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Job-related Mobility and Plant Performance in Sweden

by

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Abstract: This paper uses a Swedish micro-dataset containing 2,696,909 hires during the period 2002-2006 to assess the impact of job-related mobility on plant-level performance. The analysis classifies new recruits according to their work experience and level of formal qualification, as well as by the region of origin and of destination. New hires are divided into graduates and experienced workers and between high- and low-educated. The results point towards the importance of acknowledging both the experience and the skills of new recruits. The greatest benefits are related to hiring new workers from outside the region where the plant is located. The analysis also stresses the importance of geography, with plants in metropolitan regions gaining the most from labour mobility, while plants in smaller, more peripheral regions getting virtually no benefits from hiring new workers.

Keywords: labour mobility, productivity, education, experience, agglomeration, Sweden.

JEL classification: J24, J62, R11.

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Introduction

The role institutional structures play in localised learning processes and, consequently, in regional development, have been the object of closer scrutiny (e.g. Storper, 1997; Maskell and Malmberg, 1999; Rodríguez-Pose, 2013). While local linkages have dominated studies about localised learning (Storper and Venables, 2004), attention is increasingly being paid to how external connections and networks shape the diffusion of knowledge (Bathelt et al, 2004). A consensus is emerging indicating that both regional attributes and extra-local linkages are crucial to the understanding of spatial differences in economic development (Saxenian and Sabel, 2008), and that job-related migration is key in this process (Fratesi, 2014).

Despite the agreement on the relevance of job mobility, the exact importance of mobility for productivity and growth remains controversial. Some research has highlighted that job-related mobility matters but that it plays second fiddle to economies of scale and scope (Eriksson and Lindgren, 2009). Under certain circumstances labour mobility may even have negative consequences by undermining on-the-job training through labour poaching (McCann and Simonen, 2005; Combes and Duranton, 2006). In addition, labour flows may not always produce the intended effect in terms of knowledge diffusion and assimilation. If the cognitive and geographical proximity between the old and the new firm is too large, job mobility will be zero-sum, failing to have an economic impact (Boschma, et al, 2009; Eriksson, 2011) and may even contribute to regional job destruction (Boschma et al, 2014).

Given these potentially contradictory effects, analysing empirically the impact of labour mobility on plant performance is of capital importance. The aim of this paper is to shed light on these issues by directly tackling a number of questions about the extent to which plant performance depends on local or extra-local sources of skills.

More specifically, the paper aims to expand our understanding of the impact of labour mobility on performance in three ways. First, it makes an explicit distinction between types of job-related mobility according to work-experience. It distinguishes between inflows of graduates (inexperienced) and those of experienced workers to assess the extent to which hiring recent graduates matters in relation to experience (poaching workers from other firms). We thereby contribute to the discussion of how universities and other higher education institutions shape regional economic development (Faggian and McCann, 2006; Abel and Deitz, 2012). Second, we pay special attention to the difference between low- and high-skilled labour flows in different types of regions. This represents a new dimension, as previous studies (e.g., Boschma et al, 2009) have primarily focused on the mobility of the high-skilled (generally bachelor´s degree or higher) to the detriment of the mobility of workers with lower levels of qualification (Maskell et al, 1998; Eriksson and Lindgren, 2009). Third, since both the supply and demand of labour differ over the urban hierarchy – with large and diverse regions often considered capable of absorbing greater numbers of migrants (Partridge and Rickman, 2003) and having the greatest potential for effective matching (Puga, 2010) – we look at the geography of mobility in order to examine the extent to which plant performance is affected by the knowledge and skills acquired by workers in areas with different endowments of firms and of external economies. We focus, in particular, on the functionality and size of the region of origin and destination of the migrant. This is important as labour flows across different types of regions may reinforce already existing regional disparities (Faggian and McCann, 2009).

To achieve these aims, we resort to a longitudinal micro-database containing matched information on all workers (e.g. workplace, education, working experience, place of residence) and on the features of all plants (e.g., sector, location, performance) in Sweden between 2002 and 2006. Regression analysis is then applied to examine how the origin and type of almost 2.7 million new hires influence plant performance (defined as annual productivity growth) for a total of 69,932 Swedish plants.

The remainder of the paper is structured as follows: In section 2 the literature on labour mobility is linked to the agglomeration literature when discussing the role of local and extra-local externalities. Section 3 presents the Swedish data and the variables and introduces the model used to estimate plant performance. The main findings are presented in section 4. Section 5 concludes.

Geographical mobility and firm-level performance

Since at least the development of the endogenous growth theory, human capital has been regarded as a main – if not the main – driver of regional development (e.g., Lucas, 1988). It is assumed to be the leading vehicle of transmission of knowledge and a key facilitator of knowledge spillovers and localized learning (Malmberg and Power, 2005). Large concentrations of human capital generate and diffuse knowledge which can be transformed into productivity and growth by firms. Following Marshall (1920), it is assumed that thick, specialized labour markets trigger positive externalities by lowering search costs, due to a better matching of supply and demand and by guaranteeing an increased access to productive workers (e.g. Acemoglu, 1996; Strange et al, 2006). Firms in large, agglomerated areas are perceived to benefit more from these externalities as a consequence of higher concentration and continuous sorting of skills and ideas as well as better matching opportunities (Krugman, 1991; Storper and Venables, 2004; Glaeser, 2011; Glaeser, 1999; Puga, 2010). By contrast, firms in small regions may suffer because of shortages of skills and limited externalities. These limitations can be partially overcome by potentially higher levels of social capital and interpersonal trust (Maskell & Malmberg, 1999), although greater collaboration and embeddedness may both facilitate the generation and transformation of skills and knowledge into industrial performance (Gertler, 2003; Fitjar and Rodríguez-Pose, 2015) or, conversely, lead to lock-in and stifle the capacity of local firms to remain competitive and productive (Boschma, 2005; Rodríguez-Pose and Fitjar, 2013).

But human capital can also move. When workers relocate, they take with them two fundamental attributes: their skills and their knowledge. This makes inter-firm mobility of labour a crucial source of firm-level competitiveness. A large proportion of research has focused on mobility within relatively constrained geographical spaces and groups of workers. For example, Almeida and Kogut (1999) find that inter-firm mobility of skilled labour is responsible for knowledge spillovers and productivity in successful regions like Silicon Valley (see also Angel, 1991 and Fleming and Frenken, 2007). Similarly, intense flows of skilled personnel have been at the root of the competitiveness of firms in the British motor sport cluster (Pinch and Henry, 1999), and led to improvements in both plant performance and regional growth in Sweden (Eriksson and Lindgren, 2009; Boschma et al, 2014). Mobility is also associated with the development of social linkages between firms, which contribute to post-mobility firm performance through their ties with former colleagues in different contexts (Dahl and Pedersen, 2003; Breschi and Lissoni, 2009; Lengyel and Eriksson, 2016).

