we can reject the null hypotheses of proportions being zero, or of equality between proportions, at any level of significance. For exemplification, we illustrate one of the tests with the lowest z-score, comparing the equality of proportions between Career Cluster 2, employer switch (7.4 %), and Career Cluster 3, job switch (8 %). The z-score for testing the null hypothesis that H_0: $p_2 = p_3$ is $z = \frac{\widehat{p_2} - \widehat{p_3}}{\sqrt{\widehat{\sigma^2_{p2}} + \widehat{\sigma^2_{p3}}}} = \frac{0.074 - 0.080}{\sqrt{0.000148^2 + 0.000153^2}} = -29.3$, which falls in the rejection region at any level of significance. A similar computation for any test confirms that the proportion in each cluster is statistically different from zero and is different from the proportion in any of the other clusters.

The bottom part of Table 2 reports other statistics pertaining to the clusters, such as the average number of job, employer and sector switches throughout the career. On average, individuals change employer most often (1.11 times), followed by sector (0.94 times) and job (0.76 times). Cluster 8 shows the largest average number of switches, twice larger than the total average, as well as the largest median wage growth–possibly related to the fact that workers in Cluster 8 also display the lowest starting wages. In terms of the average number of years in the sample, workers from Clusters 3 and 7, who change only their job or job and sector, show the longer tenure at 8.8 years.

The dynamics of career boundary crossings can be visualized in a couple of plots that highlight transitions: the dynamics of career boundary crossings can be visualized in a couple of plots that highlight transitions. Figs. 1a and 1b investigate dynamics by age cohorts (annual crossings and overall career) and Figs. 2a and 2b examine dynamics by calendar year (annual crossings) and year of career start (overall career). In annual boundary crossings (Figs. 1a, 2a) the largest fraction of workers is those not crossing any boundaries. When the annual changes are accumulated over the entire career (Figs. 1b, 2b), the proportion of workers with no crossings becomes much smaller.

Figs. 2a and 2b show that younger workers are much more likely to engage in boundary crossings than older workers. Even though older workers have potentially a longer tenure over which the career crossings can accumulate, younger workers show more overall career crossings, which is indicative of a generational shift where younger cohorts of workers experience more boundary crossings. The annual boundary crossings in Fig. 2a indicate there have been an increase over time in career crossings involving switching employer and sector (either accompanies by job switch or not), but no changes in crossing only boundary (employer, sector or job). Over the entire career (Fig. 2b), the longer the tenure, the more boundary crossings accumulate. The number of workers crossing all boundaries increases with tenure; and is the dominant cluster for workers with tenures of four years and above. This is clear evidence that there is a robust presence of dynamics in career boundary crossings, which increases with tenure and, to some extent, over time. Supplemental material available upon request provides further evidence for these career-crossing dynamics, including Sankey graphs that emphasize the magnitude of the flows between the various career clusters.

We further perform sensitivity analysis for computing the size of clusters over various subsamples, which provides insights into different forms (and natures) of career dynamics: (i) looking at a balanced panel of workers with exactly 11 years in the sample; (ii) a balanced panel of workers with exactly 5 years of tenure; and (iii) clusters computed separately by cohort of birth. These statistics are reported in Supplementary Appendix Tables S1a and S1b[3] and confirm that a couple of factors are at work in motivating career dynamics. On the one hand, career changes are more likely to occur earlier in one's tenure, and for younger workers, on the other hand, career changes are likely to accumulate over the entire career tenure; thus, there are fewer year-on-year boundary crossings.

To obtain a better understanding about the determinants of career dynamics, we perform linear probability analysis for various models of crossings relative to no crossings. We report those results in Appendix Table A1. These results indicate that, conditional on all other characteristics, including birth cohort, a longer total tenure in the sample is associated with a higher probability of boundary crossings over the entire career; men are slightly more likely than women to cross career boundaries; workers from larger firms are more likely to switch occupations but less likely to switch their employer or sector. This suggests that workers may be more loyal to smaller firms; finally, smaller turnover at the worker's initial place of employment and a higher proportion of managerial and professional jobs is associated with a lower propensity for a current worker to leave.

Table 3 reports the analysis for wage outcomes for any boundary crossings over the entire career (on the left), as well as for annual boundary crossings (on the right). Panel a) refers to the log age outcome and Panel b) refers to the wage growth outcome. In Table 4, we

[3] The supplementary appendix tables can be downloaded here: Supplemental Tables.

Table 1
Means, standard deviations, and correlations.

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Real wage	s	1410.6															
2. Real wage growth	0.15	0.37	0.38**														
3. Career: no switch	0.27	0.44	−0.01**	−0.07**													
4. Career: job switch	0.07	0.26	−0.02**	−0.01**	−0.17**												
5. Career: employer switch	0.08	0.27	0.06**	−0.02**	−0.18**	−0.08**											
6. Career: job and employer switch	0.05	0.21	0.02**	0.01**	−0.14**	−0.06**	−0.07**										
7. Career: sector switch	0.04	0.19	−0.00**	−0.02**	−0.12**	−0.05**	−0.06**	−0.04**									
8. Career: job and sector switch	0.13	0.34	−0.02**	0.00**	−0.24**	−0.11**	−0.12**	−0.09**	−0.08**								
9. Career: employer and sector switch	0.01	0.12	0.01**	−0.01**	−0.07**	−0.03**	−0.04**	−0.03**	−0.02**	−0.05**							
10. Career: job, employer and sector switch	0.35	0.48	−0.02**	0.08**	−0.44**	−0.21**	−0.22**	−0.16**	−0.14**	−0.29**	−0.09**						
11. Gender (male)	0.50	0.5	0.07**	0.02**	−0.03**	−0.01**	−0.03**	−0.02**	−0.01**	0.02**	−0.02**	0.04**					
12. Born 1950s	0.20	0.4	−0.06**	−0.10**	0.12**	−0.01**	0.06**	−0.02**	0.04**	−0.04**	0.03**	−0.13**	−0.01**				
13. Born 1960s	0.22	0.42	0.00	−0.06**	0.03**	0.01**	0.02**	−0.00**	0.03**	0.00**	0.02**	−0.06**	−0.01**	−0.27**			
14. Born 1970s	0.25	0.43	0.03**	−0.02**	−0.03**	0.01**	−0.00**	0.02**	0	0.01**	0.00**	0.01**	−0.01**	−0.28**	−0.31**		
15. Born 1980s	0.23	0.42	0.04**	0.07**	−0.10**	−0.01**	−0.04**	0.01**	−0.04**	0.01**	−0.02**	0.13**	0.02**	−0.27**	−0.29**	−0.31**	
16. Born 1990s	0.10	0.3	−0.01**	0.15**	−0.01**	0.00**	−0.05**	−0.02**	−0.04**	0.02**	−0.03**	0.05**	0.03**	−0.17**	−0.18**	−0.19**	−0.18**

** Indicates $p < 0.01$.

Table 2
Frequency and characteristics of boundary crossings, 2009–2019.

Over entire career (maximum 11 years)				Year to year		
Cluster	Workers	Fraction	Std. err.	Workers	Fraction	Std. err.
(1) No switch	835,221	**0.267**	0.000250	13,583,283	**0.632**	0.000104
(2) Employer switch	230,570	**0.074**	0.000148	845,671	**0.039**	0.0000423
(3) Job switch	250,080	**0.080**	0.000153	726,750	**0.034**	0.0000368
(4) Employer and job	151,717	**0.048**	0.000121	278,201	**0.013**	0.0000215
(5) Sector switch	112,565	**0.036**	0.000105	537,991	**0.025**	0.0000368
(6) Employer and sector	417,296	**0.133**	0.000192	1,020,601	**0.047**	0.000047
(7) Job and sector	45,381	**0.014**	0.0000675	33,042	**0.002**	0.0000084
(8) Job, employer, and sector	1,089,604	**0.348**	0.000269	1,347,769	**0.063**	0.0000512
New Entrants				3,131,837	**0.146**	0.000077
Total	3,132,434	**1.00**		21,505,145	**1.00**	

Cluster over entire career	No. of job switches	No. of employer switches	No. of sector switches	Median wage growth	Starting wage	Ending wage	Average sample tenure
(1) No switch	0	0	0	6.8 %	703.7	1011.9	6.3
(2) Employer switch	0	1.44	0	7.7 %	566.9	944.7	6.8
(3) Job switch	1.26	0	0	8.0 %	769.0	1308.6	8.2
(4) Employer and job	1.41	1.52	0	8.8 %	635.1	1177.9	7.5
(5) Sector switch	0	0	1.45	7.4 %	649.9	1001.2	7.5
(6) Employer and sector	0	1.69	1.59	8.0 %	580.6	966.6	6.6
(7) Job and sector	1.29	0	1.52	8.6 %	629.3	1128.8	8.8
(8) Job, employer, and sector	1.65	2.04	1.87	9.5 %	538.1	995.4	6.9
Total	0.76	1.11	0.94	8.0 %	618.5	1028.2	6.9

