

Morkute, Gintare

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Growing surrounded by decline: do the growing sectors benefit from sharing a labour pool with declining sectors

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Growing surrounded by decline: do the growing sectors benefit from sharing a labour pool with declining sectors

Gintare Morkute

Department of Economic Geography, University of Groningen

Email: g.morkute@rug.nl

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Abstract

Background and motivation: The paper investigates what effects the colocation of growing and declining sectors has on the hiring behaviour of growing sectors in terms of labour pooling and employment growth. Given the importance of geographical proximity in labour matches, the agglomeration literature has suggested that creating dense clusters of (related) economic activities decreases the distances between the firms and the employees, which enables better labour matches and idiosyncratic labour demand absorptions. However, in such clusters the positive effects of labour pooling can be dominated by negative effects of labour poaching, depending on the labour demand of the participants of agglomeration. I build upon the agglomeration literature, but extend it to a framework where the employees flows among sectors in the region are influenced by different growth rates of sectoral labour demand. *Data and methods:* rich datasets are used with micro-level data linking jobs, firms and employees in the Netherlands 2006-2011. OLS regressions at municipality and NUTS3 area level are conducted. *Results and conclusions:* The effects of colocation with declining sectors for growing sectors are only marginal. In terms of labour pooling, the easy access to redundant labour force does not encourage the growing sectors to hire more locally. Generally, the employees from declining sectors do not dominate the inflows of declining sectors: the growing sectors focus more on new entrants in the labour market or pooling with stable and other growing sectors; they also tend to hire more outside the region. Moreover, the reluctance to hire locally is understandable: the labour pooling, quite unexpectedly, generally has negative effects on growing sectors' employment growth and even more so in regions with much decline. The overall effects of decline in the region on the employment growth of growing sectors are only statistically significant (and positive) at NUTS3 area level for related decline, probably due to capital flows from declining sectors (it does not correspond to labour force flows). While the implications of the results are quite neutral in terms of location of sectors they are quite negative for redundant employees and regional development in general. The lack of flows from declining to growing sectors indicate that many employees are not able to catch up with the rapid creative destruction. The skills in the redundant sectors are often of little relevance to other sectors.

Keywords: labour pooling, intersectoral flows, regional development.

Introduction

The jobs creation and destruction processes have been very dynamic in the last few decades in the Western world. Greater labour market flexibilization has made employers more responsive to cyclical fluctuations but also processes such as globalization and technological developments have resulted in substantial structural changes. Globalization created possibilities to outsource certain jobs and the rapidly developing technology replaced some jobs as well as created new different jobs for people able to use the new technologies: occupations such as social media marketing specialist or mobile applications developer did not exist ten years ago (see e.g. Nedelkoska (2010) for a detailed study on jobs outsourcing and labour-capital substitutability in West Germany). A high school graduate has little certainty nowadays in his/her endeavours to choose an occupation that will remain in demand throughout his or her working career in the rapidly changing labour market. Such a hypothetical high school graduate is likely to have to switch jobs and learn new skills in order to catch up with Schumpeter's creative destruction. Nedelkoska (2010) shows that indeed the involuntary occupational mobility (job –unemployment – job in another occupation) has been on the surge for 35-45 old year employees in Germany. In this paper I focus on the growing sectors (I define the growing sectors as sectors with growing employment) and how their labour market demand increases can be absorbed through intersectoral flows.

Given the emphasis on proximity to new inflows in previous research, I suggest that for growing sectors the availability of skilled employees' pool locally leads to reaping the benefits of labour pooling and subsequently greater growth; and that such a situation is bound to happen in the case of colocation of growing and declining sectors. The colocation of growing and declining sectors has been previously prescribed to promote the sectoral variety in the region as a way to also increase the variety in growth/decline rates, make the intersectoral flows from declining to growing sectors easier and consequently absorb the sectoral labour demand shocks (e.g. Boschma & Iammarino, 2009) but the mechanism has not been, to my best knowledge, empirically inspected.

I follow Menzel's (2008) line of reasoning in seeing the regional development of sectors as a reflection of the development of the whole sector nationally, but 'biased by geographical proximity and the specific regional context'. The growth of employment has been shown to be dependent on the regional environment. Dumais et al (1997) observe the great scale of job creation and destruction in the United States in the last two decades of the twentieth century. While the levels of geographical concentration remained approximately the same over this period, the job destruction and creation process has shifted many employees across plants, firms, and locations. Essletzbichler (2004) analysed the geography of job creation and destruction from 1967 to 1997 in the United States uncovering 'a complex picture undermining the simple notion of the snowbelt-sunbelt shift'. In their analysis on the manufacturing sectors, Atzema & Wever (1999, pp. 67-82)) argue that historically the Dutch manufacturing sector has also undergone considerable geographic shifts: from the process of regional specialization up to approximately 1963 to the spatial deconcentration that followed. They show that jobs were transferred, created and destroyed in different regions, heavily influenced by path dependency in response to regions' natural advantages, availability of labour force and the presence of other sectors.

The local supply of labour force is a part of such regional context determining to a great extent how much and what skills flow into sectors. For instance, Izushi & Aoyama (2006) show that the computer games sector emerged from different previously existing sectors and used different skills in Japan, United Kingdom and the United States, which resulted in unique development paths. Rigby & Essletzbichler find numerous times strongly pronounced regional differences in techniques of production with no evidence for convergence towards the best practices (Rigby & Essletzbichler 2006, Rigby & Essletzbichler 1997, Essletzbichler & Rigby 2005a, Essletzbichler & Rigby 2005b), which is supposedly related to using different skills, be it the consequence of or the reason for different production techniques.

The paper focuses on the importance of inflows **from other sectors locally**. While it might differ by the skills level, indeed it seems that the labour matches are more easily made across sectors than across space. Weterings et al (2013) show that out of all individuals that started getting the unemployment benefits in the Netherlands over the period from 2003 to 2010, only 50% had a ‘substantial’ paid job (at least one year in duration, at least twenty hours per week, excluding those who became entrepreneurs) two years later. Out of those with the ‘substantial’ paid job only 4.4 % have relocated, though 36% have found a job in another labour market area, here understood as NUTS3 area. In contrast to this, intersectoral flows are much more pervasive: for instance 77.2% of all job changers have switched sectors in Sweden over the period from 2004 to 2007 measuring at four digit level (Neffke & Henning, 2013), though certainly the transitions between different sectors are not equally easy or even possible.