The benefits of labour mobility on economic performance can also extend well beyond the local context and over large geographical distances (Agrawal et al., 2006). Firms in open regional economies are likely to be more productive (e.g., Bathelt et al, 2004). Immigrants from distant locations (often equated to foreign-born migrants) bring in skills that can be complementary to those of native workers in the countries of destination, boosting local learning and efficiency (Ottaviano and Peri, 2006; Dustmann *et al.*, 2008; Nathan, 2011). Consequently, the mobility of skilled workers is regarded as a fundamental mechanism through which knowledge and skills are transferred between firms and regions, both within countries (Malmberg and Power, 2005; Iammarino and McCann, 2006) and between countries (Rodríguez-Pose and Vilalta-Bufí, 2005; Saxenian and Sabel, 2008).

There is also a darker side to mobility. Apart from potentially causing brain-drain in the sending region, worker mobility often implies poaching. When this is the case, a high intensity of job-hopping among nearby firms may lower the incentive for firms to train and upgrade the skills of their employees (Kim and Marschke, 2005; Combes and Duranton, 2006; Fallick *et al.*, 2006). High personnel turnover can thus reduce organizational learning and productivity (Argote et al., 1997; Hatch and Dyer, 2004), limiting the potential of firms to use the knowledge and skill transfer opportunities induced by mobility to their advantage (Madsen et al., 2003). From this perspective, Philips (2002) has demonstrated that the mobility of employees among law firms in Silicon Valley actually had negative consequences for the aggregate performance of firms in this sector. An increasing, but still limited, number of quantitative studies that systematically test for the net effect of labour mobility fail to find convincing evidence of a positive general effect of labour mobility on firm performance and regional growth (McCann and Simonen, 2005; Eriksson, 2011; Boschma *et al.*, 2014).

In this paper we argue that whether the potential positive or negative effects of labour mobility for firm performance prevail depends on both the type and origin of the experience the new employee brings into the plant or firm. Following Boschma et al (2009), we argue that the influence of labour flows on plant performance depends on the type of newly acquired skills. A related question is whether the recruited experience is job-related experience or associated to the assimilation of knowledge in educational institutions. In other words, we look at the potential impact on plant performance of recruiting experienced workers versus recruiting graduates at different stages of the education process. A large amount of research in economics has come to the conclusion that wages rise with experience and seniority (Topel, 1991; Altonji and Williams, 2005; Kambourov and Manovskii, 2009). The skills associated with education are also connected to higher returns in wages. The balance in the returns between experience and education is, however, still contested (e.g. Juhn et al., 1993; Harmon, 2003) and depends on the specific conditions of the labour market (Dustmann and Pereira, 2008). How the balance between education and experience pans out in terms of firm performance has attracted less attention from economics and more from management studies. The general view is that hiring and retaining human capital strongly affects firm performance (Crook et al., 2011), but that also high labour turnover can be detrimental for productivity (Hausknecht and Trevor, 2011). The limited research which has directly focused on the balance between attracting skills immediately after formal education versus buying in experience through the poaching of experienced workers generally supports the idea that recruiting highly educated workers enhances learning-by-doing and productivity, while hiring experienced external workers with prior industry experience leads to a reduction in overall performance (Hatch and Dyer, 2004). We argue that the type of experience recruited makes a difference for reducing potential negative effects of poaching.

The second argument of our paper is that the geographical origin of the workers also matters for firm performance. Empirical studies have stressed that knowledge is typically transferred and used within a close distance from where it was first created and that spillovers weaken the greater the distance from the source (Jaffe el al., 1993; Rodríguez-Pose and Crescenzi 2008). In a study on the geography of spillovers over time, Sonn and Storper (2008) even show that the localized effect remains strong despite recent improvements in information and communication technologies that may have increased the importance of other dimensions of proximity. Based on comprehensive data for all manufacturing and service plants in the Swedish economy, Eriksson (2011) shows that this also applies to knowledge transfers through labour flows, as flows covering a radius beyond 50 kilometres from the source were found to have limited influence on plant performance.

The predominantly local effect of embodied knowledge flows can be related to the relative fixity of human capital in space. When analysing the characteristics of job movers in Sweden between 1990 and 2002, Eriksson et al. (2008) showed that about 75% of all job changes do not imply changing the region of work. This can be attributed to the fact that searching and finding a new job is time consuming and involves both monetary and social costs which tie people to their home region (Mortensen, 1986; Van der Berg, 1992). Hence, inter-regional mobility tends to be performed either by young graduates looking for their first job or consist of forced moves prompted by a scarcity of local employment opportunities. By contrast, intra-regional moves are to a greater extent characterized by career-related mobility. Further, as shown by Faggian and McCann (2006; 2009) using UK student mobility data, proximity is imperative as the ability of regions to retain their graduates is far more important for explaining regional innovation and growth than university related R&D spillovers. As noted by Abel and Deitz (2012) this is primarily because the presence of universities and colleges in a region increases both the supply and demand of skills.

Consequently, the performance of firms may be constrained by the fact that, once people have settled in the job market, only a limited amount of workers change jobs and that an even smaller number does so across labour market areas. Firms in regions with a greater capacity to attract workers from distant locations may, on the one hand, benefit from a premium linked to the introduction of new skills and knowledge from outside the region and, on the other hand, benefit from the accumulation of human capital. Nevertheless, knowledge of local habits, norms, and routines can also give local workers an advantage over external workers in adapting to a new job (cf. Maskell and Malmberg, 1999). Hence, this form of local knowledge – based on social capital, knowledge of local institutions, and local trust – may, in some cases, prove an asset for economic performance (Lundvall and Maskell, 2000). Local knowledge also generates other proximity externalities, which are not solely related to the geographical dimension, but still vital for learning and performance (Boschma, 2005).

The place-distinctiveness of knowledge can be brought into the human capital approach developed by Becker (1962). According to this perspective, knowledge is a combination of formal training (i.e. education) and on-the-job training (i.e. experience) and is transferred from the old to the new workplace in the case of changing jobs. By acknowledging the role of human capital accumulation, this distinction also considers the contradiction between the benefits of mobility, on the one hand, and the need for relative labour fixity, on the other. This is because the relative fixity of labour is often associated with the accumulation of less tangible skills, which are difficult to replace if a person leaves for another job. Such insider knowledge is however not only related to a specific task or workplace, but could also be specific to a certain sector or location. Fischer *et al*. (1998), for example, investigate the impact of place-specific insider advantages on migratory decisions and claim that people with a long experience in one place acquire a place-specific human capital that takes time to accumulate, is difficult to transfer to other locations, and may become a sunk cost in the case of outmigration.

