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Innovator Mobility in Finland and Denmark

Jesper Bagger* – Mika Maliranta** – Niku Määttänen*** – Mika Pajarinen****

* Royal Holloway, University of London
** ETLA – The Research Institute of the Finnish Economy, mika.maliranta@etla.fi and University of Jyväskylä
*** ETLA – The Research Institute of the Finnish Economy, niku.maattanen@etla.fi
**** ETLA – The Research Institute of the Finnish Economy, mika.pajarinen@etla.fi

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Abstract

Workers have different abilities in research, development and innovation (R&D&I) activities. Firms have different "prospects for innovation". Innovation is facilitated by matching innovators, i.e. workers that are specialized in R&D&I to firms with good prospects for innovation. Aggregate productivity growth requires that firms with the best prospects for innovation are quickly matched to innovators. The mobility of innovators is also important for positive knowledge spillovers to materialize. We use Finnish and Danish linked employer-employee data to study labour mobility, focusing on innovators. For Finland, Denmark is an interesting benchmark country because its labour market is generally considered very flexible. We find that overall labour mobility is significantly lower in Finland than in Denmark. However, relative to other occupation groups, innovators are actually more mobile in Finland than in Denmark. In Finland, innovators tend to cluster in firms that are among the most productive in their industry.

Key words: Research and development, innovation, occupational choice, labour mobility, innovator mobility, resource allocation

JEL: J24, J62, 030

Innovaattorien liikkuvuus Suomessa ja Tanskassa

Tiivistelmä

Työntekijöiden valmiudet tutkimuksen, kehittämisen ja innovoinnin (T&K&I) tehtävissä ovat erilaisia. Yritysten "innovaationäkymät" ovat myös erilaisia. Innovointi tehostuu, kun T&K&I tehtäviin erikoistuneet innovaattorit kohdentuvat ilman turhia esteitä sellaisiin yrityksiin, joilla on parhaat innovointinäkymät. Tämä on tärkeää kansantalouden aggregaattituottavuuskasvun kannalta. Innovaattoreiden liikkuvuus edistää myös tuottavuuskasvulle tärkeää tiedon leviämistä kansantaloudessa. Tutkimme työvoiman liikkuvuutta Suomessa ja Tanskassa käyttämällä yhdistettyjä työntekijä-työnantaja-aineistoja. Päähuomio on innovaattoreissa. Suomen kannalta Tanska on kiinnostava vertailukohta siksi, että sen työmarkkinoita pidetään yleisesti joustavina. Havaitsemme, että työvoiman liikkuvuus on Suomessa selvästi vähäisempää kuin Tanskassa. Toisaalta maan muihin ammattiryhmiin suhteutettuna innovaattorien liikkuvuus on Suomessa Tanskaa parempi. Suomessa innovaattorit ovat keskittyneet selvästi Tanskaa voimakkaammin toimialojensa kaikkein tuottavimpiin yrityksiin.

Asiasanat: Tutkimus- ja kehittämistoiminta, innovaatio, ammatinvalinta, työntekijöiden liikkuvuus, innovaattorien liikkuvuus, resurssien kohdentuminen

JEL: J24, J62, 030

1 Introduction

Recent macroeconomic literature stresses the importance of resource reallocation between firms for aggregate growth (see e.g. Bagger, Christensen, & Mortensen, 2015; Bartelsman, Haltiwanger, & Scarpetta, 2013; Lentz & Mortensen, 2008). Strong aggregate productivity growth requires that the most productive firms can quickly expand their production. Another potentially important mechanism affecting aggregate productivity growth is diffusion of technological knowledge across firms. Both of these mechanisms require that labour is mobile across firms.

Most microeconomic studies of the relationship between factor mobility and productivity growth focus on very broad categories of production inputs such as capital and labour.[1] It is, however, often argued that the allocation of labour that is skilled in research and innovation activities is of particular importance and should be considered separately from the allocation of labour across production lines (Acemoglu, Akcigit, Bloom, & Kerr, 2013). There are two main reasons for this. First, innovators are not just a production input but may also represent an investment into a firm's intangible capital thereby impacting the future productivity of its entire labour force.[2] Second, one of the main rationales for R&D subsidies is the (perceived) presence of spillover effects from one firm's (or one sector's) R&D activities to other firms (or sectors). Innovator mobility is a potential source of such spillover effects.

In this report, we use Finnish and Danish administrative linked employer-employee data to describe a set of basic facts regarding the mobility and allocation of employees across different types of firms, focusing especially on the part of the labour force that is specialized in innovation efforts. We also examine how employee mobility is associated with earnings growth at the individual level. From a Finnish point of view, Denmark is an interesting comparison country because its labour market is often considered very flexible (see, for instance Andersen, 2012). On the other hand, unlike Denmark, Finland achieved sustained high rates of productivity growth before the financial crisis.

We proceed as follows. In the following subsection, we briefly discuss a couple of related studies that make use of the linked employer-employee data. In section 2, we describe the data and some basic background information. In section 3, we compare the mobility of innovators in Finland and Denmark. In section 4, we describe the allocation of innovators and other occupation groups across firms of different productivity and age. In section 5, we consider the earnings growth of movers. We conclude in section 6.

1.1 Selected related literature

As explained above, we use linked employer-employee data to study the allocation and mobility of innovators. The data allow us to consider how different types of employees are distributed across different types of firms. Since this type of data is available only in a few countries, it is not surprising that there are only few studies using linked employer-employee data to ex-

[1] Bagger et al. (2015) represent a deviation from this trend. They base their analysis on quality-adjusted labor input in four aggregate occupations, but do not pay particular attention to "innovators".

[2] The contribution of investments in intangible capital to economic growth has been growing in developed countries (Corrado, Hulten, & Sichel, 2009)

amine the mobility and allocation of researchers and other R&D workers. Indeed, we are not aware of another study that would directly compare the mobility (or allocation) of innovators with respect to other worker groups.