Indeed, in the research focusing on individual firms’ hiring behaviour there is a large body of evidence that the firms count on the local labour pool and dislike the employees from further away. Zenou (2002) suggests a model in which firms set efficiency wages and determine the optimal catchment area. Hiring from outside the area is avoided as the remote workers are less efficient at work. Hanson & Pratt (1992) interview employers and note that they perceive that workers living close to the plant are more productive, less stressed, and more motivated to work. Some findings indicate that the employers also at least partially contribute to monetary relocation or commuting costs (e.g. Rupert et al. 2009, Mulalic et al, 2010, van Ommeren et al, 2007, van Ommeren & Rietveld, 2007). The employees also prefer being employed at firms close by (Sandow & Westin, 2010, Brownstone & Small, 2004, Rouwendal, 1999, van Ommeren et al, 2000) which gives firms with an access to a large local labour pool a comparative advantage in hiring. A greater local labour pool can be achieved in location with dense (related) economic activities, however, generally, then there are also a greater number of firms competing for the employees. But if the different labour demand growth rates are taken into consideration, the firms sometimes can benefit from a labour pool with little competition for it from other firms.

The main contribution of the paper is incorporating the geographical and regional dimensions into understanding the sectoral shifts. In the previous research, the intersectoral shifts literature has acknowledged need for reallocation of the employees from the declining sectors to the growing sectors but has largely ignored the role of geographical proximity. The agglomeration literature, on the other hand, stresses the role of proximity but sees the sectors labour demand and the regional labour pool as static. Answering the question how the growing sectors’ hiring behaviour is influenced by the proximity to declining sectors is important as the investments in human capital nowadays are greater than ever; therefore shifting to new sectors that leave the previously generated labour skills idle is also more costly than ever. Hindering the development of successful growing sectors also hampers the economic growth and competitiveness of a country. The paper also contributes to a better understanding of the development of the different regional paths of the sectors and the mechanisms of labour pooling.

Theoretical framework

The effects of declining sectors on growing sectors in the same region

The research on the colocation of growing and declining sectors has mostly focused on the renewal and restructuring of the old industrial regions. Mostly it is argued that the clusters of mature sectors produce negative externalities adversely affecting the new jobs formation in the region. Some of the effects are the following: 1) The previous success of big declining clusters results in higher prices, wages and rents (Brezis & Krugman, 1997, Stam & Garnsey, 2009), 2) The declining sectors develop certain rigidities (lock-ins): they prefer continuing with the old technology that they are efficient with, strive to preserve the present status quo and lose the ability to learn (Brezis & Krugman, 2009, Boschma & Lambooy, 1999, Grabher, 1993, Maskell & Malmberg, 2007), 3) The old declining regions tend to develop oligopolistic and vertically integrated structures creating barriers for the new entrants (Boschma & Lambooy, 1999).

However, there are some objections to the argument listed above. Firstly, it must be noted that the previous arguments are not necessarily applicable of all cases of declining and growing sectors colocation but rather make strong assumptions about the size and lifecycle of both growing and declining sectors. Secondly, it has been argued that the role of negative externalities is overestimated. Stam & Garnsey (2009) argue that next to negative path dependency also a positive path dependency is possible as the new sectors build up on the knowledge generated in the old clusters, and that it ‘remains an empirical question which one of them dominates the picture’. Boschma & Lambooy (1999), after analysing the negative externalities of old sectoral clusters, admit that those effects are often overestimated and that there are examples of successful transformations from old declining sectors to new emerging sectors, for instance in London, Paris, New York. Indeed such transformations might be not infrequent but the dramatism of declining regions attracts more interest from academia and policymakers.

Mostly the old industrial regions restructuring literature is silent on the role of labour flows from the declining to growing sectors, or this role is only implicit, e.g. when talking about the knowledge transfers. However, the availability of skilled labour force is one of the important reasons for a location to qualify for new job creation or retention (see for instance, agglomeration literature, Florida, 2002, Florida, 2005).

Yet in an another strain of literature it is argued that the decline also releases resources which enables growth elsewhere; a central role is always assigned to human resources. The argument has often been developed at firms level (Buenstorf & Fornahl, 2009, Hoetker & Agarwal, 2007, Hanson & Pratt, 1992) but has been also applied for sectors (Bathelt & Boggs, 2003, Neffke & Henning, 2013)

The labour pooling between growing and declining sectors

Using the framework of labour pooling from agglomeration literature, this section focuses on labour force flows between declining and growing sectors. Alfred Marshall has suggested in 1920 that labour pooling is one of the reasons for firms to agglomerate. The firms in agglomeration enjoy a shared labour pool and can form many high-quality labour matches with employees in the close vicinity. Ellison et al (2007) confirm empirically that labour pooling is an important force in determining firms colocation. Rosenthal & Strange (2001) show the labour pooling to be the most important of all Marshall’s hypothesized agglomeration mechanisms, present at all analysed geographical levels.

Two mechanisms are suggested to explain how labour pooling benefits the hiring firms (Moretti, 2012):

1. If a greater labour pool is available, the markets are ‘thicker’ and the matches are of better quality.
2. A laid-off employee can find a new job more easily in a thick labour market if the lay-off is caused by firm-specific problems and not recession. Similarly, firms can fill new vacancies better. A requirement is again that the firm labour demand growth is firm-specific only and not correlated across firms.

The focus of the paper lies predominantly on the second point. Overman and Puga (2010) show that indeed the sectors, whose firms are more prone to idiosyncratic volatility, are indeed more likely to agglomerate. They argue ‘The crucial point, as previously discussed, is that a labor pooling advantage only arises if whenever a plant expands employment, many other plants using similar workers are contracting and vice versa. That is, what matters is the plants’ idiosyncratic need to alter employment.’