Research design

Data

The empirical analysis is based on a comprehensive dataset consisting of official matched employer-employee registers obtained from Statistics Sweden. This detailed data source contains information on all individuals (age, income, education, and other personal characteristics) linked to features of plants for all plants or establishments[1] in Sweden (sector, location, performance). By means of the unique identification number associated with each individual and each plant, it is possible to follow people and plants in time and space to obtain longitudinal information on the jobs different individuals have implemented and on the location of these jobs. While these data allow for the possibility of a rich analysis, some selections involving data had to be made. First, we removed all plants with missing data on industry and value added (the dependent variable), as well as all plants with negative value added and those classified as neither service, nor manufacturing industries (i.e. two-digit NACE codes 15-37 and 60-74, respectively). Second, since the main focus here is to assess the impact of different types of labour flows, not the impact of flows per se, we follow a similar approach as in previous studies assessing the influence of labour flows on productivity (e.g., Boschma et al, 2009; Eriksson, 2011; Timmermans and Boschma, 2014), and exclude all plants in which no labour mobility at all took place during the period of analysis. This left a dataset of manufacturing plants and service establishments that had experienced some turnout which allowed going beyond the simple question of whether labour mobility matters for performance and examine the exact type(s) of labour mobility that make a difference.[2] Finally, we omitted all plants with less than 10 employees to guarantee sufficient data to calculate in-house characteristics. Smaller plants also tend to be more volatile and prone to exit the market. The overall sample consists of a total 69,932 plants.

Dependent variable

[1] The word plants will be used to refer to individual establishments in the manufacturing or service sector throughout the remainder of the paper.

[2] As in previous studies (e.g. Eriksson and Lindgren, 2009), the plants with inflows performed better on average than plants not registered with any inflows. In our case the average growth difference between the two types of plants is 3 percentage points.

To estimate how different types of labour flows may impact plant performance, we use productivity growth as the dependent variable. This is defined as the relative change of the log value added per worker between t_0 and t_3. This indicator is motivated by a number of reasons. First, increasing firm productivity is a main driver for regional growth and compared to other potential indicators (e.g., patents) productivity has a more direct economic impact. It also involves all plants in the economy and not just plants in a limited number of industries. Finally, in contrast to sales or revenue indicators, which may be influenced by a wide array of market-related factors, productivity is bound to have a greater connection to in-house resources.[3]

Based on previous studies showing that the very short-term effects of mobility tend to be negative, as a consequence of the costs associated with integrating new staff in an organization (e.g. Eriksson and Lindgren, 2009), we use a three year period to assess the influence of labour mobility. A three-year moving average (for t_0, the mean of t_{-1}, t_0 and t_1 is used) allows us to smooth out short-term productivity fluctuations. As we also include the productivity level in the model to control for potential catch-up effects, we only consider plants with at least five consecutive observations (t_{-1} to t_{+4}). Since the data available at the time of writing stopped in 2010, our sample is restricted to plants active between 2002 and 2006. It is important to note that value added is linked to firms only and not plants. For the 28% of plants in the sample belonging to a multi-plant firm, we have, in line with other

[3] We also considered employment growth as an alternative dependent variable to assess the performance of firms (high performing firms are more likely to expand). Employment growth was, however, closely correlated to all the mobility variables (growing firms hire more employees), with the exception of the inflow of low educated graduates. Consequently, these results were omitted from the final version. In terms of mobility induced effects on plant performance, see Eriksson and Lindgren (2009) for a comparison between productivity and wages.

studies on similar data, distributed value added to each plant using employment as weights (see Eriksson, 2011 for a similar approach).[4]

Independent variables

To assess the difference between flows of experienced and inexperienced workers, a total of 15 key-independent variables have been constructed. The database does not contain any information on mobility *per* se (i.e., on the reasons of why a person changes workplace). Mobility is thus defined by comparing the unique workplace identifier linked to each individual without information on whether it is a forced or voluntary move. If the identifier has changed between two consecutive years, we regard this as a job move, as it reflects that the worker has changed workplace. This is however only the case for individuals already in employment (i.e. experienced workers, poached or otherwise). Consequently, unemployed workers in t_{-1} are omitted from the sample since they have no previous workplace identifier. Similarly, our data do not reveal whether a person has been working abroad, meaning that the career histories of such workers cannot be included in the analysis. Graduates are defined as individuals who have completed their highest education in the previous two years before the observation takes place. This two-year window is used to allow for the fact that many graduates may continue with part-time work or other related activity for some time after graduation, before finding the first proper employment. This division between workers versus graduates is then used to calculate the different types of inflows.

Regarding graduates, two different inflow indicators have been created:

[4] Since productivity may differ across sectors and regions, this could imply that the allocation of value added to different plants within the same firm may be skewed. The results from the regressions by and large remain robust when splitting the sample both across single and multi-plant firms, as well as when estimating service and manufacturing plants independently. Moreover, there are some spatial differences in productivity growth. For example, manufacturing plants in small regions experience slower growth rates than in other regions (0.02 lower mean). Nevertheless, by including industry-specific fixed effects in the regressions together with a broad range of regional indicators, we are confident that these moderate differences are accounted for.

a) Low-skilled graduates; i.e. inflows of graduates without a university diploma;
b) High-skilled graduates; i.e. the hiring of graduates with at least a bachelor’s degree (at least three years at university).

The same division is used for the hiring of experienced workers to distinguish between the hiring of low- and high-skilled experienced workers. The two categories considered are the following:

a) Low-skilled experienced workers; i.e. the hiring of experienced workers without a university diploma;
b) High-skilled experienced workers; i.e. the hiring of experienced workers with at least a bachelor’s degree.

The next step consists in identifying whether the geographical origin of new hires matters for plant performance and, in particular, whether there is a difference between hiring local or non-local skills. This is done by considering the intra- or inter-regional dimension of the four categories presented above (low-skilled and high-skilled graduates and low-skilled and high-skilled experienced workers). Our regional definition is based on the division of Sweden into 72 functional regions (FA-regions) established by the Swedish Agency for Economic and Regional Growth (SAERG). The functional regions stem from observed commuting distances between the 290 Swedish municipalities, together with large investments and historical economic trends likely to determine future development. These 72 regions primarily reflect local labour market conditions, which make them akin to travel-to-work-areas. They are also consistent over time and suitable for longitudinal analyses.

An intra-regional flow is defined as a move within an FA-region, while an inter-regional flow implies work mobility across a regional border. Because FA-regions take into account commuting distances, we assume that intra-regional, job-related moves can be made without having to change place of residence. By contrast, in the great majority of cases, an inter-regional move will imply a change in residence and, therefore, a sunk-cost of place-specific human capital. The means for all 2,696,909 individuals included in the sample who have made a job-related move between two years are shown in Table A1 in the Appendix. This table indicates that the Swedish labour market reflects the skill composition of the labour force: low educated individuals (without a bachelor´s degree) generally end up in service occupations requiring limited skills, while a majority of all high-skilled recruits find occupations matching their skills.

Finally, previous studies highlight that while inflows of workers may indeed trigger productivity (Eriksson and Lindgren, 2009), it is not the magnitude of inflows that is important, but the type of skills entering the plant (e.g. Boschma et al, 2009). We therefore create an additional variable measuring the total inflow of labour (Total inflow of labour), by adding all flows to a plant in a given year, as well as the total number of intra- and inter-regional flows, respectively. To reduce the potential impact of a skewed distribution and to allow for the fact that although all plants have some inflows every year of observation, some of the plants may have zero inflows of either graduates or experienced workers, the log(+1) is used for all mobility indicators.

