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Regional resilience to displacements: Explaining the regional capacity to re-employ displaced workers

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Abstract

Previous empirical research shows that there are substantial regional differences in the share of establishment closures (See e.g. Nyström, 2007; 2009 for the Swedish case). Hence, the number of employees affected by establishment closures varies substantially across regions. In addition, the ability to re-employ displaced workers within either the same region or in a different region varies substantially (Nyström and Viklund Ros 2014). In this paper I study which factors that influence if a region is resilient towards the shocks induced by establishment closures and are able to re-employ the competences from establishment closures. I use individual-firm level data to identify all establishment closures and re-employments in Sweden during the period 2005-2009. I study to what extent i) the characteristics of regional closures, ii) characteristics of the individuals in the region, iii) characteristics of the regional industry iv) the characteristics of the regional economy and v) regional attractiveness influence the regional resilience to displacements in terms of the ability to re-employ displaced employees.

Keywords: Displacements, exit. Labor mobility, regional development, regional attractiveness

JEL-codes: J6, R1

1. Introduction

Through the process of “creative destruction” new more innovative or productive firms can replace exiting firms. In this process resources such as the knowledge and competence embodied in the employees of the exiting firms can be re-allocated and potentially more efficiently used in new firms (Schumpeter 1934 and 1942). If the labor market is well-functioning and the competence that these employees possess can be utilized in other parts of the labor markets, business closures should lead to labour mobility through labour re-allocation rather than increased unemployment or individuals leaving the labour market

Job displacement, which is defined as an involuntary loss of job due to economic downturns or structural changes, hit millions of workers each year. According to OECD (2013) 2-7 percent of workers are displaced every year. For Sweden, OECD (2013) reports an average displacement rate of about 2 percent for the period 2000-2008. Our knowledge on the individual consequences of displacement, in terms of, for example, unemployment duration, and earning losses is comprehensive (See e.g. Hammermesh 1989 and OECD (2013)). However, knowledge about regional differences in patterns of displacements and regional resilience to displacements is still limited. For instance, Eliasson and Storrie (2006) note that prior to their study knowledge about regional patterns of Swedish displacements is primarily based on case studies.¹ Using individual-firm level data from all firms and regions in Sweden Nyström and Viklund Ros, (2014) shows that displacement rates and the regional ability to re-allocate competence after a business closure varies substantially. This paper intends contribute to the knowledge about the regional resilience to business closures. The term resilience refers to the ability adapt to a shock incurred by, in this case, business closures. In this paper I intend to study which regional characteristics that influence the regional resilience to displacements.² Which regional characteristics influence if displaced employees quickly are re-employed in other industries and businesses? In this paper it is argued that the regional environment in terms of i) the characteristics of regional closures, ii) the characteristics of the individuals in the region, iii) characteristics of the regional industry iv) the characteristics and v) regional attractiveness of the regional economy influence the regional resilience to displacements in terms of the ability to re-employ displaced employees.

The characteristics of regional closures, refers to, for example, the regional share of closures and the size of the closures. The characteristics of the individuals in the region refer to, for example, the competence in terms of education, age structure and share of individuals with foreign background in the region. Characteristics of the regional industry refers to the unrelated and related industry variety (Frenken et al 2007 and Boschma et. al 2012) and the industry structure in terms of the share of the manufacturing industry and service sectors. The characteristics of the regional economy refer to, for example, the size of the region,

¹ A first version published in Eliasson and Storrie, (2004).

² In the paper we focus on regional context and its possible connection to the resilience to displacements. However, it should be emphasized that the ability of the individual displaced worker to get a new job are primarily related to their, education, competence and ability.

unemployment level and industrial turbulence in terms of entry and exit rates. Finally, regional attractiveness refer to the attractiveness of living in a region measured by an index including, for example, social, economic, health and education conditions. In the empirical part of the paper a unique dataset of matched firm-employees enable us to study the regional patterns of re-employment of displaced workers in 81 Swedish regions 2005-2009. For policymakers understanding how the re-employment process after displacements differs across regions should be valuable knowledge. Enhanced knowledge about which factors that influence regional resilience to displacements would be crucial for formulating well-targeted labor market policies.

