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CHAPTER 13

Enriching the Micro Perspective in Evolutionary Economic Geography: Skill Relatedness and the Mobility of Heterogeneous Workers

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Abstract: Labour mobility plays a central role in shaping local economies. Substantial contributions have been made in the Evolutionary Economic Geography (EEG) literature to understand the dynamics and geographies of local economies. A key contribution of EEG research has been the emphasis on both the supply of work and the demand for workers, raising questions about skill matching. Building on this tradition, the aim of this chapter is twofold. First, we aim to summarize the contributions on labour mobilities and skill relatedness made by EEG. Second, we argue that the micro perspective in EEG could be enriched by focusing more on the heterogeneity of workers with respect to, for instance, gender, age or ethnicity. We then outline a future research agenda within EEG that is more attentive to the diversity of workers by exploring (1) the assortativity of skill relatedness networks, (2) the bounded mobilities of workers and (3) dimensions of proximity beyond the cognitive.

Keywords: labour mobility, skill relatedness, local labour markets, spatial division of labour, skill mismatch, worker heterogeneity

1. Introduction¹

Workers and their mobility play a key role in understanding the economic performance, resilience and evolution of places. Workers provide a supply of skills that are necessary to produce goods and services, and their mobility between economic activities and places acts as a mechanism for transferring these productive capabilities. At the same time, places tend to be considered successful when they are able to provide opportunities for locals to advance their careers and have a fulfilling life. In this light, labour mobility between activities and places represents the particular ways of dealing with the opportunities and constraints of local economic structures.

In this chapter, we focus specifically on how research on labour mobility has informed, and has been informed by, the development of Evolutionary Economic Geography (EEG). EEG is a research programme that has built extensively on firm-level theorizing and has achieved considerable empirical success in deepening our understanding of the spatial evolution of firms and industries (Frenken & Boschma, 2015) as well as structural changes in and of regions (e.g. Boschma et al., 2013; Kogler et al., 2017; Neffke et al., 2011; Rigby, 2015). One of the main contributions of EEG to the literature on labour mobility is the theorization of the demand side of the labour market. As Sunley et al. (2001) pointed out, concentrating solely on the supply side becomes ineffective when local employment opportunities are lacking.

We argue that in EEG there is more work to be done on how workers shape the developments in local economies, and evolution of regional trajectories and how this in turn creates opportunities and constraints for some workers but not for others. While skills, the relatedness of economic activities and labour mobility are at the core of EEG research (e.g. Buyukyazici et al., 2024; Neffke et al., 2018; Solheim et al., 2020), the heterogeneous workers (e.g. men and women, natives and immigrants) who embody these skills have received comparatively little attention. This restriction is by no means necessary. The mobility of a diverse workforce is a core mechanism of how economic activities emerge and phase out in regions. In addition, the re-employment and mobility of different workers in the wake of plant closures and

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(economic) crises is integral to the functioning of resilient regional economies. Hence, an evolutionary perspective on structural change and economic resilience has the potential to go beyond treating workers as homogeneous, passive production resources (Herod, 2001), which is necessary if we are to address the growing intra- and inter-regional inequalities (Iammarino et al., 2019) and regional struggles to provide opportunities for the locals (Diemer et al., 2022).

Such an approach would in turn contribute to EEG research by connecting it more tightly to unfolding economic inequalities, in parallel to – or even as a result of – regional branching. In addition, a micro perspective on evolving regional economies is underway in EEG (Boschma, 2017; Elekes et al., 2019; Neffke et al., 2018), currently with a predominant focus on firms as the unit of analysis. This endeavour is necessary, given that changes in net aggregates tend to mask the turbulent underlying micro processes (Boschma, 2015; Eriksson & Hane-Weijman, 2017). Such micro processes include the interactions between the levels of the regional, the industrial and the firm, and indeed that of the worker (Conroy, 1975; Metcalfe et al., 2006; Walker & Storper, 1989). The worker level reveals how workers move and relate to different spaces and actors (Dzalbe et al., 2024). Finally, extending the scope of EEG research in this direction would create knowledge that better serves to form policies that are both place- *and* people-based.

The aim of this chapter is twofold. First, we aim to engage with the theoretical and empirical contributions within EEG on the capacities and constraints of labour mobility, and how labour mobility in turn can inform us of (uneven) regional development. The perspective that labour mobility is shaped by the worker's desire to find a good job match (Pissarides, 2011) is central in EEG, and the concept of skill relatedness has been a prominent approach to address this. Hence, skill relatedness is also put at centre stage in this chapter. Second, we propose that by taking worker heterogeneity into account when building empirical analyses on labour mobility, EEG research would unlock considerable untapped value for our understanding of opportunity creation and economic marginalization in and across regions.

To this end, we start our chapter with the classic work on agglomeration externalities and the related variety and skill matching in local labour markets through the lens of labour pooling and labour mobility across economic activities (*Section 2*). We then discuss promising current research efforts in relation to the temporal and spatial heterogeneity of (skill-)related labour mobility regarding changes both at the worker level (e.g. individual labour market trajectories)

and the regional level (e.g. regional resilience) (*Section 3*). Based on this stocktaking, we then propose three interlinked areas where EEG research, in our view, could be advanced by breaking down labour mobility in relation to different groups of the workforce (*Section 4*). In short, we structure our thinking along three “layers” of an abstract relational space between economic activities (such as industries or occupations): the layer of “true”, but mostly difficult-to-observe, skill relatedness between these activities; the layer of observed labour mobility between the activities, often used in empirical research to derive revealed skill relatedness; the layer of proximities other than cognitive proximity between the activities, for which skill relatedness serves as a proxy. With respect to these layers, we make a case for unpacking (1) the assortativity of economic activities (i.e. whether similar or dissimilar activities tend to be related) along multiple dimensions as a consequence of skill relatedness; (2) the mobilities and im-mobilities that unfold over the industry and occupation spaces; and (3) the proximities and differences beyond cognitive proximity that regional diversification and resilience encompass. We conclude the chapter with a summary of our arguments and their implications for forging a stronger connection between EEG and (inequalities in) local opportunities and constraints for different groups of a diverse workforce (*Section 5*).

