

Regional Patterns of the Recruitment of Foreign Labour: Matching Foreign Labour and Spatial Sorting in Denmark

by

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Abstract: In recent years, foreign labour has become an essential issue in Western Europe. Recent research suggests that foreign labour has implications for regional growth patterns and employment opportunities of native workers. Yet, few studies go into the dimension of the regional determinants of recruitment of foreign labour underlying these regional growth effects. Therefore, this paper considers determinants of the regional location of foreign labour. Specifically, we investigate the role of social networks for the spatial distribution of work permits in the context of the Danish regions. We first investigate motives for recruiting foreign labour by analysing the particular case of Southern Denmark relying on recently collected employer survey data with roughly 1,000 records. We also analyse on regional differences in work permits across all Danish regions.

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1. Introduction

An overall concern among many countries and regions is the population balance under ageing processes to sustain economic development. This paper takes a close look at the importance of networks and spatial sorting in the employment processes of foreign labour that would render a path dependence in the use of foreign labour in regional development. The analysis will take as a point of departure the development in Danish regions combined with detailed information on the importance of networks for the recruitment of foreign labour among firms. The paper therefore combines different sources in a sequential approach in uncovering the importance of such dynamics potentially determining the future outcomes of regional labour markets performances and development.

Ageing is a theme covered repeatedly in the public debate. This builds on the fact that ageing is a problem for many countries. All OECD countries does for example face problems of ageing populations, although at different paces, see OECD (2006). The importance of studying regional outcomes of such problems should therefore be stressed. One country facing such issues of ageing is Denmark. Although ageing is not the strongest, Denmark constitutes an interesting case of analyzing the potentials of solving regional problems of ageing through labour with a foreign background. It is a small homogenous country, with a high organization rate in the labour force and continual policies of integrating all types of marginalized resources on the labour market. Low hire and fire costs in a flexicurity system should furthermore prevent some of the barriers to enter the job market. Even if Denmark is homogenous in terms of labour market conditions, the emerging ageing problems are still regionally diverse, as concentration is still seen in the capital area of young persons entering the labour market. Studying any path dependence in the use of foreign labour at the regional scale should therefore be of interest.

The evidence on the importance of networks for job matching is not new. This has been investigated in the setup of analyzing job search using micro-data on individuals. Theoretical approaches to the importance of networks in job matching have been dealt with repeatedly. A literature in sociology has dealt with the importance of defining

social capital as a set of resources resulting from community social organization and family relations influencing the cognitive and social development of coming generations, see Loury (1977). This is overall discussed in a economic framework with job market perspective as job information networks, see Ionnides and Loury (2004). The idea that social networks are important for job matching outcomes is eminent in the widely cited works by Granovetter (1973:1995). The works has been parameterized through an intensity of social attachments in job matching in Calvó-Armengol and Jackson (2007). Another contribution pointing to a critical value of networks sizes can be found in Calvó-Armengol and Zenou (2005). An importance of social networks at the same time lends itself to an importance of neighborhoods. Social networks emerge in a spatial context as learning preconditions some proximity, see e.g. Topa (2001), Hedström, Kolm and Åberg (2003) or Weinberg, Reagan and Yankow (2004). While this is only a brief summary of the many contributions dealing with the impact of social networks for job matching outcomes, more detail can be found in Ionnides and Loury (2004).

As indicated, the importance of networks for job matching does pertain to some spatial context. Using such arguments, it becomes important to analyse the importance of foreign labour from a regional ageing perspective. Will foreign labour exhibit spatial sorting in employment patterns due to the importance of networks effects? Having a high concentration of foreign labour in employment in a given region will from such arguments more easily alleviate ageing problems on the labour market, as strong social networks among preexisting foreign labour will facilitate job matching of new resources of foreign labour. The importance of foreign labour has been investigated previously, mostly in a non-regional context. Contributions by Borjas (2003), D'Amuri, Ottaviano and Peri (2008) and Wagner (2009) suggest that increased immigration inflows could have positive effects on total employment. This is furthermore analysed in a regional context by Carrasco, Jimeno and Ortega (2008). While the importance of social networks is not explicit in these contributions, they point to the importance in terms of labour market performance in national and regional contexts of foreign labour. The idea that social networks may be important is implicit in the estimation procedure by Card (2007) and the use of specific instruments to control for endogeneity. The importance of

foreign labour for economic performance emerges from these contributions and the potential importance of social networks among foreign labour is also implicit in some of these.

The present paper combines and elaborates further on these findings using Danish data on spatial sorting for Danish municipalities. It also elaborates from a demand side perspective showing that networks are of importance for firms in recruiting labour with a foreign background. The argument is therefore sequential. The first hypothesis is that social networks are essential for job matching of foreign labour, because they are part of the recruitment strategies of firms. While it may be straightforward to argue for the importance of social networks for job matching among native workforces, the argument is therefore here tested for “new” resources in regional labour markets. This is analysed using survey data on firm recruitment among firms in Region South Denmark. Connecting this with the outcomes of regional job matching processes and the importance of spatial sorting in the employment patterns of foreign labour is the adjoin issue. The second hypothesis is therefore that spatial sorting is important for employment patterns of foreign labour. Localities with more dense patterns of pre-existing employment propensities among labour with foreign backgrounds will constitute a stronger growth potential in the employment of “new” resources of foreign labour, thereby leading to a strong spatial sorting due to the dependency of job matching on social networks. A higher pre-existing density of foreign labour in employment constitutes a stronger social network that can be used in the job matching of “new” resources of foreign labour.