One of the first studies to use register-based linked employer-employee data to study the mobility of R&D workers is Moen (2005), which uses Norwegian data. This paper also provides many references to the related earlier literature. Moen (2005), however, does not compare the mobility (or allocation) of innovators with respect to other employment groups. Instead, focus is on the wage dynamics of R&D personnel. The main research question is to what extent market mechanisms internalize R&D spillovers that are associated with employee mobility. It is found, for instance, that having working experience from R&D-intensive firms is associated with higher wages. On the other hand, employers' current R&D intensity reduces wages for young employees. The fact that individual wages appear to reflect R&D experience (or exposure) suggest that R&D spillovers are at least partly internalized in the labor market. Essentially, the fact that the knowledge generated by a firm's R&D investments may travel to other firms with workers is reflected in the wages.

Using Finnish data similar to the data used in this report, Maliranta, Mohnen, and Rouvinen (2009) studies how the worker mobility is related to productivity, wage and profitability growth of origin and destination firms, paying special attention to innovators. Maliranta et al. (2009) find that hiring employees from other firms' R&D activities into one's own is not related to increased productivity or profitability growth, suggesting that these flows do not constitute an important spillover channel. However, hiring employees that have previously worked in R&D to one's non-R&D activities (e.g. management tasks) seems to boost both productivity and profitability. One interpretation of these findings is that innovators are able to transfer knowledge that is productive also without significant further research or development.

Using Finnish data, Maliranta and Määttänen (2014) find that productivity-enhancing restructuring, or "creative destruction", is particularly intensive among firms that have a large share of innovators (measured by the share of managers and professionals). Because of creative destruction, firms that employ many innovators relative to other employee groups have an important contribution to aggregate productivity growth. Interestingly, the average productivity growth rate of these firms was not particularly high although aggregate productivity growth was faster than in other groups, thanks to creative destruction.

2 Data

Our analysis is based on two comprehensive population-wide administrative linked employer-employee datasets from Finland and Denmark. The fact that the datasets originates in administrative registers ensures high reliability and minimal measurement errors in key variables. Both datasets are population panels. That is, they cover all employees in all firms over specific time-periods to be detailed below. The size of the dataset is important because we pay particular attention to a relatively small group of workers, namely innovators. Smaller datasets would reduce the statistical power of our analysis. Both datasets also feature a comprehensive set of observed characteristics of workers (less so for the firms). This is important because the analysis rest on our ability to empirically identify innovators from other types of labour input. The linked employer-employee structure of the datasets refers to the fact that it is

possible to link every employee with his or her employer at every observation point. This feature of the data is crucial for identifying and analyzing workers' cross-firm mobility. In both datasets, workers are identified and traced over time by a unique worker ID. Similarly, firms are traced using a firm ID.

For Finland we use the *Finnish Linked Employer-Employee Data* (FLEED) that is specially constructed for research purposes. It is constructed by merging comprehensive administrative records of all labor force members as well as all employers/enterprises (including information also on their establishments) subject to value added tax (VAT). It can be complemented by a range of additional information from both private and public sources. FLEED currently covers the years 1990 onwards with near-perfect traceability of employers and employees across time. The employment statistics, educational statistics, taxation records, business register, financial statement statistics, manufacturing census as well as various surveys are among the original sources of the FLEED variables.

For Denmark we use the *Integrated Database for Labor Market Research* (IDA). We supplement IDA with administrative data on firm productivity, as measured by value added, computed from data on value added taxes (VAT). We omit the details on the construction of the analysis data from the different data sources, although they are of course available on request. The resulting dataset contains annual observations on individuals' labor market histories. We restrict attention to individuals aged 16–70 For wages, we use an estimate of the hourly wage in each job-year (see Lund & Vejlin, 2015).

Our analysis focus on the Non-Agricultural Business sector excluding real estate (STAN definition, henceforth referred to simply as the Business sector).[3] Sometimes we will refer to the Manufacturing sector, a subsector within the Business sector.[4] Additionally, we will refer to the Research sector. The Research sector is defined at the level of the individual worker. An individual is in the research sector if the individual is a university graduate,[5] and is employed in a firm/establishment with industry affiliation NACE rev. 2 code 8542: Tertiary education. Notice that the Research sector is not part of the Business sector.

2.1 Identifying innovators

Our data include detailed information on individual worker's occupation. We use this occupation data to empirically identify *Innovators*, *Managers*, (other) *Professionals*, and (production) *Workers*. For Finland, *Innovators* are defined as workers in group 32, i.e. "senior officials and employees in research and planning", in the 1989 Classification of Socio-Economic

[3] The Non-Agricultural Business sector excluding real estate comprises NACE rev. 2 codes 05-66 and 69-82. That is, it includes Manufacturing including Energy, Construction, Wholesale and Retail Trade, Information and Communication, Financial and Insurance Activities, as well as Professional, Scientific and Technical Activities; Administrative and Support Service Activities. Industry classification in the Danish data follows NACE rev. 1 from 1980–2003, NACE rev. 1.1 from 2003–2007, and NACE rev. 2 from 2007 onwards. We use the overlapping years, 2003 and 2007, to construct a correspondence table mapping NACE rev. 1 into NACE rev. 1.1, and then, NACE rev. 1.1 into NACE rev. 2. Effectively, we are backdating NACE rev. 2 codes to 1995, which allow us to directly apply the above definition of the business sector.