2. Localized labour mobility across industries and occupations

In this section we trace the development of, and key empirical findings on, the labour-focused approach to relatedness in EEG research. The section also offers an empirical illustration of industry and occupation spaces constructed for local labour markets based on labour flows.

In economics, there is a long tradition of studying the effect of size on a region’s ability to facilitate productive labour market mobilities (Puga, 2010) in terms of job matching, knowledge sharing and organizational learning (Duranton & Puga, 2004). However, in EEG the argument has often been that it is not size per se that gives rise to such advantages but rather the industry structure within regions, which is a discussion that is usually traced back to Marshall (1890) and Jacobs (1969). The seminal work by Marshall (1890), on the success of the Sheffield steel industry, pointed out the advantage of regional specialization: firms that are located close to one another and are involved in similar economic activities experience benefits from this co-location, or *localization externalities*, one benefit being the joint pool of specialized labour. Labour pooling, he argued, was also an advantage for the workers, as those who are part of these labour markets would have access to a stable demand for their skills.

These matched labour mobilities have been argued to give rise to regional growth and good re-employment opportunities, for instance in the case of a plant closure. On the other hand, based on the work by Jacobs (1969), among others, it has been argued that positive externalities arise from the diversity of economic activities located in the same place due to the interactions between workers with *different* skills and experiences in a diverse range of organizations (Glaeser et al., 1992). These so-called *urbanization externalities* are much more likely to occur in larger cities (Jacobs, 1969).

The work by Power and Lundmark (2004) showed how clusters that have a high supply and demand for the same kind of skills will facilitate and hence give rise to high levels of labour mobility due to localization externalities. At the same time, these specialized regions will be more vulnerable to sector-specific shocks, and in the case of major layoffs, there will be a large volume of workers with similar skills competing for a smaller number of similar jobs (Krugman, 1993). More generally, the expanding literature on the co-agglomeration of economic activities has shown that labour sharing is a prominent channel driving co-location, which also has gained increasing importance relative to, for instance, input–output connections (Diodato et al., 2018; Ellison et al., 2010; Juhász et al., 2024; Steijn et al., 2022).

EEG has built further on these strands with a strong emphasis on the links between firms, similar to the early cluster theories (Malmberg & Maskell, 2002; Porter, 1990). The approach to understanding these links has been heavily influenced by the French School of Proximity Dynamics (Kirat & Lung, 1999). The notion of proximity was introduced to the field through the work of Boschma (2005). The idea was that *geographical* proximity only is one dimension of proximity; there are other relational aspects between different actors that shape and influence the possibility and probability of interactions and exchange. Building on this idea, Frenken et al. (2007) developed the concepts of related and unrelated variety to distinguish between potentials for learning enabled by cognitive proximity. They subsequently showed how related variety positively affected regional employment growth in Dutch regions. This finding was later replicated for regions in a number of countries (for a review, see Content & Frenken, 2016), including for instance the United Kingdom (Bishop & Gripaio, 2010) and Sweden (Wixe & Andersson, 2017). The idea is that while specialized regions could be vulnerable and great regional diversity might entail a high risk of mismatch between the supply and demand of workers, related variety strikes a balance and gives rise to potential product innovations, opening up new markets that create further demand for local labour (Frenken et al., 2007). This

is because related economic activities offer better skill-matching potential for workers seeking re-employment (Boschma et al., 2014), and labour mobility between related activities fosters knowledge transfer (Boschma et al., 2009; Eriksson, 2011). Additionally, Frenken et al. (2007) argue that unrelated variety has a role in mitigating unemployment growth through a portfolio effect that prevents a sectoral crisis from cascading over the entire local economy.

In these studies, related and unrelated variety are measured based on the sectoral classification of economic activities. However, while industries show where people work, occupations tell us what they do (King et al., 2010). Hence, as Wixe and Andersson (2017) argue, occupations are better able to capture some of the skill similarities we are looking for. In line with this argument, Hane-Weijman et al. (2018) built on the work by Farjoun (1994) to classify industries as related or unrelated based on the similarities in their occupational structures. Following all workers made redundant in a major layoff in Sweden during a five-year period, they investigated the effect of the regional rate of jobs in the same, related and unrelated sectors as well as related and unrelated variety similar to Frenken et al. (2007). They found that while related variety did not facilitate re-employment, a high degree of jobs in related industries did speed up the process of returning to work. In addition, they did not find that a diverse regional portfolio of industries was beneficial for the absorptive capacity after major layoffs, as the concentration of both related and unrelated variety decreased the chances of finding a new job quickly. However, the longer it took for a person to find a new job, the more important a diverse local economy (unrelated variety) became for doing so.