It emerges from an affirmative answer to both hypothesis, that an importance of social networks in job matching of foreign labour and a thereupon following spatial sorting in employment patterns of foreign labour, will lead to a higher ability of some regions to handle ageing problems by “new” resources through foreign labour. A path dependence emerges on future abilities to handle regional ageing problems. It should be mentioned that the methodological approach used here allows for neighborhood effects in the spatial sorting process in terms of using a spatial lag model for estimation. This seems to be an obvious choice given that such network effects may not necessarily limit

themselves to prevailing administrative borders, but rather follow the nature of local labour markets and the dynamics therein. Furthermore the importance of networks for recruitment of foreign labour by firms is more predominant for foreign labour with Western backgrounds, while the spatial sorting results shows stronger spatial sorting patterns among foreign labour in employment with a Non-Western background. Decomposing the effects by backgrounds of origin of foreign labour in employment may therefore be taken to indicate a paradox between firms recruitment practices and actual regional job matching outcomes. This is though here interpreted in the context of the degree of networks being localized, as presented in the discussion.

The paper unfolds in a sequence similar to the arguments of the two hypotheses. Section 2 will focus on the details of the data and methods used for the analysis, while section 3 will analyse the propensities among firms in Region South Denmark to use networks in the recruitment of foreign labour. Section 4 will then turn to the more general issue of spatial sorting of foreign labour in employment potentially emerging from the importance of social networks in job matching and section 5 offers a discussion of the findings.

2. Data and methodological approach

Dealing with the recruitment of foreign labour and the associated regional outcomes is a difficult issue in terms of required data. The approach taken here is to combine different types of data to arrive at the results on the recruitment of foreign labour and spatial sorting. The present analysis will be based on two types of data. One is a survey among firms in Region South Denmark on the details on recruitment of foreign labour, hereunder recruitment methods¹, which will be the main emphasis here. The other dataset is based on official regional statistics from Statistics Denmark on the regional employment of individuals with a foreign background including descendants.

The first data contains information arrived at from a survey among a sample of firms in the Region South Denmark, which is one of five regions in Denmark. While this data may be biased from regional specificities, it should be considered that the area includes

¹ The questionnaire contains a total of 22 questions to the firms in the sample.

quite different geographic conditions and specificities. The data is established from a web-based questionnaire combined with telephone interviews with selected firms to correct for any problems of the sample being representative in firm size and sector background. The sample is established through the use of different employment and population registers at Statistics Denmark and the questionnaire/interviews have accordingly been undertaken by Statistics Denmark. The types of foreign labour includes different types, such as cross-border commuters, labour arriving at the Danish labour market using the rules for labour from EU accession countries and other types of foreign labour moving into the Danish labour market. The data has been collected in November and December 2007 and refers to recruitments among the firms in the period August 2006 to July 2007. Among the 4593 firms being asked to respond to the survey, there were just over 43 percent that participated. There were among these nearly 56 percent that had recruited foreign labour during the period August 2006 to July 2007. This results in a sample of 1103 firms for which information about recruitment of foreign labour is available. There is among these 65 respondents that are left out, as the recruitment of foreign labour pertains to special schooling regulations at the Danish labour market that cannot be compared to normal recruitments among firms. A total of 1038 responses remain available for the analysis. The exact use of data in the estimation specification is discussed in section 3.

The second dataset is by nature rather different. Moving from a matching perspective at the micro level, i.e. firms, the second dataset focuses on the regional outcomes of the recruitment concerning labour with a foreign background. This data is taken from official statistics on regional employment and regional populations from Statistics Denmark. The data contains information on the employment by the location of workplaces among Danish municipality in the spatial dimension and by foreign background including descendants in the dimension concerning origin of labour. There is data for 266 municipalities, out of originally 275 municipalities. The number of municipalities is reduced, as some municipalities in Denmark have been merged during the period considered, why they enter in merged form. A period from 1997 to 2006 is considered, why the data essentially consists of a cross-section over municipalities of changes over the period from 1997 to 2006. This rather long period is chosen, as we are

not interested in short-term fluctuations in employment patterns of labour with a foreign background, but rather the long-term effects of initial high employment of labour with a foreign background. The exact use of data in the estimation specification will be laid out in detail in section 4.

The overall approach in terms of methodology is accordingly to combine micro-data from surveys on matching instruments with regional data on overall matching outcomes. While the survey data therefore to a very high degree reflects the detailed recruitment instruments used by firms to recruit foreign labour, the regional data will focus on the actual regional outcomes of foreign labour employment from these micro-data details. Given the focus taken here on recruitment and the associated regional outcomes in terms of spatial sorting of foreign labour, the issue dealt with using micro-data will be to analyse if firms use networks in the recruitment of foreign labour with different foreign backgrounds. The regional data will flowingly be associated with these findings by analyzing the strength of spatial sorting in the employment of foreign labour, which should expectedly be the regional outcome in the presence of networks being important for the recruitment by firms of foreign labour. The next sections of the paper therefore in a sequential manner analysis the hypotheses on foreign labour moving from the micro level to the regional level.