Control variables

To control for other aspects that may co-determine plant performance, a number of control variables are included in the analysis. The size of the plant and the change in labour force influence plant productivity (e.g. Boschma et al, 2009; Eriksson and Lindgren, 2009; Timmermans and Boschma, 2014). We therefore construct variables measuring the log number of employees (Plant Size), which we expect to be positively correlated to productivity due to scale effects, and the change in the log number of employees between t_0 and t_3 (LEmployee Growth). The latter control is of capital importance since it, on the one hand, controls for the net change of employees reflecting whether the firm is expanding or just replacing labour. On the other hand, productivity growth could lead to labour release due to increasing efficiency from, for example, labour saving technologies, meaning that employment growth may be strongly negatively associated with productivity growth.

Concentrations of human capital also tend to influence productivity. However, as noted for example by Farjoun (1994), the level of education for each worker does not always reflect the occupation of workers. Consequently, we use the share of occupations present in a plant for which an academic specialist competence is needed as a proxy of plant-specific human capital (1-digit ISCO codes: 2 and 3).[5] The final plant-specific indicator is the log level of productivity in t_0 (Initial Productivity) – defined as the 3-year running means of productivity for t_0 (t_{-1}, t_0 and t_1) – to control for the influence of productivity levels on future growth.

Labour flows may be driven by the proximity to social and physical infrastructures, which can both generate cumulative pooling effects, but also higher amenity values for workers and externalities for firms. We therefore include a set of regional indicators reflecting size and industrial composition. To capture urbanization effects (size), which is expected to both increase attraction among workers and as well as produce significant matching externalities

[5] This choice is also driven by empirical reasons. When explicitly addressing the different impact of low/high skilled workers, the use of educational levels in a plant is strongly correlated with the different type of inflows (high concentrations of human capital implies a higher likelihood of entries of skilled workers), which is reflected in significantly higher standard errors. The results are however the same.

(e.g., Puga, 2010), most studies use indicators of population density. However, as noted by Wixe (2014), this is a poor indicator in Sweden due to the relatively large area of the country and the small population concentrated in urban areas. Therefore, following Andersson and Klaesson (2009), we address this as the size of the accessible market in terms of wage sums (WS), divided into a local (within the municipality), intra-regional (the FA-region, excluding the municipality), and extra-regional (all other FA-regions) component:

$$Local\_Acc = \mathrm{WS}_r \exp\{-\lambda_r \mathrm{t}_{rr}\}, \quad (1)$$

$$IR\_Acc = \sum_{R-m} WS_k \exp\{-\lambda_{ir} t_{rk}\}, \quad (2)$$

$$ER\_Acc = \sum_{W-R} WS_k \exp\{-\lambda_{er} t_{rk}\}, \quad (3)$$

where *R* represent all municipalities within a FA-region and *W* all Swedish municipalities. t_{rk} is the travel time distance between the main urban area in each municipality, t_{rr} is the average travel time distance within each municipality. λ represents time distance sensitivity estimated by Johansson et al (2003) based on commuting data, where λ_r is 0.02, λ_{ir} 0.1 and λ_{er} 0.05. These measures, on the one hand, allow to control for market potential within and across regions, as well as for relative attraction (i.e., higher wages in more attractive areas), and, on the other, to capture the spatial dependence between locations (Andersson and Gråsjö, 2009).

The final set of regional indicators reflects the industrial composition, which is strongly linked to productivity differentials (Frenken et al, 2007). First, regional diversity is defined by means of an entropy measure

$$\mathrm{D}_r = -\sum_{i=1}^{n} \left(\frac{e_{i,r}}{e_r}\right) \ln\left(\frac{e_{i,r}}{e_r}\right) \quad (4)$$

where D_r reflects diversity in region *r*, $e_{i,r}$ is the number of employees in a two-digit industry *i* and region *r*, and e_r is the total number of employees in region. As this indicator reflects overall regional diversity and not industry-specific diversity, it could be understood as a proxy for unrelated variety (Frenken et al, 2007). We therefore follow Wixe (2014) in applying the same equation for each two-digit industry category using employment in the respective five-digit sub-categories to create a proxy for within-industry variety (i.e., related variety) ascribed to each plant. Finally, an indicator for industry specialization is created by means of a conventional location quotient ($LQ_{i,r}$) comparing the number of employees in each two-digit sector in region $e_{i,r}$ and in Sweden e_i with the total number of employees in region e_r and Sweden e, respectively.

$$LQ_{i,r} = \frac{e_{i,r} / e_r}{e_i / e} \tag{5}$$

Model

Due to the panel structure of the data (i.e., multiple plant-year observations), we resort to a fixed-effects (FE) model with a full set of time-dummies to capture unobserved time-specific heterogeneity. Compared to a pooled-OLS, this model emphasizes the within variation in the data. Hence, it controls for unobserved plant-specific factors and could be regarded more efficient than a between-estimator. As time-invariant variables (or variables with only moderate changes over time) cannot be included in such a model, we also added a further indicator of the national size (employment) of each 4-digit sector to capture sector-specific effects that are not encompassed in the variables. This is displayed as an industry-specific fixed effect. The model is specified as follows:

$$\Delta \ln(Y_{it}) = \alpha_1 + \beta_1[Mobility_{it-1}] + \beta_2[Control_{it}] + \vartheta_i + \varepsilon_{it} \tag{6}$$

where $\Delta \ln(Y_{it})$ is the difference in labour productivity (log) between t_0 and t_3, $\mathrm{Mobility}_{\mathrm{it\text{-}1}}$ is the vector of mobility indicators and $\mathrm{Control}_{\mathrm{it\text{-}1}}$ is the vector of control variables. α_1 is the unobserved individual-specific effect. $\varepsilon_{\mathrm{it}}$ is the unobserved random error term. All right-hand-side variables are observed in t-1 to mitigate the impact of reversed causality. The models are weighted on employment size due to the uneven distribution of employment (over 60% of all employees in the sample is employed by the largest 5% plants), and with cluster-robust standard errors at the regional scale to adjust for the fact that observations are correlated within groups (plants in the same regions are more similar to other plants in that region) but independent across regions (Cameron and Trivedi, 2010). Based on the correlation matrix (not reported) and additional VIF-tests, no serious mulitcollinearity is detected.

Analysis of Results

Job-to-job mobility in Sweden has in the past been comparatively moderate. This was mainly a consequence of institutional arrangements favouring wage equality in the provision of long-term posts with relatively high salaries linked to the accumulated firm experience. The general consensus between labour unions and employers was that workers staying in the same firm would benefit not only in terms of income, but be also protected from lay-offs by seniority rules. However, as noted by Holmlund and Storrie (2002), the deep recession of the early 1990s – when national unemployment figures rose from 1.5% to 8.2% – marked a restructuring of both economy and policy with a shift towards an increasing share of fixed-term contracts (a 50% rise during the 1990s) and somewhat relaxed seniority rules to facilitate knowledge upgrading within firms. This process implied that mobility rates increased significantly and are today similar to what is observed in many other European countries (e.g., Finland, the Netherlands, or Spain), where almost 50% of the workforce joined their current employer within a five-year window (EUROFUND, 2006).