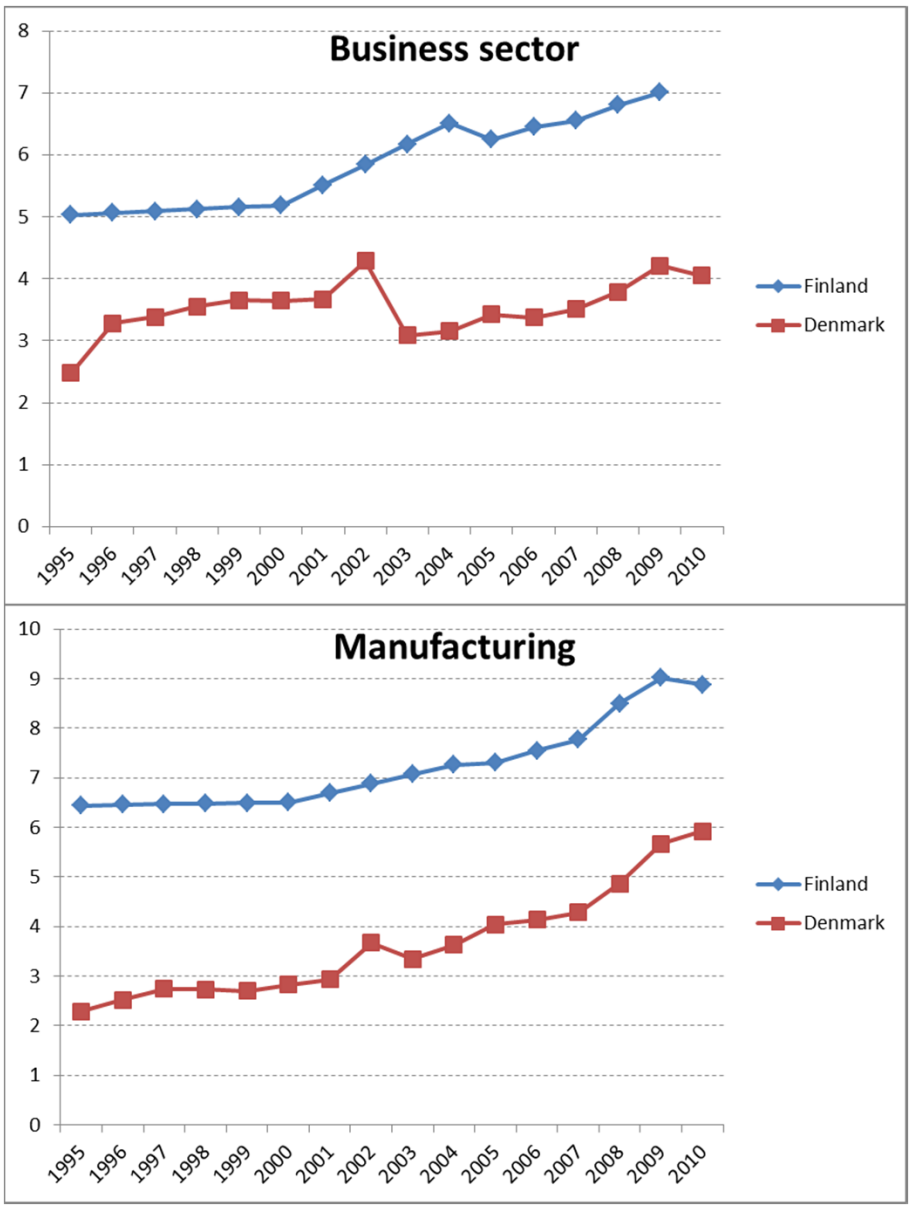
[4] Manufacturing is defined according to the STAN classification. That is, Manufacturing is comprised of NACE rev. 2 2-digit codes 10-33.

[5] Using worker-level information on highest completed education, we identify university graduates as individuals with Master's degrees or PhD degrees. We refer to these individuals as university graduates. Formally, we use the IDA variable HFAUDD. University graduates are defined as individuals with 2-digit HFAUDD codes equal to 70 or 80. This is equivalent to 1-digit ISCED-codes 7 and 8 as applied in the Finnish data.

Groups. Table A1 in the appendix lists the ISCO-08 occupations included in the definition of Innovators (for Denmark, we define all the four groups of workers in terms of ISCO-08, see below). *Managers* consist of groups 1 and 20, other *Professionals* consist of groups 31, 33 and 34, and production *Workers* refer to all other groups, including those with unknown occupational group.

For Denmark, we use ISCO-08 codes for the grouping of workers. Our data covers 1995–2010. For the period 1995–2007, occupations are categorized according to the ISCO-88 classification. For 2008–2010, it follows the ISCO-08 classification. However, at the level of aggregation

Figure 1 Employment share of the innovators



Note: Years 1996–1999 and 2001–2003 are extrapolated for Finland.

we operate, there is very little difference in the occupation classifications based on ISCO-88 and ISCO-08. The few differences that do arise are allocated to one of the four groups on a case-by-case basis. Details of this procedure are available on request. Managers are ISCO-08 2-digit categories 11, 12, 13, and 14. Innovators are ISCO-08 4 digit codes 2111, 2112, 2113, 2114, 2120, 2131, 2133, 2132, 2141, 2143, 2149, 2142, 2144, 2145, 2146, 2151, 2152, 2153, 2161, 2162, 2163, 2164, 2165, 2166, 2421, 2422, 2423, 2424, 2631, and 2632. Professionals are ISCO-08 2-digit categories 21, 22, 23, 24, 25 and 26, excluding Innovators. (Other) workers are the residual category.

Figure 1 shows the employment share of innovators in the countries for years 1995–2010. The employment share is displayed both for the entire business sector and separately for the manufacturing sector. In both countries, the employment share of innovators has increased over time. The increase is especially pronounced in Manufacturing. However, at any given year, the share of innovators is lower in Denmark than in Finland.

