

Baranowska-Rataj, Anna; Elekes, Zoltán; Eriksson, Rikard

**Working Paper**

## Escaping from low-wage employment: The role of co-worker networks

CERS-IE Working Papers, No. CERS-IE WP - 2021/23

**Provided in Cooperation with:**

Institute of Economics, Centre for Economic and Regional Studies, Hungarian Academy of Sciences

*Suggested Citation:* Baranowska-Rataj, Anna; Elekes, Zoltán; Eriksson, Rikard (2021) : Escaping from low-wage employment: The role of co-worker networks, CERS-IE Working Papers, No. CERS-IE WP - 2021/23, Hungarian Academy of Sciences, Institute of Economics, Centre for Economic and Regional Studies, Budapest

This Version is available at:

<https://hdl.handle.net/10419/237566>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

## **Escaping from Low-Wage Employment: The Role of Co-worker Networks**

ANNA BARANOWSKA-RATAJ – ZOLTÁN ELEKES – RIKARD  
ERIKSSON

**CERS-IE WP – 2021/22**

May 2021

<https://kti.krtk.hu/wp-content/uploads/2021/05/CERSIEWP202123.pdf>

CERS-IE Working Papers aim to present research findings and stimulate discussion.

The views expressed are those of the author(s) and constitute “work in progress”.

Citation and use of the working papers should take into account that the paper is preliminary. Materials published in this series may be subject to further publication.

## ABSTRACT

Low-wage jobs are often regarded as dead-ends in the labour market careers of young people. Previous research focused on disentangling to what degree the association between a low-wage job at the start of working life and limited chances of transitioning to better-paid employment is causal or spurious. Less attention has been paid to the channels that may facilitate the upward wage mobility of low-wage workers. We focus on such mechanisms, and we scrutinize the impact of social ties to higher-educated co-workers. Due to knowledge spillovers, job referrals, as well as firm-level productivity gains, having higher-educated co-workers may improve an individual's chances of transitioning to a better-paid job. We use linked employer-employee data from longitudinal Swedish registers and panel data models that incorporate measures of low-wage workers' social ties to higher-educated co-workers. Our results confirm that having social ties to higher-educated co-workers increases individual chances of transitioning to better-paid employment.

JEL codes: C23, D85, J24, J31

Keywords: co-worker networks, employer-employee data, low-wage, wage mobility

Anna Baranowska-Rataj  
Department of Sociology, Umeå University  
and  
Centre for Demographic and Ageing Research, Umeå University  
e-mail: [anna.baranowska-rataj@umu.se](mailto:anna.baranowska-rataj@umu.se)

Zoltán Elekes  
Agglomeration and Social Networks Research Group, Centre for Economic and  
Regional Studies  
and  
Department of Geography, Umeå University  
e-mail: [elekes.zoltan@krtk.hu](mailto:elekes.zoltan@krtk.hu)

Rikard Eriksson  
Department of Geography, Umeå University  
and  
Centre for Regional Science, Umeå University  
e-mail: [rikard.eriksson@umu.se](mailto:rikard.eriksson@umu.se)

# **Szabadulás az alacsony bért kínáló állásokból: a munkatársi kapcsolathálózatok szerepe**

ANNA BARANOWSKA-RATAJ – ZOLTÁN ELEKES – RIKARD

ERIKSSON

## ÖSSZEFOGLALÓ

Az alacsony bért kínáló állásokat gyakran tekintik zsákuccának a fiatalok munkaerőpiaci karrierjében. Korábbi kutatások annak szétválasztására fókuszáltak, hogy a karrier alacsony bért kínáló állásban való megkezdése és a jobban fizető állásokba történő elmozdulás korlátozott esélye közötti kapcsolat milyen mértékben látszólagos, vagy pedig oksági. Kevesebb figyelmet kaptak azok a csatornák, amelyek könnyíthetik az alacsony keresetűek felfelé irányuló bérmobilitását. Egy ilyen mechanizmusra fókuszálunk és alaposan megvizsgáljuk a felsőfokú végzettséggel rendelkező munkatársakhoz fűződő társas kapcsolatok hatását. A tudástúlsordulás, ajánlások, illetve vállalati szintű termelékenység-növekedés következtében a felsőfokú végzettségű munkatársak jelenléte javíthatja a jobban fizető állásba történő elmozdulás esélyét. Svéd adminisztratív regiszterekből származó kapcsolt munkáltatói-munkavállalói longitudinális adatokra építve panel modelleket használunk, amelyek tartalmazzák az alacsony keresetű munkavállalók felsőfokú végzettséggel rendelkező munkatársakhoz fűződő társas kapcsolatainak becsült mérőszámát. Eredményeink megerősítik, hogy ezek a kapcsolatok javítják a jobban fizető állásba történő elmozdulás esélyét.

JEL: C23, D85, J24, J31

Kulcsszavak: munkatársi kapcsolathálózatok, munkáltatói-munkavállalói adat, alacsony bér, bérmobilitás

# Escaping from Low-Wage Employment: The Role of Co-worker Networks

Anna Baranowska-Rataj<sup>1,2</sup>, Zoltán Elekes<sup>3,4,5</sup>, Rikard Eriksson<sup>4,5</sup>

<sup>1</sup> Department of Sociology, Umeå University, Umeå, Sweden.

<sup>2</sup> Centre for Demographic and Ageing Research, Umeå University, Umeå, Sweden.

<sup>3</sup> Agglomeration and Social Networks Research Lab, Centre for Economic and Regional Studies, Budapest, Hungary.

<sup>4</sup> Department of Geography, Umeå University, Umeå, Sweden.

<sup>5</sup> Centre for Regional Science, Umeå University, Umeå, Sweden.

**Abstract:** Low-wage jobs are often regarded as dead ends in the labour market careers of young people. Previous research focused on disentangling to what degree the association between a low-wage job at the start of working life and limited chances of transitioning to better-paid employment is causal or spurious. Less attention has been paid to the channels that may facilitate the upward wage mobility of low-wage workers. We focus on such mechanisms, and we scrutinize the impact of social ties to higher-educated co-workers. Due to knowledge spillovers, job referrals, as well as firm-level productivity gains, having higher-educated co-workers may improve an individual's chances of transitioning to a better-paid job. We use linked employer-employee data from longitudinal Swedish registers and panel data models that incorporate measures of low-wage workers' social ties to higher-educated co-workers. Our results confirm that having social ties to higher-educated co-workers increases individual chances of transitioning to better-paid employment.

**Keywords:** co-worker networks, employer-employee data, low-wage, wage mobility

## 1. Background

Low-wage employment has become increasingly common on the European labour markets (Lucifora et al., 2005; Krings, 2020; McBride et al., 2018), raising concerns about job quality and long-term career opportunities of younger generations (Kalleberg, 2020). On the one hand, broadening the opportunities for paid work has been seen as the most effective tool to reduce poverty and provide routes out of unemployment (Brülle et al., 2018; Rubery et al., 2018). Compared to prolonged unemployment, having a low-wage job may provide better conditions for gaining skills and experience and for developing social networks, and thus increase chances of moving to a better-paid job in the future (Fok et al., 2015; Pavlopoulos and Fouarge, 2010). On the other hand, jobs differ in terms of the opportunities for accumulating human and social capital (Piore and Doeringer, 1971; Bills et al., 2017). Many low-wage jobs provide limited chances of career advancement (Kalleberg, 2020), hence, from a life course perspective, starting a working career with a low-wage job may be a dead end.