Relatedly, the redundancy literature has studied worker mobilities more explicitly, considering them as more than mere proxies or input when understanding firm, industry or regional dynamics. In addition, compared to voluntary moves, involuntary job separation following for example plant closures offers an empirical setting that makes the effects of relatedness clearer to identify. In general, it is clear that workers seek new employment that is as similar as possible to the work that they had before the involuntary job separation, trying to stay in the same sector (Eriksson et al., 2016; Eriksson et al., 2018; Jacobson et al., 1993) and labour market. Their ability to do so depends on what part of the economy they work in as well as regional and individual factors (Eriksson et al., 2018). The longer it takes to find new employment, the more likely it is that the redundant worker needs to search further and further away from their initial point of departure to become re-employed, even in unrelated industries and in new labour markets. However, Eriksson et al. (2018) showed that safe moves (same industry, same labour

market) after redundancies increase the likelihood of the worker going through yet another major layoff. This could be due to the risk that these redundancies are related to sector-specific changes and shocks. Even though returning to the same sector seems like a desirable outcome for the individual, returning to the same occupation seems to be an even stronger force shaping these labour market mobilities (Hane-Weijman, 2021). This is not surprising, as we have previously argued that occupations are a better proxy of what workers actually do. Hence, an occupation-based relatedness measure for sectors might to some extent capture the willingness to return to the same occupation.

Another strategy to address relatedness between industries was developed by Neffke and Henning (2013) and Neffke et al. (2017), who used the observed labour flows between industries as a way of revealing the degree of relatedness between pairs of industries. The underlying assumption is that workers prefer reusing their accumulated skills and competences and would hence normally strive for a good skill matching when changing jobs. This measure was termed *revealed skill relatedness* and has been shown to explain, among other things, the regional absorptive capacity towards redundant workers (Diodato & Weterings, 2015; Eriksson et al., 2016), labour mobilities linked to productivity growth (Boschma et al., 2014; Csáfordi et al., 2020; Lengyel & Eriksson, 2017) and regional diversification into new jobs (Deegan et al., 2024; Elekes et al., 2023).

The conviction that labour mobilities are shaped by the workers' desire to find a good job match (Pissarides, 2011) is central in EEG. Revealed skill relatedness has been a prominent approach to address this, aiming to understand both how workers are able to navigate within and between labour markets and the effects of these mobilities. Within this research field, the skill relatedness of industries and occupations is often depicted as a network where the nodes represent the economic activities and the edges represent the revealed skill relatedness between them (the strength of normalized labour flows). These networks show a modular structure, meaning that the economic activities tend to cluster in groups. These "groups" form "skill-basins", and workers are more likely to circulate within these skill-basins rather than between them (O'Clery & Kinsella, 2022), as they are looking for a good skill match. The most common approach to capture a revealed skill relatedness network is to use national aggregates of labour flows. The national networks are then projected to a regional context by highlighting the economic activities in which regions exhibit relative specialization (Hidalgo, 2021). The underlying assumption here is that aggregate labour flows offer evidence on the overall

structure of skill similarities between economic activities, while local labour markets differ from one another in their composition of activities and hence their underlying skill demands.

Here we provide an empirical illustration of this approach by constructing an industry and an occupation space from register data, covering the universe of workers and their workplaces in Sweden. We start by first aggregating industry (occupation) switches made by workers to pairs of industries (occupations), covering the period from 2013 (2016) up until 2019. Then, following the methodology outlined by Neffke et al. (2017), we construct these relatedness spaces by comparing the observed volume of labour flows between a pair of activities (F_{ij} , where $i \neq j$ are industries or occupations) with what we would expect based on their propensity to partake in labour flows ($F_i F_j / F_{..}$):

$$SR_{ij} = \frac{F_{ij}}{F_i F_j / F_{..}} \quad (1)$$

Here, SR_{ij} represents the revealed skill relatedness between activities i and j , while F_i represents all outgoing labour flows from i . F_j represents all incoming flows to j , and $F_{..}$ denotes the sum of all labour flows in the system. In principle, $SR_{ij} \neq SR_{ji}$; however, this aspect of industry and occupation spaces has, to our knowledge, not been studied in depth in the EEG literature. Instead, the two-way relatedness values are often averaged to yield a symmetric measure of revealed skill relatedness. We further normalize the skill relatedness values between -1 and $+1$, where values above 0 indicate above-expected labour flows between a pair of activities: $\widetilde{SR}_{ij} = \frac{SR_{ij}-1}{SR_{ij}+1}$. Following Neffke et al. (2017) and O’Clery and Kinsella (2022), we consider economic activities with above-expected labour flows to be *skill related*. Hence, in the subsequent calculation, we use the revealed skill relatedness values in the following form:

$$\phi_{ij} = \begin{cases} \widetilde{SR}_{ij} & \text{if } \widetilde{SR}_{ij} > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

To measure the local concentration of related activities around a given industry or occupation, we use *relatedness density*, a measure originally introduced by Hidalgo et al. (2007), which has been used extensively for various technology and activity spaces (for an overview, see Hidalgo, 2021). Relatedness density ($RD_{i,r}$) shows the share of total relatedness connecting an activity

i to others j ($j \neq i$) among the activities in which a region r has relative specialization ($I(LQ > 1)$). Here, the LQ (location quotient) for 2019 measures the extent to which the specific economic activity's share in local employment exceeds the employment share of the same activity in the national economy. Relatedness density is then expressed as:

$$RD_{i,r} = \frac{\sum_j \phi_{ij} I(LQ_{j,r} > 1)}{\sum_j \phi_{ij}} \quad (3)$$

Relatedness density² has a range between 0 and 1, where a higher value indicates that an industry or occupation has more related activities concentrated in a given region.

Based on these measures, *Figure 13.1* summarizes a few key stylized facts about local economies and the revealed skill relatedness of economic activities that are carried out within. The histograms in the figure show the distribution of relatedness density of industries and occupations across three selected local labour markets in Sweden: Åsele, which represents a small and peripheral region with outmigration; Umeå, which represents a larger regional centre with a growing economy and population; and Stockholm, which represents a metropolitan region and is the country's capital. The insets in the figure offer a visual representation of the industry and occupation spaces, also highlighting local specializations in terms of industries or occupations.