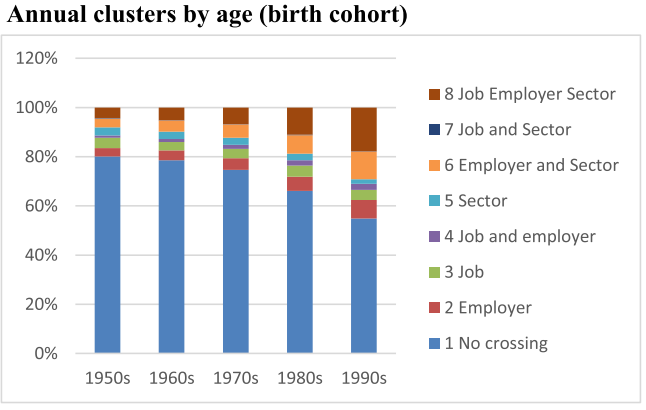


Fig. 1a. Annual clusters by age (birth cohort).

estimate similar models except we replace the single boundary-crossing indicator with the seven career clusters relative to the base of no boundary crossings. For reasons of space, we do not include here all of the regression coefficients, but full estimation results are available upon request.

Table 3 reveals a 4.4 % increase in the final year's wage resulting from any career boundary crossing. In the right panel of the table, the wage effect of a boundary crossing measured year-by-year is smaller, 1.9 %. These effects are all statistically significant given that the very large sample sizes are driving standard errors down. We document an even larger effect of a boundary crossing on wage growth than on wage levels. This effect is a comparable 4.3 % increase in annual wage growth from any boundary crossing over the entire career and a much larger effect of 9.4 % increase from a boundary crossing year-to-year.

Moreover, to better account for dynamic effects, we repeat the wage premium regression analysis separately year-by-year. We plot in Figs. 3 and 4 the coefficients from each cluster, representing the wage premia of each cluster relative to base (no crossings), from the base specification (no moderators, Fig. 3) as well as the specification accounting for personal and firm characteristics (Fig. 4). The annual results of the effect of career boundary crossings on wages without accounting for worker and firm characteristics (Fig. 3a) show that Cluster 3, job boundary crossing, is the only cluster outperforming the no crossings cluster in terms of wage returns. This is probably due to promotions, given the 1-digit ISCO codes (less likely to record demotion). Over entire career (Fig. 3b), workers in Cluster 3 (job crossings) get the highest wage premia, while workers in all other clusters earn more or less the same as workers with no

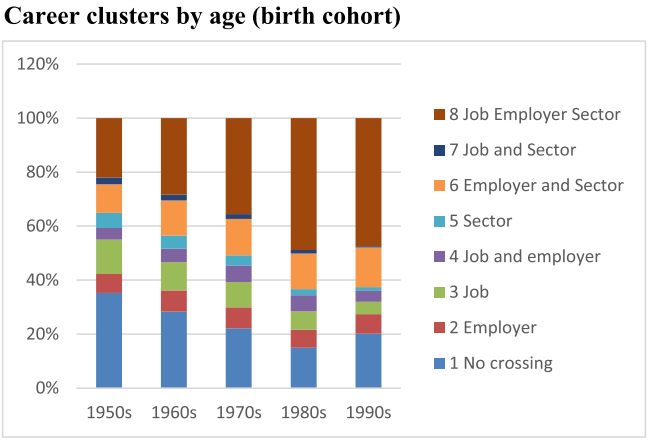


Fig. 1b. Career clusters by age (birth cohort).

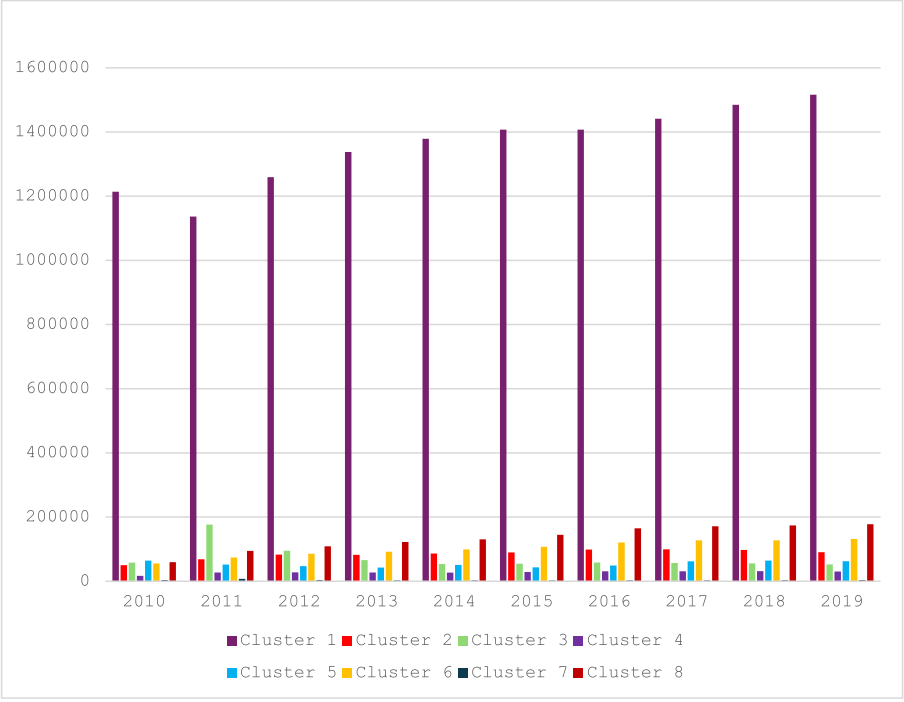


Fig. 2a. Annual boundary career crossings.

boundary crossings.

Once we condition by worker and firm characteristics (Figs. 4a and b), the wage gap between the clusters decreases in magnitude, which is to be expected since workers chose boundary crossings depending on the same human capital characteristics used in the wage regression analysis to account for human capital and productivity. In the year-by-year analysis (Fig. 4a), only cluster 5, sector crossing (not accompanied by employer or job crossing), remains worse performing than no crossings. This is also true in the overall career analysis (Fig. 4b), especially for shorter careers starting in later years. For career starts from 2009 until 2014, workers who cross all boundaries in Cluster 8 have the highest earnings. Workers crossing only job boundaries in Cluster 3 have the highest earnings among more recent, shorter careers starting in years from 2015 onward. The only boundary crossing clusters with lower earnings than no boundary crossings are those workers in Cluster 5 (sector crossing) and, for more recent careers only, Cluster 2 (job crossing), earn less than those workers who did not cross a boundary. This result is consistent with a human capital accumulation theory where boundary-crossing can provide stronger human capital, though time is needed until the potential increase in earnings for the sector or job switches can be realized.

The conclusions from this analysis are threefold: first, our findings support Hypothesis 2, stating that there is a wage effect of any

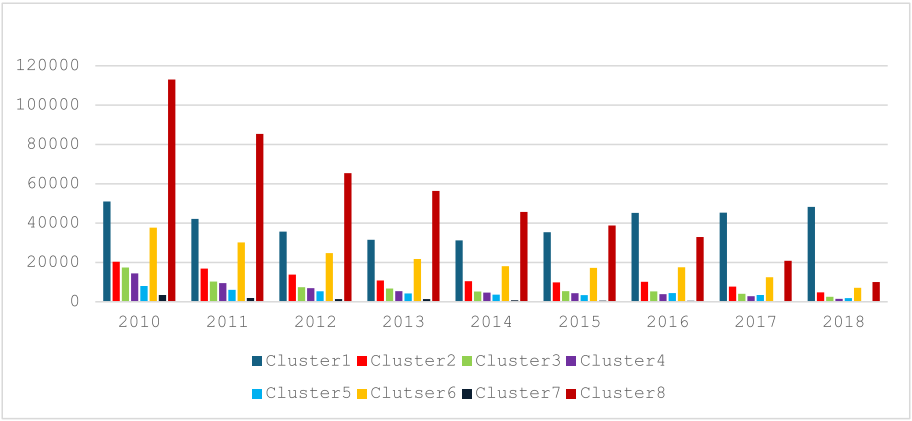


Fig. 2b. Career boundary crossings over the entire career. Clusters reported by year of career start. (Career start year 2009 not depicted here).