We have exerted a lot of efforts to make these figures as comparable between countries as possible but we cannot exclude the possibility that some of these differences may be partly driven by differences in the classification of occupations. In any case, it would be interesting to be able to compare the employment share of innovators across several countries. Unfortunately, international data sets typically do not feature innovators (as we define them) separately from other professionals. Appendix 1 shows the development of the employment share (full-time employees) of professionals (that includes "innovators" and other professionals) in the business sector and manufacturing, obtained from Eurostat. It shows that the employment share of professionals is higher in Finland than in Denmark or Sweden. The employment share of the professionals has also been higher in these Nordic countries than in the Euro area on average. We have also included corresponding estimates for Finland and Denmark from our data. Our

Table 1a Monthly earnings in 2005, Finland

	Percentile			
	25th	*50th*	*75th*	*75th/25th ratio*
Managers	1 375€	3 292€	5 283€	3,8
Innovators	2 672€	3 497€	4 503€	1,7
Professionals	2 258€	3 215€	4 417€	2,0
Workers	1 623€	2 139€	2 711€	1,7

Table 1b Hourly wages in 2005, Denmark

	Percentile			
	25th	*50th*	*75th*	*75th/25th ratio*
Managers	DKK 219	DKK 291	DKK 406	1,9
Innovators	DKK 219	DKK 264	DKK 319	1,5
Other professionals	DKK 192	DKK 243	DKK 308	1,6
Production workers	DKK 133	DKK 168	DKK 207	1,6

data give somewhat smaller estimates for Finland (especially in the business sector) and larger for Denmark (especially in the manufacturing sector) than Eurostat data.

Tables 1a and 1b report earnings or wages in selected percentiles in Finland and Denmark, respectively. In the Finnish case we report monthly earnings. Unfortunately, we do not have strictly comparable information on the earnings of the employees for Denmark and Finland, but we report an estimate of the hourly earnings for Denmark instead. In both countries, the median (50th percentile) earnings of innovators is pretty close to that of managers. However, earnings (or wages in the case of Denmark) of the innovators (and other occupation groups) are much more compressed than those of the managers in both countries.

3 Mobility

We first compare employee mobility in Finland and Denmark by considering the share of employees who have recently changed their employer. Specifically, we compute the share of employees who have been working for their current employer for less than 5 years.

Tables 2a and 2b show the results. As for Finland, the proportion of all employees that have recently changed their employer has declined from 47.3% in 2000 to 43.4% in 2011. In Denmark, that proportion has declined from 74.6% in 2000 to 70.0% in 2010. That is, overall worker mobility is much higher in Denmark than in Finland. The general decline in labour mobility has also been found elsewhere, for example in the United States (Davis & Haltiwanger, 2014).

Table 2a Share of employees that have been in the current firm less than 5 years (%), Finland

	2000	*2005*	*2009*	*2010*	*2011*
All employees	47.3	41.3	44.2	42.4	43.4
Managers	70.8	30.1	40.2	32.9	32.0
Innovators	47.2	49.7	44.9	44.4	44.4
Professionals	45.0	41.5	45.0	43.7	42.8
Workers	44.7	42.3	44.8	43.8	45.6

Table 2b Share of employees that have been in the current firm less than 5 years (%), Denmark

	2000	*2005*	*2009*	*2010*
All employees	74.6	73.3	71.0	70.0
Managers	54.4	55.1	55.8	52.3
Innovators	68.6	66.3	63.4	62.1
Professionals	76.9	71.6	71.6	67.3
Workers	75.4	74.4	72.0	71.9

Differences between occupation groups are relatively modest except that managers typically have longer job spells. Zooming in on the mobility of Innovators, Tables 2a and 2b show that innovators are also less mobile in Finland than in Denmark. For example, for Denmark in 2010, 62.1% of innovators have been hired into their current firm within the past 5 years while the corresponding share for Finland was 44.4%. Also, the mobility of innovators declined in both countries from 2005 to 2009. It should be noticed, however, that in Finland innovators have often been the most mobile group of labour, whereas in Denmark, innovators are less mobile than managers, (other) professionals, and (other) workers.

For the results presented in tables 2a and 2b, mobility was identified based on employers' firm IDs. Specifically, we considered whether the firm ID that the employee is associated with had changed. We also conducted a complementary analysis based on establishment IDs. There are two main reasons why the results based on establishment codes may differ from those based on firm codes. First, in some cases the firm code changes due to e.g. ownership change, even though all employees continue working in their current jobs. Second, some employees may move to a different establishment within the same firm. The results based on the establishment codes are reported in tables 3a and 3b. The mobility of the employees appears somewhat higher when identified by means of the establishment code. This can be explained by labour mobility between establishments within the same firm. However, the basic patterns are similar to those reported in tables 2a and 2b. One important difference with respect to tables 2a and 2b is that when measured by the establishment code, the mobility of innovators has remained more or less stable since 2005. Also the differences in labour mobility between the two countries now seem somewhat smaller than when comparing tables 2a and 2b.

Table 3a Share of employees that have been in the current establishment less than 5 years (%), Finland

	2000	*2005*	*2009*	*2010*	*2011*
All employees	61.9	57.4	60.0	58.6	56.5
Managers	79.0	55.5	63.2	52.7	46.0
Innovators	67.4	58.3	58.6	57.9	57.1
Professionals	64.1	61.2	60.9	60.5	57.7
Workers	59.8	57.5	59.5	59.5	58.2

Table 3b Share of employees that have been in the current establishment less than 5 years (%), Denmark

	2000	*2005*	*2009*	*2010*
All employees	70.1	69.9	72.7	72.2
Managers	51.1	52.3	58.0	57.4
Innovators	68.5	65.5	67.8	67.5
Professionals	73.1	70.2	75.4	74.1
Workers	70.6	60.6	73.4	73.1

4 Innovators and productivity

In this section we consider the allocation of innovators across firms with different labour productivity, measured as value-added per unit of labour. We think of labour productivity as a crude indicator of the firm's technological level. In order to improve the relevance of our indicator, we use within-industry relative labour productivity. That is, we concentrate on labour productivity differences between firms operating in the same industry (defined about 2-digit industry-level).[6] This is to control for the marked differences in capital intensity (i.e. capital input per labour input) between industries. We compare the allocation of innovators to that of other professionals, managers and production workers.