However, labour demand changes are not always uncorrelated across firms but rather to great extent also depend on a broader economic environment. Following Overman and Puga’ (2010) argument, in this case labour pooling might be more harmful to a firm that it would be advantageous. Hanson & Pratt (1992) show that while in the area they studied 90% of the employers recognize that they share a labour pool with other local employers, 34% of those considered it to be disadvantageous, mostly because of competition. Indeed if many establishments experience growth in labour demand simultaneously, the negative effects of labour poaching would dominate the positive effects of absorbing the idiosyncratic

volatility (see Combes & Duranton, 2006 for analysis of positive effects of labour pooling versus negative effects of labour poaching). It seems therefore that as firms' labour demand grow they benefit from sharing labour pool with the firms whose labour demand decreases.

In other words, firms do not want to be close to firms using the same labour skills as Marshall's labour pooling has been often conceptualized. As determined by the laws of demand and supply, firms benefit from being close to labour force, not to other firms. Though indirectly the presence of other firms enables generating a bigger labour pool, other firms are also direct competitors for the labour force. While it is likely that most of the times the magnitude of the desirable labour pool and the number of firms competing for it are in the state of equilibrium, certain (temporary) discrepancies are bound to arise if there indeed are patterns in labour demand growth of the firms located close to each other.

In order to address the issue that the labour demand changes are not always uncorrelated across firms but rather to great extent also depend on a broader economic environment an argument similar to that of Overman and Puga (2010) has also been developed for sectors. If labour pooling between sectors is important, sectors benefit from a greater sectoral diversity in the region as the sectoral labour demand shocks can be absorbed by other sectors more easily. The application of Overman & Puga's (2010) findings to sectors is meaningful in several ways. First of all, the magnitude of intersectoral labour flows suggest that the labour pooling is by no means limited to one sector. Secondly, the sectoral shifts can be of a more substantial importance in comparison to fairly short-lived and unpredictable idiosyncratic establishment-level labour demand fluctuations.

This argument has been presented in various manners. Pasinetti (1993) argues that due to technological change certain sectors are inevitably experience declining unemployment. One way of dealing with technological unemployment is increasing the diversity by creating new goods and services to absorb the redundant employees. Boschma & Iammarino (2009) also speculate that a diverse economy can better absorb asymmetrical and sectoral shocks through redirecting the redundant employees into other sectors. Frenken et al (2006) suggest 3 mechanisms through which the sectoral diversity benefit regions (distinguishing between related and unrelated variety): Jacob's spillovers, portfolio diversification protecting the region from external shocks in demand, and the easier redundant labour force absorption in growing sectors.

Hypotheses

The paper enquires into the overall effects of colocation with the declining sectors on employment growth of growing sectors and more specifically, the effects on employment growth of growing sectors due to labour pooling with the declining sectors, stemming from colocation. Based on this research objective, the hypotheses are formulated:

H1 Growing sectors grow more rapidly in the regions where there are many declining sectors. The productivity of employees living close is higher and the costs are lower. As discussed above, they are more productive, more efficient and motivated the firm does not have to compensate their relocation or commuting expenditures. This makes additional hiring more desirable.

H2 Growing sectors labour-pool more in the regions where there are many declining sectors.

H3 Labour pooling in general and labour pooling with the declining sectors (partially) explain the greater employment growth.

H4 The relationships in H1, H2 and H3 are stronger for growing sectors being located in the regions with declining sectors related to them than with unrelated declining sectors. The growing sectors are more inclined to use the redundant employees if the skills distance is small. Since the sectoral relatedness is an important determinant of intersectoral flows (Neffke & Henning, 2013, for instance, argue that the magnitude of intersectoral flows is the best measure of sectoral relatedness) I analyse the influence of the

presence of declining related and declining-non related sectors separately. I hypothesize that the greater skills relatedness enables easier intrasectoral transitions between declining and growing sectors.

H4 The relationships are the strongest at NUTS3 area level. The analyses are performed at municipality and NUTS-3 area levels to reveal on which spatial scale the effects are at work. As traditionally in the Netherlands NUTS3 areas are used to define the regional labour markets, it is expected that the effects are the strongest at this geographical level.

H6 The growing sectors with lower levels of skills and specialization benefit more from being located close to declining sectors. In case of mismatches in the labour market geographical mobility is more prominent for highly-skilled positions and employees (Bound & Holzer, 2000, Reisinger, 2003), the low-skilled are less geographically mobile but can switch sectors more easily (Neffke & Henning, 2013), therefore I expect proximity to be more important for growing sectors with low skills level.

Data and methods

Data

The paper uses unique very rich microdatasets provided by Statistics Netherlands. The datasets contain detailed information on employment histories as well as characteristics of firms (sector, location, size), jobs (location, wages, part time factor, type of contract (fixed-term or indefinite duration)...) and employees (residential location). The constructed dataset covers all jobs in the Netherlands over the period from 2007 to 2011, also the data from year 2006 is used to calculate some input for later years.

The rich data enables me to effectively link firms, employees and locations at every given period of time between 2006 and 2011 as well as determine various characteristics of firms (sector, location, size), jobs (location, wages, part time factor, type of contract) and people (residential location).

The data coverage is somewhat smaller for the location of the jobs. Statistics Netherlands provides two data sources: one of them records the location of the firms, but the location for firms with more establishments is imputed to be the location of the main establishment. The second dataset registers the location of jobs in December. Combining the two datasets I reach the coverage of 98.6% for all the jobs that existed at the end of every year from 2006 to 2011 and 86.3% for all the new jobs over the period from year 2007 to year 2011. The location data is known better for one-establishment firms and long jobs that span over at least one December.

In addition to that, certain assumptions had to be made given the complexity of the data. There are numerous employees (typically with fixed-term job contracts) that have episodes of the same job with gaps of various length in between. This probably happens as employee's temporary contract expires and is not renewed straight away but only after a certain time. A question arises whether those episodes should be treated as a one job or several jobs, whether renewing a contract at a previous employer is comparable to finding a new job. Here those jobs are treated as a one job if the gap between two episodes is shorter than six months.

First I use the dataset with all new jobs to enquire into strategies of labour demand absorption of the growing sectors. Then I run the analysis on a dataset aggregated at region-sector combinations level. For this analysis next to the microdata provided by Statistics Netherlands I also use publicly available Statistics Netherlands data on dwellings growth, working age population density, roads length and IBIS database on the business area size.