Table 3
Effect of any career boundary crossing on wage. Model with single career boundary crossing indicator.

	Over career		Year-to-year	
	Without moderators	Including personal + first job charact.	Without moderators	Including personal + first job charact.
Boundary crossing	0.039***	0.044***	−0.160***	0.019***
	(0.001)	(0.001)	(0.0004)	(0.0002)
Constant	6.580***	6.031***	6.543***	6.458***
	(0.001)	(0.002)	(0.0002)	(0.001)
Observations	3,132,434	3,131,258	18,372,711	18,367,619
R^2	0.001	0.452	0.010	0.708
Boundary crossing	0.056***	0.043***	0.123***	0.093***
	(0.0005)	(0.0005)	(0.0003)	(0.0003)
Constant	0.106***	0.094***	0.111***	0.181***
	(0.0004)	(0.002)	(0.0002)	(0.001)
Observations	3,132,434	3,131,258	18,372,711	18,367,619
R^2	0.005	0.118	0.008	0.063
Personal charact.	No	Yes	No	Yes
First job charact.	No	Yes	No	Yes

Notes: *p < 0.10; **p < 0.05; ***p < 0.01. Standard errors in parentheses. Because of big data, coefficients are very precisely estimated (large t-statistics). OLS regression. Because of the logarithmic transformation of the dependent variable, the coefficient in Panel a) measures the percentage change in wages from career boundary crossing, without the need for further normalization or size effect measurements; likewise, in Panel B the dependent variable is already normalized as rate of growth. Also included in second and fourth column models: birth cohort, occupation (1-digit ISCO code), wage decile within occupation, position in employer wage distribution, year. Employer characteristics are for first or previous year employer. The full set of regression coefficients including those for ISCO categories and year dummies are available from Tables S2a (for the wage outcome) and S2b (for the wage growth outcome) in the PDF supplementary appendix file: Supplemental Tables.

career boundary crossing, since all the coefficients are statistically significant. Second, the wage effect is present whether measured in levels (log wage) or in annual wage growth.

A few remarks can be made: (i) we have not yet differentiated across types of boundary crossings; (ii) we control for a large set of job and employer characteristics in the first year (or previous year), including occupation, the position in the wage distribution within the occupation, the position in the wage distribution within the employer as well as other personal and employer characteristics; and (iii), assuming that the coefficients on the career boundary-crossing indicator are stochastically independent from those on the annual boundary crossings, we can compute *t*-tests for the equality of these coefficients. In log wages, the *t*-test is $t = \frac{\widehat{\beta}_N - \widehat{\beta}_1}{\sqrt{serr(\widehat{\beta}_N)^2 + serr(\widehat{\beta}_1)^2}} = \frac{.044-.019}{\sqrt{.001^2+.0002^2}} = 24.51$, whereas in wage growth, the *t*-test is $\frac{.043-.094}{\sqrt{.0005^2+.0003^2}} = -85.75$. In both cases, we can reject the null hypothesis that there is no difference in the career and the annual coefficients against the double-sided alternative that the coefficients are equal, or against the single-sided alternative that one coefficient is larger than the other, at any level of significance.

To investigate the heterogeneity in the effect of the type of boundary crossing, we replace the single boundary-crossing indicator with seven separate indicators for each type of boundary crossing relative to no crossings, what we call “clusters”. The regression results are in the first part of Table 4 for the log wage outcome and in the second part of Table 4 for the wage growth outcome. Consistently across all specifications, being in Cluster 5 –that is, crossing only the sector boundary– results in wage outcomes that are worse than no crossings over the entire career, as well as in annual crossings’ specifications. All other boundary-crossing clusters outperform no crossings, with perhaps the exception of Cluster 2, crossing only the employer boundary, which can lead to worse wage

Table 4
Effect of career clusters on log wage. Model with career boundary crossing clusters.

	Over career			Year to year		
	Without Modera-tors	Including personal + first job charact.	Hierarchical model	Without Modera-tors	Including personal + first job charact.	Hierarchical model
a) Effect on log monthly wage						
(2) Employer switch	−0.081***	−0.024***	0.006***	−0.223***	0.007***	−0.006***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.0004)
(3) Job switch	0.286***	0.084***	0.058***	0.046***	0.051***	0.045***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)
(4) Employer and job	0.117***	0.049***	0.048***	−0.163***	0.015***	−0.006***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
(5) Sector switch	−0.007***	−0.054***	0.010***	−0.132***	−0.020***	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.0005)
(6) Employer and sector	−0.054***	0.017***	0.004***	−0.182***	0.026***	−0.013***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.0003)
(7) Job and sector	0.165***	0.006**	0.081***	−0.146***	0.028***	0.046***
	(0.003)	(0.003)	(0.002)	(0.004)	(0.002)	(0.002)
(8) Job, employer, and sector	0.031***	0.066***	0.010***	−0.227***	0.021***	−0.035***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.0003)
Birth cohort		✔	✔		✔	✔
Tenure in sample		✔	✔		✔	✔
Gender (male)		✔	✔		✔	✔
Position in wage distrib.		✔	✔		✔	✔
Firm size		✔	✔		✔	✔
Share Emp. in Occ.1, 2, 3		✔	✔		✔	✔
Employee turnover in firm		✔	✔		✔	✔
Multiple switches over career		✔	✔		✔	✔
Constant	6.580***	6.036***		6.543***	6.460***	
	(0.001)	(0.002)		(0.000)	(0.001)	
Observations	3,132,434	3,131,258	3,131,258	18,372,711	18,367,619	18,367,619
R2	0.016	0.455	0.314	0.015	0.708	0.519
b) Effect on annual wage growth						
(2) Employer switch	0.029***	0.013***	0.020***	0.076***	0.049***	0.033***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(3) Job switch	0.018***	0.040***	0.034***	0.083***	0.091***	0.082***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(4) Employer and job	0.062***	0.056***	0.054***	0.166***	0.131***	0.105***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(5) Sector switch	−0.004***	−0.013***	0.008***	0.006***	−0.011***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(6) Employer and sector	0.043***	0.036***	0.030***	0.135***	0.107***	0.062***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(7) Job and sector	0.017***	0.015***	0.043***	0.093***	0.081***	0.093***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
(8) Job, employer, and sector	0.083***	0.072***	0.050***	0.202***	0.153***	0.088***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Birth cohort		✔	✔		✔	✔
Tenure in sample		✔	✔		✔	✔
Gender (male)		✔	✔		✔	✔
Position in wage distrib.		✔	✔		✔	✔
Firm size		✔	✔		✔	✔
Share Emp. in Occ.1, 2, 3		✔	✔		✔	✔
Employee turnover in firm		✔	✔		✔	✔
Multiple switches over career		✔	✔		✔	✔
Constant	0.106***	0.093***		0.111***	0.179***	
	(0.000)	(0.002)		(0.000)	(0.001)	
Observations	3,132,168	3,131,003	3,131,003	18,372,711	18,367,619	18,367,619
R2	0.009	0.121	0.182	0.011	0.065	0.142
Personal charact.	No	Yes	Yes	No	Yes	Yes
Initial job charact.	No	Yes	Yes	No	Yes	Yes

Notes: *p < 0.10; **p < 0.05; ***p < 0.01 using 1.96 critical value. The Bonferroni-corrected critical value at 5 % (seven hypothesis tests) would be 2.75. Standard errors in parentheses. Coefficients are very precisely estimated (large t-statistics). Due to the logarithmic transformation of the dependent variable, the coefficients in Panel a) measure the percentage change in wages from each career boundary crossing relative to none, without the need for further normalization or size effect measurements; in Panel B the dependent variable is already normalized as rate of growth. Also included in second and fourth column models are: birth cohort, occupation categories (1-digit ISCO code), wage decile within occupation, position in employer wage distribution, year dummies. Employer characteristics are for first or previous year employer. Table Appendix A2 has coefficients for employer and personal characteristics, while the full set of regression coefficients including those for ISCO categories and year dummies are available from Tables S3 (for wage) and S4 (for wage growth) in the PDF supplementary appendix file: Supplemental Tables.