3. Network effects and recruitment of foreign labour in Southern Denmark?

One of the aspects of spatial sorting of foreign labour is the underlying process of recruitment methods potentially supporting such sorting of foreign labour. Recruitment procedures of foreign labour predominantly ascertained through networks would point to path dependence in the regional labour market resources leading to a spatial sorting of foreign labour. The focus in this section will accordingly be on the extent and determinants of recruitment of foreign labour through networks. Using the survey data among firms in a region in Denmark, the section will give both describe the use of networks to recruit foreign labour and offer a probability model for the underlying determinants of the use of networks for such recruitment?

Initially, it is worth considering the baseline of recruitment of labour in different regions. Different types of firms segmented by e.g. size, sector and management structure may find it convenient to pursue recruitment through different channels. The clearest of such dependencies seems to be a dependence on the size of the firm. Large firms would expectedly have a more structures and formalized method of recruitment. Such should also apply for the recruitment of foreign labour. This implies that regional differences in firm demographics will render different outcomes in terms of the prevailing recruitment methods of foreign labour. One such overall difference is in the general recruitment practices, i.e. recruitment directly to the firm or through recruitment agencies. Given the nature of recruitment of foreign labour is across rather varied market conditions and labour market cultures in different countries. One expected outcome would therefore be a widespread use of recruitment agencies. The survey data shows that Danish recruitment agencies are used by 13.7 percent of the firms that have recruited foreign labour in the period considered, while only 8.1 percent have used foreign recruitment agencies. A total of 93.7 percent of firms recruiting foreign labour in the period-considered have on the other hand used methods of directly recruiting foreign labour to the firm. While agencies are of importance, the overwhelming mass of firms does though rely on the direct methods of recruitment.

Among the direct methods of recruitment is the potential of using networks to get contact to potential foreign employees. A total of 44.1 percent of the firms recruiting foreign labour directly have relied upon networks to recruit. One may suspect that such methods are of less importance from a distance argument. Spatial sorting of foreign labour would indicate otherwise. A large prevailing stock of foreign employment will make it easier to recruit additional foreign resources through networks. These networks may either shape through the contacts of the current employees with a foreign background to additional foreign labour in Denmark or in their homeland or it may shape through firm networks leading to information on concrete vacant labour market resources of foreign labour. To get an impression on the importance of networks for the recruitment of foreign labour, table 1 presents the percentage among firms having used networks in direct recruitment depending on the origin of the foreign labour recruited and on the sector of the firm recruiting.

The impression from table 1 is the overwhelming majority of firms that recruited foreign labour using networks have recruited foreign labour with a Western background. For Non-Western backgrounds only 17.7 percent of the firm’s recruited foreign labour directly using networks. Networks are therefore overall important as a tool for recruitment of foreign labour directly to firms irrespective of origin, but it is outspokenly important for the recruitment of labour with a Western background. The recruitment of foreign labour through networks is much more widespread among firms in the agricultural sector, while it is much less outspoken among firms in manufacturing. Only 6.5 percent of the firms that recruited foreign labour directly using networks are found in the manufacturing sector, while 92.8 percent are found in the agricultural sector. This is a first indication of the importance of regional differences for the spatial sorting processes underlying infusion of foreign labour to regional labour market resources.

Table 1: Networks as a vehicle of recruiting foreign labour – percentage by origin

	Percentage of firms recruiting directly using networks
Recruited Western labour directly using networks	92.8
Recruited Non-Western labour directly using networks	17.7
Agricultural firms using networks recruiting foreign labour	92.8
Manufacturing firms using networks recruiting foreign labour	6.5
Service firms using networks recruiting foreign labour	52.3

Note: Percentage refers to the number of firm and do not correct for differences in the size of the firms. This should especially be considered, when interpreting the percentages that are sector specific, as some sectors would typically have a higher average firm sizes and others a smaller average firm size.

Source: Survey data described in section 2 and own calculations.

The drawback in table 1 is clearly the lacking impression on the sensitivity of probabilities for the recruitment of foreign labour through networks to several underlying factors that may be perceived as varying regionally. Table 2 accordingly presents probit models for the use of networks among firms to recruit foreign labour depending on firm characteristics. To give some point of reference, similar probit models are estimated for the use the two other modes of directly recruiting foreign

labour to firms – jobcentres and job ads on the Internet. These reference modes of direct recruitment are chosen, because they are functionally rather different and show quite different dependencies on characteristics of firms.

Table 2: Probit models for recruitment modes by direct recruitment of foreign labour

	Networks	Jobcentre	Job ads on internet
Non-Western	-0.367** (-2.32) -0.137**	0.367* (1.77) 0.068	-0.400 (-1.58) -0.070**
Both Western and Non-Western	0.313* (1.95) 0.124*	0.209 (0.96) 0.036	0.400** (2.14) 0.101*
1-10 employed	-0.230 (-1.46) -0.089	-0.103 (-0.49) -0.016	-0.421** (-2.35) -0.086**
11-50 employed	-0.141 (-0.93) -0.055	-0.266 (-1.30) -0.039	-0.418** (-2.43) -0.083***
51-100 employed	-0.176 (-0.94) -0.068	0.023 (0.10) 0.004	-0.173 (-0.82) -0.337
Agriculture	0.612*** (3.62) 0.239***	-0.537** (-2.41) -0.072***	0.138 (0.61) 0.031
Services	0.374** (2.55) 0.144***	-0.284 (-1.60) -0.045	0.455** (2.36) 0.092**
Strategy	0.028 (0.33) 0.011	-1.048*** (-4.72) 0.028	-0.049 (-0.45) -0.010

Source: Survey data collected among a sample of firms in Southern Denmark, see section 2.