First, one can observe that regional economies often exhibit specializations in selected parts of these economic activity spaces, and this is more pronounced for smaller places (insets). Second, this means that, especially in less populated regions, the majority of economic activities is less related to the local portfolio than in more populated regions, as indicated by the decreasing median relatedness density moving down the spatial hierarchy (histograms). Third, occupations are on average more related to the local portfolio than industries are. Note that due to the normalization in the relatedness density calculation, this is unlikely to be just a direct consequence of the higher number of industries compared with occupations in these activity spaces. In terms of labour mobility, these observations mean that a smaller place, like Åsele,

² We note that alternative formulations of relatedness density can be found in the literature, for instance those proposed by Davies and Maré (2021). For a discussion and comparison of different approaches in empirical analyses, see e.g. Elekes et al. (2023).

would be able to offer new job opportunities in a very narrow set of economic activities, located in distinct pockets of the local economy, with very little connection to other such clusters of activities. This increases the risk of workers' economic marginalization in the face of major layoffs and redundancies.

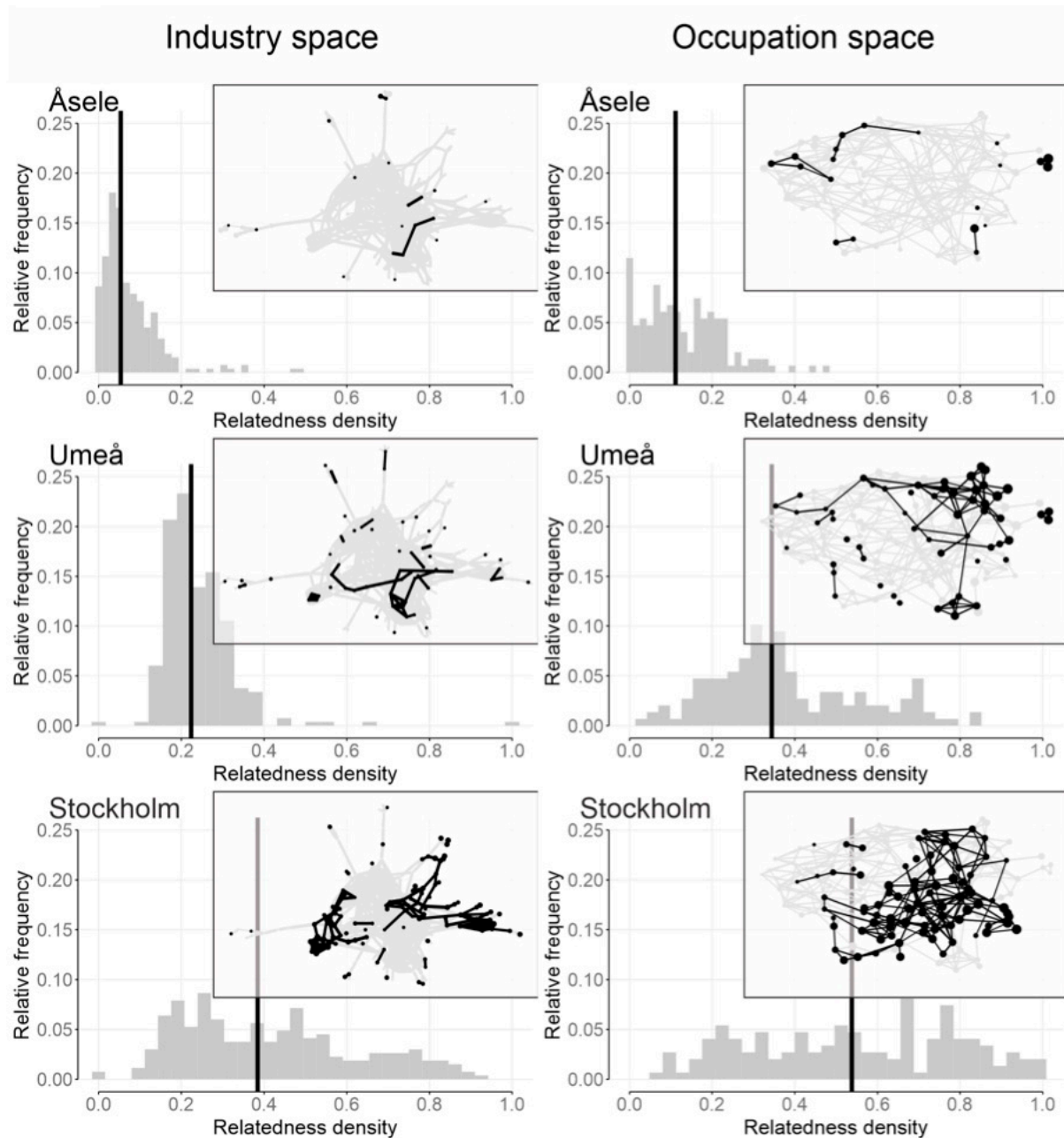


Figure 13.1. The revealed skill relatedness and relatedness density of industries and occupations in selected Swedish local labour markets.

Note: The histograms indicate the relatedness density distribution of industries (left) and occupations (right). Black vertical lines represent the median relatedness density in the specific local economy. The insets offer a visual representation of the industry and occupation spaces. Black highlights in the insets indicate economic activities and connections in which the specific region has relative specialization ($LQ > 1$).

These clustering patterns of diverse regional skill profiles and local portfolios of economic activities are one of the central tenets in economic geography and regional science, and they are one of the most prominent features of the world economy (e.g. Hidalgo et al., 2007; Neffke et al., 2011). The EEG literature on regional branching stresses the importance of time in the (re)production of these portfolios, that is, the path dependency of regional economic activities (Henning et al., 2013). The idea of regional branching suggests that industries that are relatively unrelated to the regional industrial portfolio are more likely to exit while new industries that enter generally are more related to the overall composition of economic activities (Frenken & Boschma, 2007; Neffke et al., 2011). This results in strong forces reproducing the regional sectorial composition over time, even more so in terms of the occupational structure (Hane-Weijman et al., 2022).