Previous research has paid a lot of effort to disentangling to what degree the persistence of low-wage employment across life course is causal or spurious. Advanced statistical methods have been marshalled to study to what degree the persistence of low-wage employment results from the unobserved heterogeneity of workers (Cappellari, 2002; Fok et al., 2015; Cai et al., 2018; Clark and Kanellopoulos, 2013). However, the role that low-wage jobs play for individual careers depends not only on observed or unobserved characteristics of workers, but also on the social context, in which these jobs are embedded. In this article, we point to the need to identify the social environments that facilitate transitions from low-wage to better-paid employment.

Our study makes a number of contributions. First, we outline the theoretical underpinnings and provide empirical evidence on the role of social ties to higher-educated co-workers for upward wage mobility. Using longitudinal matched employer-employee data from Swedish registers, we identify a group of individuals who started their labour market careers in low-wage employment, and we follow them over the course of their careers. We then assess whether having ties to higher-educated co-workers increases the likelihood that these workers would transition to better-paid employment. Taking advantage of firm-level data, we also explore the potential mechanisms that drive these effects. Research on social stratification has stressed the need to scrutinize how firms shape labour market inequalities (Tomaskovic-Devey and Avent-Holt, 2017; Baron and Bielby, 1980; Avent-Holt et al., 2019). Recent contributions to this literature have emphasized that the share of earnings inequality

that is generated between workplaces is growing in high-income countries (Tomaskovic-Devey et al., 2020). However, to the best of our knowledge this is the first study, which incorporates the insights from this literature to study the mechanisms shaping the wage mobility of low-wage workers.

Second, as our longitudinal register data follow individuals from the onset of their labour market careers, including in cases in which individuals change their workplace or place of residence, we are able to examine workers' long-term career outcomes. By contrast, previous research on low-wage workers often examined transitions between two consecutive years only (Mosthaf et al., 2010; Cappellari and Jenkins, 2004; Cappellari, 2006). Taking a long-term perspective improves our understanding of how having a precarious job upon entering the labour market affects an individual's career outcomes across the life cycle (Reichenberg and Berglund, 2019; Pavlopoulos and Fouarge, 2010; McVicar et al., 2018).

Finally, we take advantage of methodological innovations to capture the social ties developed at firms. Previous studies assumed that all co-workers within firms know each other (Hensvik and Skans, 2016). However, employees tend to bond with co-workers who resemble themselves and social proximity within firm-specific social networks has important implications for the processes of sharing knowledge and learning within organisations (Fernandez et al., 2000; Kmec and Trimble, 2009; Aven and Zhang, 2016). Employees who are very different from their co-workers may find it more difficult to participate in team learning or to build mentoring relations with other employees. Hence, social proximity between low-wage workers and their better-educated peers should be considered when assessing the role the social ties play for chances of upward wage mobility. This study reconstructs co-worker networks using recently developed methods for longitudinal matched employer-employee data. This method relies on probabilistic tie weight assignment, whereby the formation of a social tie between two co-workers depends on the co-workers' social proximity and hence it recognizes the importance of homophily in processes of social network formation.

## **2. Theoretical insights**

Research on the long-term consequences of precarious employment for labour market careers has been inspired by two main theoretical perspectives. Segmentation theory points to the mechanisms that make such employment a "trap" (Piore and Doeringer, 1971; Bills et al., 2017; Rubery, 1978). According to this literature, precarious employment brings not only

immediate implications for individual incomes and working conditions; it is also related to poor prospects for workers' future. Jobs in the secondary labour market segment offer limited job autonomy, training opportunities and chances for a promotion, and high levels of insecurity. As accumulating tenure and work experience in the secondary segment does not augment workers' skills, their ability to move from the secondary to the primary labour market segment remains restricted, leading to entrapment effects.

Another theoretical perspective, referred to in the literature as "entry port" or "stepping-stone" hypothesis (Boschman et al., 2021; Scherer, 2004; Bukodi and Dex, 2010; Knabe and Plum, 2013), emphasizes that precarious employment may constitute a route out of unemployment. While joblessness leads to human capital deterioration (Pissarides, 1992), involvement in paid work – even if low-paid – may nevertheless function as an entry port into stable and better-paid employment, since it provides labour market entrants with opportunities to gain work experience. Furthermore, access to paid work gives opportunities to enter social networks that may improve their chances of finding a better-paid job in future.

Instead of viewing these two theoretical perspectives as competing or contradictory, we propose to see them as alternative explanations that may be relevant depending on the context, and specifically, conditional on the firm-specific social environment. Thus, instead of asking *whether* low-wage jobs are traps or stepping-stones, we examine theoretically and empirically *when* transitions from low-wage to better-paid jobs are more likely. Recent research emphasizes that precarious employment may play different roles for different groups of workers (Kiersztyn, 2016; Knabe and Plum, 2013; Krings, 2020; Boschman et al., 2021) and in different societal contexts (Scherer, 2004; Gebel, 2010; Lucifora et al., 2005; Clark and Kanellopoulos, 2013). This article contributes to debates on how firms shape labour market inequalities (Avent-Holt et al., 2019), and we examine specifically the role of social environments established in co-worker networks.

Sociological research has long recognized that social networks are crucial for labour market success (Lin, 1999; Lin et al., 1981; Granovetter, 1995). Social relations between co-workers play an important role for the transfer of knowledge within organisations (Aven and Zhang, 2016). The qualitative content of skills in a workplace matters not only for the employees who possess these skills, but also for the performance of the whole organization (Edmondson, 2002; Neffke, 2019). As co-workers tend to share their knowledge and experiences, due to knowledge spillovers low-wage workers are more likely to acquire new skills, thereby improving their opportunities for upward wage mobility. In addition, the



mechanism of “peer pressure” may act as an incentive for workers to increase their efforts, which could, in turn, lead to higher earnings in the long run (Cornelissen et al., 2017). Low-wage workers who are employed at firms with better-educated peers may also be more advantaged because co-workers help each other find jobs within and outside of their workplaces (Ioannides and Datcher Loury, 2004; Granovetter, 1995), and having higher-status personal contacts improves chances of obtaining higher-quality jobs (Lin, 1999; Lin et al., 1981).

### **3. Previous empirical research**

Previous research on how firm-specific social environment affects upward mobility of low-wage workers has been scarce. Mosthaf et al. (2010) examined the role of the composition of the firm’s workforce. Their results indicated that a company with a high share of low-wage earners constitutes an environment in which it is more difficult to make the transition to a better-paid job. These findings suggest that the composition of an individual’s co-workers may play a role in upward wage mobility.

Studies that are somewhat less closely related to our research question, present evidence on how firm-specific social networks shape a broad range of labour market outcomes among disadvantaged social groups. For example, Hensvik and Skans (2013) examined how social ties to co-workers affected the job searches of young workers. They showed that youth who had participated in a summer job at a particular firm later had a higher probability than their school peers of securing a stable job at that firm. Eliason et al. (2019) found that social connections played a large role in hiring for smaller, younger, and less productive firms. De Grip and Sauermann (2012) provided evidence on knowledge transfers resulting from interactions between trained and untrained workers. Mellander et al. (2017) showed that for workers in low-skilled occupations, employment in a workplace with a substantial share of highly-skilled workers is strongly positively associated with income. It appears, however, that the wage benefits of having highly-skilled peers are restricted to low-skilled occupational groups. Yu (2013) found that having many co-workers with non-standard employment contracts is negatively related to wages, as well as to perceived chances of promotion. Overall, these studies suggest that the composition of peers in the workplace and of co-worker networks may have important consequences for workers’ chances of finding a job, and for their level of income. Nevertheless, more research is needed to gain a better understanding of

how social ties in a workplace can foster the careers of low-wage workers (Bolvig, 2005; Schultz, 2019).