Note: the left out group concerning the origin is recruitment only of foreign labour with a Western background, while the reference group for firm size is firms with more than 100 employees and finally the reference group for business sector is manufacturing. Point estimates in first line of each cell of table, z-stats in parentheses in the second line and marginal effects in third line, significance: *** p<0.01, ** p<0.05, * p<0.1

The backgrounds for choices of different modes of recruiting foreign labour directly to the firms without any intermediary (recruitment agencies) vary considerably. The reference group for the origins of the foreign labour is Western labour. While Non-Western recruitment relies too much lesser extent on networks, this is not the case for use of jobcentres. The importance of considering backgrounds is confirmed by the group of firms that have recruited both Western and Non-Western labour. While the sign of marginal effects for Non-Western for the reliance upon networks for direct recruitment is negative, this turns positive when comparing the group of form that have

recruited both Western and Non-Western labour as compared to the reference group only having recruited foreign labour with a Western background.

The potential variation in firm sizes and business structure also filters through to the choice of recruitment mode by direct recruitments of foreign labour in the firms. Smaller firms have a lower propensity to use job ads on the web, which is also associated with a lower use if recruiting both Western and Non-Western labour. Sectoral compositions are clearly important for the use of jobcentres and networks. Agricultural firms and firms in the service sector have a lower propensity to use jobcentres but higher propensity to use networks as compared to the manufacturing sector. Finally, the importance of having a strategy for the recruitment of foreign labour seems to matter little for the choice of recruitment mode, which is somewhat surprising. It does though seem to reduce the propensity to use jobcentres.

The impression from these estimation results stresses that networks may be subject to important differences in use among firms in different businesses and that *networks are more likely to be used if recruiting Western labour*. The results presented in this section can therefore be seen as an indication of the importance of firm recruitment methods and their dependence on spatial sorting issues of foreign labour. The first hypothesis stated in the introduction is that social networks are essential for job matching of foreign labour, because they are part of the recruitment strategies of firms. From the results arrived at here, there seems to be an affirmative to this hypothesis. Social networks are important in the recruitment strategies of firms concerning labour with a foreign background.

4. Spatial sorting of foreign labour in the Danish regions?

To get some more detailed information on the actual patterns of spatial sorting of foreign labour, this section presents a spatial model for the location choices of foreign labour in Denmark. The maintained hypothesis will be that a high share of foreign labour in employment will foster more inflow of foreign labour into employment. The baseline model will therefore test for the importance of existing stocks of foreign labour in employment for the inflow of foreign labour to employment in a region. A challenge

in that respect is that data usually follows administrative borders, which may most likely not be associated with actual labour market dynamics of foreign labour, i.e. what is in the literature labeled measurement or aggregation errors. To counter such caveats, the approach here will be to specify a spatial model, which allows for neighborhood effects. This implies that inflows into a given region depend on the initial shares, but also on the initial shares in surrounding regions. In this sense, such modeling does alleviate some of the problems of the data being specified by administrative borders. While local labour markets are therefore explicitly defined and used in the present context, the estimation results will allow for neighborhood effects implicit in such local labour markets. The usual choices in modeling spatial dependencies are the spatial error model and spatial lag models². The spatial error model allows for spatial correlation in the error terms of different spatial units. It therefore attends the problem of omitted variables that are spatially correlated. The spatial lag model both allows for spatial correlation in the error terms, but does furthermore allow for spatial dependence in the observations, i.e. a value observed in one location depends on values observed in neighboring locations. The later specification therefore allows for diffusion processes by arguing that values observed in one location predict increased likelihood of similar values in neighboring locations. Given the diffusion process implied therein is similar to relieving some of the problems of using administrative borders rather than functional borders, the present analysis will focus in the spatial lag model³. Both types of models imply a spatial dependence defined by a weighting matrix. The present weighting matrix will be a (first order) contiguity matrix, thus primarily allowing for neighborhood effects in the immediate neighborhoods. This does seem to be a fair model strategy given that it is to counter problems of administrative borders relative to more functionally defined bordering on the labour market. The model used is a spatial lag model and the baseline specification is:

$$\frac{\Delta N_t^F}{N_{t-n}} = \rho W \frac{\Delta N_t^F}{N_{t-n}} + \frac{N_{t-n}^F}{N_{t-n}} \beta_1 + x_{t-n}^{control} \beta_2 + \varepsilon \quad (1)$$

² For a reference on spatial econometrics, see e.g. Anselin (1998).