3. The dynamics, geographies and structures of local labour markets

In this section, we highlight three focus points where recent advancements in EEG research, in our view, help elaborate on the process of regional branching and the associated labour mobilities. First, new types of economic activities beyond industries and technologies are considered, with a specific emphasis on workers and the spatial division of labour. This is done to help us understand, in Hidalgo's (2023) words, *what kind* of activities enter or exit regions. Second, efforts are concentrated on unpacking skill relatedness and labour mobility by considering how relatedness may be space- and time-specific, creating pockets of re-employment possibilities. Third, a strong connection between regional branching and regional economic resilience has been developed in recent years (Boschma, 2015), with more focus on workers' associated labour market trajectories. We can also frame these advancements in terms of spaces of relatedness. The first main question is what type of activities best capture the shifts in local opportunity spaces for workers (the node level). The second question is whether relatedness between activities is constant over time and universal across space (the dyadic level). The third question is what kinds of opportunity space topologies are more conducive to a resilient local labour market (the structural level). We now discuss these points in more detail.

First, while EEG research historically predominantly was centred around industries, recent work has begun to explore path-dependent changes in occupational or job structures in regions (e.g. Deegan et al., 2024; Elekes et al., 2023; Hane-Weijman et al., 2022). Additionally, building on Massey's seminal work on the spatial division of labour (Massey, 1984) as well as

the interconnected regional functional specialization outlined in the global production network literature, scholars assess regional path dependency and diversification in terms of functions (Hernández-Rodríguez et al., 2025). Production networks are increasingly fragmented into different functions with a clear vertical hierarchy, which are ever more geographically dispersed. Importantly, there is a path dependency not only in terms of economic activities but also in the inter-regional (and the national) power relations that in turn are shaping these geographies (Massey, 1984). Specific functions are located in specific places, resulting in regions becoming hubs for activities that are connected to one particular part of the vertical power hierarchy of global production networks. Hence, an industry or a firm would have very different occupational setups depending on where one looks (Massey & Meegan, 1982; Massey, 1984). The result is that regions become specialized in functions rather than in industries (Hernández-Rodríguez et al., 2025; Wixe & Andersson, 2017). Hence, the spatial division of occupations is more pronounced than that of production, and this spatial sorting of occupations is connected to the vertical power hierarchy of global production networks, reproducing similar patterns of labour allocation over space. The result is potentially perpetuating inter-regional inequalities and patterns of (uneven) economic development.

This spatial division of labour, together with the economic structural changes of the last decades, has also given rise to growing inter-regional inequalities (Eriksson & Hane-Weijman, 2017) and labour market polarization (Henning & Eriksson, 2021), nor is it independent of intra-regional inequalities (Cortinovis et al., 2024). The de-industrialization of the economy in Western countries has entailed a destruction of manufacturing jobs and a creation of service jobs. While the manufacturing sector has decreased relatively equally across space, the growth of the service sector is primarily an urban phenomenon (Andersson et al., 2018; Eriksson & Hane-Weijman, 2017). The dismantling of once stable manufacturing industries with strong unions has given rise to labour market polarization; new labour markets of precarious, low-skilled service jobs are emerging on the one hand, and highly trained white-collar workers are thriving on the other. From the workers' perspective, this entails a shift not only in *where* jobs are located but also *what* these jobs entail. Hence, it is now pressing that research in EEG unpacks what necessary adjustments these workers have made in order to become re-employed, who has managed to embark on productive labour market trajectories, and who is becoming increasingly economically marginalized.

Second, the strong path dependency of spatial divisions of labour generates distinct local profiles of economic activities and hence also labour redeployment potentials that are historically contingent. This means that the local supply of jobs today is shaping the local supply of jobs tomorrow (Farinha et al., 2019; Kuusk, 2021; O’Clery & Kinsella, 2022). This is due to the recombinatorial possibilities that related occupations offer, creating consistent regional profiles that strongly condition overall development trajectories and the growth of specific jobs. Based on this, an interesting question is how considering (revealed) skill relatedness to be place- and time-specific could enrich the study of labour mobility.

Indeed, some *labour flows* may be specific to certain *types of regions*. This may for instance be the case for rare activities, such as complex activities that concentrate in large cities (Balland et al., 2020) or take place through local networks that have developed over time. Others may be more ubiquitous, such as activities related to the foundational economy (Martynovich et al., 2023). Such distinctions have, however, not yet been explored in depth in the literature. Still, Fitjar and Timmermans (2017), for instance, characterized the related variety of regions by combining a nationally aggregated labour flow network with local employment weights. Straulino et al. (2021) demonstrated that even national aggregates of inter-industry labour flows differ from one another when comparing their modular structures. This is likely the case within regional economies as well. In fact, Boschma (2017) made a general call for exploring local specifics in the relatedness of economic activities.

Additionally, (skill) *relatedness* may be *time specific* and hence change over time. For instance, Juhász et al. (2021) recently demonstrated that the relatedness of co-locating technological capabilities increases over time, while Kuusk and Martynovich (2021) showed that a considerable portion of the ties between industries concerning revealed skill relatedness based on labour mobility changed over the course of nearly two decades in Sweden. The co-agglomeration literature also highlights that the co-location of industries increasingly has been driven by labour sharing and technological relatedness (Diodato et al., 2018; Steijn et al., 2022). In line with this, Henning (2019) called for an inclusion and deeper exploration of the time dimension in EEG research. From the perspective of workers embedded in local economies, it is unclear, for instance, how regional branching over the course of a working life opens up new ways of redeploying existing human capital, or how sudden technological changes foreclose previous skill related opportunities for work.