However, the spatiality of job-related mobility is highly localized. It was mainly workers in their early career stages that moved to larger regions, either to pursue higher education or in search of a job. More experienced workers, by contrast and due to life-course events, seldom changed labour markets (e.g. Lundholm, 2007; Eriksson et al, 2008). The majority of work-related mobility in Sweden during the period of analysis was intra-regional, taking place fundamentally within metropolitan regions and large regional centres (Table 1). Some upward and downward job-related mobility also took place. Almost half of those who left a small region ended up in large regional centres. If we add to this figure the almost 18% of movers relocating to a large regional centre, this means that about 70% of the people leaving the two smallest regional categories in size ended up in large regional centres, rather than in the metropolitan regions. However, the most frequent moves took place between metropolitan and large regional centres. For example, about 50% of workers leaving large regional centres for job-related causes ended up in metropolitan regions. This represents the majority (53%) of all flows to metropolitan regions.

Table 1: Number of flows to and from different types of regions together with share of total flows from each type of region (origin) and to each type of region (destination).

<table>
<tr><th colspan="3" rowspan="2"></th><th colspan="8">FROM (ORIGIN)</th></tr>
<tr><th colspan="2">Metropolitan</th><th colspan="2">Large Regional Centres</th><th colspan="2">Small Regional Centres</th><th colspan="2">Other Small</th></tr>
<tr><td rowspan="4">TO (DESTINATION)</td><td>Metropolitan</td><td>N
% of origin
% of destination</td><td>Inter
63,933
0.37
0.33</td><td>Intra
1,293.820
-
-</td><td colspan="2">100,937
0.50
0.53</td><td colspan="2">21,786
0.34
0.11</td><td colspan="2">5.401
0.20
0.03</td></tr>
<tr><td>Large Regional Centres</td><td>N
% of origin
% of destination</td><td colspan="2">86,340
0.50
0.45</td><td>Inter
60,304
0.30
0.31</td><td>Intra
707,210
-
-</td><td colspan="2">31,879
0.49
0.17</td><td colspan="2">13,723
0.50
0.07</td></tr>
<tr><td>Small Regional Centres</td><td>N
% of origin
% of destination</td><td colspan="2">18,568
0.11
0.31</td><td colspan="2">29,404
0.15
0.50</td><td>Inter
6,076
0.09
0.10</td><td>Intra
180,554
-
-</td><td colspan="2">5,038
0.18
0.09</td></tr>
<tr><td>Other Small</td><td>N
% of origin
% of destination</td><td colspan="2">4,541
0.03
0.20</td><td colspan="2">10,160
0.05
0.45</td><td colspan="2">4,263
0.06
0.19</td><td>Inter
3,424
0.12
0.15</td><td>Intra
49,537
-
-</td></tr>
</table>

Following this description of job mobility in Sweden, the estimation results are displayed in Tables 2 and 3. Each table is structured in a similar way. Model A estimates the relationship between the total inflow of workers (taking into account the intra- or inter-regional dimension of the flow in Table 3); Model B divides the different inflows into graduate- and experienced-worker movements for the entire sample. Models C-F runs separate regressions for different types of regions. This reflects the fact that Sweden is a sparsely populated country with a large concentration of firms and workers in a limited number of regions. We therefore split the sample based on the definition by SAERG that group the 72 regions according to size and, in particular, to functionality in the urban system. The three largest cities in Sweden – Stockholm, Gothenburg and Malmö – make up the metropolitan regions (n=3) and contain about 46% of all plants in the sample. The large regional centres (n=19) comprise the remaining university regions – Uppsala, Lund, Umeå, Linköping, Jönköping, Luleå, Karlstad, Örebro Växjö, and Kalmar – and other large regional centres (37% of all plants). The small regional centres (n=20) have a somewhat smaller population than the larger regional centres (13%) and are without universities, although colleges may be present. Finally, the other smaller locations (n=30) are relatively peripheral and have the weakest prerequisites for sustaining growth, with a more limited number of employers (6% of all plants in this sample). Since plants can hire both low- and high-skilled workers/graduates, the precise influence of each indicator on productivity can be difficult to disentangle. We therefore regressed all inflow indicators separately, which resulted a similar picture, as will be discussed below.

Table 2: Fixed effect models on plant productivity growth (3-year running means) 2002-2006 based on type (graduates /poached and high/low educated) of recruited labour.

	A1 Total	B1 Skills	C1 Metropolitan	D1 Large RC	E1 Small RC	F1 Other Small
Low-skilled graduates		0.008*** (0.002)	0.034*** (0.003)	-0.010*** (0.004)	0.002 (0.005)	0.016* (0.009)
High-skilled graduates		0.003 (0.003)	0.014*** (0.003)	-0.011** (0.005)	0.010 (0.007)	0.039*** (0.012)
Low-skilled experienced workers		0.068*** (0.015)	0.133*** (0.017)	-0.086*** (0.030)	0.044 (0.053)	0.081 (0.073)
High-skilled experienced workers		0.031*** (0.004)	0.086*** (0.006)	-0.037*** (0.008)	-0.001 (0.012)	0.001 (0.018)
Total inflow of labour	0.003 (0.002)					
Total outflow of labour	0.082*** (0.011)	0.087*** (0.011)	0.101*** (0.014)	0.109*** (0.022)	0.021 (0.035)	0.024 (0.036)
Initial Productivity	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
LEmployee Growth	-0.362*** (0.005)	-0.361*** (0.005)	-0.370*** (0.007)	-0.347*** (0.010)	-0.240*** (0.016)	-0.340*** (0.023)
Plant Size	-0.071*** (0.009)	-0.167*** (0.016)	-0.296*** (0.020)	0.006* (0.032)	0.012* (0.057)	-0.204** (0.080)
Academic knowledge required	0.116*** (0.018)	0.104*** (0.018)	0.136*** (0.022)	-0.124*** (0.035)	0.173*** (0.066)	-0.027 (0.112)
Specialization	-0.020*** (0.004)	-0.020*** (0.004)	0.319*** (0.023)	-0.063*** (0.008)	-0.051*** (0.007)	-0.030*** (0.004)
Industry Diversity	0.006*** (0.002)	0.006*** (0.002)	0.009* (0.004)	0.010*** (0.003)	0.007* (0.003)	0.037*** (0.006)
Regional Diversity	0.007*** (0.001)	0.007*** (0.001)	0.001 (0.001)	0.018*** (0.002)	-0.008** (0.003)	0.007 (0.005)
Local Accessibility	0.003 (0.002)	0.003 (0.002)	0.035*** (0.008)	-0.013 (0.014)	0.179 (0.146)	-0.001 (0.128)
Intra-regional Accessibility	0.001 (0.000)	0.001 (0.000)	-0.001*** (0.000)	0.001** (0.001)	-0.053 (0.044)	-0.023 (0.167)
Extra-regional Accessibility	-0.001* (0.000)	-0.001* (0.000)	-0.001** (0.000)	0.001 (0.001)	0.001** (0.001)	0.001 (0.002)
Constant	2.222*** (0.403)	2.212*** (0.403)	2.441*** (0.439)	-2.252 (2.744)	-4.305 (6.440)	0.475 (2.947)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.176	0.177	0.209	0.223	0.314	0.327
N	69,925	69,925	32,078	26,246	9,128	2,473

Coefficients and cluster-robust standard errors at regional level (within brackets) are reported.
Significant at: 0.1 (*), 0.05 (**) and 0.01 level (***).