³ Not allowing for such spatial dependencies would potentially lead to biased inference due to the omitted spatial dependence in observations and inefficient estimates due to the omitted spatial dependence in error terms

where $\frac{\Delta N_t^F}{N_{t-n}}$ is the inflow rate to employment of foreign labour to a region relative to the initial total employment, $\frac{N_{t-n}^F}{N_{t-n}}$ is the initial share of foreign labour in employment in a region, $x_{t-n}^{control}$ is a matrix of other controls for spatial heterogeneity, W is the contiguity matrix, ρ is the parameter of the first order of spatial autoregressive effect, β_1 is the parameter indicating the extent of spatial sorting and β_2 is a parameter indicating the importance of controlling for other spatial heterogeneity. Finally, the error terms ε have standard properties, $\varepsilon \sim N(0, \sigma^2 I)$. Notice that the time period considered is from 1997 to 2006, which implies that $t=2006$ and $n=9$ in equation (1). As indicated previously the model incorporates both a spatial dependence in the observables and in the error terms, which can be seen from the standard transcription of equation (1):

$$\frac{\Delta N_t^F}{N_{t-n}} = (I - \rho W)^{-1} \beta_1 \frac{N_{t-n}^F}{N_{t-n}} + (I - \rho W)^{-1} \beta_2 x_{t-n}^{control} + (I - \rho W)^{-1} \varepsilon \quad (2)$$

Equation (2) will be estimated using data for 266 municipalities and the inflow of new foreign labour to regional employment will be measured by the increase in employment with a foreign background for the whole period from 1997 to 2006 relative to total employment in 1997. Initial share of foreign labour in employment will therefore be captured by the share of foreign labour in employment in a given municipality in 1997. Table 3 presents the results of estimating equation (2)⁴. The estimation results are reported for different combinations of covariates.

The results in table 3 show that the *initial share of labour with a foreign background significantly influences the growth rate in the employment of labour with a foreign background* over the period 1997 to 2006. This is to be taken as an indication of spatial sorting. This effect is robust over different specifications of the model. Including the unemployment rate seems to have a minor negative effect in the last two specifications

⁴ Estimation results are obtained in STATA using the commend *spatreg*, see Stata Technical Bulletin (2001). The weighting matrix W is a contiguity matrix of dimension 266x266, which is row standardized.

and insignificant effects in other specifications. A negative effect of unemployment rates would be expected, as it would indicate a tighter regional labour market and thereby less potential for job growth. Including the share of firms with different sizes in terms of number of unemployed does not enter significantly into the estimation results, which is also the case for the share of employment in different sectors. The results in table 2 indicated that the use of networks for recruitment of foreign labour depended on sectoral association, but this is not reflected in the overall outcome of regional job matching of labour with a foreign background reflected in table 3. The main determinants of overall outcomes of regional job matching of labour with a foreign background are therefore measures of spatial sorting and labour market tightness.

Table 3: Spatial lag model for regional employment growth of foreign labour 97-06

	(1)	(2)	(3)	(4)	(5)	(6)
Share 1997		0.300 (5.80)**	0.300 (5.73)**	0.239 (3.62)**	0.257 (4.46)**	0.247 (3.76)**
Unemployment rate			-0.043 (1.73)	-0.044 (1.74)	-0.052 (2.09)*	-0.054 (2.15)*
1-10 employed					-0.186 (1.29)	-0.187 (1.26)
11-50 employed					-0.188 (1.16)	-0.193 (1.19)
51-100 employed					-3.420 (0.18)	-3.774 (0.20)
Share agriculture				-0.016 (1.44)		0.002 (0.13)
Share private services				0.010 (1.00)		0.008 (0.84)
Share public services				-0.006 (0.89)		-0.003 (0.42)
Constant	0.850 (6.83)**	0.449 (3.31)**	0.815 (3.21)**	1.072 (2.37)*	19.331 (1.33)	19.384 (1.30)
ρ	0.580 (10.68)**	0.358 (4.65)**	0.335 (4.21)**	0.324 (4.13)**	0.308 (3.85)**	.305 (3.82)**
Observations	266	266	266	266	266	266
Morans I	-	5.048**	4.796**	4.494**	4.079**	4.048**
LM* $_{\lambda=0}$	-	0.002	0.006	0.025	0.205	0.202
LM* $_{\rho=0}$	-	4.838*	3.197	4.073*	5.265*	5.143*

Note: Absolute value of z statistics in parentheses, * significant at 5%; ** significant at 1%. Tests comparing OLS, spatial lag and spatial error specification follow Anselin et. al. (1996) from the STATA command *spatdiag*.

Concerning the importance of using specifications allowing for neighborhood effects using a contiguity matrix, the results indicate that a spatial lag model is preferable. Spatial lags are important, as shown by the significant parameter of ρ , which also indicates positive neighborhood effects. The Lagrange multiplier tests for $\rho=0$ rejects the H_0 , while the test for spatial error model cannot reject $\lambda=0$ ⁵. This gives support to the choice of specification in terms of spatial modeling in table 3, i.e. the spatial lag model.