#### **4. Research design**

To assess the likelihood of transitioning from low-wage to better-paid employment, we use longitudinal matched employer-employee data from Swedish registers. These data combine education registers, income tax registers, and social security registers, and use personal identity numbers and firm identity numbers to link individuals with their employers within and across registers. Our data provide annual information on incomes from employment, as well as study loans and scholarships, self-employment, parental leave benefits, and cash benefits for the unemployed and the poor. We select cohorts born in 1970-75, and follow individuals in these birth cohorts from the onset of their labour market careers until ages 40-45; i.e., at the life course stage in which annual income levels tend to stabilize, and can be seen as proxies for lifetime income (Lucifora et al., 2005).

In our analysis, we focus on individuals whose first experience of employment was in a low-wage job, defined as a job in which the earnings are below 60% of the median earnings in Sweden. Since income tax registers do not provide information about the hours of work, and instead sum up a worker's earnings on an annual basis as reported to the tax office, we use annual earnings, including all cash compensation paid by employers. Annual earnings may be a biased measure of wages for individuals working part-time, which often occurs in Sweden when a person combines paid work with parental leave, or is taking a career break. Thus, our analysis excludes observations of individuals whose incomes remained below the low-wage threshold while they were participating in education (which is captured by information on study loans or stipends from education registers), on parental leave, or unemployed (based on information on income from parental benefits, unemployment benefits, unemployment assistance, or social assistance). The aim of this step is to avoid capturing transitions from having a lower to having a higher income that are, for instance, related to returning from parental leave. Since our focus is on how firm-specific co-worker networks foster upward wage mobility, we exclude observations of self-employed people and of employees working at companies that employ only one person. This analysis includes 47,217 individuals and 82,101 person-year observations.

Our key explanatory variable measures social ties to co-workers with university education who are employed at the same workplace (i.e., are working for the same employer

and at the same establishment or plant) as any given individual in our sample. While in our data, co-workers are defined as employees at the same workplace, i.e. working for the same firm *and* at the same establishment or plant, the terms “a workplace” and “a firm” are used interchangeably. Because the employer-employee links are available for the 1990–2015 period on a yearly basis, we are able to observe all of the co-workers for our cohorts over the course of their labour market careers. The workers are listed repeatedly with different workplace codes in the same year if they change workplaces over the year. In the first step, for descriptive purposes, we calculate the share of higher-educated co-workers, and we categorize it into deciles, adding a separate category of individuals who have no co-workers with tertiary education. In the next step, we reconstruct co-worker networks on a yearly basis using methods developed by Lengyel and Eriksson (2017). This method relies on probabilistic tie weight assignment, whereby the formation of a social tie between two co-workers depends on the co-workers’ similarities in terms of age, gender, and country of birth. As the probability of tie creation is inversely proportional to the size of the group and the workplace, we take into account that the probability of forming social ties decreases with firm size (i.e., a person is less likely to know everyone in a large than in a small workplace). Finally, there is no straightforward way of defining the appropriate number of co-worker ties. We select the strongest 25% of (i.e., the most likely) social ties that could be created within each firm. We group low-wage workers into categories according to the weighted sum of their predicted social ties to educated co-workers, distinguishing between categories of less than five, 5-9, 10-49, and over 50. We add a category of workers without any social ties to higher educated co-workers, which mostly captures employees at firms in which the whole workforce is low-educated.

We control for a wide range of factors that may affect both the risk of being a low-wage worker and the outcome of interest; i.e., the probability of moving to a better-paid job. Specifically, we control for age, sex, and educational attainment. Educational attainment has the following categories: less than primary, primary, lower secondary, upper secondary, university program of up to three years, university program of more than three years, as well as a separate category for missing information. We distinguish between people born in Sweden, another Nordic country (or as a second-generation immigrant to Sweden), a non-Scandinavian country within Europe, or a country outside of Europe. We control for job tenure, which includes the following categories: one year, two years, three years, and four years or more. Our measure of firm size distinguishes between smaller companies with up to 300 employees and larger firms with 300 or more employees. We control for firm age,

distinguishing between start-ups; firms that have been active 1-5 years, 5-10 years, or more than 10 years; and companies that were established before 1986 (the earliest year of observation of firm ageing in Swedish registers). We control for industry using the following categories: manufacturing of foods and beverages; manufacturing of chemicals and machinery; manufacturing related to water, gas, and waste; construction and trade; advanced services; personal services; education and health care; and personal services, leisure, and culture. Finally, dummies for the periods analysed in our data (1990-1995, 1996-2000, and 2001-2005), as well as for the region type (distinguishing between rural and urban functional labour markets), are included in our models to control for differences in economic conditions across time and space. All of these control variables are lagged by one year in the panel setting so that they correspond to the observation of low-wage employment (instead of relating to the year of transition to a better-paid job).

In additional analyses, we also use variables that are not confounders but instead capture the potential mediating influences. As the content of skills in a given workplace matters for the performance of the whole organization (Edmondson, 2002; Neffke, 2019), the enhanced economic performance of firms should be reflected in a faster wage growth. Therefore, in an additional specification, we include a measure of the average annual firm-level wage growth. In addition, upward wage mobility may be facilitated by the mechanisms of peer pressure (Cornelissen et al., 2017), which should lead to decreases in productivity differentials, and, in turn, to decreases in wage inequality. Changes in wage inequality can in turn be related to better opportunities for the most disadvantaged group of low-wage workers. Hence, in the additional specification, we include a measure of firm-level wage skewness, as proxied by the ratio of the firm-level median wage to the mean wage. Finally, in order to assess whether upward wage mobility results from improved chances of moving to a better-paid job in another firm (Ioannides and Datcher Loury, 2004; Granovetter, 1995), we include a variable indicating between-firm job changes.

We first estimate random effects models that analyse transitions from low-wage to better-paid employment. In the second step, we consider the possibility that the unobserved characteristics of workers may bias the results. Workers with better abilities and stronger motivation may have more opportunities to develop social ties to higher-educated co-workers. At the same time, these individual characteristics may affect upward wage mobility. Therefore, we run fixed effects models that control for such unobservable factors. Fixed effects panel data models allow us to compare how changes in the degree of connectedness to higher-educated co-workers relate to transitions to better-paid employment by exploiting