Model

Growing sectors are identified on a national level and their regional variation in employment growth rates and labour pooling is explored. The definition of growing and declining sectors is based on the sectoral growth rates over the period 31 December 2006 to 31 December 2011. The division is made so that

approximately 25% of the FTEs throughout that period are considered to be in growing sectors and approximately 25% are considered to be in declining sectors. Such a classification has little to do with actual growth or decline but rather concerns the relative position of the sector with regard to that of the other sectors. However, the distribution of the growth of growing sectors in the regions is skewed as there are many extreme positive values. In small sector-region combinations, even small employment changes in absolute numbers can lead to big growth in relative terms (small sector-region combinations are quite prevalent, the 25th percentile of municipality-sector size equals 4.90 FTEs or 7 jobs, for NUTS3 areas-sectors the 25th percentile is 24.73 FTEs or 30 jobs). Therefore in regressions the cases are weighed by the employment size. This limits the influence of observations where small employment growth in absolute numbers lead to big relative change. It also builds upon the line of reasoning of this paper by treating hiring behaviour as partially also determined by the external limiting factors, such as the availability of labour force. In this case not only the employment growth relative to previous size of the sector-region matters but also its magnitude in absolute numbers, reflecting its effect on labour market.

The definitions of sectors are based on Standard Firms Classification 2008 (Dutch: Standaard Bedrijfsindeling 2008, further referred to as SFC2008) version of year 2013. SFC2008 is based upon NACE rev. 2 with the first 4 digits being the same with only a few exceptions. The variables are measured and the analyses are conducted at municipalities and NUTS3 areas level. A municipality is the smallest Dutch administrative unit; the Netherlands consisted of 418 municipalities in year 2011. Since mergers or divisions of municipalities occur regularly, all the municipalities were transformed into year 2011 municipalities in order to be able to follow them in time. NUTS3 areas, also defined as labour market areas, are bigger; the Netherlands consist of 40 NUTS3 areas.

The magnitude of decline in the region is operationalized as the ratio between the FTEs lost in a sector-region in a period and the size of growing sector in the beginning of the period. I distinguish between the decline in related and unrelated sectors, based on SFC2008 2-digit level.

Labour pooling is the most difficult to operationalize of all Marshall's suggested mechanisms, as noticed by Rosenthal & Strange (2001). Different proxies have been used for labour pooling, e.g. Ellison et al (2007) hypothesize that the firms are more likely to agglomerate for labour pooling if they use the employees with the same occupations. Rosenthal & Strange (2001) suggest that firms are likely to want to colocate for labour pooling with firms that employ workers with sector specific skills. To measure the specificity of skills they introduce three proxies: net productivity, management/ production workers ratio and employees' education. Given how in the agglomeration literature the benefits of labour pooling are described as the ability to share employees with other firms I operationalize the labour pooling as the share of all inflows FTEs that previously worked in the same region. Such a measure is different from those used by Ellison et al (2007) or Rosenthal & Strange (2001) as it measures the realized labour pooling rather than the potential for it. The implications of such a choice are going to be discussed further.

However, within the framework of the selection made (only the jobs for which the sector and location is known, which excludes 16.4 % of the inflows), some sector-region combinations do not have inflows at all. After excluding the sector- region combinations which have inflows but with the location of their previous job unknown, there are still 803 out of 11733 municipality-sectors and 10989 out of 60703 NUTS3 area-sectors that do not have any inflows at all, that is, the missing values exist not because the value is unknown but because the value does not exist. In addition, the missingness of the values also correlates with the dependant variable as the sector –region combinations without inflows certainly tend to have lower growth rates. The solution applied here is replacing the missing values with series mean and creating a dummy variable indicating whether the missing value has been imputed. In this case the dummy absorbs the effects of missingness and the imputed variable gives an unbiased estimates for the other values.

In choosing the covariates for regression on employment growth I largely follow Frenken et al (2004) and Frenken et al (2007). The variables included are:

- Sectoral dummy. 3-digit SFC2008 level sectoral dummy is included to control for growth differentials across different sectors.
- The mean of natural logarithm of wage in the region –sector combination to account for growth differentials because of wage differentials and as a proxy for the human capital level.
- Business area growth and dwellings growth in the region. The rationale for including those variables is that such arrangements facilitate and attract economic activities.
- Sectoral diversity level of the region. It is operationalized as Herfindahl-Hirschman index, calculated at two digits level of SFC2008.
- Natural logarithm of working age (15-65) population density in the region.
- Location quotient. It reflects the relative regional specialization in the sector concerned and controls for the agglomeration effects within the sector.
- Average establishment size in the region/sector combination as a proxy for competition.

The variables included in regression on labour pooling are the following:

- Sectoral dummy. 3-digit SFC2008 level sectoral dummy is included to control for growth differentials across different sectors.
- The mean of natural logarithm of wage in the region –sector combination to control for the ability to attract employees from further away because of the wage differentials.
- Dwellings growth. New dwellings make a region more attractive for relocation.
- Natural logarithm of working age (15-65) population density. The density of economic activity increases the quality of labour matches (see Bleakly & Lin, 2007).
- Average establishment size, reflecting the fact that bigger firms might be more salient among job seekers (Williamson et al, 2002), have better formalized hiring strategies and broader networks.
- Inflows characteristics per region sector: the natural log of average wage, average part-time factor, share of inflows with flexible contracts, average part time factor of the inflows. This controls for different willingness of firms and employees to make investments in terms of spatial mobility depending on the returns (see Blau, 1991).
- Road length per square kilometre to account for different accessibility in the regions.

The standard errors are clustered by region.

It also seems plausible that the effects of colocation with declining sectors differ depending on the characteristics of the growing sector. Sectors with high level of skills and specialization are likely to be less responsive to the redundant labour force in the region as they tend to prefer good labour matches, even if they are found further away. To explore the differences the wages level in the sector-region combination is used as a proxy for the skills and specialization level. The same regression is conducted including the interaction terms between the independent variables and the average wage.

I also check what the effects of labour pooling on employment growth are. It is possible that while labour pooling in general increases the employment growth, the effects of labour pooling with declining sectors are different, for instance, due to worse labour matches. Therefore I also include the labour pooling with declining and non-declining sectors separately.

Results

Descriptive statistics

The labour market dynamics analysed here take place in the context of economic recession of 2008- 2009. While the economic cycles have the potential of influencing the results as they modify the relative labour force supply and demand and the adjustments made by the employees and the employers, the recession has had surprisingly little effect on the employment. The total magnitude of employment measured in FTEs has been only declining in years 2009 (0.92%), in the other years there has been a slight growth.