The paper is organised as follows. Section 2 discuss the concept of regional resilience and apply it to shocks induced by displacements. Furthermore, this section outlines how the regional context may influence the regional differences in re-employment after displacements. Section 3 describes displacements in a Swedish regional context. Section 4 provides a description of the data the empirical strategy. The empirical results are discussed in section 5. Finally, we discuss our main conclusions and suggestions for future research in section 6.

2. Regional resilience and re-employment of displacements

The term resilience originates from the Latin word *resilio* which means rebound and refers to the ability to adapt to a change (Rose, 2009). The term has been used in different disciplines in science. The term *engineering resilience*, used in physical science, refers to the ability of a system approaching a stable equilibrium to return to equilibrium after a shock or disturbance (Pimm, 1984). Engineering resilience is measured by the speed at which the system can return to equilibrium (Modica, and Reggiani, 2014). *Ecological resilience* refers to what extent a shock can be absorbed to a local stable domain before induced into another stable equilibrium (Holling, 1973). As such the interpretation of ecologically resilience measures the elasticity of the system when receiving a shock (Modica, and Reggiani, 2014). More recently, the term *adaptive resilience* has been introduced by Martin (2012).³ In the regional context adaptive resilience could be viewed as having to do with the capacity of a regional economy to reconfigure, that is adapt its structure (firms, industries, technologies) so as to maintain an acceptable growth path in output, employment, and wealth over time Martin (2012). This self-organizing adaptability may occur in response both to external shocks and due to internal emergent mechanisms (Martin and Sunley (2007). According to Martin (2011) the adaptive resilience will depend on, for example, the rate of entrepreneurial activity and new firm formation, innovativeness of incumbent firms and their willingness to shift to new products or sectors, the diversity of the regional industry structure and the availability of labour with the right skills.

Regional resilience is according to Chapple and Lester (2010 p. 86) defined as “the ability to transform regional outcomes in face of a challenge.” Regional resilience is then evaluated by measuring regional assets. According to Modica, and Reggiani, (2014) the indicators of regional resilience generally falls into 6 categories. Most measures of resilience include measures that take into account socio-economic and access to financial resources. This may for instance be income per capita, employment, economic diversification and educational attainment. Accessibility to infrastructure is also argued to be important for the regions ability to efficiently react to shocks or disturbances. Furthermore, the community capacity to collaborate and may influence the ability to react to shocks. Finally innovation and technology and the natural environment can be important for reducing the impact of shocks where the latter primarily is relevant for shocks in terms of natural disasters. As an example of an index trying to measure socio-economic resilience, the Resilience Capacity Index (RCI), has been created. This index consists of multiple components in the three areas economic capacity, socio-demographic capacity, and community connectivity capacity (Cowell, 2013). Partly inspired by the resilience literature I identify five categories of possible explanatory variables for explaining the regional resilience to displacements here measured by the variation in regional re-employment rates. Firstly, I investigate if the *characteristics of the closures* appearing in the region influence re-employment rate. These measures provide

³For an elaborate discussion of the concept of resilience and various interpretations in the spatial economic literature see Modica and Reggiani, (2014).

indications of how severe the disturbance is in terms of, for example the size of the business closing or the share of displacements in the region. Secondly the *characteristics of the regional industry* are argued to influence the absorptive capacity of displacements. Do, for example, sectoral variety influences the regional capacity to re-employ displaced workers? Thirdly, the skills and human capital in the region i.e. the *characteristics of the individuals* in the region are argued to be influential for the ability to re-employ workers. Fourth the characteristics of the *regional economy* in terms of for instance unemployment rates and the size of the region may influence regional resilience to displacements. Finally the regional attractiveness in terms of attractiveness to living including aspects of health, leisure, social, economic and education variables. Hence the factors that are argued to measure the regional capacity to re-employ employees affected by displacements are categorized into: i) the characteristics of regional closures, ii) the characteristics of the individuals in the region, iii) characteristics of the regional industry iv) the characteristics of the regional economy and v) regional attractiveness.

Characteristics of regional closures

The category characteristics of regional closures include measures that indicate how severe the regional shock is. Firstly it includes the share of displacements in the region. If a large share of workers are simultaneously displaced this may make the adjustment process and re-employment possibilities slower. It also includes measures of the size and age of the closing firms. If the closures in the region is large size closures it may be more difficult to re-employ a large amount of workers with similar competence.