The drawback of this measure of productivity is that it fails to capture absolute differences in productivity. For example, if a worker moves from a relatively low productive firm in a highly productive industry to a relatively high productive firm in a low productive industry, the worker will see an increase in the within-industry relative productivity, but may experience a decrease in absolute productivity. Given that Danish workers (including innovators) are much more mobile than their Finnish counterparts (and presumably also more mobile across 2-digit industries), this problem is likely to be more pronounced in Denmark than in Finland. We proceed keeping this potential caveat in mind.

4.1 Allocation of the employees by firm productivity

Figure 2 displays employment shares of different occupation groups by firm productivity. For these figures, the firms are classified so that each firm group accounts for 20 percent of the total labour force.

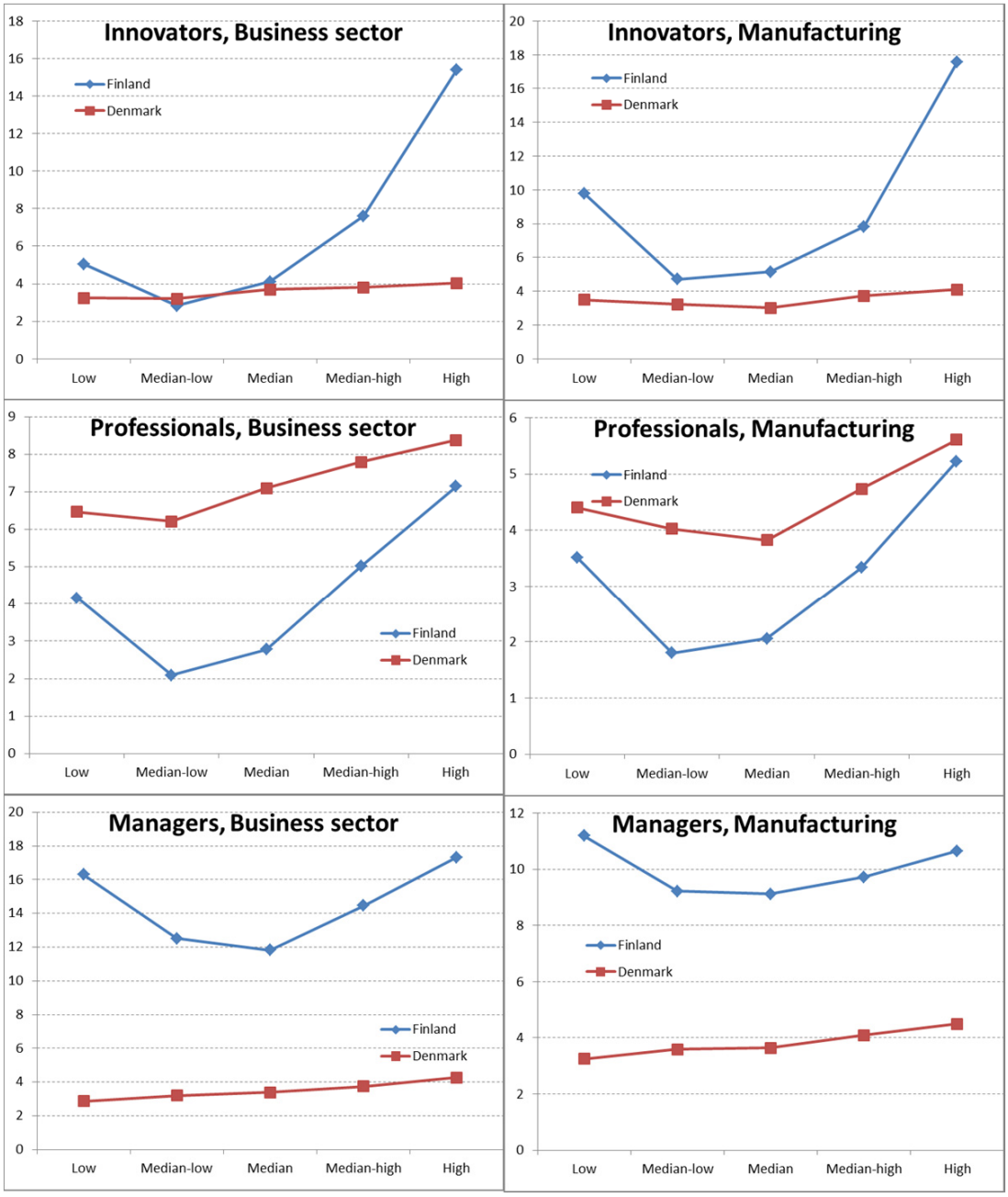
In Finland, innovators cluster in high productive firms. Indeed, within the business sector, 16 percent of the workers in the top quintile of the employment weighted productivity distribution are innovators. Among workers in the 3rd (middle) quintile, only 4 percent are innovators. As it turns out, the share of innovators increases a bit to about 5 percent when we consider workers in the bottom quintile of the employment weighted productivity distribution. The employment shares of innovators by productivity quintiles are similar in the manufacturing sector, although here, the share of innovators in the bottom quintile is higher, at about 10 percent. For managers and other professionals the pattern is similar but the productivity gradient is less pronounced.

We obtain qualitatively similar results for Denmark, but quantitatively, there is much less evidence that innovators cluster in high productive firms. For managers and professionals, we also find a much weaker productivity gradient in Denmark than in Finland. The distribution of worker types across productivity quintiles is also found to be similar in the business sector and the manufacturing sector.

While some of the differences between the Finnish and Danish results are quite striking, it should be noted that it is not clear what the optimal allocation of innovators (or other workers) across firms of different productivity should look like. It should also be clear that these static

[6] Labor input is the number of persons engaged measured in full-time equivalent units, i.e. effectively in hours worked.

Figure 2 The share of employment groups by firm productivity (%)



measures of allocation of labour between less and more productive firms need not tell much about the causal relationship between firms' occupational structure and their productivity.