The modest effects of recession on the labour market are attributed to ‘labour hoarding’: the firms have striven to retain the employees (also more employees than they actually needed) due to (overly) optimistic expectations on the impact of the recession, good financial situation before the recession enabling to avoid the disruptive measures of laying employees off and the preference to rather keep more employees than needed rather than struggle to fill in the vacancies once the labour demand increases again, this preference being predetermined by the relative scarcity of the (skilled) employees before the recession (de Jong, 2011).

While there was little change in the overall employment level, the employment growth has in no way been uniform but rather a lot of labour force have switched sectors. The growth rates for broad SFC2008 categories are shown in the table 1 (please note that the descriptive statistics are based on jobs for which the sectors and region are known, this constitutes 98.6% of all jobs and 83.6% of new inflows). Certain sectors, such as *Activities of households as employees, undifferentiated goods- and services- producing activities for own use* and *Activities of extraterritorial organizations and bodies* have experienced enormous growth however, those sectors were initially were small and did not have much influence on the overall economy. In general, the sectors witnessing the greatest decline are mostly the sectors specializing in processing the physical resources such as *Agriculture, forestry and fishery*, *Manufacturing*, *Construction*, *Transportation and storage*, with *Mining and quarrying* being the exception, while the services have seen an increase in employment (except *Financial and insurance activities*, *Administrative and support service activities*).

Activity	Growth
Agriculture, forestry and fishery	-4.32%
Mining and quarrying	15.75%
Manufacturing	-4.95%
Electricity, gas, steam and air conditioning supply	26.69%
Water supply, sewerage, waste management and remediation activities	9.24%
Construction	-5.64%
Wholesale and retail trade, repair of motor vehicles and motorcycles	3.34%
Transportation and storage	-0.96%
Hotels and catering	9.75%
Information and communication	4.53%
Financial and insurance activities	-4.76%
Real estate activities	1.50%
Professional, scientific and technical activities	6.69%
Administrative and support service activities	-6.55%
Public administration and defence, compulsory social security	8.16%
Education	5.618%
Human health and social work activities	18.11%
Arts, entertainment and recreation	3.42%
Other service activities	4.89%
Activities of households as employees, undifferentiated goods- and services- producing activities for own use	1004.392%
Activities of extraterritorial organizations and bodies	143.21%

Table 1 The sectoral growth 2006 December- 2011 December, in FTEs

The growing and declining sectors defined at three-digit level of SFC2008, as used further in the analysis, seem to distributed quite randomly in different areas of economic activity, only with a few visible trends: there are many declining sectors in manufacturing, trade consists mostly of stable and growing sectors, growing sectors are also abundantly present in healthcare.

While the sectors defined nationally as growing, declining or stable are spatially spread out fairly evenly, the regional growth rates differ quite substantially (table2). This suggests that the economic growth of regions depends largely not on the sectorial composition, but on how the sectors perform in the specific regional environment.

	Percentage of FTEs in declining sectors in 2011	Percentage of FTEs in stable sectors in 2011	Percentage of FTEs in growing sectors in 2011	Regional growth 2006 December-2011 December, in FTEs, %
Groningen	24.49%	48.07 %	27.44%	-.03
Friesland	23.78%	53.57%	22.65%	2.46
Drenthe	23.99%	53.01%	23.00%	2.17
Overijssel	26.22%	49.99%	23.79%	5.74
Flevoland	20.19%	51.99%	27.82%	12.74
Gelderland	23.12%	52.01%	24.87%	5.08
Utrecht	18.46%	51.59%	29.96%	3.94
Noord Holland	23.03%	51.54%	25.42%	2.99
Zuid Holland	20.97%	53.37%	25.66%	2.05
Zeeland	22.96%	53.22%	23.83%	5.95
Noord Brabant	25.29%	50.99%	23.72%	4.29
Limburg	26.02%	50.13%	23.85%	1.37

Table 2 The percentage of FTEs in declining, stable and growing sectors in year 2011 in Dutch provinces, the regional growth in FTEs for provinces (NUTS2 areas) 2007-2011, in FTEs

Where does the employment growth in certain sectors come from? Table 3 shows the socioeconomic status of new inflows into different sectors one year before starting the job. Growing and declining sectors are quite similar in the composition of their inflows; in contrast to the declining sectors a slightly lower proportion of their new labour force had a paid employment or were on state benefits before commencing the jobs, however, the group consisting of not yet studying/ pupils and students play a relatively more important role in their inflows. The four socioeconomic statuses in the table are derived by regrouping the socioeconomic statuses determined by Statistics Netherlands on basis of the size of income obtained from different activities combined with the data on enrolment into education institutions. The group prominent in new inflows of stable and growing sectors, *Not yet studying/pupil/student*, consist of both graduates looking for a job and students holding a side job; this category accounts for a substantial part of the new inflows, which is probably explained by the relative prominence of the graduates in the labour market, among all the other jobseekers, as well as the frequent side-jobs switching of the pupils and students.

The sector of temporary employment has been shown separately in this table, due to its size and the specific nature of the employment (otherwise it would have been assigned to declining sectors). This category here includes a large *Temporary employment agencies* category from SFC2008 (17.5 % of all new inflows over the period 2007 to 2011, also very connected to other sectors via intersectoral flows), but excludes a lot smaller and interconnected *Activities of employment placement agencies* and *Other human resources provision*.

Declining sectors	Employed	54.9%
	Entrepreneur/ other active	3.1%
	On state benefits (including retirees)/no income	15.1%
	Not yet studying/pupil/student	26.8%
Stable sectors	Employed	53.2%
	Entrepreneur/ other active	2.7%
	On state benefits (including retirees)/no income	12.4%
	Not yet studying/pupil/student	31.7%
Growing sectors	Employed	52.2%
	Entrepreneur/ other active	3.2%
	On state benefits (including retirees)/no income	12.7%
	Not yet studying/pupil/student	32.0%
Temporary employment agencies	Employed	55.9%
	Entrepreneur/ other active	2.0%
	On state benefits (including retirees)/no income	20.3%
	Not yet studying/pupil/student	21.8%

Table 3 The composition of the inflows of declining, stable, growing sectors and temporary employment agencies by the status of the employees one year before accepting the job, in FTEs (valid procent)

The composition of the inflows that have previously been working can be looked into further to see which sectors these employees come from (table 4). Most of the sectors have substantial inflows from/ outflows to temporary employment agencies, which dominate the dynamics of intersectoral flows. However, it is the declining sectors that are more likely to offer a job for people previously working for temporary employment agencies as compared to the stable or growing sectors. The stable or growing sectors do not count much on the inflows from declining sectors but rather compete for employees from other stable or growing sectors.