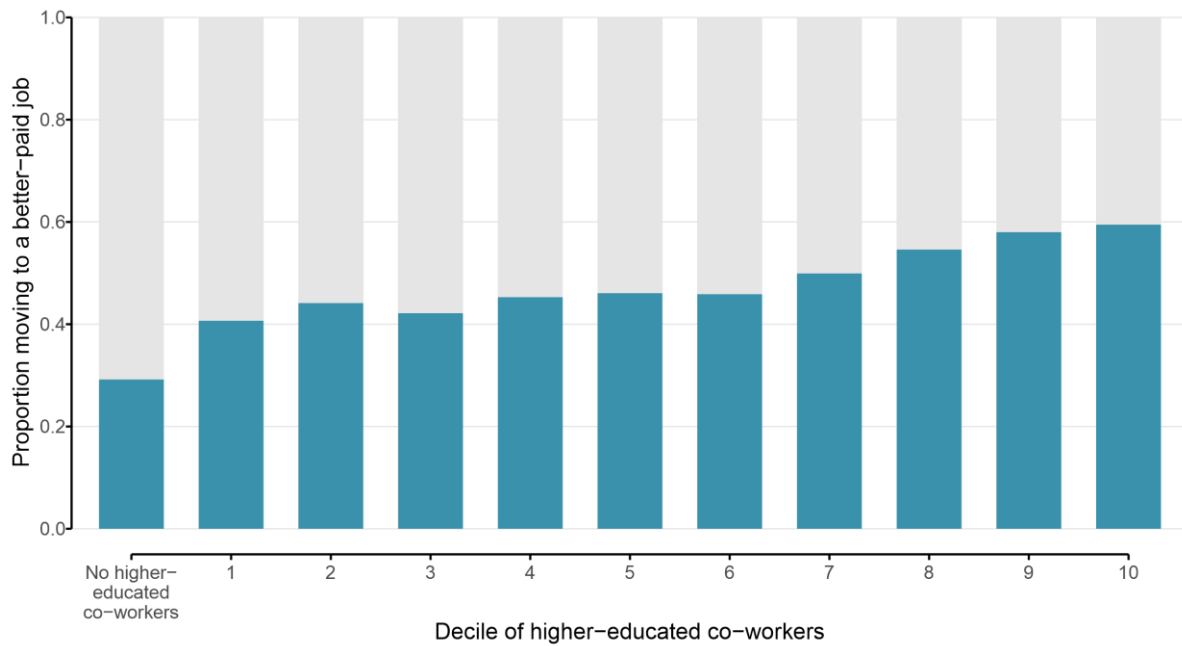
variation in social ties to higher-educated workers over time within individual careers. This variation comes from two main potential sources. First, the distribution of workers in the firm changes across the three dimensions: age, gender, and region of origin. This distribution is, in turn, driven by employee turnover (increasing or decreasing employment in the workplace and the mobility of the focal worker and co-workers). Second, an individual with a predicted tie within a workplace may obtain a higher level of education. While the nature of the network in the former case changes depending on who leaves or enters the workplace, the latter will increase the number of potential ties. By stressing the within-variation instead of comparing different low-wage workers, our fixed effects models consider these different transitions when analysing how changes in the number of social ties over time change chances of getting a better-paid job.

While standard fixed effects models control for individual-level unobserved heterogeneity, they still do not control for the non-random sorting of individuals into firms that provide better career opportunities. To explore how social ties to higher-educated co-workers affect upward wage mobility net of sorting, we estimate models that incorporate fixed effects for firm-worker matches (Abowd et al., 1999; Andrews et al., 2002), also known as spell fixed effects (hereafter: spell FE) models. This approach exploits the variation in individual employees' social ties to higher-educated workers, which stems only from changes in the number of ties within the same firm. In other words, we no longer use the variation in access to educated co-worker networks that stems from changing employers and from moving from one firm to another during an individual's career. Instead, this analysis is restricted to variation in access to educated co-worker networks that stems from changes in the number of higher-educated co-workers at a firm, based on the entries and exits of these co-workers from the firm. The basic version of such a modelling approach assumes that the exits and entries of higher-educated co-workers have opposing signs (Allison, 2019). The entries of new co-workers are expected to increase the upward wage mobility of their peers, and the exits are expected to decrease it. We instead use a more flexible version of this approach that separately assesses these two sources of variation in the number of ties.

## 5. Empirical findings

We start by presenting the descriptive evidence on the proportion of low-wage workers who advance within a year to a better-paid job according to the shares of higher-educated co-workers within firms. As shown on Figure 1, the likelihood of moving to a better-paid job is higher among the low-wage workers employed by firms with a better-educated workforce. Especially in three top deciles of firms with the largest proportions of higher-educated co-workers, the probability of transitioning to a better-paid job is more than 10 percentage points higher than it is in the firms with the smallest shares of highly-skilled peers.

Figure 1. Proportion of workers who transition from low-wage to better-paid employment according to the within-firm share of educated co-workers.



Source: Swedish register data.

In the next step, we use random effects models to examine whether having higher-educated co-workers is associated with higher chances that a low-wage worker will transition to better-paid employment (Table 1). The results confirm the conclusions from descriptive evidence that working in a firm with a higher proportion of higher-educated co-workers increases the likelihood of transitioning to a better-paid job. We find that workers with no higher-educated co-workers are least likely to escape low-wage employment. The probability

of upward wage mobility increases for workers at firms in the higher deciles of better-educated workforce.

The results for the control variables are in line with previous research. Women and workers with an immigrant background, are less likely to transition to a better-paid job. Higher educational attainment is associated with better chances of transitioning to a better-paid job, however, workers who are currently in education are less likely to make such a move. We find that having spent a longer period of time in a low-wage job decreases an individual's chances of escaping low-wage employment. Workers employed in larger and more mature firms are more likely to transition to a better-paid job. Upward wage mobility varies markedly across broad industry categories. For example, working in manufacturing or advanced services increases the chances of advancing to a better-paid job, while working in personal services or in trade has the opposite effect.

Table 1. The effect of having higher-educated co-workers on the upward wage mobility of low-wage employees – results from panel data models.

	Model 1, RE
Age	0.00 (0.00)
Sex: Women	-0.11*** (0.00)
Country of birth (ref. Sweden)	
Nordic	-0.04*** (0.01)
European	-0.09*** (0.01)
Non-European	-0.12*** (0.01)
Educational attainment (ref. Less than primary)	
Primary	-0.04*** (0.01)
Lower secondary	0.06*** (0.01)
Upper secondary	0.04*** (0.01)
University <=3 years	0.07*** (0.01)
University > 3 years	0.11*** (0.02)
Education unknown	0.03*** (0.01)
Studying	-0.05*** (0.01)
Duration of low-wage employment (ref.1 year)	

2 years	-0.14*** (0.00)
3 years	-0.18*** (0.01)
4 years or more	-0.26*** (0.01)
Firm size: large firm>300 emp.	0.08*** (0.01)
Firm age: (ref. start-up)	
1-5 years	0.01 (0.01)
5-9 years	0.04*** (0.01)
Over 10 years	0.07*** (0.01)
Established before 1986	-0.17*** (0.01)
Industry (ref. Manufacturing of beverages)	
Manufacturing of chemicals and machinery	0.14*** (0.01)
Manufacturing - water, gas, waste	0.06*** (0.02)
Construction	0.02** (0.01)
Trade	-0.09*** (0.01)
Advanced services	0.07*** (0.01)
Personal services	0.02** (0.01)
Education and health care	-0.02** (0.01)
Personal services/leisure/culture	-0.10*** (0.01)
Share of higher-educated co-workers (ref. 1 decile)	
No higher-educated co-workers	-0.05 (0.03)
2 decile	0.09*** (0.01)
3 decile	0.06*** (0.01)
4 decile	0.06*** (0.01)
5 decile	0.06*** (0.01)
6 decile	0.05*** (0.01)
7 decile	0.07*** (0.01)



8 decile	0.09*** (0.01)
9 decile	0.12*** (0.01)
10 decile	0.12*** (0.01)
Period (ref. years 1996-2000)	
Years 1990-1995	0.07*** (0.01)
Years 2001-2015	-0.12*** (0.01)
Region type: Metropolitan	
Large centre	0.00 (0.00)
Small centre	-0.00 (0.01)
Rural near centre	-0.00 (0.01)
Rural periphery	-0.01 (0.01)
Other	-0.02 (0.03)
Constant	0.70*** (0.02)
N	82101

---

Source: Swedish register data. Notes: standard errors in parentheses.