From table 2, it was seen that the probability of firms to use networks for the recruitment of foreign labour depends on the background of the foreign labour. It is less outspoken for persons with a Non-Western background. The issue becomes, if this is associated with differences in spatial sorting depending on the background of foreign labour. Equation (2) is therefore estimated for two different backgrounds: Western background and Non-Western background. This will identify if the specificity of firm recruitment through networks in firms depending on backgrounds can be associated with spatial sorting or if it reveals differences in the human resource management in firms. It becomes clear from table 2 that there are clear differences in probability of using different recruitment methods depending on the mix of types of backgrounds that are recruited i.e. only recruit western backgrounds, only recruit non-western backgrounds or recruiting both kinds of backgrounds. Although the data used in the present section is based on regional data, any effects of such different mixes are attempted captured by including both the initial shares of western labour in regional employment and initials shares of non-western labour in regional employment, when estimating equation for inflow rates of western and non-western backgrounds respectively.

Table 4 and 5 show the results for foreign labour with Western and Non-Western backgrounds respectively.

⁵ Similar results are ascertained using the non-modified test. These tests do not correct for the problem of nuisance parameters, while they have a higher power than the modified tests, see Anselin et. al. (1996). When testing for $\lambda=0$ using the non-modified LM also corresponds to nonzero ρ and vice versa. See Anselin et. al. (1996) for robust LM tests of the two H_0 .

Table 4: Spatial lag model for regional employment growth of Western foreign labour 97-06

	(1)	(2)	(3)	(4)	(5)	(6)
Share 1997 western		-0.024 (0.47)	-0.030 (0.58)	-0.022 (0.38)	-0.028 (0.52)	-0.024 (0.41)
Share 1997 non-western		0.031 (1.13)	0.024 (0.86)	0.069 (2.49)*	0.052 (1.79)	0.069 (2.47)*
Unemployment rate			-0.039 (3.01)**	-0.043 (3.44)**	-0.036 (2.74)**	-0.043 (3.43)**
1-10 employed					0.006 (0.09)	-0.024 (0.36)
11-50 employed					-0.004 (0.06)	-0.024 (0.32)
51-100 employed					-2.848 (0.31)	-4.853 (0.54)
Share agriculture				0.019 (3.13)**		0.019 (2.32)*
Share private services				0.005 (1.25)		0.005 (1.27)
Share public services				0.001 (0.29)		0.001 (0.32)
Constant	0.301 (6.28)**	0.303 (4.49)**	0.636 (5.37)**	0.225 (1.00)	0.122 (0.02)	2.656 (0.39)
ρ	0.259 (2.95)**	0.260 (2.91)**	0.194 (2.17)*	0.209 (2.34)**	0.217 (2.45)**	0.209 (2.33)**
Observations	266	266	266	266	266	266
Morans I	-	3.437**	2.372*	2.444*	2.732**	2.426*
LM* $_{\lambda=0}$	-	0.252	0.454	0.856	0.000	1.209
LM* $_{\rho=0}$	-	0.106	1.100	2.074	0.210	2.549

Note: Absolute value of z statistics in parentheses, * significant at 5%; ** significant at 1%. Tests comparing OLS, spatial lag and spatial error specification follow Anselin et. al. (1996) from the STATA command *spatdiag*.

There are major differences in the importance of spatial sorting, when considering labour with a background in Western and Non-Western countries respectively. *Western backgrounds do not respond to spatial sorting effects*, while unemployment rates are a more outspoken determinant for employment growth among labour with a Western background. While the spatial lag parameter ρ is significant and positive indicating the importance of neighborhood effects, the Lagrange multiplier tests are rather more

inconclusive. The LM test for $H_0: \rho=0$ are in some specifications close to significant, but not in others. It can be noticed that this may reflect the weaker power of the modified LM test, as the non-modified tests are in general significant, with a slightly higher significant for $H_0: \rho=0$. While there is spatial dependence, it is not clear which is the proper specification of such.

Table 5: Spatial lag model for regional employment growth of Non-Western foreign labour 97-06

	(1)	(2)	(3)	(4)	(5)	(6)
Share 1997 western		0.068 (1.29)	0.066 (1.26)	-0.003 (0.05)	0.057 (1.08)	0.012 (0.22)
Share 1997 non-western		0.500 (6.53)**	0.500 (6.52)**	0.402 (4.53)**	0.420 (4.93)**	0.400 (4.53)**
Unemployment rate			-0.013 (0.67)	-0.014 (0.69)	-0.021 (1.14)	-0.020 (1.04)
1-10 employed					-0.189 (1.66)	-0.165 (1.41)
11-50 employed					-0.190 (1.50)	-0.185 (1.47)
51-100 employed					-1.004 (0.06)	-0.465 (0.03)
Share agriculture				-0.025 (2.89)**		-0.014 (1.21)
Share private services				0.011 (1.50)		0.009 (1.38)
Share public services				-0.004 (0.84)		-0.003 (0.51)
Constant	0.646 (6.66)**	0.495 (4.39)**	0.607 (3.02)**	0.939 (2.79)**	19.343 (1.69)	17.297 (1.48)
ρ	0.602 (11.29)**	0.260 (3.59)**	0.254 (3.45)**	0.241 (3.16)**	0.236 (3.08)**	0.225 (2.91)**
Observations	266	266	266	266	266	266
Morans I	-	2.334*	2.386*	2.516*	2.057*	2.065*
LM* $_{\lambda=0}$	-	4.267*	4.132*	1.576	3.434	2.467
LM* $_{\rho=0}$	-	14.428**	13.462**	8.948**	12.174**	9.900**

Note: Absolute value of z statistics in parentheses, * significant at 5%; ** significant at 1%. Tests comparing OLS, spatial lag and spatial error specification follow Anselin et. al. (1996) from the STATA command *spatdiag*.