Before turning to the presentation of the mobility-variables, it needs to be mentioned that all control variables display the expected signs: Initial productivity and a relatively high increase of personnel is negatively correlated to per capita productivity growth, as is specialization across all regions, bar the metropolitan regions (Models C). Moreover, the coefficients for plant size are negative, which, as pointed by Models C-F, is mainly a metropolitan feature (metropolitan regions have a greater share of small firms). Industrial diversity (related variety) is as expected growth-promoting as are occupations requiring academic knowledge.

Regional diversity (unrelated variety) is mainly a feature of the large regional centres (Models D), indicating that firms in university regions with a high variety of economic activities perform better in relative terms than firms in more specialized university regions. Finally, although mainly serving as a control for potential cross-border interdependencies, the three indicators of accessibility signal that a strong local market is particularly beneficial in the metropolitan regions while regional- and extra-regional accessibility, respectively, is beneficial for large regional centres and small regional centres. Hence, a weak local demand could be compensated by proximity to either a strong regional or extra-regional growth centre.

All these control variables remain stable when including additional variables in subsequent models (Table 3). Despite the great deal of heterogeneity involved when modelling large micro-data sets, the explanatory power of the models is satisfactory (ranging between 18 and 34 percent).

Regarding our independent variables of interest, the results in Table 2 show that the total inflow of new labour into Swedish plants has no significant relationship with productivity growth while the total outflow of workers has (A1). This finding is in line with most previous studies looking at the influence of overall labour flows on plant performance. Neither McCann and Simonen (2005) nor Boschma et al (2009), or Timmermans and Boschma (2014) found any significant relationship between the overall inflow of new workers and productivity growth in Scandinavian plants. Additionally, Eriksson (2011) shows that outflows of labour are positively correlated with growth, as they may represent an introduction of labour-saving technologies and/or relative redundancies which jointly increase per capita productivity. However, neither of these studies distinguished between the hiring of graduates directly out of the educational system versus the hiring of experienced workers, nor did they include low-skilled flows of workers.

When dividing the job-related moves into low- and high-educated graduates and experienced workers (Model B1) to highlight potential differences between experienced and inexperienced intakes, the results show that all inflows, with the exception of high-skilled graduates, show a strong significant positive correlation with productivity growth. This means that, in the case of Sweden, recruiting a high share of university graduates does not have an immediate growth-promoting effect. This could be explained by the mismatch between the skills acquired at university and the demands of employers. Conceptual knowledge may require some honing in the workplace in order to start enhancing productivity.

Table 2 also points towards differences in the regional hierarchy (Models C1-F1). Metropolitan regions are the biggest winners from labour mobility, indicating a spatial sorting of skills and the accumulation of knowledge in the three largest Swedish cities. By contrast, the role of mobility is less clear in the remaining types of regions. The large regional centres seem to be the greatest losers from job-related mobility (Model D1), while no significant estimates are found for the small regional centres (Model E1). Firms in the smallest regions benefit from the recruitment of graduates and of high-skilled graduates, in particular.

While the findings in Table 2 could be driven by geographical differences in both labour supply and demand, the models of Table 3 take into account the geographical origin of newly hired workers. Three fundamental findings emerge from the analysis. In first place, the insignificant influence of labour mobility on plant performance detected in Table 2 (Model A1) is due to the difference between the influences of intra- and inter-regional mobility (Table

3, Model A2). The coefficient for the impact of new hires from outside the region on plant level economic performance is positive and moderately significant, while that of intraregional hires is not significant. Hence, in the case of Sweden, hiring workers from outside the region does seem to pay off in economic terms. This positive sign of the interregional mobility variable fits nicely with most of the literature on migration and with other analyses looking at migration in the Nordic countries. (McCann and Simonen, 2005, for Finland; Timmermans and Boschma, 2014, for Denmark). When including all types of flows in the Swedish economy and not only workers with higher education, our results confirm the views of the proximity school literature, as intra-regional linkages may be less beneficial for economic performance due to spatial lock-in (e.g., Boschma, 2005).

Table 3: Fixed effect models on plant productivity growth (3-year running means) 2002-2006 based on type (graduates/poached and high/low educated) and origin of recruited labour.

	A2 Total	**B2 Skills**	**C2 Metropolitan**	**D2 Large RC**	**E2 Small RC**	**F2 Other Small**
Low-skilled graduates		0.003	0.020***	-0.008**	-0.006	-0.000
Intra-regional mobility		(0.002)	(0.003)	(0.004)	(0.006)	(0.009)
Low-skilled graduates		0.013***	0.034***	0.005	0.013*	0.040***
Inter-regional mobility		(0.003)	(0.004)	(0.005)	(0.007)	(0.011)
High-skilled graduates		0.013***	0.018***	0.002**	-0.049	-
Intra-regional mobility		(0.003)	(0.004)	(0.006)	(0.040)	-
High-skilled graduates		0.002	0.006**	-0.010**	0.002*	0.016**
Inter-regional mobility		(0.003)	(0.004)	(0.005)	(0.007)	(0.012)
Low-skilled experienced workers		0.044***	0.107***	-0.046**	0.029	0.119**
Intra-regional mobility		(0.011)	(0.014)	(0.022)	(0.037)	(0.049)
Low-skilled experienced workers		0.015***	0.036***	0.020***	0.022***	0.004
Inter-regional mobility		(0.002)	(0.003)	(0.003)	(0.006)	(0.009)
High-skilled experienced workers		0.029***	0.080***	-0.030***	-0.006	-0.031**
Intra-regional mobility		(0.004)	(0.006)	(0.008)	(0.012)	(0.017)
High-skilled experienced workers		-0.001	0.006	-0.017***	-0.002	0.040***
Inter-regional mobility		(0.003)	(0.004)	(0.005)	(0.007)	(0.013)
Intra-regional mobility	-0.001					
	(0.002)					
Inter-regional mobility	0.004*					
	(0.002)					
Total outflow of labour	0.082***	0.087***	0.101***	0.113***	0.028	0.022
	(0.011)	(0.011)	(0.014)	(0.022)	(0.035)	(0.036)
Initial Productivity	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LEmployee Growth	-0.362***	-0.360***	-0.365***	-0.340***	-0.245***	-0.334***
	(0.005)	(0.005)	(0.007)	(0.010)	(0.016)	(0.023)
Plant Size	-0.078***	-0.162***	-0.297***	0.030**	0.020**	-0.233***
	(0.009)	(0.014)	(0.018)	(0.026)	(0.043)	(0.061)
Academic knowledge required	0.115***	0.107***	0.132***	-0.126***	0.176***	0.065
	(0.018)	(0.018)	(0.022)	(0.035)	(0.066)	(0.112)
Specialization	-0.020***	-0.019***	0.292***	-0.063***	-0.046***	-0.031***
	(0.004)	(0.004)	(0.023)	(0.008)	(0.007)	(0.004)
Industry Diversity	0.006***	0.006***	0.005*	0.009***	0.006*	0.033***
	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.006)
Regional Diversity	0.007***	0.006***	0.001	0.018***	-0.008**	0.011*
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.005)
Local Accessibility	0.003	0.003	0.034***	-0.015	0.169	0.001
	(0.002)	(0.002)	(0.008)	(0.014)	(0.146)	(0.136)
Intra-regional Accessibility	0.001	0.001	-0.001***	0.001*	-0.050	-0.011
	(0.000)	(0.000)	(0.000)	(0.001)	(0.044)	(0.021)
Extra-regional Accessibility	-0.001***	-0.001***	-0.001***	0.001	0.003**	0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)
Constant	2.255***	2.300***	2.731***	-2.141	-4.252	0.838
	(0.403)	(0.403)	(0.436)	(2.745)	(6.432)	(2.932)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.176	0.179	0.216	0.224	0.316	0.338
N	69,925	69,925	32,078	26,246	9,128	2,473