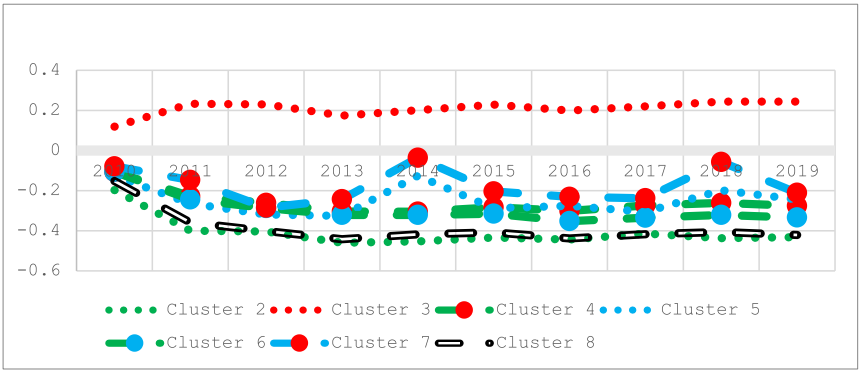


Fig. 3a. Annual wage premia by cluster, relative to no boundary crossing. Does not account for worker or firm characteristics.

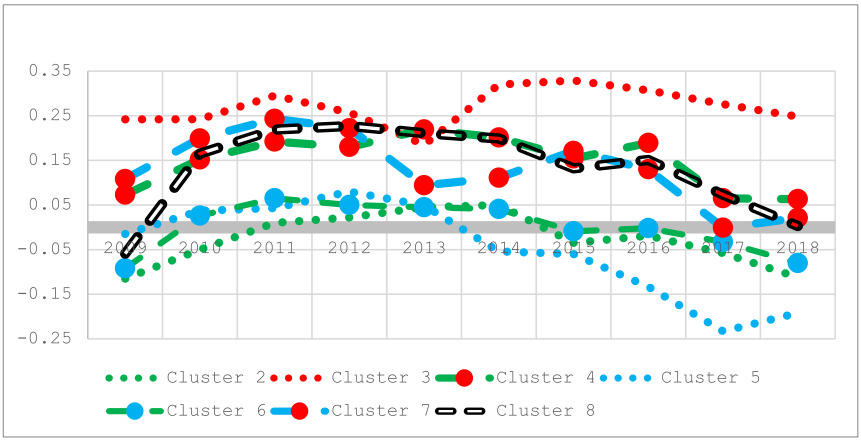


Fig. 3b. Wage premia by cluster, relative to no boundary crossing, over entire career (grouped by year of career start). Does not account for worker or firm characteristics.

outcomes than no crossings in some specifications. Focusing on the discussion on the second specification "Including personal+first job characteristics" we discuss the magnitude of the wage effect of each cluster compared to the baseline of no boundary crossings. These wage effects are largest for Cluster 3, job crossing, showing 8.4 % higher wages for workers who switch jobs at some point in their career compared to those who do not. Other large wage effects are observed for Cluster 8, crossing job, employer, and sector boundaries (6.6 %), and Cluster 4, crossing employer and job boundaries (4.9 %). The effects are positive but very small for Clusters 6 (1.7 %) and 7 (0.6 %) and negative for Clusters 2 (−2.4 %) and 5 (−5.4 %). Due to the large sample size, the standard errors of these estimated coefficients are very small, and each coefficient is statistically significant at any level of significance. A largely similar conclusion is found from the annual clusters, where Cluster 5 leads to a negative wage outcome in the year of the switch, and the largest positive wage outcome occurs for Cluster 3, job switch. As in the previous case of a single switch indicator, the magnitudes of the annual cluster effects on the wage outcome are smaller than those over the entire career, with the possible exception of Clusters 6 and

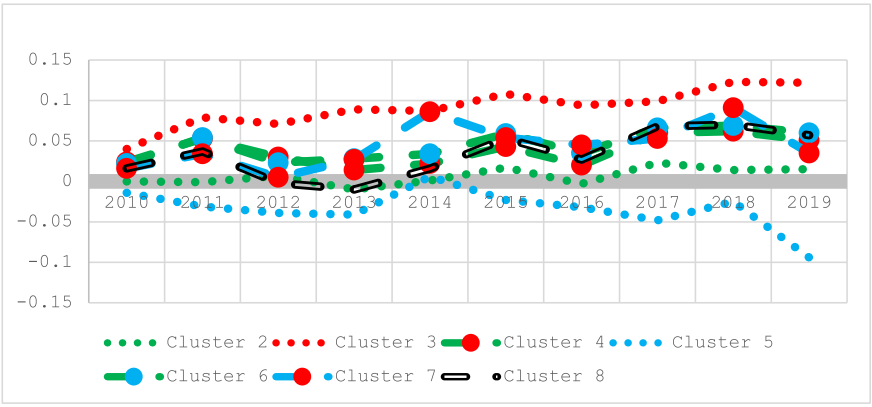


Fig. 4a. Annual wage premia by cluster, relative to no boundary crossing. Accounts for worker and firm characteristics.

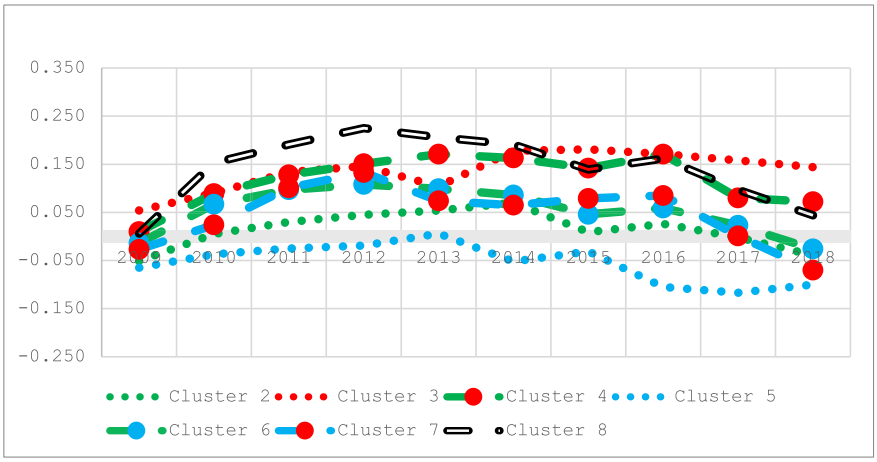


Fig. 4b. Wage premia by cluster, relative to no boundary crossing, over the entire career (grouped by year of career start). Accounts for worker and firm characteristics.

7.[4]

We reach substantively similar conclusions for the wage growth outcome. Cluster 5, sector switch, is associated with a negative annual wage growth outcome both throughout the career and annually, but not Cluster 2, whose effect remains small but positive on wage growth. Except for the negative effect of Cluster 5, all other clusters show a larger effect on the wage growth when measured in the year after the boundary crossing has occurred; in fact, it is twice to three times larger than on the wage levels. Furthermore, the hierarchical analysis from Table 4 (columns three and six) shows that, over the entire career, the wage effects from any type of career boundary crossing are positive and result in around 5 % wage increases (ranging from about 1 % to a highest effect of 8 % higher wages) compared to no career boundary crossings, even after accounting for within-firm heterogeneity as well as for a whole host of other factors related to workers' productivity, including their position in the initial firm's wage and occupation distributions. In terms of wage growth, the hierarchical model also shows that ultimately career boundary crossings will result in larger growth than no boundary crossings, but, although positive, these effects remain smaller than the effect on wage growth reflected immediately after the career boundary crossing in the year-to-year results.

In conclusion, our findings support Hypothesis 3, which states that the financial benefits of boundary crossings are moderated by the type of career move, with all clusters leading to financial gains, except for Cluster 5 (sector crossing) for both wage and wage growth outcomes and Cluster 2 (employer crossing) for the wage outcome only.

The previous results for Hypothesis 4 (a–b) largely support it: the immediate wage gains following a boundary crossing (the year-to-year effects reported in the two right-hand columns of Tables 4 and 5) are smaller compared to the gains at the end of the career (the

[4] One possible explanation is that, since a sector is always associated with the employer, in order to switch job and sector but not employer, a worker needs to get a different job with the same employer; at the same time, the employer must change its activity and declare a new sector of main activity.

two left-hand columns), providing support for Hypothesis 4a. The opposite is true for the wage growth outcome reported in the bottom half of Tables 4 and 5: the immediate wage growth gains following a boundary crossing (year-to-year analysis) are larger compared to the annualized wage growth over the entire career, providing support for Hypothesis 4b. In other words, career dynamics vary depending on wage *gains* or *growth* and the sequential relationship with the particular point of time in the career. As in the previous case with a single boundary-crossing indicator, we can compute *t*-statistics for the pairwise equality of the cluster coefficients between the career and annual clusters. We would find that the career and annual clusters are statistically significantly different (except for Cluster 5 for the wage growth outcome).