Third, labour mobility across and within economic activities and regions plays an important role in shaping regional economic resilience at the aggregate level. Regional economies can be regarded as networks that largely are dependent on the technologies, embodied skills and tacit knowledge integrated in economic processes (Boschma & Martin, 2010). The systemic performance of such regional economies as complex systems in which the resources necessary for the successful functioning of the system are distributed among many interconnected actors (Martin & Sunley, 2007) depends upon the often location-specific structures of these networks (Guerrero & Axtell, 2013; López et al., 2020). This is particularly evident when facing economic disturbances.

At the firm level, this line of research was advanced by Gianelle (2014), who studied the firm-to-firm labour-flow network of the Veneto region in Italy. The study revealed that firms generally were only a few steps away from one another in terms of workers' job switches, indicating a well-integrated local labour market. At the same time, a handful of key firms were responsible for the cohesion of this firm-to-firm network, which made it vulnerable to sector-specific shocks. On a more aggregate level, Sánchez-Moral et al. (2022) found that the cohesiveness of the industry space of Spanish regions, measured by revealed skill relatedness, contributed to both the resistance to and the recovery from the 2008 crisis. Recently, measuring significant labour flows in local labour markets, Elekes et al. (2024) showed that the robustness of these labour-flow networks against random and targeted failures showed substantial variation across functional regions in Sweden. Additionally, network robustness was found to have a positive association with employment change, among other established structural measures, during a grand recession. Diodato and Weterings (2015) placed labour flows and input–output connections in the same framework of modelling regional resilience. In their model, an input–output layer links various industry-regions across the Netherlands, spreading an initial shock. Meanwhile, labour flows—broken down into revealed skill relatedness and worker mobility between regions—determine how reemployment opportunities emerge and thus how the shock's impact on labour is distributed.

The micro processes of labour redeployment lay the groundwork not only for withstanding economic disturbances but also for a region's potential for path renewal and reorientation. As argued, the creation of jobs is a path-dependent process (Andersson et al., 2018), but so is the resilience of local labour markets, as the success in responding to one crisis conditions the ability of regions to do so in subsequent ones (Eriksson & Hane-Weijman, 2017). To better

understand the dynamics and geographies at play here, we need to ask questions about resilience *of what* and *for whom* (Cretney, 2014; Martin, 2012), but also *where*. We argue that one way to enrich this literature is to put more emphasis on the temporal and spatial micro processes at work here – the mobilities and im-mobilities of *whom* within the region, as well as from *what* and to *where* within the economy – rather than solely focusing on places' ability to attract global capital and skilled workers (Bristow, 2010) to upgrade their position within global production networks (Hudson, 2010).

Hence, in line with this argument and the call by Neffke et al. (2024), further studies are needed not only on the *distance* but also on the *direction* of labour mobility following job destruction and creation. *Distance* here refers to how far a person needs to move in different spaces (e.g. in terms of skill relatedness) following job separation, while *direction* refers to the degree to which the new position is similar, better or worse than the old one. In this spirit, Hane-Weijman (2021) shows how the distance – in a sectorial and spatial space – that workers need to move after redundancy has an impact on the direction of their labour market trajectories. A shorter distance, such as finding new employment in the same sector in the old labour market, significantly increased the chances of having a job similar to one's pre-displacement employment. Needing to go too far, especially to unrelated sectors in new labour markets, meant a higher risk of becoming underemployed. Some distances, however – such as finding a new job in a related sector within the same labour market or in the same sector in a new labour market – meant increasing the chances of embarking on an upward career trajectory. Holm et al. (2017) found similar effects, concluding that related moves mean less risk of skill destruction than unrelated moves. After layoffs, workers switch jobs more often (Hane-Weijman, 2021) and are more likely to end up in new jobs where some or a lot of their skills are left idle (Neffke et al., 2024). These groups of workers are embarking on labour market trajectories that are clearly diverging, in line with the polarization of the labour market in general: one group experiences upward mobility while the other faces underemployment.

Taken together, we see these works as promising efforts to unpack the structures that (revealed) skill relatedness and labour mobility create with respect to spatial, temporal and individual heterogeneity. Next, we turn to identifying ways in which these efforts could be further advanced to develop a more comprehensive understanding of the role of skill relatedness and mobility in shaping the development in local economies and the evolution of regions.

4. Advancing the evolutionary perspective on labour mobility across economic activities and regions

In this section we propose three interrelated sets of open questions that represent ways in which existing knowledge on labour mobility and skill relatedness in EEG research could be enriched by connecting such analyses more closely with pressing societal challenges. Such challenges include increasingly uneven intra- and inter-regional developments, pressures from automation and the green transition, and the economic marginalization of particular groups of workers. We argue that these challenges generally are connected to issues of treating labour as a homogeneous input into the production process (Herod, 2001; MacKinnon, 2017), at least when it comes to heterogeneity beyond (but perhaps not independent of) skills. We structure our thinking on these questions along three “layers” of an abstract relational space between economic activities (such as industries or occupations), where these activities are connected by skill relatedness, labour mobility and/or revealed skill relatedness, and other proximities than cognitive.

The first set of open questions emerges on the layer of actual skill relatedness, that is, the extent to which economic activities *actually* share similar skill requirements. We argue that assortativity (the tendency for similar or dissimilar activities to be related) is poorly explored in the network representation of this relatedness space. The second set of questions relates to the labour mobility layer that unfolds over the layer of skill relatedness. We argue that in common approaches to measuring revealed skill relatedness on the basis of labour mobility, this layer has underexplored implications in terms of mobility constraints. We then propose that an additional layer of questions tends to go understudied in EEG research: (revealed) skill relatedness, and relatedness analysis more broadly, have predominantly focused on the cognitive proximity of economic actors and activities. We argue that this is not a necessary restriction in the context of proximity thinking and that considering additional proximities would benefit the study of labour mobility and reallocation in EEG research.