Characteristics of the regional industry

According to Chapple and Lester (2010) regions with a more diverse industry are less likely to experience large changes in employment since they are less affected by exogenous changes in demand for their products. In addition, they are more likely to have industries at different stages of the product life cycle (Markusen, 1985). In order to measure the diversity of the regional industry I employ measures of related and unrelated variety defined by Frenken et al (2007) and Boschma et. al (2012). Following Boschma et. al , (2012) unrelated variety (UV) is defined as:

$$UV_{rt} = \frac{G}{g=1} P_{g_{rt}} \log_2 \left(\frac{1}{P_{g_{rt}}} \right) \quad (1)$$

As previously mentioned the measure of variety indicate the regional “portfolio of industries” which can act as a shock absorber (Essletzbichler, 2007). Hence we expect regions with greater variety (both variety and unrelated variety) to have a better capacity to absorb displaced workers.

The related variety (RV) measure indicate to what extent there are possibilities of positive externalities coming from knowledge-spillovers between related industries in the region. These possibilities of learning are argued to enhance regional performance (Boschma et. al (2012). Related variety is defined as:

$$RV_{rt} = \sum_{g=1}^G P_{g_{rt}} H_{g_{rt}} \quad (2)$$

where:

$$H_{g_{rt}} = \sum_{i \in S_g} \frac{P_{i_{rt}}}{P_{g_{rt}}} \log_2 \left(\frac{1}{P_{i_{rt}} P_{g_{rt}}} \right) \quad (3)$$

where $P_{i_{rt}}$ is the 5-digit SIC employment share in region r at year t and where $P_{g_{rt}}$ is the 2-digit NACE employment share in region r at year t . In the framework of regional ability to absorb displacements regions with a higher degree of related variety may imply greater regional competitiveness and hence could imply a greater opportunity to absorb displacements. On the other hand, as previously argued, there also a greater risk that negative demand shocks diffuses to related industries which would make the labour market for displaced workers even more difficult. Hence, the resulting effect is yet to be determined.

In addition to the measures of variety we also include measures which broadly characterize the regional industrial sectors in terms of the regional share of the manufacturing industry, service sector and public sector. Finally, we also include a measure of the structure of the regional industry by including average plant size and the share of self-employment in the region. Finally, if the turbulence of the regional industry is high (entry and exit rates) this may also increase chances of re-employment. Hence, we include measure of industry turbulence in terms of entry rates. In terms of empirical evidence on the relationship between sectoral diversity and resilience Duschl (2014), studying German regions, find that a diversified and heterogeneous regional industrial structure make regional economies more resilient.

Characteristics of the individuals in the region

Skills and human capital characteristics of the labour force in the region can be expected to be a key factor determinant for regional resilience. Among those who argue that skills and human capital are of importance for regions affected by adverse regional shocks are Glaeser et. al (2014) Chapple and Lester (2010) and Martin (2011). Duschl (2014) find that a qualified workforce in the region make the economy more resilient. Furthermore, the regional demographics may influence the resilience. In regions with an old labour force the process of re-employment may be more difficult since potential new employers may find it less attractive to invest in training new or complementary competences for new employees that they expect to retire in the near future. Also regions with a high share of population with foreign background may experience more difficulties to employ displaced workers. This may be due to individuals with a foreign background may experience difficulties in the labour market due to language difficulties, non-validated foreign qualifications or even due to discrimination.

Characteristics of the regional economy

Chapple and Lester (2010) propose that a regions size shape regional resilience. In a large region the turbulence in terms of new firms created and labour mobility are larger in absolute terms. Hence, the possibility of finding a good match in terms of competence and skills for a new employment can be argued to be better in large regions. Furthermore, the unemployment level in the region can be expected to influence the share of employees that are re-employed in the region. Podgursky and Swaim (1987) as well as Jacobson (1977) find high unemployment levels to reduce the re-employment earnings of displaced workers. Related to the regional economic conditions it can also be mentioned that Bendick and Devine (1981) find that unemployment duration of displaced workers in growing regions was almost half of what those displaced in declining regions experienced. Howland and Peterson (1988) show that in particular blue-collar workers are found to be sensitive to local employment growth in the sector that they are working in. The ability for white-collar workers to become re-employed is on the other hand more dependent on the general labor market conditions and employment growth in the region.