To summarize, our findings suggest that the *wage* effects of boundary crossings are larger over the entire career compared to the year they occur in. Based on our results, we confirm Hypotheses 4a and 4b: time moderation yields better results in the longer term for the *wage* outcome, while time moderation tempers results in the long term for the *wage growth* outcome. Thus, time performs as a key factor in understanding the varied nature of career dynamics.

To sum up, our analysis supports the baseline first hypothesis, which indicates that the career system is highly dynamic. Hypothesis 2 is supported, hence; there is a wage effect of any career boundary crossing. Hypothesis 3 is also supported by our analysis and therefore confirms that the type of career move moderates the financial benefits of boundary crossings, except for Cluster 5 (sector crossing) for both wage and wage growth outcomes and Cluster 2 (employer crossing) for the wage outcome only. Finally, our analysis also confirms Hypotheses 4a and 4b that demonstrate how time performs as a key factor in appreciating the varied nature of dynamic careers. More specifically, in the longer term, time moderation yields better results in terms of the wage outcome, however; time moderation also yields better results in the long term for the wage growth outcome.

5. Discussion

We address a longstanding debate in the career studies literature–that is, have careers become dynamic or are they stable? This question has generated significant debate in the field (e.g., see the work of Inkson et al., 2012 and Rodrigues et al., 2016, compared with Rousseau, 1995 and Arthur, 2014). We identify that just about one-third of the population has maintained stable careers with no changes within merely a single decade of their working life. This result is even more significant because the sample covered the entire population of one country, which includes many who find themselves in inherently stable careers (e.g., teachers and government civil servants). Conducting the study outside of the conventional Anglo-Saxon or OECD countries expands the current knowledge of global careers. Further, it adds to the ongoing debate on the nature of contemporary careers, offering a robust answer to the question whether careers are now dynamic. Showing the level of career transitions is of major contribution, then (Sullivan & Al Ariss, 2021).

5.1. Theoretical contribution

The contribution of our study enhances the understanding of the state of the art in the field of career studies. We were able to compare a variety of boundary crossings and their impact on objective career outcomes in terms of eight clusters of career patterns. The clusters reflect the possibilities of crossing the boundaries regarding three important factors: job changes, organizational changes and sectoral changes.

Career theory is still developing–often in symbiosis with advancements in HRM research. We provide support, in terms of relevance and credibility, for both the established boundaryless career theory (Arthur, 2014; Arthur & Rousseau, 1996) and the career ecosystem (Baruch, 2015; Baruch & Rousseau, 2019) to resolve outstanding theoretical inquiries (Guan et al., 2019; Spurk, 2021). The career ecosystem helps in integrating contrasting views, via a holistic perspective that emphasizes a social system of employment and in which careers are developed, comprising actors (employers, organizations, applicants, employees) as interacting and interconnected actors (Baruch, 2015; Baruch & Rousseau, 2019). Thus, the boundary crossings identified in this study reveal new types of interconnectedness that need to be considered integral, too, in the broader holistic career system. Within the broader field of HRM, we contribute to the boundaryless career theory by demonstrating significant evidence of boundary-crossing relating to three different realms (job, employer and industry/sector), manifesting that the actual meaning of the boundaryless metaphor is more of boundary crossing. While the label 'boundaryless' literally suggests 'no boundaries', we demonstrate that the meaning of the theory concerns that boundaries are more permeable and people are not bounded to a single career, be it occupation, employer, industry or any other type of work-related career realm. Furthermore, we identified a phenomenon of a dynamic labor market where career change in various constellations is frequent. Within the 10-year period, over 73 % of the population had crossed the boundaries of job, employers and industry/sector, and other boundary-crossing actions such as geographic moves may make this tally higher. This indicates a very high level of dynamism, and when examining year-on-year changes, we identified an increase in this dynamism (see, supplementary material). These findings help to resolve the debate about the validity of the boundaryless theory (Inkson et al., 2012; Rodrigues et al., 2016). We challenge the theory for its illusive and linguistically misleading label because any career features certain boundaries. Unlike earlier works, we do not merely explore a single boundary crossing but the sequence of changes in a long-term period. Moreover, we were able to identify what type of changes that conditioned which improved career outcomes in terms of objective career success (Ng, Eby, Sorensen, & Feldman, 2005; Spurk et al., 2019).

More specifically, we support the baseline hypothesis indicating that the career system is very dynamic, because three quarters of the population did not have a stable career within a significant time span of 11 years. This can be partly explained by career inaction, as suggested by Verbruggen and De Vos (2020). More than a third crossed three career boundaries, offering support to the boundaryless career theory (Arthur, 2014). This not only validates the theory but also expands it to indicate that the true meaning of the metaphor; 'boundaryless' is in fact about boundary-crossing. We offer a more nuanced contribution to this theory. We argue against the use of

"boundaryless" as a confusing, unrealistic metaphor and focus instead on "boundary crossing." Indeed, most workers cross boundaries, and our contribution underscores that the applicable boundaries are not singular but in fact *multiple* in nature. Furthermore, boundary crossings do not play out in a linear fashion but appear to have a *tipping point in the transition* between stability and dynamicity. We therefore demonstrate a multifaceted nature of career dynamism.

Additionally, we advance the theory by pinpointing that job, employer and sector perform as the nature of the aforesaid boundaries, and we indicate which of the boundaries is more impactful. This means, on the other hand, that there *are* boundaries to consider within the boundaryless career theory. However, we consider these as *different types* of boundaries; the boundaryless career theory can be validated as boundary crossing because boundaries still exist, but movement across jobs, employers and sectors is indeed highly dynamic. Thus, boundaries as *organizational* boundaries have loosened. At the same time, boundaries in the sense of transitions *do* exist, hence; the notion that careers do not have boundaries needs to be modified.

As for the career ecosystem theory, we highlight the interplay, interdependence and interconnectedness across different career actors as suggested by theory (Baruch, 2015; Baruch & Rousseau, 2019). We extend the theory by following the way actors frequently move across boundaries, and particularly the outcomes of such dynamics, which said theory did not discuss. We advance the theory by integrating it with the boundaryless career theory, showing that the career transitions featuring both the ecosystem and boundaryless careers lead to a positive outcome for individuals regardless of the type of boundary crossings in terms of an annual wage and wage growth. In line with the expectations in Hypotheses 4a and 4b, most career changes involved transitions that were associated with a positive impact (apart from merely changing the sector). Such transitions had a positive impact on wages, and this impact tended to be small soon after the boundary crossing. However, the aforesaid impact increased significantly later through the progression of careers, pointing out the impact time factor on career sustainability (De Vos et al., 2020). Conversely, in terms of wage *growth*, although these career transitions also have a positive impact on wage growth, the impact was more substantial soon after the boundary crossing. Nonetheless, this impact was lessened as the career progressed. These observations expand past the knowledge or general assumptions of the positive impact of mobility (Becker, 1960; Kiazad, Kraimer, Seibert, & Sargent, 2020; Ng & Feldman, 2007).

These findings offer what we consider a meaningful contribution to the study of contemporary careers by showing that boundary crossing is not only frequent but also adds value to critical career outcomes (Spurk et al., 2019). The findings manifest the many factors that influence career moves and boundary crossing as multilevel phenomena. In line with the career ecosystem theory, there are interrelated factors involving many actors (Baruch, 2015; Baruch & Rousseau, 2019). The nature of added value to individual career moves reinforces multiple moves, and these moves cover most of the population. Our study demonstrates that the timing of career transitions plays an important role in understanding the effect on career success outcomes such as wage and annual wage growth. Time in current career was suggested to be a moderator for intangible career-related factors (Kooij & Boon, 2018), and we extend the relevance for covering tangible career outcomes.

A related contribution concerns the moderating role of the type of career transition as most of the transition types (clusters), apart from sector change, have resulted in a positive outcome (financial gains for individuals). These findings expand the boundaryless career theory by indicating not only the existence of new trends but also the outcomes of these trends. The evidence for constant moves and the distinctions across various clusters expand the career ecosystem theory by pointing out the various career moves that individuals may take and their respected outcomes. Due to its overarching nature, empirical testing of the career ecosystem theory so far has been limited to specific populations or sectors (Richardson, Karam, & Afiouni, 2019), and the current study validates the theory, answering calls to study the current trends in career studies (Akkermans & Kubasch, 2017).