Declining sectors	Declining sectors	17.4%
	Stable sectors	31.8%
	Growing sectors	13.7%
	Same sector	21.0%
	Temporary employment agencies	16.1%
Stable sectors	Declining sectors	13.2%
	Stable sectors	31.4%
	Growing sectors	17.2%
	Same sector	25.8%
	Temporary employment agencies	12.4%
Growing sectors	Declining sectors	12.5%
	Stable sectors	36.8%
	Growing sectors	17.7%
	Same sector	20.9%
	Temporary employment agencies	12.1 %
Temporary employment agencies	Declining sectors	15.8%
	Stable sectors	30.5%
	Growing sectors	14.1%
	Same sector/ temporary employment agencies	39.5%

Table 4 The previous sector of new inflows that were previously employed for declining, stable, growing sectors and temporary employment agencies, in FTEs,

Geographically, the growing sectors also tend to have a broader search field for the new inflows: on all geographical levels they hire slightly more outside their own region (table 5). Also the temporary employment agencies tend to hire more outside the region at higher geographical levels. This is quite unexpected as one would anticipate less spatial mobility being acceptable for jobs that are temporary. A

plausible explanation could be, however, that the temporary employment agencies hire staff for firms located also outside the region, and the proximity is sought between the employee and the firm for which the employee is going to factually work rather than between the employee and the temporary employment agency.

	Share of new inflows hired in the same municipality	Share of new inflows hired in the same NUTS3 area	Share of new inflows hired in the same NUTS2 area	Share of new inflows hired in the same NUTS2 area
Declining sectors	36.7%	57.5%	71.9%	84.0%
Stable sectors	32.1%	54.2%	69.8%	82.5%
Growing sectors	32.9%	53.3%	67.9%	81.9%
Temporary employment agencies	33.2%	50.0%	64.9%	77.6%

Table 5 The share of inflows coming from the same region, for declining, stable, growing sectors, and temporary employment agencies.

Based on descriptive statistics there is no evidence that the growing sectors employ the labour force left redundant in declining sectors: In relative terms, the labour force from declining sectors does not play a big role in the inflows to stable and growing sectors, the stable and growing sectors rather compete for the same employees coming from other stable and growing sectors. The growing sectors also tend to extend the geographic search field looking for new employees.

Regression

Firstly, I perform a regression to show whether many employees left redundant in the region would encourage the local hiring by the growing sectors (further referred to as regression 1). The results of the regression are presented in table 6. While the effects of decline in the region have the positive sign on local hiring in growing sectors at municipality level and a negative sign at NUTS3 area level, none of those is statistically significantly different from zero, indicating the lack of positive labour pooling effects between declining and growing sectors.

While the model, just as expected, performs better at NUTS3 area level in terms of variance explained, there is a number of variables that are statistically significant only in the model at the municipality level, suggesting only very local, geographically not far-stretching effects. The higher wage level is associated with more hiring outside the region. This supports the argument developed by Russo et al (1996): highly-skilled positions require higher level of specialization, therefore also a broader search field can be justified in order to ensure the quality of the labour match. At a municipality level, higher working age population density is associated with more hiring within the same region, probably because better quality labour matches can be formed locally due to agglomeration effects. The effect however disappears at a broader geographical scale. This could be explained by the greater ability of large urban areas to attract employees also from further away. The mean firm size, contrary to what has been expected, is positively related to hiring locally, though the coefficient is only significant at NUTS3 areas level. Higher average workload is statistically significantly associated with greater extent of hiring outside the region, higher share of flexible contracts is related to more hiring within the region but the relationship is only statistically significant at municipality level. This suggests that the higher the level of commitment, the more important the quality of labour match becomes, motivating the firms to also hire further away. The average length of roads is related to less hiring in the region (the relationship is only statistically significant at municipality level), suggesting that it also increases the access from people commuting from further away.

Dep var. =share of new inflows hired locally	Municipality level		NUTS3 area level	
	B	beta	B	beta
Magnitude of decline in related sectors	.0583	.0051	-.2161	-.0102
Magnitude of decline in non-related sectors	.0141	.0103	-.0500	-.0166
Mean of ln of wage	-.0480***	-.1353***	-.0503**	-.01460**
Ln of working age pop. density	.1029***	.5755***	-.0207	-.0923
Dwellings growth	.0089	.0022	-.5102	-.0323
Mean establishment size	.0000	.0148	.0000***	.2087***
Average workload of inflows	-.2893***	-.2807***	-.1508***	-.2029***
Share of inflows with flexible contracts	.0539**	.03136**	.0448	.0238
Roads length per square km	-.0208***	-.3402***	.0250	.2339
Sector dummies
R squared		.2635		.3757
R squared adjusted		.2622		.3708

Table 6. Regressing share of new employees hired locally on the magnitude of decline in the region (based on the cases with inflows only).

***- $p < 0.01$, **- $p < 0.05$, *- $p < 0.1$.

Secondly, a regression is performed to investigate how the colocation with declining sectors affects the employment growth of growing sectors (further referred to as regression 2). As table 7 (columns 2-5) demonstrates, there are some positive effects on the employment growth of the growing sectors from being located in the regions with much decline, but the effects are only statistically significant at NUTS3 area level and only if the declining sectors are related to growing sectors. Since this positive effect does not correspond to a positive effect on labour pooling, one concludes that the positive effects from colocation of declining and growing sectors results from the flows of capital rather than flows of labour force. As opposed to the regression on labour pooling, the relatedness seems to play an important role here as the standardized coefficients for related decline are always considerably higher, suggesting that the other mechanisms of interactions between colocated growing and declining sectors happen more along the sectoral lines than the labour force flows. Only working age population density of all the other predictors is shown to have significant effects (at least if the standard errors are clustered by region – standard error clustering substantially decreases the significance levels, suggesting high level of homogeneity within regions). The negative effects of population density are in line with Frenken et al (2008) findings in analysing the regional employment growth differentials in the Netherlands. Frenken et al also find the population density to have negative effects though in their analysis the effects are statistically insignificant. This suggests that in the densely populated Dutch regions the positive agglomeration effects are outweighed by the negative congestion effects, as also shown for productivity growth by Broersma & van Dijk (2008).