Regional attractiveness

Furthermore we hypothesize that the attractiveness of the region in terms of if it's a good region to live in from social, economic or educational aspects. The possible positive effect of attractive regions and the regional ability to re-employ displaced workers are twofold. Firstly an attractive region may generate more opportunities which also generate additional openings for employment or entrepreneurship for displaced workers. Secondly, once affected by a firm closure the individual may be more prone to stay in the region if the region has attractive properties to live in. In this paper a measure of the regional attractiveness constructed by the Swedish journal Focus⁴ is used. The index is based on statistics from different statistical sources such as Statistics Sweden, Swedish confederation of employers and The Swedish National Agency for Education. The index covers 6 areas which are argued to be important for the attractiveness of living in different regions⁵:

- Private economy: Includes Taxation value for houses, Taxation rate, share of millionaires, net wealth
- Economic situation of the Municipality: Amount of increased population by newly born, in and out migration, social assistance, dependency ratio solidity, tax revenues participation in elections
- Social aspects and security: expenses elderly care, reported crimes, divorces, suicides. Sick leave, gender equality index, deaths related to alcohol
- Leisure: Environmental protected area, Places aloud to serve alcohol, expenditures for culture and leisure, Amount of sport clubs,
- Jobs and Growth: unemployment, new businesses, business climate and education level.
- Education: education expenditures, share of students qualified for secondary education. Amount of teacher per students employee per child in the kinder garden

⁴ Information about the construction of this index and data can be found on www.fokus.se

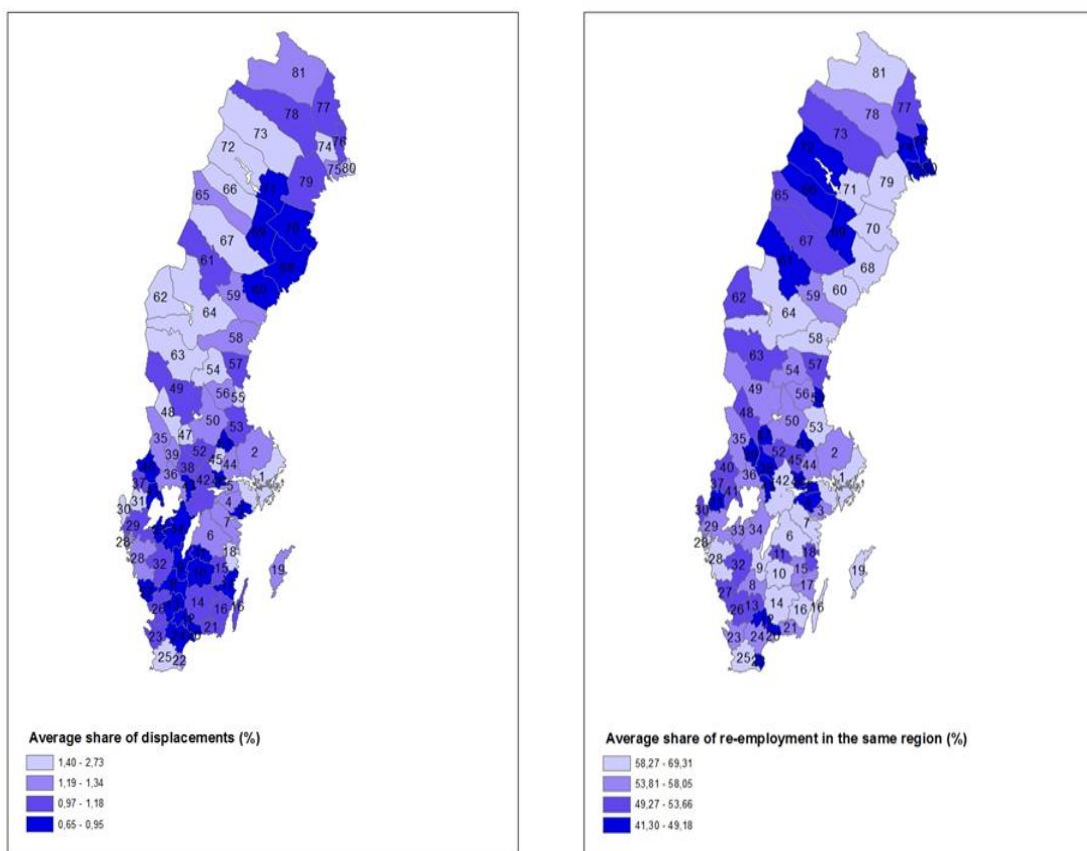
⁵ It should be noted that the content of the index varies somewhat across years. The content reported here refers to data published for 2006.