5.2. Managerial implications

5.2.1. For individuals

Our findings suggest that career changes, including major ones, are typical and frequent in contemporary labor markets. Individuals who wish to benefit from smooth career transitions may best invest in their employability (Fugate, Kinicki, & Ashforth, 2004) and career progress (Gerpott & Van Quaquebeke, 2023). Employees should be ready and open to changes, as these may lead to better work and life experience and can generate improved career outcomes, especially objective measures of income. This may be more acceptable for younger generations entering the labor market with no expectation of stability, as was the case in the 20th century. Yet, for those in precarious employment, such fluidity may increase hardships due to the competitive nature of the labor market. As our findings suggest, not every type of move leads to an improved wage, and one should consider the most optimal way of achieving their goal when making a boundary-crossing decision. Changing jobs or employers typically leads to a high level of wage growth in the short term and a better wage in the longer term. These outcomes will not follow a change in the sector, which means that a career change to a different sector may not yield financial benefits, even though such changes may follow a career calling and improve intangible career outcomes (Praskova, Hood, & Creed, 2014). They might also take place due to a decline in the employment opportunities available in that sector.

5.2.2. For organizations

The lessons are that employees tend to change careers and that organizations, and HR managers and senior executives should be prepared for this. Anticipating employees' aspirations may mean that employees' reasons for wanting to leave can be addressed; thus, a strong organizational career management would mitigate against the loss of human talent. Our analysis strongly supports those HR managers and international companies that emphasize internal global mobility across job-roles and business divisions for career and human capital development. To remain competitive and retain talented employees, career management systems (Bagdadli & Gianecchini, 2019) should realize the role of wage in career change decisions, and remuneration should be constantly evaluated against

the comparable level in the labor market. Employers should be aware of the dynamism of the labor market and apply flexibility in career management as part of general HRM planning. People may be happy to switch jobs without changing their employer (Cluster 3), meaning that career opportunities can be offered within the organization–that is, having the protean career orientation does not necessarily lead to changing the employer (Hall, 2004). This has possible learning points for vocational psychologists and other career advisers, to understand possible dynamics and consequences of career boundary crossing. This new reality of labor markets has inputs for the mission statement of vocational psychologists and career counsellors, for example to add under focused 'domains of inquiry' such as contextual and cultural variables (Lent, 2001).

Moreover, vocational psychologists can play a key role in how career development benefits both employees and employers. For example, crafting career goals and enhancing self-awareness about personality traits and accrued human capital can assist employees in executing more informed and potentially better decision-making regarding their own career and their suitability of career transitions. In contrast to the traditional advice of finding a stable job in one organization, career counsellors should emphasize those looking for career advice that the 'norm' is following career transitions that can contribute to the individual's human capital. Negative experiences associated with making the wrong transitions within the organizations might result in quitting. This might carry a cost such as damaged self-esteem for the individual but also loss of key talent for the employer. In terms of the latter, using vocational psychologists can provide short-term wellbeing among staff and reduce costs in the long run. This might be resultant of reducing frequency of stress-related illnesses and subsequent sick leaves or even turnover, if staff are better prepared on the uncertainties that often arise during career deliberations and transitions in addition to working in a post-COVID work environment that feature different work patterns, a higher degree of home-office and isolation, and added technological solutions.

5.2.3. For national public policy makers

Investment in employability may improve the adjustment period that people undergo following a career transition, making it easier to sustain career success (Blokker, Akkermans, Tims, Jansen, & Khapova, 2019) and to improve national competitiveness. Another issue for policy makers to consider is the need to avoid age discrimination and stereotyping. Improvement in skills would be instrumental when a career changes, which should be relevant to an employee at any career stage. Thus, encouraging skills upgrades for older employees can be supported at the national level.

5.3. Limitations and future research agenda

Each study suffers from limitations, and ours is no exception. The study was conducted in one country, Bulgaria, which is not an Anglo-Saxon, representing a deviation from much of the literature. Yet. Bulgaria represents middle-income countries (as per the World Bank classification) and also the other Central and Eastern European (CEE) countries. Its labor market is integrated within the broader EU27 context, which enhances the relevance of the findings beyond the national level. Moreover, our data cover the entire population and are based on hard and validated data. Another limitation is that we could only check external career changes; thus, other career transitions may be subject to further research scrutiny (Louis, 1980). Furthermore, in the case of employer change, we could not distinguish between voluntary and involuntary moves due to the nature of our big dataset. Also, we address the physical aspect of boundaryless careers but not psychological mobility (Sullivan & Arthur, 2006). Another limitation is the reliance on secondary data, whereas ideally using academically validated constructs such as employability, career adaptability and protean career would be helpful.

Lastly, the data were collected during the pre-COVID pandemic and might not reflect the dynamics and shifts of the post-pandemic labor market. However, we do not consider the reliance on pre-pandemic data to represent an outright weakness. As Caligiuri, De Cieri, Minbaeva, Verbeke, and Zimmermann (2020) and Carnevale and Hatak (2020) point out, work organizations became subject to unprecedented challenges and an altered work life during the COVID-pandemic. Thus, if our data had been fully or partly collected during and after the COVID-19, our dataset would most likely become "muddled" and less valid. This is because such collected data would uniquely be tied to two specific contexts (The COVID-19 and the post-COVID-19). Furthermore, although the post-pandemic work environment features altered work patterns, policies and practices (see Cooke, Dickmann, & Parry, 2020) as well as new ambiguities and managerial paradoxes (Collings, Nyberg, Wright, & McMackin, 2021), scholars appear increasingly in agreement that a complete 'new normal' has not manifested itself as a transformed world of work (e.g., Perkins et al., 2021; Vyas, 2022). From this we discern our data should not be discounted or considered less relevant of today's vocational landscape due to human behavior in relation to career choices resemble a "back to normal" scenario, albeit facing reconfigured work tasks and modes (Manroop et al., 2025) and the theoretical mechanisms we highlight are valid regardless of the time frame.

Future studies may test our framework in various countries (Bagdadli et al., 2021; Smale et al., 2019); in particular, the universality of our findings could be validated if countries belonging to different income classifications (as per the World Bank) and economic systems are compared. At the individual level, gender may be an issue worth further study to assess its impact (Arena, Volpone, & Jones, 2023; Gatrell et al., 2022; Sullivan & Al Ariss, 2021; Woehler, Cullen-Lester, Porter, & Frear, 2021). A qualitative study may explore the "why" question for career transitions by enabling a comparison of voluntary versus non-voluntary employer changes as well as identify any linkages to particular perceptual categories for doing so (Verbruggen & van Emmerik, 2020). A mixed-method study has the potential to investigate the motivation and intentions associated with various career change patterns identified as a component of quantitative analysis.

6. Conclusion

In this study, we explored the status of contemporary careers and show the validity of the contemporary view concerning "new careers" as being dynamic (in various ways) and characterized by frequent moves in various directions. Our analysis of the entire labor market of one country provides compelling evidence for the pervasive dynamism of contemporary careers, directly supporting the core tenets of boundaryless career and career ecosystem theories. Answering the longstanding debate in the career literature–that is, we indicate that careers have become dynamic rather than stable. We observed that much of the workforce tends to be involved in several types of major career changes. Frequent boundary-crossing is the norm, with most workers undertaking multiple job, employer, and sector changes over a decade. While financial gains are generally associated with these transitions, the type of move and the temporal dynamics of wage and wage growth reveal nuanced patterns such as a difference between short-term and long-term gains. These findings highlight the need to re-evaluate traditional career models and inform more adaptive strategies for individuals and organizations.

CRediT authorship contribution statement

Yehuda Baruch: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Conceptualization. **David S.A. Guttormsen:** Writing – review & editing, Writing – original draft, Conceptualization. **Stanley B. Gyoshev:** Writing – review & editing, Writing – original draft, Data curation, Conceptualization. **Trifon Pavkov:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation. **Miana Plesca:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

There is no conflict of interest for this submission: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Moreover, the submitted work was not conducted in the presence of any personal, professional, or financial relationships that could potentially be construed as a conflict of interest.

Appendix A

Appendix Table A1
Probability of career boundary crossings.