Turning to the model for *Non-Western backgrounds of foreign labour*, the importance of spatial sorting re-emerges. Spatial sorting takes place by backgrounds. Initial employment of foreign labour with a Non-Western background determines the growth rate in employment of labour with a Non-Western background, while the initial share of Western backgrounds is not significant. This renders the result, that while firms may consider a Western and Non-Western backgrounds complementary when choosing networks for their recruitment strategies, this effects does appear in the final regional outcomes in the job matching of labour with a foreign background. The spatial lag parameter ρ is also positive and

The results are therefore that the importance of spatial sorting and the proper specification of spatial dependencies doe seem to vary according to the foreign background of labour. Western backgrounds do not render the spatial sorting results and should less clearly be specified as a spatial lag model. The results of the aggregate across different backgrounds in table 3 do therefore reflect the spatial dynamics among labour with a Non-Western background.

Also for Non-Western backgrounds it should be noted that the sectoral factors does seem to be different from Western backgrounds. Only the share of employment in agriculture is significant in table 4 and 6, but with different signs. A higher regional share in agricultural employment leads to less job growth in Non-Western backgrounds, while it increases employment growth in Western backgrounds. This should be interpreted in the context of a high share of foreign employment in the agricultural sector arriving from Belarus, Ukraine, Poland and the Baltic countries, which are all counted as Western. Given the regional variation in the importance of agricultural employment, this expectedly renders the results for Western backgrounds.

The overall impression from the analysis in this section is that spatial sorting is of importance, which is especially so for labour with a Non-Western background. Also, the importance of using empirical approaches that allow for spatial dependences in the analysis of impacts of foreign labour should be indicated. The second hypothesis stated in the introduction is that spatial sorting is important for employment patterns of foreign

labour. The findings in this section seem to be affirmative to this hypothesis, although depending on the background of foreign labour.

5. Discussion and conclusion

The issue at hand was whether a potential solution of ageing problems through labour with foreign backgrounds exhibits spatial sorting and thereby can be expected to render particular regional path dependencies in labour market developments. This was motivated by the importance of networks in the job matching processes. If networks are important for job matching a prevailing high employment of labour with foreign backgrounds will render a higher potential, as networks ties evolve through family and friends. This was analysed in a sequential manner focusing on the small homogenous labour market in Denmark with regional heterogeneity in demographic changes. The sequence first focused on the propensity of firms to focus on networks in the recruitment of labour with foreign backgrounds. The hypothesis was that social networks are essential for job matching of foreign labour, because they are part of the recruitment strategies of firms. The findings in section 3 were that networks are comparably important for firms in their recruitment of labour with a foreign background. This was dependent on the specific backgrounds of foreign labour and the sectoral association of the firms, with agriculture standing out. The second step in the sequence was a focus on the regional outcomes of job matching of foreign labour and the emergence of spatial sorting on the regional job markets. The hypothesis was that spatial sorting is important for employment patterns of foreign labour, as networks among family and friends with a foreign background in employment would make probabilities of job offers more likely and therefore lead to a more efficient regional job matching. The finding was that spatial sorting is of importance and this was robust to the presence of neighborhood effects modeled through spatial dependence. The more surprising result in section 4 on spatial sorting as compared to the findings in section 3 on firm recruitment of labour with foreign labour through networks, is that labour with Non-Western backgrounds exhibit higher propensities of spatial sorting as compared to labour with a Western background. This may be interpreted as indicating an important heterogeneity in the dynamics among different types of labour with a foreign background. Two aspects of such heterogeneity may be offered as underlying these

results. One is an underlying difference in mobility. It may be that labour with Western backgrounds may be more mobile either moving between different regions or repatriating after some period. Alternatively it may be that labour with Non-Western backgrounds may be more localized, why networks evolve more strongly. These effects may render it continually important for firms to use networks for the recruitment of foreign labour and especially non-localized networks for foreign labour with Western backgrounds. If the networks important for the recruitment of Western labour are not localized to a particular geographical area, this may not lead to the spatial sorting expected in terms of local labour market outcomes for labour with foreign backgrounds. If on the other hand recruitment through networks is less dominant among labour with Non-Western backgrounds, but these networks are on the other hand more localized geographically, they might even so lead to strong forces of spatial sorting in the employment of foreign labour with Non-Western backgrounds.

The findings arrived at here, point to an overall importance of spatial sorting in the employment patterns of labour with a foreign backgrounds. This is here interpreted in the context of networks being important for job matching in general and particularly for labour with foreign backgrounds. Given this result, the importance of labour with a foreign background to solve for the problems of regional ageing processes will be highly dependent on historical evolving employment of labour with foreign backgrounds. Facing ageing problems in a region but having no strongholds in terms of traditions for employment of foreign labour may make it problematic to solve such ageing problem through the foreign labour channel. A path dependence emerges.

Connecting back to the results on different types of labour in terms of backgrounds points to the importance of considering the extent to which networks are localized. The results presented here may be interpreted as pointing to more localized networks among labour with a Non-Western background. Solving regional ageing problems with labour of foreign background, may therefore be more relying on labour with a Non-Western background with a potentially highly localized network even if firms do seem to more often recruit Western backgrounds through networks – that are potentially less localized.