3. Regional displacements and re-employments in Sweden

3.1 Regional displacements and re-employment patterns

Displacements can occur either through business closing down their activities or by reduction of employees due to economic downturns or structural change- As regards firms closing down their activities about 10 percent of the firms in the Swedish manufacturing industry enter or close down each year. In service sectors, entry and exit rates are even higher (See for example Nyström 2007; 2009). These closures contribute to labour market turbulence which in Sweden, according to Anderson and Thulin, (2008), was on average 12.5 percent for the period 1987-2005. At the country level there are some recent cross country evidence available. For the Swedish case OECD (2013) reports that about 90 percent of the displaced workers in Sweden are re-employed within one year, which is highest re-employment rate among the 15 countries in the study. As previously mentioned most of the previous studies on Swedish displacements and re-employment is based on case studies (for a literature review see Nyström and Viklund Ros, 2014). Figure 1 is adapted from Nyström and Viklund Ros (2014) and display the regional pattern of displacements and the share of employees re-employed within the same region as the displacement took place. As indicted by the figure regional differences in displacements and re-employments are quite substantial.

Figure 1: Displacements and re-employment with in one year



Source: Nyström and Viklund Ros (2014) page 14 and 16

3.2 The Swedish model and the institutions for supporting re-employment after a business closure

Before we enter the empirical part of the paper it is important to describe the institutional conditions which influence the mobility and conditions for people who have been affected by a displacement. The Swedish welfare system provides unemployment insurance has two parts. The first part consist of basic amount and the second an income related benefit. To qualify for the basic amount, the individual needs to be 20-years-old or older and fulfil a working requirement.⁶ The amount received from basic unemployment insurance is currently capped at 320 SEK per day (5 days per week). For the second part, which provide income-related benefits, the individual must fulfil the working requirement and have been a member of an unemployment insurance fund for at least twelve months. The amount of the income-related benefit is 80% of the individual's income up to a maximum of 680 SEK per day (5 days per week). Unemployment benefits can be received for a maximum of 300 days⁷ (The Swedish Federation of Unemployment Insurance Funds, 2013). In the beginning of the period there are

⁶This working requirement requires that the individual must have worked at least 80 hours per month for at least six months during the last twelve months before unemployment.

⁷ For individuals with children under the age of 18 the benefits can be received for 450 days.

no explicit request from the Swedish public Employment service (Arbetsförmedlingen) to apply for other jobs than your current occupation or area of living. However, as the unemployment period increases there are stronger pressure to apply for jobs in different sectors/ occupation and areas.

As a complement to the unemployment insurance and the support that the Swedish public Employment service can provide in the event of an establishment closure many Swedish labor market organizations has established employment security funds which aim to smooth the re-employment process in conjunction with a termination of an employment contract This can be seen as a part of the Swedish model where the parties on the labour market take responsibility for the readjustment process. The employment security funds are available for employees were the firms has signed a collective agreement with the union. The goal, set-up and extent of the support that these funds offer differ across sectors and labour market organizations. Currently there are about 15 organizations working with these re-employment processes and are organized by collective agreement foundations (Walter, 2015). The amount of employees covered by these agreement has increased from about 800 000 in 1970s to more than 3 million employees in 2012 (Walter, 2015).