In the next step, we re-examine the role of employment in a firm with a better-educated workforce by considering that social ties are not made at random, instead the likelihood of establishing a tie varies based on social proximity between co-workers. Therefore, in the next step, instead of using deciles of shares of higher-educated co-workers, we use a measure of predicted social ties to higher-educated co-workers constructed following the approach proposed by Lengyel and Eriksson (2017). We present the results in Table 2. In Model 2, the specification is the same as in Model 1, but the key explanatory variable is the sum of predicted tie weights to higher-educated co-workers. The results confirm that low-wage workers are more likely to transition to a better-paid job when they operate in a workplace with higher-educated peers. Specifically, we observe that compared to the reference category of low-wage workers with 1-5 ties, workers with no ties have a seven-percentage-point lower probability of transitioning to a higher-paying job. At the same time, we find that compared to the reference category, low-wage workers with 5-9 ties have a four-percentage-point higher probability of upward wage mobility. For low-wage workers with 10-

20 ties and for those with more than 20 ties, the chances of getting a better-paid job are 12 percentage points and 13 percentage points higher, respectively.

In our more detailed analysis, we examine the robustness of our results after controlling for unobserved characteristics of workers. Some low-wage workers may have skills that make them more likely to develop ties to higher-educated workers, and to simultaneously improve their chances of transitioning to a higher-paying job. Therefore, in Model 3, we present results from a fixed effects model, which controls for worker-specific unobserved heterogeneity in addition to variables included in Model 1 and 2. According to our results, a part of the association between higher-educated co-workers and upward wage mobility observed earlier can be attributed to unobserved heterogeneity, as the key coefficients of interest become smaller in magnitude. But even after controlling for workers' unobserved heterogeneity, we still observe a positive relationship between social ties to higher-educated workers and upward wage mobility. Workers with no ties have a three-percentage-point lower probability of upward wage mobility than workers with 1-5 ties. Moreover, low-wage workers with 10-20 ties have a four-percentage-point higher probability of moving to a higher-paying job, and the coefficient for more than 20 ties is similar, but not statistically significant.

In the next step, we look at the potential mechanisms that drive the effects of having higher-educated peers. In Model 4, in addition to covariates included in the previous models, we include the potential mediators: firm-level wage growth, firm-level wage inequality, and measures of mobility between the firms. We expected that firms with higher-educated workforce may become more productive and have a higher pace of overall wage growth, which should help low-wage workers move to better-paid employment. Our results show that, indeed, firm-level wage growth increases the chances of upward wage mobility, but that the effect is rather small, and does not “explain away” the relationship between social ties to higher-educated co-workers and the chances of transitioning to a better-paid job. Our findings further indicate that firm-level wage inequality does not have a statistically significant effect on upward wage mobility. We also scrutinize another potential channel related to between-firm transitions. Thus, we can confirm that low-wage workers who move to a different firm, and specifically to a firm with a higher overall level of wages, are more likely to transition to a better-paid job. However, this factor does not “explain away” the relationship that we observe, as the estimates for regression coefficients in Models 3 and 4 are quite similar.

Table 2. The impact of ties to higher-educated co-workers on the chances of transitioning to a better-paid job – results from panel data models.

	Model 2 RE	Model 3 FE	Model 4 FE + mediators	Model 5 spell FE
Number of ties to higher-educated co-workers (ref. 1-5 ties)				
Zero ties	-0.07*** (0.00)	-0.03*** (0.01)	-0.04*** (0.01)	
5-9 ties	0.04*** (0.01)	-0.01 (0.02)	-0.01 (0.02)	
10-20 ties	0.12*** (0.01)	0.04* (0.02)	0.04* (0.02)	
More than 20 ties	0.13*** (0.01)	0.03 (0.04)	0.04 (0.04)	
Changes in no ties to higher-educated co-workers (ref. stable level)				
Decreasing				0.04*** (0.01)
Increasing				0.06*** (0.01)
Zero ties				0.02 (0.01)
Mobility between firms (ref. no mobility)				
Into a low-wage firm			-0.10*** (0.01)	
Into a high-wage firm			0.03*** (0.01)	
Firm-level wage inequality			-0.01 (0.01)	
Firm-level wage growth			0.01** (0.00)	
Constant	0.82*** (0.02)	0.89*** (0.04)	0.94*** (0.04)	0.71*** (0.07)
N	82101	82101	82101	82101

Source: Swedish registers. Notes: standard errors in parentheses. The control variables are included as in Table 1, results not displayed. The number of ties to higher-educated co-workers is weighted, as explained in Section 3.

Finally, we examine to what degree the effects of social ties to educated workers that we observed in Models 3 and 4 may be still biased due to workers' sorting into firms with differential chances of upward wage mobility. One solution for this problem is to estimate spell FE models (Abowd et al., 1999; Andrews et al., 2002). Using this approach, we examine whether changing the numbers of higher-educated co-workers that the same person has ties to while working for the same firm is related to upward wage mobility (Model 5). Our findings suggest that both increases and decreases in social ties have the same sign and a similar magnitude. Our interpretation of these results is that when the number of higher-educated co-

workers increases, low-wage workers' chances of benefitting from knowledge spillovers also increase, and their chances of upward wage mobility are raised. Higher-educated co-workers are most likely to exit their current firm by moving to a higher-paying firm, which may improve low-wage workers' chances for making a similar move (Eliason et al., 2019), or for receiving a promotion. Hence, both the arrival and the departure of higher-educated co-workers can enhance low-wage workers' opportunities for upward wage mobility.

A move to a higher-paid job is one of the multiple potential labour market outcomes for low-wage workers. In principle, following the arguments outlined in (Cornelissen et al., 2017), one could argue that while having higher-educated co-workers may increase the pressure on productivity, and improve the chances of higher pay, this pressure may also increase the risk of job loss for those who cannot adjust to this increased competitiveness. As a result, firms with a skilled workforce may create a competitive environment in which “the only way is up,” and workers who do not progress to a better-paid job are likely to be laid off. To address this concern, we estimated a multinomial logistic regression with fixed effects proposed by Chamberlain (1980) and implemented by Pforr (2014) (see Table A2 in the Annex). This model examines the following potential outcomes: (1) a better-paid job, (2) participation in education or parental leave, or (3) leaving employment. In this modelling framework, we examine the impact of having social ties to higher-educated co-workers on the relative risks of these outcomes compared to the risk of remaining in low-wage employment. Since our data are longitudinal and include multiple observations per individual, we used clustered standard errors. These results indicate that having social ties to higher-educated co-workers is associated with higher chances of transitioning back to education or to parental leave, but it does not increase the relative risk of transitioning out of the labour market to states that are not related to a student or a parent role. Hence, these results do not suggest that the benefits of having higher-educated co-workers for upward wage mobility comes at the cost of higher risk of losing a job.