Coefficients and cluster-robust standard errors at regional level (within brackets) are reported.
Significant at: 0.1 (*), 0.05 (**) and 0.01 level (***).
Note: No high-skilled graduates are observed in Other small regions (F2)

In second place, compared to the findings in Table 2, the results of Table 3 (Model B2) show that the geographical origin (local vs non-local) of inflows does play a significant role for the understanding on the economic impacts of mobility. While the coefficients for both types of inflows are positive for low-skilled experienced workers, the positive estimate of low-skilled graduates mainly emanates from inter-regional flows. By contrast, the positive influence of high-skilled experienced workers is primarily driven by intra-regional flows. Moreover, when making a distinction between intra- and inter-regional moves, the non-significant estimate reported in Table 2 for high-skilled graduates changes as flows from within the region are procutivity-enhancing, while inter-regional flows remain insignificant

Third, the findings of Table 3 vary over the regional hierarchy (Models C2-F2). Once again, the metropolitan effect is highlighted. Firms in Stockholm, Gothenburg, and Malmö gain the most from job-related mobility and, in particular, from the different forms of inter-regional mobility (Table 3, Model C2). These findings are in line with previous research. De la Roca and Puga (2017), when analysing labour flows in Spain, highlight that inter-regional worker mobility is a key contributor to productivity growth in metropolitan regions, as more productive workers sort themselves into larger regions where they can expect higher returns from their skills. Hence, in Sweden, as in Spain, worker mobility towards large cities may generate the job opportunities and wage premia which attract the most productive and ambitious workers (Gordon, 2015). Poaching experienced and highly educated local workers from other firms is also positively and significantly connected with economic performance as is the recruitment of low-skilled graduates within the region. This latter finding is not surprising given the growing skill-based polarization between low-skilled service jobs and high-skilled occupations in the job market of metropolitan areas.

Plants in large and small regional centres also benefit from specific aspects of mobility, but, by contrast, lose out as a result of others. As shown in Table 2, all types of inflows influenced productivity negatively in large regional centres, but this is strongly related to the type and origin of flow (Model D2, Table 3). Plants in large regional centres benefit from poaching low-skilled experienced workers from outside the region and from hiring highly-educated graduates from local universities. This positive effect is reflected in the fact that large regional centres attract almost 41% of all inter-regional low educated experienced labour moving in Sweden (Table A1 in Appendix). Most of these workers come from smaller regions in the vicinity of the large regional centres to find the jobs which their places of origin are unable to provide. Large regional centres however lose out when hiring locals, regardless of whether they are experienced workers or graduates with low levels of qualification. It should also be noted that employment in these regions tends to be dominated by the public sector (large universities and regional governmental agencies), which are not included in this sample but absorb many of the high-skilled workers and are characterized by low mobility rates.

Plants in small regional centres benefit from the hiring of low-skilled experienced workers and highly qualified graduates from outside the region as well as of low-skilled graduates from other regions. Employing, by contrast, highly skilled experienced workers (regardless of origin) does not increase plant productivity. The most diverse findings are detected for the smallest areas. Among the firms recruiting in these regions, those able to attract non-local skills witnessed a highest increase in performance. That is the case for inflows of both low- and high-skilled graduates, as well as high-skilled experienced workers. Importing high-skilled experienced workers thus only seems to increase productivity on aggregate in smaller locations.

In brief, these results point to the fact that local universities may serve as important sources of human capital, but mainly in metropolitan regions and large regional centres where also the demand for such skills is higher. Recruiting graduates from colleges within small regional centres, however, does not yield the productivity results that these regions strive for. Instead, firms in smaller regions, and in particular in the smallest and most peripheral regions, benefit the most from recruiting non-local knowledge. This could either be in the form of low-skilled graduates, but also – as in the case of other small regions - highly-skilled experienced workers. About 65% of all migrants to other small regions originate from metropolitan regions or large regional centres (Table 1). Hence, the ability to attract workers stepping down from or out of the escalator is a crucial source of new knowledge for firms in smaller regions.

Concluding remarks

In this paper we have assessed the link between labour mobility and changes in plant-level performance using a micro-dataset covering a total of 2,696,909 job changes in Sweden during the period between 2002 and 2006. The novelty of the analysis consists in looking at different categories of job-related mobility, considering both experienced workers and graduates (defined as those finding a job in the two years after graduation). Newly-hired workers have also been classified as graduates or experienced workers according to their level of formal education, distinguishing between those highly qualified (bachelor's degree and above) and those with a lower level of qualification. Together with a broad range of firm- and regional-specific control, we have also taken into consideration the geographical mobility of new recruits across 72 functional regions in Sweden, focusing on migration between four types of Swedish regions: metropolitan regions, large urban centres, smaller urban centres, and smaller locations

Overall a number of conclusions can be extracted from the results. First, job-related migration in Sweden has its biggest positive impact in the three largest cities: Stockholm, Gothenburg, and Malmö. Firms in these cities, by and large, benefit from hiring new workers. This does not necessarily mean that these firms are employing a majority of workers from elsewhere in the country, causing brain-drain in smaller regions as about 55% of all job moves occur within or between the three metropolitan regions (Table 1 and Table A1). The results also indicate that universities also play a fundamental role in supplying skills to the private sector (c.f., Abel and Deitz, 2012). However, this does not prevent firms in large urban and university regions – our second regional category – from being the biggest losers from job mobility.