4. Data and empirical strategy

4.1 Defining displacements and re-employment

Individual-firm level data from 2000 to 2010 provided by Statistics Sweden through the Micro Data Online Access (MONA) database are used to identify business closures. Hence we define business closures and re-employments within one year for the period 2001-2009. The dataset include information on all individuals that were employed in a firm or establishment in November each year. Each individual is identified by a personal identification number and is connected to an establishment and, or, to a firm through firm and establishment-specific identification numbers respectively. If an establishment which identification number was existing in November one year is non-existing in November the following year, it is defined as a closed establishment and can be so due to three different reasons; either, the establishment has closed due to a merger or due to a split, or the establishment has closed due to exit. The latter alternative is used to avoid problems with false firm deaths as discussed by Kuhn (2002). The acquisition of one firm by another would cause the bought firm's employer identity number to disappear. The same problem could arise when using establishment closure, as two establishments merge, one of the establishments will lose its identification number and thus seem to have disappeared although a majority of its workers are still employed and just have moved to the new larger establishment. Furthermore, if an establishment closed due to a split were included there would be a problem with false firm death as well. This is however avoided by only using the establishments that have closed due to exits. Even though the data is organised in such way that it recognises closures due to mergers, it is possible that one specific establishment is defined as a closure but a minority of its workers are re-employed within the same firm. These individuals are not considered to be displaced and thus excluded from the data. Furthermore, those who at the time of closure were self-employed are excluded as the closures then could reflect the productivity of the worker and thus could bias the results. Furthermore, our focus is on the regional capacity to re-employ displaced workers and hence we want to exclude transitions to necessity-based self-employment.

The definition of displacements varies substantially across studies, both in terms of how to define the displacements and with regard to which restrictions that are imposed regarding sectors and ages of employees included. (For a more detailed description of different definitions se Nyström and Viklund Ros, 2014.) In this paper the same flexible time window methodology to identify displacements as Eliason and Storrie (2004) von Greiff (2009) and Nyström and Viklund Ros, (2014) is used. Since the closure process starts several years before the finalized closure is reported in the statistics, in particular for large scale closures, a flexible time window is necessary to impose. However one disadvantage of using a wider and flexible time window is that some normal labour turnover may be included in the measure (Kuhn 2002). According to Eliason (2005) an upper limit of three calendar years minimises

the risk of including normal labour turnover. Following the methodology applied by Eliason and Storrie (2004) von Greiff (2009) the closure process in the dataset is defined to be one, two or three years long depending on the size of the establishment and observed patterns of job reductions. The length of the closing process according to the following:

- The closure process is *three* years long if the number of employees at the firm three years prior to the closure was 50 employees or more, and if the workforce was reduced by at least 20% each year during the closure process.
- The closure process is *two* years if it does not fulfil the requirements of a three-year closure process and if the number of employees, two years prior to the closure was at least 25, and if there was a reduction of the workforce by at least 10 employees, corresponding to at least a reduction of 20%, the year before the closure.
- The closure process is defined to be *one* year which simply corresponds to all the establishments that are not defined to have two- or three-year processes. Most establishments are defined to have a one-year closure process.

With this definition the vast majority (about 80%) of displacements are defined according to the one year process.⁸ Following von Greiff (2009) workers older than 55 and younger than 25 are excluded in the year prior to displacement since young workers may have a high probability to leave the labour market to educational activities and older workers are likely to retire. Unfortunately with this dataset we do not know what the displaced workers do during the period of joblessness since we are unable to distinguish between individuals that are unemployed, leave the labour force or even are deceased.⁹ In our dataset we can observe that they don't appear as employees or self-employed in the dataset.

When studying the regional resilience to displacements the regional definition is highly important. In this paper I use local labor market regions, henceforward denoted (LM) which is defined by Statistics Sweden. The administrative borders of these geographical units are based on patterns of commuting between municipalities. In this paper a definition where Sweden consists of 81 LM-regions is used.¹⁰

The regional number of displacements and re-employments are constructed by summing the number of individuals displaced each year in each LM-region and by summing the number of individuals that are re-employed each year without changing LM-region. The re-employment capacity is calculated as the fraction of displaced workers who are re-employed within the same region, within a year after the displacement. We also calculate the total reemployment

⁸Since our access to data end in 2010 and a flexible window for defining closures with a maximum of three years is used this implies that the number of displacements are truncated in the end of the period. However, we argue that the truncation will have less influence on the re-employment rates since these are calculated as a share of the number of displaced workers. Excluding these last years from our study would imply losing important observation years.