	Over career			Year to year		
	Job	Employer	Sector	Job	Employer	Sector
	Switch	Switch	Switch	Switch	Switch	Switch
Tenure in sample (base = 2 yrs)						
3 years	0.112***	0.103***	0.098***	−0.026***	−0.036***	−0.037***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
4 years	0.172***	0.154***	0.149***	−0.046***	−0.066***	−0.065***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
5 years	0.214***	0.193***	0.184***	−0.057***	−0.084***	−0.082***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
6 years	0.234***	0.209***	0.199***	−0.070***	−0.102***	−0.099***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
7 years	0.249***	0.221***	0.210***	−0.080***	−0.120***	−0.114***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
8 years	0.256***	0.227***	0.220***	−0.091***	−0.137***	−0.128***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
9 years	0.252***	0.223***	0.211***	−0.102***	−0.155***	−0.142***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
10 years	0.231***	0.193***	0.181***	−0.115***	−0.175***	−0.157***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
11 years (max)	0.126***	−0.004***	0.021***	−0.140***	−0.215***	−0.189***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Gender (male)	0.028***	0.049***	0.062***	0.012***	0.025***	0.028***
	(0.001)	(0.001)	(0.001)	(0.0002)	(0.0002)	(0.0002)
Firm size 10 to 49 employees	0.007***	−0.010***	−0.002**	0.005***	−0.009***	−0.004***
	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0003)	(0.0003)
Firm size 50 to 249 emply.	0.015***	−0.038***	−0.018***	0.011***	−0.022***	−0.010***
	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0004)	(0.0004)
Firm size ≥ 250 employees	0.019***	−0.116***	−0.063***	0.018***	−0.044***	−0.023***
	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0004)	(0.0004)

(*continued on next page*)

Appendix Table A1 (*continued*)

	Over career			Year to year		
	Job	Employer	Sector	Job	Employer	Sector
	Switch	Switch	Switch	Switch	Switch	Switch
Share emply. in occ.1, 2, 3	−0.031***	−0.112***	−0.065***	0.016***	−0.007***	0.009***
	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0004)	(0.0004)
Share stayers with employer	−0.068***	−0.136***	−0.071***	−0.128***	−0.268***	−0.184***
	(0.002)	(0.001)	(0.002)	(0.0003)	(0.0004)	(0.0004)
Share leavers with employer	0.085***	0.183***	0.123***	0.039***	0.150***	0.081***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Constant	0.216***	0.371***	0.333***	0.166***	0.259***	0.248***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Observations	3,131,258	3,131,258	3,131,258	18,367,619	18,367,619	18,367,619
R^2	0.103	0.145	0.099	0.057	0.127	0.081

Notes: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. Because of big data, coefficients are very precisely estimated (large t-statistics). Linear probability model. Coefficients measure the change in the probability of career boundary crossing from each indicator, all else equal. Standard errors in parentheses. Also included: birth cohort, occupation (1-digit ISCO code), wage decile within occupation, position in employer wage distribution, year. Employer characteristics are for first or previous year employers. The full set of regression coefficients including those for ISCO categories and year dummies are available from Tables S2a and S2b in the PDF supplementary appendix file: Supplemental Tables.

Appendix Table A2

Effect of career clusters on wage. Model with clusters.

	Over career			Year to year		
	Without Modera-tors	Including personal + first job charact.	Hierarchical model	Without Modera-tors	Including personal + first job charact.	Hierarchical model
a)	Effect on log monthly wage					
(2) Employer switch	−0.081***	−0.024***	0.006***	−0.223***	0.007***	−0.006***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.0004)
(3) Job switch	0.286***	0.084***	0.058***	0.046***	0.051***	0.045***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)
(4) Employer and job	0.117***	0.049***	0.048***	−0.163***	0.015***	−0.006***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
(5) Sector switch	−0.007***	−0.054***	0.010***	−0.132***	−0.020***	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.0005)
(6) Employer and sector	−0.054***	0.017***	0.004***	−0.182***	0.026***	−0.013***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.0003)
(7) Job and sector	0.165***	0.006**	0.081***	−0.146***	0.028***	0.046***
	(0.003)	(0.003)	(0.002)	(0.004)	(0.002)	(0.002)
(8) Job, employer, and sector	0.031***	0.066***	0.010***	−0.227***	0.021***	−0.035***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.0003)
Birth cohort						
1960s		0.075***	0.057***		0.022***	0.0005**
		(0.001)	(0.001)		(0.0003)	(0.0002)
1970s		0.125***	0.078***		0.038***	−0.007***
		(0.001)	(0.001)		(0.000)	(0.0002)
1980s		0.232***	0.106***		0.066***	−0.020***
		(0.001)	(0.001)		(0.000)	(0.0003)
1990s		0.273***	0.093***		0.101***	−0.014***
		(0.001)	(0.001)		(0.001)	(0.0004)
Years in sample		0.087***	0.070***		0.010***	0.010***
		(0.0001)	(0.0001)		(0.00004)	(0.00004)
Gender (male)		0.073***	0.068***		0.047***	0.051***
		(0.001)	(0.001)		(0.0002)	(0.0002)
Position in wage distrib.		−0.089***	0.047***		−0.055***	0.124***
		(0.002)	(0.002)		(0.001)	(0.001)
Firm size 10 to 49 empl.		0.015***	−0.017***		0.014***	−0.011***
		(0.001)	(0.001)		(0.0004)	(0.0004)
Firm size 50 to 249 empl.		0.030***	−0.046***		0.030***	−0.053***
		(0.001)	(0.001)		(0.0004)	(0.0005)
Firm size ≥ 250 empl.		0.057***	−0.091***		0.060***	−0.108***
		(0.001)	(0.001)		(0.0004)	(0.0005)
Share Emp. in Occ.1, 2, 3		0.165***	−0.113***		0.084***	−0.194***
		(0.001)	(0.001)		(0.000)	(0.001)
Share stayers with employer		−0.016***	0.007***		−0.009***	0.001***
		(0.002)	(0.001)		(0.0004)	(0.0004)
Share leavers with employer		0.005**	0.014***		−0.022***	0.015***
		(0.002)	(0.002)		(0.001)	(0.001)
Multiple switches over career						

(*continued on next page*)

Appendix Table A2 (*continued*)