Second, job-related mobility in Sweden follows patterns akin to those of the ‘metropolitan escalator’ described by Fielding (1993) for London or by de la Roca and Puga (2017) for Spanish cities. Swedish large cities seem to "to provide the greatest opportunities for those with ambition and capacity to learn” (Gordon, 2015: 1045). These cities act as a magnet to people in the early stages of their career, when their motivation to contribute to the economy is greatest. This applies to workers willing to make rapid career progress (De la Roca and Puga, 2017), regardless of their level of formal training.

Third, as highlighted by Eriksson (2011), the results of the analysis underline the importance of acknowledging the geographical dimension of labour flows for plant performance. The benefits of hiring workers from outside the region where the plant is located have been far greater than those of relying on local talent. One of the main exceptions is the recruitment of high-skilled experienced workers from other regions, which is, however, only positively significant in the smallest regions. This relatively moderate effect could be due to the profile of the migrants trading down from metropolitan areas in Sweden to smaller urban centres. As shown by, for example, de la Roca and Puga (2017) while these workers may gain both in salary and quality of life, they may lack the same ambition and capacity to learn which motivates experienced workers trading up in big cities. Ambition and motivation are, according to Gordon (2015), crucial factors for improvements in plant performance. Hence, higher competition for jobs in metropolitan areas leads to a pronounced spatial sorting, leaving more experienced workers to make a greater contribution to the economies of smaller, more peripheral regions.

The analysis has highlighted that, when analysing job-related mobility, the experience, level of education, and geography of flows are all extremely useful in order to better understand the impact of labour mobility. In the case of a country like Sweden, with relatively low inter-regional mobility rates and with only a few large diverse regions that together account for almost half of the plants, geographical mobility is a fundamental factor for improving the productivity and economic performance of firms, although the degree of impact of cross-regional job-related migration varies across categories of workers and according to the type of region of origin and destination.

While our findings on the general impact (or lack thereof) of high-skilled flows on productivity are in line with other studies, the results also raise a number of important questions which would deserve greater scrutiny in future research. Differences in the impact of new hires may be connected with the age profile of the employees being hired as well as the skill-requirement of different occupations (Gathmann and Schönberg, 2010). But even more important may be the drive and ambition of new recruits since the most productive workers tend to agglomerate in the largest and most densely populated regions. In contrast to studies which have highlighted the presence of a wage premium associated to work in large cities (cf. De la Roca and Puga, 2017) – a premium which is portable when the individual leaves the large city to find a job elsewhere – our analysis has found little evidence of a firm-level productivity premium when workers leave the metropolitan areas of Sweden for smaller locations. This may point to a trade-off between the wages and quality of life of these workers on the one hand, and their productivity at their new location, on the other. It may also signpost differences in career- and life-cycles and ambition between those moving in and out of large cities (Lundholm, 2007). Future studies could employ individual level micro-data to discern the potential sorting mechanisms of more productive workers in certain areas. Despite controlling for plant- and industry-specific unobservables, as well as well-established drivers of plant performance (e.g., human capital, plant size, initial productivity and agglomeration), without information about recruitment policies we only can draw limited conclusions on the impacts of different job flows on productivity.

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APPENDIX

Table A1: Descriptives (means) of all recruited individuals included in sample 2002-2006

	ALL	GRADUATES				EXPERIENCED WORKERS			
		Lower Education		Higher Education		Lower Education		Higher Education	
		Intra	Inter	Intra	Inter	Intra	Inter	Intra	Inter
Age	33.622	22.620	22.612	29.233	27.433	38.404	37.184	40.390	38.461
Female	0.539	0.541	0.540	0.643	0.589	0.536	0.388	0.600	0.506
Years in school	12.656	11.711	12.252	14.757	14.928	11.989	11.996	14.987	15.119
Work Experience (years)	10.671	1.370	1.852	0.889	0.558	17.291	16.215	10.114	8.617
Income t-1	196.487	54.715	46.861	110.693	74.067	235.060	249.553	351.045	354.076
Income Change	24.565	27.220	26.026	77.633	87.933	13.191	11.147	25.954	29.187
Occupation									
Management	0.032	0.002	0.002	0.009	0.007	0.034	0.051	0.075	0.084
TheoSpecialists	0.164	0.023	0.035	0.321	0.334	0.082	0.088	0.563	0.562
ShortHighEduc	0.158	0.049	0.064	0.251	0.224	0.173	0.202	0.221	0.224
Clerks	0.088	0.083	0.083	0.083	0.077	0.111	0.100	0.036	0.033
Service	0.223	0.263	0.239	0.147	0.117	0.293	0.195	0.051	0.033
AgroForest	0.004	0.004	0.006	0.002	0.002	0.005	0.008	0.001	0.001
Constructor	0.052	0.029	0.027	0.010	0.010	0.081	0.103	0.005	0.005
Manu	0.066	0.055	0.052	0.022	0.022	0.091	0.125	0.010	0.009
Other occupation	0.069	0.090	0.085	0.030	0.028	0.086	0.068	0.012	0.007
Sectors									
KnowManu	0.063	0.063	0.052	0.066	0.080	0.058	0.070	0.066	0.069
CapManu	0.008	0.015	0.011	0.010	0.015	0.006	0.008	0.003	0.008
LabourManu	0.055	0.073	0.054	0.023	0.026	0.060	0.083	0.012	0.026
R&D	0.017	0.006	0.014	0.054	0.048	0.005	0.006	0.044	0.067
Finance	0.130	0.100	0.146	0.136	0.146	0.127	0.153	0.165	0.157
CapServ	0.083	0.083	0.073	0.044	0.033	0.104	0.114	0.041	0.029
LabServ	0.222	0.336	0.303	0.119	0.109	0.219	0.288	0.065	0.078
New region									
Metropolitan	0.551	0.502	0.412	0.588	0.435	0.581	0.395	0.718	0.449
Large Centres	0.334	0.366	0.414	0.331	0.413	0.313	0.413	0.230	0.411
Small Centres	0.089	0.104	0.125	0.064	0.115	0.082	0.137	0.043	0.105
Other Small	0.027	0.028	0.049	0.017	0.037	0.024	0.055	0.009	0.034
Previous region									
Metropolitan t-1	0.544	-	0.336	-	0.349	-	0.367	-	0.425
Large Centres t-1	0.337	-	0.440	-	0.490	-	0.421	-	0.426
Small Centres t-1	0.091	-	0.159	-	0.121	-	0.145	-	0.107
Other Small t-1	0.029	-	0.065	-	0.039	-	0.067	-	0.042
N	2,696,909	619,986	75,453	198,757	40,345	1,084,519	254,882	327,859	95,108

Note: Work experience = years since completing highest education, occupation is based on 1-digit ISCO codes, income is measured in thousands SEK (10SEK = 1EURO) and measured before the change. IncChange is the income difference after the move. Apart from research and development (R&D) and the finance and insurance sectors (Finance), sectors are defined either as labour- (Lab), capital- (Cap), or knowledge- (Know) intensive manufacturing (Manu) or service (Serv).