## **6. Conclusions**

Increasing incidence of precarious jobs, such as low-wage jobs, raises concerns about career opportunities of young workers (Kalleberg, 2020). This study contributes to the ongoing debate about the long-term consequences of such non-optimal labour market entries (Boschman et al., 2021; Scherer, 2004; Bukodi and Dex, 2010; Knabe and Plum, 2013). Previous research emphasized that whether precarious jobs constitute “stepping stones” or

“traps” may crucially depend on the social category of workers (Kiersztyn, 2016; Knabe and Plum, 2013; Krings, 2020; Boschman et al., 2021) or country context (Scherer, 2004; Gebel, 2010; Lucifora et al., 2005; Clark and Kanellopoulos, 2013). This article adds to this debate by highlighting the role of social environment at the meso-level, that is, the firm-specific skill composition of the co-workers. Sociological research has recognized that social ties play an important role for labour market success (Lin, 1999; Lin et al., 1981; Granovetter, 1995), and more recently has stressed the need to scrutinize the role of the workplace context for earnings inequality (Tomaskovic-Devey et al., 2020). This study builds on these insights to further the knowledge on the opportunities for upward wage mobility of low-wage workers. Specifically, we examine whether having higher-educated co-workers influences the chances of upward wage mobility. Our empirical results confirm that a workplace with a higher proportion of higher-educated co-workers raises the likelihood of upward wage mobility. These effects do not vanish even after we controlled for unobserved differences between workers.

This study also explores the potential mechanisms linking firms that employ better-educated workforce with higher upward wage mobility. The skills of employees may be positively related to a faster wage growth of the whole organization (Edmondson, 2002; Neffke, 2019), thus contributing to upward wage mobility of all the workers, including the ones with lowest wages. Our analysis reveals that while the average firm-level wage growth is positively related to upward wage mobility, this is not the main reason for benefits from having better-educated co-workers. Previous studies suggested also the mechanism of peer pressure (Cornelissen et al., 2017), which should lead to decreases in productivity differentials, and, in turn, to decreases in wage inequality. Again, we do not find strong evidence suggesting that peer pressure mediates the positive impact of higher-educated co-workers on chances of upward wage mobility. In addition, we assess whether upward wage mobility results from improved chances of moving to a better-paid job in another firm. While our results confirm that moving to a high-wage firm is related to escaping low-wage employment, this mechanism also does not appear to “explain away” the benefits from having better-educated co-workers. Thus, the relationship observed in our results may be related to knowledge spillovers. Firms with a high proportion of well-qualified employees may constitute environments in which low-wage workers are more likely to acquire new skills, thereby improving their opportunities for upward wage mobility.

This study has some limitations. Relying on data from administrative registers has both advantages and drawbacks when researching labour market inequalities. On the one hand, using data from tax registers enables us to research individuals at the extreme ends of the

income distribution, whereas these groups are typically underrepresented in survey data (Hümbelin and Farys, 2016). By merging income register data with data from other registers, we are able to gain insight into the mechanisms that drive earnings differentials and upward wage mobility over time (Antelius and Björklund, 2000). On the other hand, register data are not free from measurement error (Pavlopoulos et al., 2012), and do not cover some important details of individuals' working lives. Specifically, a limitation in this study is that we only include indirect measurements of co-worker networks without explicit information on the qualitative content of social ties between co-workers. Moreover, we have information on annual incomes, which restricts our ability to make inferences about the differences in the hourly wages of low-wage workers. In the context of our study, some of the upward mobility of low-wage workers may reflect transitions from part-time to full-time employment. In addition, our data contain limited information about individual-level life course events such as health shocks, which may affect the risk of having a low-wage job and the chances of upward wage mobility (Lundborg et al., 2015).

Despite these limitations, our findings offer several insights that are relevant both for labour market research and policy-making. First, the results from our study contribute to the discussions on peer processes at workplaces, such as the implications of ethnic concentrations (Hudson et al., 2017; Bryson and White, 2019) and the societal benefits from increasing diversity at firms (Herring, 2009). This study also highlights that education attainment should not be seen a private investment which brings benefits only to those who receive it. Instead, given that the knowledge spillovers at workplaces seem to benefit also the least advantaged groups of workers, education attainment should be regarded as a collective resource, and an important dimension of social policy. Finally, our results indicate that when investing in active labour market policies related to job placements and internships, policy-makers should focus on workplaces in which young workers have the opportunity to learn from others and to benefit from the presence of co-workers with human capital and social connections that could lead to better jobs. This insight is particularly important given the evidence showing that broad policies that are not targeted to specific firms tend to miss their target (Rosholm and Svarer, 2014). More broadly, our study contributes to the debates on how employers affect individual career outcomes, and on between-workplace inequality in high-income countries (Tomaskovic-Devey et al., 2020; Avent-Holt et al., 2019).

## References

- Abowd JM, Kramarz F and Margolis DN. (1999) High wage workers and high wage firms. *Econometrica* 67: 251-333.
- Allison PD. (2019) Asymmetric fixed-effects models for panel data. *Socius* 5: 1-12.
- Andrews M, Schank T and Upward R. (2002) Practical estimation methods for linked employer-employee data. *Discussion Paper. Lehrstühle für Arbeitsmarkt- und Regionalpolitik, Friedrich-Alexander-Universität, Erlangen-Nürnberg.*
- Antelius J and Björklund A. (2000) How reliable are register data for studies of the return on schooling? An examination of Swedish data. *Scandinavian Journal of Educational Research* 44: 341-355.
- Aven B and Zhang EY. (2016) Social Distance and Knowledge Transformation: The Effects of Social Network Distance on Organizational Learning. *Sociological Science* 3: 1103-1131.
- Avent-Holt D, Henriksen LF, Hägglund AE, et al. (2019) Occupations, workplaces or jobs?: An exploration of stratification contexts using administrative data. *Research in Social Stratification and Mobility* in press.
- Baron JN and Bielby WT. (1980) Bringing the firms back in: Stratification, segmentation, and the organization of work. *American Sociological Review*: 737-765.
- Bills DB, Di Stasio V and Gërkhani K. (2017) The demand side of hiring: employers in the labor market. *Annual Review of Sociology* 43: 291-310.
- Bolvig I. (2005) Within-and between-firm mobility in the low-wage labour market. *Job quality and employer behaviour*. Springer, 132-156.
- Boschman S, Maas I, Vrooman JC, et al. (2021) From Social Assistance to Self-Sufficiency: Low Income Work as a Stepping Stone. *European Sociological Review*.
- Brülle J, Gangl M, Levanon A, et al. (2018) Changing labour market risks in the service economy: Low wages, part-time employment and the trend in working poverty risks in Germany. *Journal of European Social Policy* 29: 115-129.
- Bryson A and White M. (2019) Migrants and low-paid employment in British workplaces. *Work, Employment and Society* 33: 759-776.
- Bukodi E and Dex S. (2010) Bad start: Is there a way up? Gender differences in the effect of initial occupation on early career mobility in Britain. *European Sociological Review* 26: 431-446.