4.2 Employee flows by firm productivity

We now consider worker flows between firms with different labour productivity. In our baseline analysis, the mobility is identified on the basis of the establishment code. We consider all employees that have been working in a business sector firm in either 2005 or 2010 and have changed their employer between these years.[7, 8]

Some of these employees have made a switch between an establishment in the business sector and other sectors of the economy. With micro data we can identify individuals that have a university degree and have been employed in the research sector. In our terminology, "research sector" includes the universities (industry 85 in the NACE 1 classification) and the "scientific research and development" industry (industry 72 in the NACE 2 classification). Hence, we can consider mobility from the research sector to the business sector.

We examine the distributions separately on the basis of relative labour productivity of the source firm, i.e. employer in 2005, computing the share of employees moving to destination establishments in different productivity groups in 2010. We conduct the analysis separately for innovators, professionals, managers, and workers. Of course, when interpreting our results, the caveats relating to the use of relative within-industry productivity rankings described above should be kept in mind.

Figure 3 shows the results. To understand the figures, consider first the top-left panel (innovators) in Figure 3 (Finland). The figure shows, for instance, that about 25 percent of the innovators that left a high-productivity firm in 2005 were in a low-productivity firm in 2010 while 45 percent of them were in a high-productivity firm. If the sorting were random, the share of each destination group would be 20 percent.

The following two patterns can be observed both in the Finnish and the Danish data.

1. There is a strong tendency for employees in a high-productivity establishment to move to another high-productivity establishment. This tendency is especially pronounced in the case of innovators and other professionals.

As mentioned above, Figure 3 shows that in Finland about 45 per cent of the innovators and professionals that have left a high-productivity firm in 2005 were found in another high-productivity firm in 2010. In Denmark, these two shares are about 75 per cent.

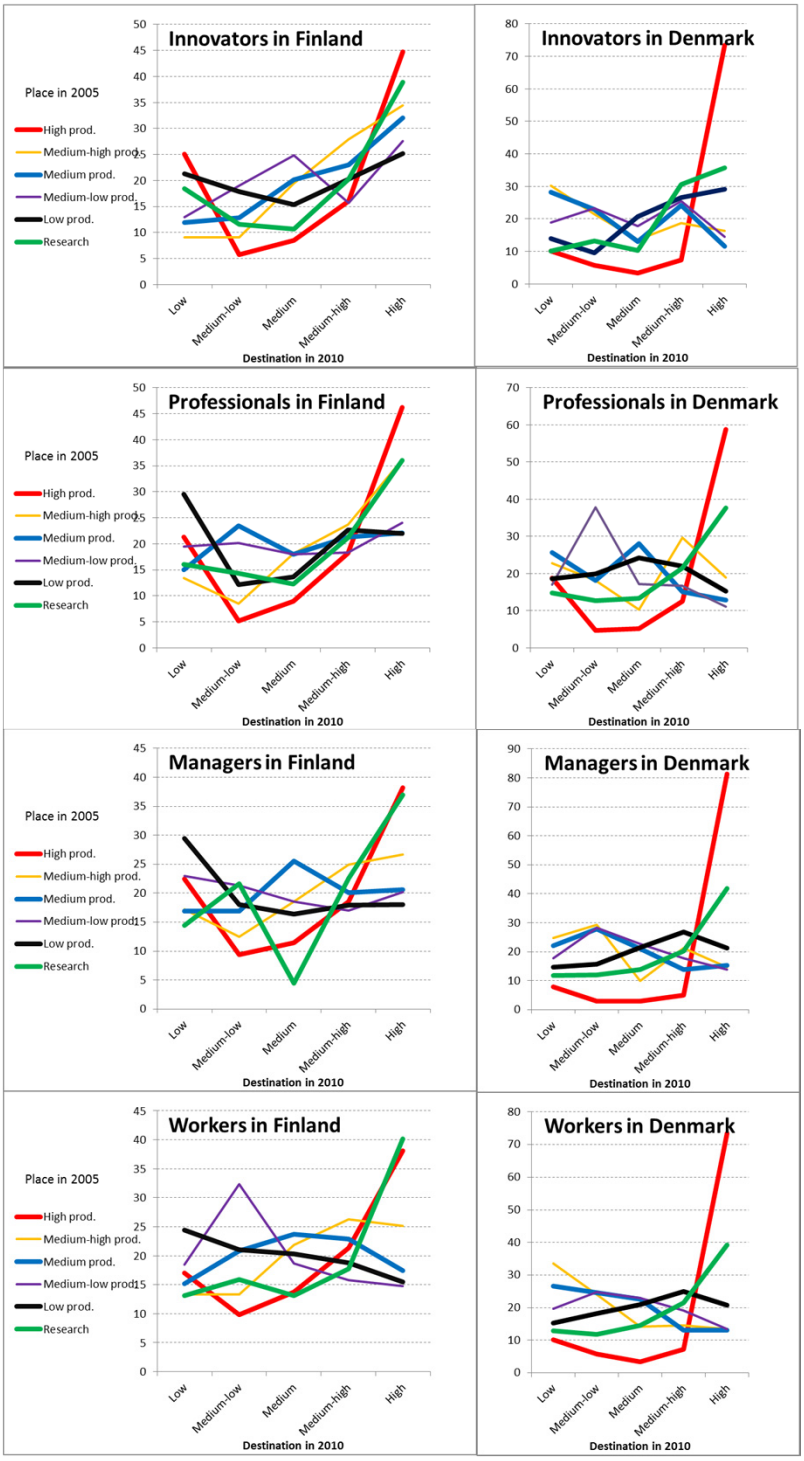
2. Innovators tend to move towards employers having a higher productivity level than their previous employer.

[7] Insurance and finance sector as well as the private research sector are not included. However, the private research sector is considered as a potential source of worker flows, i.e. we examine employment flows also from the private research to firms operating in (other) Business sector industries.

[8] The employment group of the individual is defined on the basis of year 2005 if she worked in a business sector firm, otherwise on the basis of year 2010 (i.e. she has entered the business sector after 2005).

Upward-sloping lines in the top panels of Figure 3 indicate that the next employer of an innovator usually has a higher productivity than the current one. This is especially the case in Finland. This pattern is much less pronounced among (other) workers in both countries.