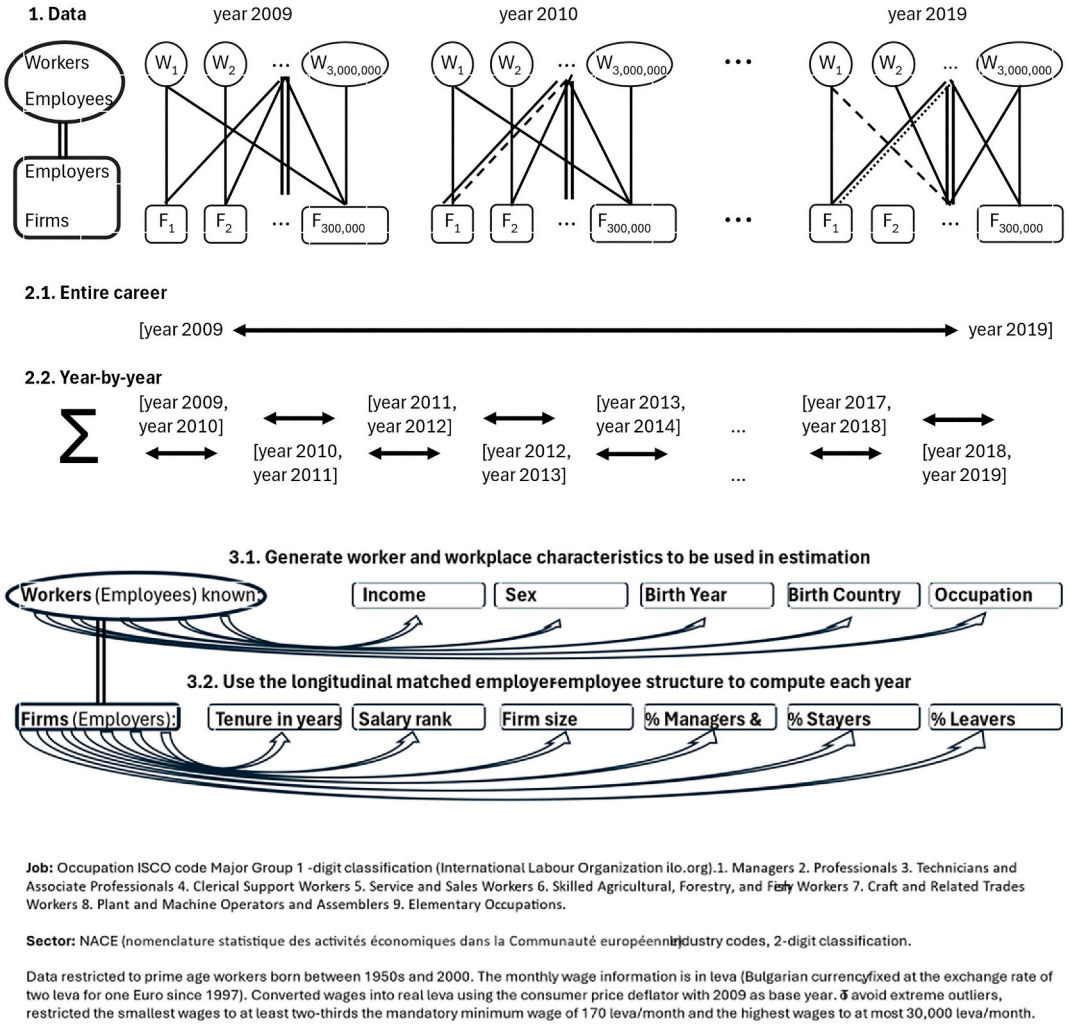
	Over career			Year to year		
	Without Modera-tors	Including personal + first job charact.	Hierarchical model	Without Modera-tors	Including personal + first job charact.	Hierarchical model
2 Occ. Switches		0.006***	−0.001			
		(0.001)	(0.001)			
≥ 3 Occ. Switches		0.024***	0.003**			
		(0.001)	(0.001)			
2 Empl. Switches		0.013***	0.008***			
		(0.001)	(0.001)			
≥ 3 Empl. Switches		−0.007***	−0.008***			
		(0.001)	(0.001)			
Constant	6.580***	6.036***		6.543***	6.460***	
	(0.001)	(0.002)		(0.000)	(0.001)	
Observations	3,132,434	3,131,258	3,131,258	18,372,711	18,367,619	18,367,619
R2	0.016	0.455	0.314	0.015	0.708	0.519
b) Effect on annual wage growth						
(2) Employer switch	0.029***	0.013***	0.020***	0.076***	0.049***	0.033***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(3) Job switch	0.018***	0.040***	0.034***	0.083***	0.091***	0.082***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(4) Employer and job	0.062***	0.056***	0.054***	0.166***	0.131***	0.105***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(5) Sector switch	−0.004***	−0.013***	0.008***	0.006***	−0.011***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(6) Employer and sector	0.043***	0.036***	0.030***	0.135***	0.107***	0.062***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(7) Job and sector	0.017***	0.015***	0.043***	0.093***	0.081***	0.093***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
(8) Job, employer, and sector	0.083***	0.072***	0.050***	0.202***	0.153***	0.088***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Birth cohort						
1960s		0.007***	−0.001**		0.015***	−0.005***
		(0.001)	(0.001)		(0.0004)	(0.0004)
1970s		0.022***	−0.002***		0.031***	−0.012***
		(0.001)	(0.001)		(0.000)	(0.0004)
1980s		0.068***	0.012***		0.069***	−0.013***
		(0.001)	(0.001)		(0.000)	(0.0005)
1990s		0.133***	0.054***		0.148***	0.036***
		(0.001)	(0.001)		(0.001)	(0.001)
Years (tenure) in sample		0.014***	0.010***		0.012***	0.014***
		(0.000)	(0.0001)		(0.0001)	(0.0001)
Gender (male)		0.043***	0.032***		0.048***	0.045***
		(0.000)	(0.0005)		(0.0003)	(0.0003)
Position in wage distribution		−0.052***	0.0005		−0.082***	0.068***
		(0.001)	(0.002)		(0.001)	(0.001)
Firm size						
10 to 49 employees		0.002**	−0.008***		0.010***	−0.025***
		(0.001)	(0.001)		(0.001)	(0.001)
50 to 249 employees		0.010***	−0.012***		0.031***	−0.064***
		(0.001)	(0.001)		(0.001)	(0.001)
≥ 250 employees		0.018***	−0.024***		0.062***	−0.116***
		(0.001)	(0.001)		(0.001)	(0.001)
Share Employees Occ. 1, 2, 3		0.081***	−0.030***		0.101***	−0.147***
		(0.001)	(0.001)		(0.001)	(0.001)
Share stayers with employer		−0.030***	−0.025***		0.015***	0.038***
		(0.001)	(0.001)		(0.001)	(0.001)
Share leavers with employer		0.004***	0.003**		0.019***	0.046***
		(0.001)	(0.001)		(0.001)	(0.001)
Multiple switches over career						
2 Occ. Switches		−0.006***	−0.008***			
		(0.001)	(0.001)			
≥ 3 Occ. Switches		0.002**	−0.005***			
		(0.001)	(0.001)			
2 Empl. Switches		−0.008***	−0.014***			
		(0.001)	(0.001)			
≥ 3 Empl. Switches		−0.013***	−0.021***			
		(0.001)	(0.001)			
Constant	0.106***	0.093***		0.111***	0.179***	

(*continued on next page*)

Appendix Table A2 (*continued*)

	Over career			Year to year		
	Without Modera-tors	Including personal + first job charact.	Hierarchical model	Without Modera-tors	Including personal + first job charact.	Hierarchical model
	(0.000)	(0.002)		(0.000)	(0.001)	
Observations	3,132,168	3,131,003	3,131,003	18,372,711	18,367,619	18,367,619
R2	0.009	0.121	0.182	0.011	0.065	0.142
Personal charact.	No	Yes	Yes	No	Yes	Yes
Initial job charact.	No	Yes	Yes	No	Yes	Yes

Notes: *p < 0.10; **p < 0.05; ***p < 0.01 using 1.96 critical value. The Bonferroni-corrected critical value at 5 % (seven hypothesis tests) would be 2.75. Standard errors in parentheses. Coefficients are very precisely estimated (large t-statistics). Due to the logarithmic transformation of the dependent variable, the coefficients in Panel a) measure the percentage change in wages from each career boundary crossing relative to none, without the need for further normalization or size effect measurements; in Panel B the dependent variable is already normalized as rate of growth. Also included in second and fourth column models are: birth cohort, occupation (1-digit ISCO code), wage decile within occupation, position in employer wage distribution, year. Employer characteristics are for first or previous year employer. The full set of regression coefficients including those for ISCO categories and year dummies are available from Tables S3 and S4 in the PDF supplementary appendix file: Supplemental Tables.

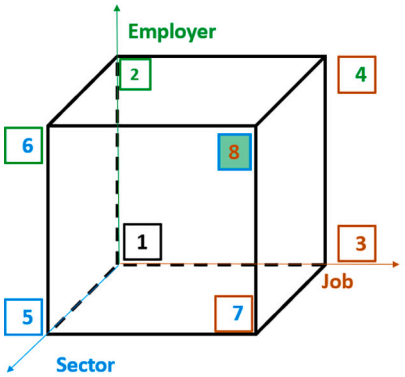


Job: Occupation ISCO code Major Group 1 -digit classification (International Labour Organization ilo.org).1. Managers 2. Professionals 3. Technicians and Associate Professionals 4. Clerical Support Workers 5. Service and Sales Workers 6. Skilled Agricultural, Forestry, and Fishy Workers 7. Craft and Related Trades Workers 8. Plant and Machine Operators and Assemblers 9. Elementary Occupations.

Sector: NACE (nomenclature statistique des activités économiques dans la Communauté européenne) industry codes, 2-digit classification.

Data restricted to prime age workers born between 1950s and 2000. The monthly wage information is in leva (Bulgarian currency fixed at the exchange rate of two leva for one Euro since 1997). Converted wages into real leva using the consumer price deflator with 2009 as base year. To avoid extreme outliers, restricted the smallest wages to at least two-thirds the mandatory minimum wage of 170 leva/month and the highest wages to at most 30,000 leva/month.

Figure Appendix 1. Create longitudinal matched employer-employee data from administrative tax data.
Create longitudinal variables (tenure) and firm variables from the matched employer-employee structure



Cluster	Workers	Fraction	Std. Err.
(1) No switch	835,221	**0.267**	0.000250
(2) Employer switch	230,570	**0.074**	0.000148
(3) Job switch	250,080	**0.080**	0.000153
(4) Employer and job	151,717	**0.048**	0.000121
(5) Sector switch	112,565	**0.036**	0.000105
(6) Employer and sector	417,296	**0.133**	0.000192
(7) Job and sector	45,381	**0.014**	6.75E-05
(8) Job, employer, and sector	1,089,604	**0.348**	0.000269
New Entrants			
Total	3,132,434	**1.000**	

Figure Appendix 2. Frequency and characteristics of boundary crossings, 2009–2019.

Data availability

Data can be shared for collaborative research if approved by the authorities

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