Clearly a number of research agenda are still open to the future. The measures presented may be criticized for being too crude. While the segmentation into Western and Non-Western backgrounds may be indicative for different educational, cultural and other social backgrounds, this would be valuable to elaborate on to understand the asymmetry between firms use of networks for recruiting Western backgrounds as compared to a stronger spatial sorting in the employment of labour with Non-Western backgrounds. This would render a more precise impression of the unfolding matching processes taking place in local labour markets and give more understanding of the dynamics. As is so often the case, a lack of sufficient data does though render such endeavor to future research, when such become available.

References

- Anselin, L. (1988): *Spatial Econometrics: Methods and Models*. Kluwer Academic Press, Dordrecht
- Anselin, L., A.K. Bera, R. Florax and M.J. Yoon (1996): Simple Diagnostics Tests for Spatial Dependence. *Regional Science and Urban Economics*, vol. 26, pp. 93-115
- Calvó-Armegnol, A. and M. O. Jackson (2007): Networks in Labor Markets: Wage and Employment Dynamics and Inequality. *Journal of Economic Theory*, vol. 1, January 2007, pp. 27-46
- Calvó-Armegnol, A. and Y. Zenou (2005): Job Matching, social networks and word-of-mouth communication. *Journal of Urban Economics*, vol. 57, pp. 500-522
- Card, D. (2007). How Immigration Affects U.S. Cities. Cream discussion paper series, Department of Economics, University College London.
- Carrasco, R., Jimeno, J.F., Ortega, A.C., (2008). The effect of immigration on the labor market performance of native-born workers: some evidence for Spain. *Journal of Population Economics*, vol. 21, pp. 627-648.

- D'Amuri, F., Ottaviano, G.I.P., Peri, G. (2008). The Labor Market Impact of Immigration in Western Germany in the 1990's. National Bureau of Economic Research, Working Paper #13851.
- Granovetter, M. (1973): The Strength of Weak Ties. *American Journal of Sociology*, vol. 78, no. 6, pp. 1360-80
- Granovetter, M. (1995): *Getting a Job: A Study of Contacts and Carrers*. Chicago Press.
- Hedström, P., A-S. Kolm and Y. Åberg (2003): *Social Interactions and Unemployment*. Working Paper no. 2003:15, Institute of Labor Market Policy Evaluation, University of Uppsala
- Ionnides, Y.M. and L.D. Loury (2004): Job Information Networks, Neighborhood Effects, and Inequality. *Journal of Economic Literature*, vol. XLII, pp. 1056-1093
- Loury, G. (1977): A Dynamic Theory of Racial Income Differences. In *Women, Minorities and Employment Discrimination*. P.A. Wallace and A. Le Mund, eds., Lexington Books
- OECD (2006): *Live Longer, Work Longer. Ageing and Employment Policies*. OECD, Paris.
- Stata Technical Bulletin (2001): STB-60. StataCorp.
- Topa, G. (2001): Social Interactions, Local Spillovers and Unemployment. *Review of Economic Studies*, vol. 68, pp. 261-295
- Wagner, M. (2009). *Understanding the Labor Market Impact of Immigration*, University of Chicago job market paper.

Weinberg, B., P.B. Reagan and J.J. Yankow (2004): Do Neighborhoods Affect Hours Worked? Evidence from Longitudinal Data. *Journal of Labor Economics*, vol 22, no. 4, pp. 891-924.

Appendix

Variable definition table 2

<i>Variable</i>	<i>Definition</i>
Non-Western	Takes value 1 if firm has recruited labour with Non-Western background and 0 otherwise
Both Western and Non-Western	Takes value 1 if firm has both recruited labour with Western and Non-Western background and 0 otherwise
1-10 employed	Takes value 1 if firm has 1-10 employed and 0 otherwise
11-50 employed	Takes value 1 if firm has 11-50 employed and 0 otherwise
51-100 employed	Takes value 1 if firm has 51-100 employed and 0 otherwise
Agriculture	Takes value 1 if firm is in the agricultural business and 0 otherwise
Services	Takes value 1 if firm is in the service business and 0 otherwise
Strategy	Takes value 1 if firm indicates to have a recruitment strategy and 0 otherwise

Variable definition table 3-5

<i>Variable</i>	<i>Definition</i>
Share 1997	Share of employed with a foreign background out of total employment in a municipality (workplace) in 1997
Share 1997 western	Share of employed with a Western background out of total employment by municipality (workplace) in 1997
Share 1997 non-western	Share of employed with a Non-Western background out of total employment by municipality (workplace) in 1997
Unemployment rate	Unemployment rate 1997
1-10 employed	Share of employment in firms with 1-10 employed by municipality (workplace) in 1997
11-50 employed	Share of employment in firms with 11-50 employed by municipality (workplace) in 1997
51-100 employed	Share of employment in firms with 51-100 employed by municipality (workplace) in 1997
Share agriculture	Share of employment in the agricultural sector by municipality (workplace) in 1997
Share private services	Share of employment in private services by municipality (workplace) in 1997
Share public services	Share of employment in public services by municipality (workplace) in 1997