Figure 3 Distribution of employment flows by destination



One difference between the Finnish and the Danish results is that, in Finland, mobility from the most (relatively) productive employers to the least (relatively) productive employers is relatively common, especially in the case of innovators. Indeed, about 25 percent of innovators that left a high (relative) productivity employer end up in a low (relative) productivity employer. This type of transition is also not uncommon among managers and professionals. A possible explanation for this pattern is that the group of employers with low relative productivity includes new firms with good growth prospects, and that this is attractive to innovators (and managers as well as professionals). For example, Bartel and Lichtenberg (1987) found evidence that highly educated workers have a comparative advantage at an early stage of plant lifecycle when implementation of new technologies is most intensive. It may of course also be the case that individuals find absolute, and not relative within-industry, productivity an attractive characteristic of an employer, and that our relative productivity measure fails to pick this up.

As for the employees coming from the research sector, it is interesting to note that they cluster at employers with high within-industry relative productivity. This pattern is similar for all worker groups.

In Figure 3, the mobility of employees is identified on the basis of whether or not the establishment identifier was the same in years 2005 and 2010. As a robustness check, we have performed the same analysis by use of firm identifier. We have also performed the same analysis for the period 2000-2005 in Finland. Results are generally similar to those presented here.

5 Earnings growth of movers

In this section we consider how labour mobility is related to earnings growth (or wage growth in the case of Denmark). We are interested in two main questions. First, we wish to see whether there is a substantial difference between Finland and Denmark in terms of the relation between job mobility and earnings growth. Second, we want to explore whether innovators differ from other worker groups in this respect. Note that we examine changes in the earnings of the movers. This effectively controls for individual characteristics in the level of earnings (see Tables 1a and 1b)

In the following analysis, the source and destination firms are classified into ten groups on the basis of both their age and relative efficiency. By taking firm age into account, we can check whether the results are driven by issues related to firm life cycles that are shown to play an important role in the reallocation of labour (for Finnish evidence, see Hyytinen and Maliranta, 2013). We follow the same approach as Haltiwanger, Jarmin, and Miranda (2013) and measure a firm's age on the basis of its oldest establishment. Firms are classified into two groups; the young firms, whose oldest establishment is not older than four years old, and the old firms, whose oldest establishment is at least 5 years old. Both age groups are classified into five groups on the basis of their relative productivity.

Figure 4 shows the growth rates of nominal earnings (monthly earnings in Finland and hourly wages in Denmark) of the employees that have changed employer (identified on the basis of establishment code) between years 2005 and 2010 in Finland.[9] We focus on the movements

[9] Our measurement of earnings is based on the median earnings.

from the old firms to young and old firms.[10] In the remainder it is understood that we refer to growth in monthly earnings when we refer to Finland, and growth in the hourly wage rate when we refer to Denmark.

According to the statistics of the National Accounts compiled in the OECD's Stan-database, nominal aggregate hourly wages in the business sector increased by 25.7% in Finland and by 18.1% in Denmark from 2005 to 2010.

Figure 4 indicates substantial variation in the earnings growth rates depending on the occupation as well as the age and productivity of the source and destination firms. This variation is particularly pronounced in Finland. It seems that the higher is the productivity of the destination firm, the higher is earnings growth rate (the lines are upward-sloping). Moreover, the highest pay rises are given to employees who move from an old low-productivity firm (dark-line is above other lines). These patterns in the earnings dynamics are roughly similar across all employee groups in Finland. More generally, the observation that different firms may need to provide different earnings for the same workers is evidence of some type of labor market rigidities.

We find, roughly, the same qualitative pattern for Denmark, but we note a quantitative difference. The wage growth profiles for Denmark appear slightly flatter than for Finland for most worker groups. Indeed, for earnings growth for movers among the group of (other) workers in Denmark appears to be independent of the within-industry relative productivity of the destination firm (the lines in figure 4 are essentially flat for this group of workers). These differences may of course stem from the fact that we consider hourly wage growth in Denmark and monthly earnings growth in Finland, or from differences in the aggregate economic conditions in the two countries.

Perhaps more importantly, labor market mobility is very high in Denmark relative to Finland. Some of this mobility is manifested through more direct job changes without intervening unemployment (a likely source of wage growth), and some from higher likelihood of job destruction. The higher rate of job destruction in Denmark is likely to dampen the average wage growth observed between 2005 and 2010 for Danish workers. Specifically, the relatively low earnings growth associated with transitions from low to high productive employers observed in Denmark, may come from the fact that many of the workers found in low productive firms in 2005 and high productive firms in 2010 have experienced an unemployment period somewhere in between 2005 and 2010. This would have weakened their bargaining power upon taking finding a new job, resulting in a relatively low wage, even if hired into a high productive firm.

Individual earnings and wage growth results from experience (or human capital) accumulation or investments, learning, job mobility, productivity shocks etc. It is beyond the scope of this paper to interpret the findings reported in Figure 4 in terms of the relative importance of these different sources. However, we note that both the upward sloping lines (for given productivity of the origin firm, wage growth is increasing in the productivity of the destination firm) and the ranking of the lines (for given productivity of the destination firm, wage growth

[10] We have also examined the growth of earnings of the employees that have left a young firm. The patterns are broadly similar to those reported in Figure 4 but they involve a great deal of irregularities.

Figure 4 Median wage growth of the firm switchers by source and destination in the Business sector

is decreasing in the productivity in the origin firm) is qualitatively consistent with the predictions of a standard on-the-job search model with heterogeneous (see e.g. Mortensen, 2003).

As depicted in Figure 3, especially in Finland and to some extent also in Denmark, innovators and other professionals tend to move towards more productive firms. Figure 4 in turn suggests that these employee flows are driven by higher pay increases offered by more productive destination firms.

6 Conclusions

We use Finnish and Danish linked employer-employee data to study the mobility of innovators, i.e. employees that firms are likely to use in various R&D&I activities. From a Finnish point of view, Denmark provides an interesting benchmark country because its labour market is often considered very flexible.