Firstly, considering the layer of the actual skill relatedness of economic activities, a key attribute of the resulting skill relatedness network is its assortativity. If a pair of occupations or industries is similar in terms of its skill requirements, it will also be more likely to be similar along dimensions that are connected to these skills. A prominent example is wage assortativity whereby a certain skill combination yields higher economic returns, and skill related economic

activities based on these skills similarly tend to offer higher wages. For instance, Alabdulkareem et al. (2018) showed that in the United States, occupations that in similar ways rely on cognitive skills tend to offer higher wages. Although not considering assortativity directly, Frank et al. (2024) found that the degree of embeddedness in the occupation space of labour markets across the United States influences worker wages. More evidence on this is available based on skill relatedness revealed by labour mobility between activities. For the French labour market, Joyez and Laffineur (2022) found that the centrality of occupations (i.e. the number of significant connections) in the revealed skill relatedness network influenced wages. If the skill relatedness space is wage assortative, the embeddedness or centrality of activities in this network's high-wage clusters will generally be connected to other high-wage activities. The visible polarization of occupations with respect to automation risk (del Rio-Chanona et al., 2021) or cognitive versus physical skills (Alabdulkareem et al., 2018) represent further examples. Elekes et al. (2023) offered direct evidence on wage assortativity in the context of Sweden by showing that jobs (combinations of industries and occupations) that offer higher wages are likely to be connected to other higher wage jobs in the revealed skill relatedness space.

We here argue that assortativity merits further analysis for two broad reasons, one methodological and one substantive. From a methodological perspective, several studies characterize worker (wage) mobility on the basis of the embeddedness or centrality of their industries and occupations in these activities' skill relatedness space. However, as workers are more likely to be mobile in the network neighbourhood of their current occupation or industry (see e.g. O'Clery & Kinsella, 2022) rather than making larger jumps, this limits the potential for upward mobility. If wage assortativity is strong in the skill relatedness network, then the skill related set of mobility options for low- and high-wage workers will tend to reinforce their current position in the wage distribution. These dissimilar potential wage gains are averaged out when considering only the presence of skill related occupation and industry alternatives.

From a substantive perspective, assortativity in the skill relatedness space involves more than the similarity of related activities in terms of wages. First, it is well known that different groups of workers, such as men and women or native-born and immigrant workers, tend to be concentrated in different sets of occupations and industries (Eriksson et al., 2020). If skills obtained through education, work experience or retraining indeed drive the structure of the skill relatedness space, then assortativity in terms of, for example, jobs dominated by men or women

would anchor the option set for (upward) job mobility of these different groups of workers. Second, from this perspective, contemporary challenges like automation or the green transition may not just be a question of which specific occupations or industries are subject to these changes; rather, worker adaptation will be influenced by how assortative the skill relatedness space is for different kinds of technological changes. Third, if the skill relatedness space is strongly assortative along a given dimension, this also increases the importance of understanding the role of the occupations and industries that act as bridges in this space. Such bridges would, for instance, boost the potential for wage mobility, as indicated by evidence on local Swedish labour markets (Elekes et al., 2023), or the potential for adapting to pressures from technological change in the form of automation.

Secondly, we argue in favour of taking into account that workers are people who hold multiple identities beyond that of a worker (such as mother, child or partner) and interact in a variety of settings beyond the workplace (such as the home, public space or the pub). Given the diversity of these individual characteristics, constraints and societal biases, the labour mobility that we observe may capture the actual underlying skill relatedness space less accurately for some individuals than others. Considering *who* is able to achieve *what* mobility would allow us to unpack such mobilities beyond averages. For example, we know that labour markets still are gender segmented, with strong clusters of women and men in different parts of the economy, both in terms of occupations and sectors (Eriksson et al., 2020) and in terms of skills (Buyukyazici, 2023). However, we know comparatively little about how their differing mobility patterns are shaping and reshaping these structures. Understanding this would require not just investigating the activities in the (revealed) skill relatedness space with respect to wages, automation and gender distribution, but also differentiating between significant mobilities of different groups of workers.

To once more take the gender aspect as an example, we know that women are less spatially mobile than men (Eriksson et al., 2018) and that this most likely is due to prevailing gender roles where women do the majority of the care work (Hanson & Pratt, 1991). This would mean that the search radius in both the physical and the relatedness space is much more restricted for women than for men when searching for new employment. These restrictions could mean that men will find a new job faster (Eriksson et al., 2018), but also that there is a higher risk that women need to be more “flexible” in terms of what job they accept. This bounded mobility would entail a risk of both longer time in unemployment and skill mismatch and hence

underemployment or downskilling (Neffke et al., 2024). The result could mean that an average revealed skill relatedness space would be less able to capture the actual mobilities of women compared to men, but also that it might be less likely to reflect true skill relatedness for women. As functions are clustered in geography and belong to a specific level in the hierarchy of a production network, this would also imply that moving to a new labour market in many cases is necessary in order to advance to a better job. While women's relative spatial immobility is well documented, we currently know less about the career paths or upgrading potential for female-dominated low-wage jobs than we know about male-dominated ones.