- Cai L, Mavromaras K and Sloane P. (2018) Low Paid Employment in Britain: Estimating State- Dependence and Stepping Stone Effects. *Oxford Bulletin of Economics and Statistics* 80: 283-326.
- Cappellari L. (2002) Do the 'working poor' stay poor? An analysis of low pay transitions in Italy. *Oxford Bulletin of Economics and Statistics* 64: 87-110.
- Cappellari L. (2006) Earnings mobility among Italian low-paid workers. *Journal of Population Economics* 20: 465-482.
- Cappellari L and Jenkins SP. (2004) Modelling low income transitions. *Journal of Applied Econometrics* 19: 593-610.
- Chamberlain G. (1980) Analysis of Covariance with Qualitative Data. *The Review of Economic Studies* 47: 225-238.
- Clark K and Kanellopoulos NC. (2013) Low pay persistence in Europe. *Labour Economics* 23: 122-134.
- Cornelissen T, Dustmann C and Schönberg U. (2017) Peer Effects in the Workplace. *American Economic Review* 107: 425-456.
- De Grip A and Sauermann J. (2012) The effects of training on own and co- worker productivity: Evidence from a field experiment. *The Economic Journal* 122: 376-399.
- Edmondson AC. (2002) The local and variegated nature of learning in organizations: A group-level perspective. *Organization Science* 13: 128-146.
- Eliason M, Hensvik L, Kramarz F, et al. (2019) Social Connections and the Sorting of Workers to Firms. CEPR Discussion Papers.
- Fernandez RM, Castilla EJ and Moore P. (2000) Social capital at work: Networks and employment at a phone center. *American journal of sociology* 105: 1288-1356.
- Fok YK, Scutella R and Wilkins R. (2015) The Low-Pay No-Pay Cycle: Are There Systematic Differences across Demographic Groups? *Oxford Bulletin of Economics and Statistics* 77: 872-896.
- Gebel M. (2010) Early career consequences of temporary employment in Germany and the UK. *Work, Employment and Society* 24: 641-660.
- Granovetter M. (1995) *Getting a Job: A Study of Contacts and Careers*: University of Chicago Press.
- Hensvik L and Skans ON. (2013) Networks and youth labor market entry. *Nordic Economic Policy*: 81.
- Hensvik L and Skans ON. (2016) Social networks, employee selection, and labor market outcomes. *Journal of Labor Economics* 34: 825-867.



- Herring C. (2009) Does diversity pay?: Race, gender, and the business case for diversity. *American Sociological Review* 74: 208-224.
- Hudson M, Netto G, Noon M, et al. (2017) Ethnicity and low wage traps: favouritism, homosocial reproduction and economic marginalization. *Work, Employment and Society* 31: 992-1009.
- Hümbelin O and Farys R. (2016) The Suitability of Tax Data to Study Trends in Inequality—A theoretical and empirical review with tax data from Switzerland. *Research in Social Stratification and Mobility* 44: 136-150.
- Ioannides YM and Datcher Loury L. (2004) Job information networks, neighborhood effects, and inequality. *Journal of economic literature* 42: 1056-1093.
- Kalleberg AL. (2020) Labor Market Uncertainties and Youth Labor Force Experiences: Lessons Learned. *The Annals of the American Academy of Political and Social Science* 688: 258-270.
- Kiersztyn A. (2016) Fixed-Term Employment and Occupational Position in Poland: The Heterogeneity of Temporary Jobs. *European Sociological Review* 32: 881-894.
- Kmec JA and Trimble LB. (2009) Does it pay to have a network contact? Social network ties, workplace racial context, and pay outcomes. *Social Science Research* 38: 266-278.
- Knabe A and Plum A. (2013) Low- wage Jobs—Springboard to High- paid Ones? *Labour* 27: 310-330.
- Krings T. (2020) ‘Good’Bad Jobs? The Evolution of Migrant Low-Wage Employment in Germany (1985–2015). *Work, Employment and Society*: 0950017020946567.
- Lengyel B and Eriksson RH. (2017) Co-worker networks, labour mobility and productivity growth in regions. *Journal of Economic Geography* 17: 635-660.
- Lin N. (1999) Social networks and status attainment. *Annual Review of Sociology* 25: 467-487.
- Lin N, Ensel WM and Vaughn JC. (1981) Social resources and strength of ties: Structural factors in occupational status attainment. *American Sociological Review*: 393-405.
- Lucifora C, McKnight A and Salverda W. (2005) Low-wage employment in Europe: a review of the evidence. *Socio-economic review* 3: 259-292.
- Lundborg P, Nilsson M and Vikström J. (2015) Heterogeneity in the impact of health shocks on labour outcomes: evidence from Swedish workers. *Oxford Economic Papers* 67: 715-739.

- McBride J, Smith A and Mbala M. (2018) ‘You End Up with Nothing’: The Experience of Being a Statistic of ‘In-Work Poverty’ in the UK. *Work, Employment and Society* 32: 210-218.
- McVicar D, Wooden M, Laß I, et al. (2018) Contingent Employment and Labour Market Pathways: Bridge or Trap? *European Sociological Review* 35: 98-115.
- Mellander C, Stolarick K and Lobo J. (2017) Distinguishing neighbourhood and workplace network effects on individual income: evidence from Sweden. *Regional Studies* 51: 1652-1664.
- Mosthaf A, Schnabel C and Stephani J. (2010) Low-wage careers: Are there dead-end firms and dead-end jobs? *Zeitschrift für Arbeitsmarkt Forschung* 43: 231-249.
- Neffke FM. (2019) The value of complementary co-workers. *Science advances* 5: eaax3370.
- Pavlopoulos D and Fouarge D. (2010) Escaping low pay: do male labour market entrants stand a chance? *International Journal of Manpower*.
- Pavlopoulos D, Muffels R and Vermunt JK. (2012) How real is mobility between low pay, high pay and non-employment? *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 175: 749-773.
- Pfarr K. (2014) femlogit—implementation of the multinomial logit model with fixed effects. *The Stata Journal* 14: 847-862.
- Piore M and Doeringer P. (1971) Internal labor markets and manpower policy. Lexington: DC Heath and Company.
- Pissarides CA. (1992) Loss of skill during unemployment and the persistence of employment shocks. *The Quarterly Journal of Economics* 107: 1371-1391.
- Reichenberg O and Berglund T. (2019) “Stepping up or stepping down?”: The earnings differences associated with Swedish temporary workers’ employment sequences. *Social Science Research* 82: 126-136.
- Rosholm M and Svarer M. (2014) *Nordic Economic Policy Review: Consequences of youth unemployment and effectiveness of policy interventions*.
- Rubery J. (1978) Structured labour markets, worker organisation and low pay. *Cambridge journal of Economics* 2: 17-36.
- Rubery J, Grimshaw D, Keizer A, et al. (2018) Challenges and contradictions in the ‘normalising’ of precarious work. *Work, Employment and Society* 32: 509-527.
- Scherer S. (2004) Stepping-stones or traps? The consequences of labour market entry positions on future careers in West Germany, Great Britain and Italy. *Work, Employment and Society* 18: 369-394.

- Schultz MA. (2019) The Wage Mobility of Low-Wage Workers in a Changing Economy, 1968 to 2014. *RSF: The Russell Sage Foundation Journal of the Social Sciences* 5: 159-189.
- Silva F, Vieira J, Pimenta A, et al. (2018) Duration of low-wage employment: a study based on a survival model. *International Journal of Social Economics*.
- Tomaskovic-Devey D and Avent-Holt D. (2017) Organizations and stratification: Processes, mechanisms, and institutional contexts. *Research in Social Stratification and Mobility* 47: 1-5.
- Tomaskovic-Devey D, Rainey A, Avent-Holt D, et al. (2020) Rising between-workplace inequalities in high-income countries. *Proceedings of the National Academy of Sciences* 117: 9277-9283.
- Yu W-h. (2013) It's who you work with: effects of workplace shares of nonstandard employees and women in Japan. *Social Forces* 92: 25-57.