Dep =employment growth in growing sectors	var.	Municipality level		NUTS3 area level		Municipality level		NUTS3 area level	
		B	beta	B	beta	B	beta	1.0123	.0057
Magnitude of decline in related sectors		254.6195	.1191	426.4469**	.1136**				
Magnitude of decline in non-related sectors		7.3648	.0281	8.8246	.0166				
Share inflows from the same region						-2.3823	-.0124	-3.4818**	-.0028**
Dummy_sector-region has inflows						-1.6746*	-.0034*	1.5336	.0252
Mean of ln of wage		-3.5379	-.0528	1.6977	.0279	-3.6087	-.0538	2.6240	.0079
Business area growth		-.1373	-.0027	1.9598	.0059	-.0161	-.0003	5.0861	.0018
Dwellings growth		-1.1738	-.0015	1.4614	.0005	-1.9533	-.0025	-.7041**	-.0185**
Ln of working age pop. density		-.9906**	-.0290**	-.5844**	-.0154**	-.9043**	-.0265**	92.3108*	.0238*
Sectoral diversity		8.5716	.0045	71.9493*	.0188*	7.0901	.0037	-.0427	-.0046
Location quotient		-.0266	-.0108	-.0652	-.0070	-.0131	-.0128	.0023	.0594
Mean establishment size		.0125	.0882	.0021	.0552	.0131	.0925	.0023	.0594
Sector dummies					
R squared			.1079		.3115		.0942		.3007
R squared adjusted			.1066		.3064		.0929		.2955

Table 7. Regressing employment growth in growing sectors on the magnitude of decline in the region and hiring locally.

***- $p < 0.01$, **- $p < 0.05$, *- $p < 0.1$.

Subsequently I check the assumption that the region-sectors benefit from labour pooling in terms of employment growth by regressing the employment growth in growing sectors on the share of their new inflows that have previously worked in the same region (further referred to as regression 3). As shown in table 7 columns 6-9, labour pooling is not related to higher employment growth: on contrary, the effects are negative and in the model at NUTS3 area level they are also statistically significant. One possible explanation for this is that it is not hiring further away that leads to employment growth but rather the employment growth that forces the firms to expand their employees search field. Indeed, as shown in table 6, the labour force becoming redundant in other sectors in the same region does not encourage the growing sectors to hire increase the hiring locally, therefore it is likely that the labour force demand growth of growing sectors is absorbed by interregional flows rather than through intersectoral flows (see also table 5 demonstrating that growing sectors hire relatively more outside the region).

Alternatively, it is possible that hiring close by is not always a blessing: it might be a result of limited information about employees further away and limited abilities to reach and attract them. The employer would then choose to form a worse quality labour matches with employees closer by due to the spatial restrictions and the sectors better able to form long-distance better quality labour matches would grow faster. This relates directly to the definition of labour pooling used here: while previously mostly the potential for labour pooling has been measured and related to actual colocation (Ellison et al 2007, Rosenthal & Strange, 2001), in this paper the realized labour pooling is measured, expressed as the share of all employees that previously worked in the same region. While firms benefiting from agglomeration tend to agglomerate and labour pooling plays an important role in this process (Ellison et al, 2007, Rosenthal & Strange, 2001), it is possible that the firms find not only the most optimal labour matches in the vicinity. Therefore the labour pooling definition used here reveals not only the benefits of hiring close by but also spatial restrictions. While such a definition fits the purpose of analysing the hypothesized symbiosis between the declining and growing sectors, it might be interesting for the future research how the results would change using the definitions analogous to those of Ellison et al (2007) or Rosenthal & Strange (2001).

For more nuanced insights, I also add labour pooling variables and their interactions with the magnitude of decline in the region to regression 1. The interaction effects are only statistically significant at NUTS3 area level and only for non-related decline. The regression coefficients are shown in table 8. It can be concluded from it that indeed not always hiring close by has positive effects in terms of employment growth, and it is the case with employees from declining sectors.

Dep var. =employment growth in growing sectors	NUTS3 area level B
Magnitude of decline in related sectors (mean centered)	516.2963*
Magnitude of decline in non-related sectors (mean centered)	10.5832
Share inflows from the same region (mean centered)	2.7890
Mean of ln of wage	1.6259
Business area growth	1.8171
Dwellings growth	0.1058
Ln of working age pop. density	-.6423**
Sectoral diversity	75.4939*
Location quotient	-.0619
Mean establishment size	.0020
Sector dummies	...
Magnitude of decline in related sectors* Share inflows from the same region	945.2722
Magnitude of decline in non-related sectors* Share inflows from the same region	-46.5585**
R squared	.3128
R squared adjusted	.3118

Table 8. Regressing employment growth in growing sectors on the magnitude of decline in the region and hiring locally with interaction effects (based on the cases with inflows only).

***- p<0.01, **-p<0.05, *-p<0.1.

It is also checked whether low-wages sectors benefit more from being located in sectors with much decline in terms of growth and labour pooling. This seems to be the case (interaction is statistically significant) at NUTS3 area level for labour pooling but never for growth. As it has been expected, the lower the wages in the growing sectors the more they are responsive in their hiring behaviour to labour force becoming redundant in the same region (table 9). However, this local hiring does not contribute to more growth.

Dep var. =employment growth in growing sectors	NUTS3 area level
	B
Magnitude of decline in related sectors (mean centered)	-.2745
Magnitude of decline in non-related sectors (mean centered)	-.0393
Mean of ln of wage (mean centered)	-.0511***
Ln of working age pop. density	-.0206
Dwellings growth	-.5264
Mean establishment size	.0000***
Average workload of inflows	-.1495**
Share of inflows with flexible contracts	-.0461
Roads length per square km	.0249
Sector dummies	...
Magnitude of decline in related sectors* Mean of ln of wage	-.4939
Magnitude of decline in non-related sectors* Mean of ln of wage	-.1859***
R squared	.3128
R squared adjusted	.3119

Table 8. Regressing employment growth in growing sectors on the magnitude of decline in the region and hiring locally with interaction effects (based on the cases with inflows only).