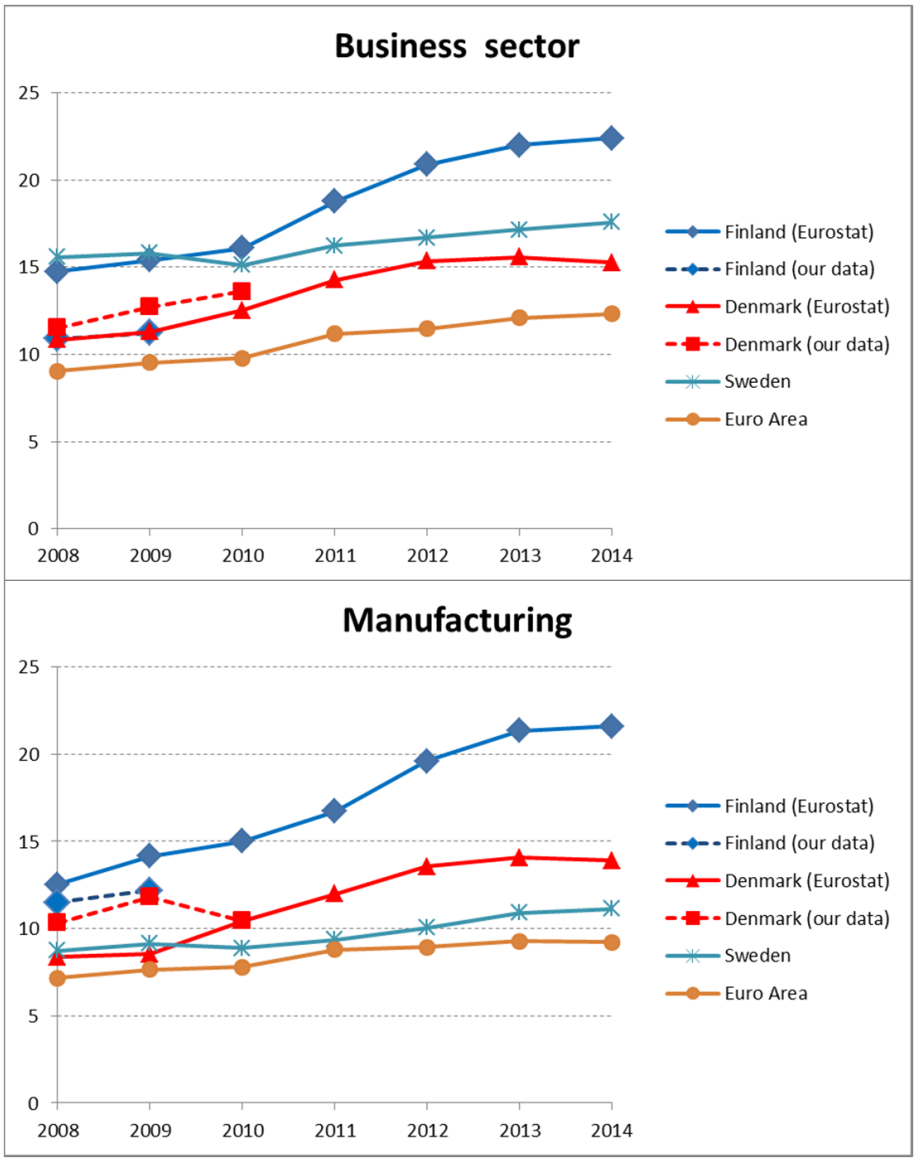
We find, first of all, that average labour mobility is indeed much lower in Finland than in Denmark. We also find that, unlike in Denmark, in Finland movements of production workers from low productivity firms to high productivity firms are associated with relatively large wage increases, the average wage growth rate being the highest for those who move from a very low productivity firm to a very high productivity firm.

Also Danish innovators are more mobile than Finnish innovators. However, unlike in Denmark, in Finland innovators are actually more mobile than other main occupation groups. Moreover, when considering the patterns of earnings growth associated with employee mobility among innovators, the differences between Finland and Denmark appear to be much less pronounced than in the case of production workers. The employment share of innovators is also higher in Finland than in Denmark.

In Finland, innovators tend to cluster in firms with high within-industry relative productivity. This pattern is less pronounced in Denmark. However, in both countries innovators tend to move towards more productive firms. In these respects, innovators seem very different from production workers.

Appendix

Figure A.1 Employment share of professionals ("innovators" + other professionals), %



Source: Eurostat and our data.

Table A.1 "Innovators" (i.e. senior officials and employees in research and planning)

ISCO-08	*Occupation*
2111	Physicists and astronomers
2112	Meteorologists
2113	Chemists
2114	Geologists and geophysicists
2120	Mathematicians, actuaries and statisticians
2131	Biologists, botanists, zoologists and related professionals
2132	Farming, forestry and fisheries advisers
2133	Environmental protection professionals
2141	Industrial and production engineers
2142	Civil engineers
2143	Environmental engineers
2144	Mechanical engineers
2145	Chemical engineers
2146	Mining engineers, metallurgists and related professionals
2149	Engineering professionals not elsewhere classified
2151	Electrical engineers
2152	Electronics engineers
2153	Telecommunications engineers
2161	Building architects
2162	Landscape architects
2163	Product and garment designers
2164	Town and traffic planners
2165	Cartographers and surveyors
2166	Graphic and multimedia designers
2421	Management and organization analysts
2422	Policy administration professionals
2423	Personnel and careers professionals
2424	Training and staff development professionals
2631	Economists
2632	Sociologists, anthropologists and related professionals

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ETLA
Elinkeinoelämän tutkimuslaitos
The Research Institute of the Finnish Economy
Lönnrotinkatu 4 B
00120 Helsinki

Puh. 09-609 900
Fax 09-601 753
www.etla.fi
etunimi.sukunimi@etla.fi

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