## Annex

Table A1 Sample composition

	Total Mean	According to the number of ties to higher-educated co-workers:				
		Zero ties	Less than 5 ties	5-9 ties	10-20 ties	More than 20 ties
N	82101	44967	29857	3353	1816	2108
% moving to higher-paid job	48%	43%	51%	56%	69%	74%
Age	31	31	32	33	33	33
Duration of low-wage employment: 1 year	39%	39%	38%	33%	39%	59%
2 years	22%	21%	23%	24%	23%	19%
3 years	14%	13%	14%	15%	15%	10%
4 years or more	26%	26%	26%	27%	22%	11%
Sex: Women	47%	41%	53%	54%	61%	45%
Educational attainment: Less than primary	3%	3%	3%	1%	0%	1%
primary	8%	10%	5%	3%	2%	0%
upper secondary	34%	41%	29%	16%	10%	5%
high school	6%	6%	6%	5%	3%	2%
university 3 years	29%	22%	36%	51%	50%	34%
longer university	2%	0%	2%	7%	15%	26%
missing	19%	18%	19%	17%	20%	32%
Studying	3%	3%	4%	6%	7%	7%
Country of birth: Sweden	38%	42%	37%	31%	30%	7%

	Nordic	15%	13%	16%	20%	27%	7%
	European	26%	26%	24%	32%	30%	58%
	Non-European	21%	20%	23%	17%	13%	28%
Firm size: large firm > 300 emp.		14%	1%	21%	40%	78%	99%
Firm age: start-up		3%	3%	2%	2%	1%	1%
	less than 5 years	11%	14%	10%	5%	4%	2%
	5-9 years	12%	13%	11%	9%	6%	3%
	over 10 years	38%	28%	44%	61%	70%	77%
	established before 1986	36%	42%	33%	22%	18%	17%
Industry: Manufacturing of beverages		6%	8%	5%	2%	1%	1%
	Manufacturing of chemicals and machinery	7%	6%	7%	8%	9%	9%
	Manufacturing - water, gas, waste	1%	1%	1%	1%	1%	0%
	Construction and trade	24%	33%	15%	3%	1%	0%
	Trade	21%	26%	16%	8%	2%	0%
	Advanced services	4%	3%	5%	9%	4%	1%
	Personal services	5%	4%	7%	8%	10%	10%
	Education and health care	27%	14%	38%	57%	70%	77%
	Personal services/leisure/culture	5%	5%	6%	4%	2%	0%
Mobility between firms: no mobility		73%	72%	73%	75%	80%	84%
Into a low-wage firm		11%	13%	9%	5%	3%	2%
Into a high-wage firm		16%	15%	17%	21%	16%	14%
Firm-level wage inequality		51%	47%	50%	60%	83%	92%
Firm-level wage growth		63%	58%	66%	77%	87%	97%

Years 1990-1995	11%	14%	9%	4%	4%	2%
Years 1996-2000	24%	27%	21%	17%	12%	13%
Years 2001-2015	65%	60%	70%	79%	83%	85%
Region type: Metro	69%	66%	73%	74%	71%	70%
Large centre	19%	20%	17%	17%	20%	22%
Small centre	3%	3%	3%	3%	3%	2%
Rural near centre	6%	7%	5%	4%	4%	4%
Rural periphery	3%	3%	2%	2%	2%	2%
Other	0%	1%	0%	0%	0%	0%

---

Source: Swedish registers. The number of ties to higher-educated co-workers is weighted as explained in Section 3.

Table A2. The impact of ties to higher-educated co-workers on the probability of transitioning to a better-paid job, education, parenthood, or out of work – results from multinomial fixed effects models.

	High wage employment OR (SE)	Education/Parental leave OR (SE)	Out of paid work OR (SE)
Age	-0.22*** (0.00)	0.03*** (0.00)	0.14*** (0.00)
Studying	0.06 (0.06)	0.36*** (0.05)	0.23*** (0.06)
Duration of low-wage employment (ref. 1 year)			
2 years	2.54*** (0.04)	0.02 (0.03)	-0.03 (0.04)
3 years	3.95*** (0.05)	0.08* (0.03)	-0.07 (0.05)
4 years or more	5.60*** (0.07)	0.07 (0.04)	-0.10 (0.06)
Large firm	0.04 (0.05)	0.10* (0.04)	0.03 (0.05)
Firm age (ref. start-up)			
1-4 years	0.10 (0.07)	-0.15** (0.06)	-2.16*** (0.06)
5-10 years	0.26*** (0.08)	-0.02 (0.06)	-2.40*** (0.06)
Over 10 years	0.31*** (0.07)	0.00 (0.05)	-3.51*** (0.06)
Established before 1986	-0.23** (0.07)	0.39*** (0.06)	0.23*** (0.06)
Industry (ref. Manufacturing of foods)			
Manufacturing of chemicals and machinery	0.53*** (0.10)	0.27*** (0.08)	0.19* (0.09)
Manufacturing - water, gas, waste	-0.24 (0.16)	-0.17 (0.13)	-0.42** (0.15)

Construction and trade	-0.07 (0.08)	-0.26*** (0.06)	-0.48*** (0.07)
Trade	-0.36*** (0.08)	-0.42*** (0.06)	-0.50*** (0.08)
Advanced services	0.27* (0.11)	-0.06 (0.08)	0.07 (0.10)
Personal services	0.12 (0.10)	-0.22** (0.07)	-0.33*** (0.09)
Education and health care	0.03 (0.08)	-0.18** (0.06)	-0.83*** (0.08)
Personal services/leisure/culture	-0.17 (0.10)	-0.29*** (0.08)	-0.46*** (0.09)
No. of ties to higher-educated co-workers (ref. 1-5 ties)			
Zero ties	-0.24*** (0.03)	-0.07** (0.02)	0.19*** (0.03)
5-9 ties	0.25*** (0.07)	-0.14* (0.06)	-0.29*** (0.08)
10-20 ties	0.55*** (0.10)	0.00 (0.09)	-0.23 (0.12)
More than 20 ties	0.62*** (0.14)	0.30* (0.12)	0.01 (0.16)
Period (ref. years 1996-2000)			
Years 1990-1995	0.66*** (0.05)	-0.46*** (0.04)	-0.62*** (0.05)
Years 2001-2015	-0.54*** (0.05)	0.46*** (0.04)	1.43*** (0.05)
Region type (ref. Metro)			
Large centre	0.01 (0.08)	0.01 (0.06)	-0.02 (0.07)
Small centre	0.08 (0.16)	0.01 (0.13)	-0.18 (0.16)
Rural near centre	-0.02	0.02	0.05



	(0.12)	(0.10)	(0.12)
Rural periphery	0.37*	0.25	0.20
	(0.17)	(0.13)	(0.17)
Other	0.77*	0.44	0.67*
	(0.37)	(0.28)	(0.32)
N	182113		

---

Source: Swedish registers. Note: coefficients represent odds ratio from multinomial logit models, standard errors in parentheses. The number of ties to higher-educated co-workers is weighted as explained in Section 3.