***- p<0.01, **-p<0.05, *-p<0.1.

Robustness checks

The same model has been run with different definitions of declining, stable and growing sectors (next to division 25%, 50%, 25% also 20%, 60%, 20% and 30%, 40%, 30%) This has not substantially changed the results.

It has also been tested whether the results are sensitive to the scale on which the sectoral relatedness is measured. The model has been performed with related sectors being defined as the sectors belonging to the broad SFC2008 group, defined by letters A to U. If the relatedness is defined at two-digit level definition the effects of related declining sectors are considerably stronger in regression 2 but the same hierarchical effects cannot be observed in regression 1. If the relatedness is defined at the letters level, the signs and significance levels remained similar; the expected convergence of standardized coefficients of related and non-related sectors was not always observed (only in regressions at NUTS3 areas level).

Conclusions

The previous research suggests several mechanisms in which the geographically closely located declining and growing sectors interact. There is a variety of negative externalities of declining sectors proposed; the possible effects are mostly hypothesized to happen through the release of labour force possessing knowledge and skills by the declining sectors. Such inflows are argued to enable the successful growth of the growing sectors. However, the previous research largely is limited to case studies and the proposed relationships have not been examined empirically on a larger scale. In this paper the overall effects of colocation with declining sectors on growing sectors employment growth have been tested as well as whether they are mediated by local labour force flows from declining to growing sectors.

The results of this paper indicate that the effects of colocation with declining sectors for growing sectors are only marginal. The overall effects on their employment growth are only statistically significant (and positive) at NUTS3 area level for related decline. However, this does not correspond to more labour pooling between declining and growing sectors. The positive effects on employment growth therefore probably are caused by the capital flows rather than labour force flows from the declining sectors to the

growing sectors. Furthermore, there is no evidence that making use of the labour force becoming redundant locally actually benefits the growing sectors in terms of employment growth – in fact, the effects of hiring locally are negative, on NUTS3 area level they are also statistically significant – and the more decline in the region the more negative they tend to become. There are some examples of the inflows from declining sectors benefiting the growing sectors (Neffke & Henning (2013)) mention a technological leap in the German automotive industry following the inflows of highly-skilled aeronautical engineers, however it seems that in general the inflows from declining sectors are not that desirable. The growing sectors are shown to absorb their increased labour demand by seeking for employees further away rather than hiring the redundant employees locally. This does not deny the benefits of agglomeration, however it does show that the hiring in the vicinity is not always beneficial as it can always reflect the poor ability of the firm to reach and attract the more suitable candidates from further away.

However, while the implications of the results are quite neutral in terms of location of sectors- it really does not matter that much where they are located - in this case no news is bad news for redundant employees and regional development in general. The lack of flows from declining to growing sectors indicate that as the creative destruction is more rapid than ever, people are not able to catch up with it. The skills possessed by the redundant employees are also not sought by the growing sectors locally, which is especially worrisome in the light of the findings of Weterings et al (2013) indicating that employees that have lost jobs are also not very geographically mobile.

The growing sectors tend to hire somewhat more new entrants to the labour market, but not employees that previously worked in the declining sectors, therefore the redistribution happens in the beginning of the career but to a much lesser extent for employees later in their careers. Rather the declining sectors compete for other employees from growing or stable sectors. The employees left redundant do not seem to attract new jobs nor stimulate the preference of high-potential sectors for the local labour market. Some differences however exist by the wage level of the growing sectors: The magnitude of decline promotes the local hiring for low-wage sectors, though the overall effects are not statistically significant. One might wonder what constitutes the flows to those low-paying sectors: are the low-skilled generally more prone to intersectoral mobility while the high earners use different strategies, such as geographical mobility as proposed by Bound & Holzer (2000) and Reisinger (2003)? Or do the low-paying sectors also absorb the high-earners which redundant skills are not compensated to the same extent as they were before, as shown by Holm et al (2012)? In any case, the results suggest that a relevant scale to for policies regarding labour market and regional development is NUTS3 areas.

Limitations and future research

Firstly, one cannot reject the possibility that the results are influenced by the timespan analysed. Even if the employers were doing their best to retain their employees at the time of recession (de Jong, 2011), it is entirely possible that the growing sectors were less inclined to hire, and especially the employees with somewhat different set of skills, and could use their market power to attract the employees from further away than they otherwise would have been.

Secondly, temporary work arrangements via employment agencies is widespread in the Netherlands: 17.5 % of all the inflows 2007-2011 were in temporary employment agencies. While officially in these arrangements the temporary employment agencies are the employers, the actual work can be performed in virtually any other sector. Presumably, in many cases the employees working in a sector directly and employees working in a sector via a temporary employment agency can be easily interchangeable, depending e.g. by how sustainable the labour demand is. For the purpose of this analysis it would therefore be desirable to have the data on in which sectors the employees actually work rather than seeing whether they are employed via temporary employment agencies, but such data is unfortunately unavailable. In this analysis the temporary employment agencies were always included under declining

non-related sectors (at least when relatedness was defined at 2-digit level as there are no growing sectors related to temporary employment agencies at this level). However, it is difficult to include the substitutability between jobs in this sector and other sectors in the analysis or to estimate to what extent they are related to other sectors as the employees hired via temporary employment agencies can have very different skills.

Thirdly, the employment growth has been used here as a success indicator. On a firm level success and growth have been often used interchangeably (e.g. Beekman & Robinson 2004, Schutjens & Wever 2000), however, it does not necessarily have to be the case, for instance in case of technological advancements a successful firm can retain stable employment or employment decline and it is even more difficult to relate growth to success on a sector level. It seems worthwhile to also add other indicators of success to see how they are influenced by the decline in the region.

Also more advanced measures of sectoral relatedness could be applied, though an ideal one is difficult to find. Neffke & Henning (2013) give an overview of the limitations of many possible measures, however, their suggested alternative of calculating the skill relatedness index between two sectors based on the flows between those sectors is not applicable in this case due to endogeneity as the intersectoral flows is what the paper strives to explain.

In addition, spatial interactions are going to be tested in the models.

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