Our third and last point is related to the initial call in EEG made by Boschma (2005), who argued for the importance of considering several dimensions of proximity in relation to one another. We argue that while there is much evidence on cognitive and geographical proximity, other dimensions of proximity also influence patterns of labour mobility. For example, it is likely that *social proximity* has an effect on the perception of cognitive proximity, in contrast to “true” cognitive proximity. This would mean that a segmented labour market becomes reproduced over time, as the social proximity dimension (pertaining to homophily, i.e., that similar individuals are more likely to form social ties) interferes with *perceived* skill relatedness and hence has an impact on mobility and *revealed* skill relatedness. This is, of course, highly related to current norms, as workers who are part of the norm group will generally be considered to be “closer” than workers who are outside it (e.g. straight White men will generally be considered more similar to everyone else independent of the receiver). These dimensions are important when we study labour mobilities between regions, sectors and occupations, but also within organizations. Cognitive proximity alone cannot explain why, for example, Eriksson et al. (2020) found that when operators and assemblers became redundant in major layoffs in manufacturing firms, men were more likely than women to return to a similar job, while women were more likely to start working in unrelated jobs like retail.

Hence, mobilities are gendered, with different restrictions shaping when and how men and women move within and between organizations, sectors, occupations and labour markets. Gender is, however, only one aspect of identity through which a diverse workforce interacts with labour market structures and constraints. For example, Cardoso et al. (2024) found persistent hierarchical occupational segregation in relation to ethnicity, with Black people constantly being allocated to jobs with low socioeconomic status, unlike White people.

Naturally, these sets of open questions are not independent of one another. For instance, for workers, navigating a wage-assortative skill relatedness space involves not only changing their skills to acquire better paying jobs but also managing other constraints that may limit their ability to change between economic activities that would otherwise be skill related. In this way, the actual labour mobility network above an underlying skill relatedness space could be even more wage assortative. Weaker assortativity in terms of skill relatedness could still mean stronger assortativity along dimensions other than this proximity, such as the social, organizational or institutional proximity of pairs of workplaces. Finally, constraints to labour mobility may hinder actual worker transitions even when multiple dimensions of proximity would suggest the presence of feasible worker transitions. These interacting factors very much represent open questions in EEG while also bearing consequences for labour redeployment potential in and across regions in the context of regional branching.

5. Summary and concluding remarks

Scholars in EEG have devoted much work to labour mobility across economic activities and regions, both as a subject of its own and in relation to structural change in and the economic resilience of regions. In this chapter, we first took stock of the literature on labour mobility as it relates to classical theories of agglomeration and more recent concepts such as related variety and regional branching. We also discussed how using information on labour mobility now is an established way of revealing the skill relatedness of economic activities and how this can be used to appraise regions' economic portfolios. Next, we discussed labour mobility and skill relatedness in relation to structural change and regional resilience, highlighting recent research efforts to understand the spatial, temporal and structural characteristics of these networks and labour market trajectories. Finally, we proposed ways in which the evolutionary approach to labour mobility and spaces of relatedness could be enriched to strengthen the micro perspective in EEG research with respect to worker heterogeneity.

Despite the substantial analytical role that skill relatedness spaces play in the EEG literature in explaining the diversification and resilience of local labour markets, the assortativity of these spaces along various dimensions is seldom considered explicitly. We argue that doing so would offer added value to this literature, first by connecting the now mounting evidence of related regional diversification to the opportunities and constraints that such diversification creates for different groups of workers. While new activities that emerge in regions *on average* tend to be

well matched to the region's existing capability base (e.g. Neffke et al., 2011), assortativity in terms of wages or dominant worker groups (e.g. jobs mostly performed by men or women) could still mean that emerging (and declining) activities would create (diminish) opportunities for workers in certain parts of the skill relatedness space but not in others. Second, since local labour markets tend to be specialized in certain parts of the skill relatedness space, this may exacerbate the level of average assortativity and accentuate the existence and importance of bridges in these local spaces. Regions in which (related) diversification regularly creates such bridges could be more resilient against technological change and wage polarization, among other things.

Next, even though research in EEG frequently emphasizes heterogeneity and micro processes, we argue that there is value in shifting some of the focus to individuals as the fundamental micro units. There is value in recognizing workers' diversity and their entanglement in not only economic production but also social reproduction. Workers do not suddenly pop up in a new part of a space of relatedness, but such moves have rather entailed mobility in space, and sometimes in several spaces, which always comes at a cost. And the cost of this mobility differs between different groups of workers. An EEG that incorporates these bounded mobilities could more fully contribute to an understanding of uneven development, especially in relation to labour market polarization and regional divergence, while at the same time augmenting the analytical potential of the (revealed) skill relatedness approach.

Lastly, while we have argued that there is much more to be explored in the interplay between cognitive and geographical proximity, there are also other dimensions of proximity, such as social proximity, that need to be explored further. For instance, most skills and competences are difficult to directly and objectively validate, and the assessment of a person's skills is affected by norms, prejudice and homophily. Hence, we argue that labour market research that considers different groups of workers' skill relatedness with these individual and contextual factors in mind is better equipped to connect structural change with unequal development, as it will be more attentive to processes of polarization and marginalization beyond the cognitive (and perhaps geographical) proximity represented by the skill relatedness space. Such enrichment of the EEG research agenda would allow for a more diverse approach to the economy, thereby opening up for perspectives that are not "White" and "masculine" (Adjei & Morales, 2024; Pugh, 2018).

In sum, we believe that unpacking labour mobility and (revealed) skill relatedness along these proposed dimensions would reinforce the micro perspective in EEG by connecting aggregate outcomes at the firm, industry and regional levels with the mobility of diverse groups of workers. Doing so would also open up ways of understanding the opportunities and constraints that emerge through regional branching and that different workers face. We argue that this would strengthen the theorization of key areas within EEG, such as resilience, path renewal and regional branching, and would also open up opportunities to make unique contributions to the growing literature on “left-behind places” (Pike et al., 2024; Rodríguez-Pose, 2018), ultimately shedding more light on how inequalities within and across regions develop and how economic and technological changes mitigate or reinforce these inequalities, where they do so and for whom.

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