⁹ For further details about the definition of displacements and re-employment see Nyström and Viklund Ros (2014)

¹⁰See ITPS (2004) for a description of the definition and a complete list of which municipalities that are included in the regions.

rates i.e. this share also includes re-employed workers regardless of if they were displaced in the same region. We denote this measure of re-employment total re-employment.

Table 1. Definition of variables

Variables	Description
Characteristics of regional closures	
Displacement share	Share of displaced workers in the region.
Average size of closure	Mean employment size of closed establishments in the region.
Average age of closure	Mean employment age of closed establishments in the region.
Characteristics of the individuals in the region	
Higher education	Share of employees with tertiary or research education in the region.
Foreign background	Share of employees born abroad or having both parents born abroad in the region
Characteristics of the regional industry	
Entry rate	Share of entering establishments in the region
Manufacturing sector	Share of employment in the manufacturing sector (SIC 15-37).
Low end service sector	Share of employment in low end service sector (SIC 40 -64).
High end service sector	Share of employment in high end service sector (SIC 65-74).
Public sector	Share of employees working in the public sector and other service activities (SIC 75-99).
Unrelated Variety	Industry variety defined according to equation 1.
Related Variety	Industry related variety defined according to equation 2.
Characteristics of the regional economy	
Unemployment rate	Unemployment rate in the region (Source AMS)
Population	Log value of the number of population in the region
Regional attractiveness	
Attractiveness of living	Ranking of the attractiveness of living according to the journal Fokus Available at www.fokus.se ¹¹ . At the municipality level this index range from 1 to 290 where 1 refers to the most attractive municipality to live in.

¹¹ Unfortunately data prior to 2006 is not available. We used the data for 2006-2010. However since the data published for 2006 are based on data from 2005 we decided to match the Fokus data with our data on displacement and re-employment with the data 2005-2009 in order to enable us to include one additional year in our data.

Table 2: Summary statistics

Variable	Obs	Mean	Std, Dev,	Min	Max
Re-employment same region	405	0.530	0.107	0.148	0.822
Re-employment total	405	0.789	0.177	0.347	1.943
Displacement share	405	0.010	0.006	0.001	0.070
Average size of closure	405	3.450	1.402	1.000	13.067
Average age of closure	405	4.944	1.154	0.000	10.273
Higher education	405	0.127	0.039	0.065	0.257
Foreign background	405	0.101	0.064	0.028	0.485
Entry rate	405	0.079	0.011	0.044	0.133
Manufacturing sector	405	0.087	0.021	0.047	0.212
Low end service sector	405	0.355	0.031	0.238	0.449
High end service sector	405	0.143	0.043	0.069	0.324
Public sector	405	0.210	0.024	0.141	0.273
Variety	405	2.940	0.126	2.472	3.173
Related Variety	405	1.649	0.254	1.002	2.160
Unemployment rate	405	5.758	2.174	2.040	14.120
Population (ln)	405	9.805	1.365	6.910	13.740
Attractiveness of living	405	162.030	66.151	5.000	289.000

4.1 Econometric strategy

In this paper I want to explore to what extent how the characteristics of regional closures, the characteristics of the individuals in the region, characteristics of the regional industry, the characteristics regional economy and regional attractiveness influence the regional capacity to absorb displacements. However, we can expect that the effect of some of these variables may differ across regions with low or high absorptive capacity. Such asymmetries in the data could not be detected if OLS is used (Buchinsky 1998).¹² Therefore, a quantile regression methodology is used. The quantile regression methodology, introduced by Koenker and Basset (1978), provide an opportunity to explore such asymmetries. The quantile regression approach provides a more detailed description of the relationship between dependent and independent variables. Furthermore quantile regression techniques can deal with skewed distributions. Furthermore, the quantile regression methodology deals with the heteroscedasticity problem since it estimates a conditional quantile of the dependent variable as a function of the independent variables. By contrast, OLS estimates the conditional mean of the dependent variable as a function of the independent variable. Thus, quantile regression analysis allows detecting if the marginal effects of the independent variables differ. In general a quantile regression is specified as:

¹² One alternative approach would of course be to estimate different subsets of the data (for example, high growth, medium growth and low growth industries) separately. In this way a lot of information will be lost since only a limited number of observations can be used in each regression. The advantage with using the quantile regression is that all observations are used in the estimations.

$$y_i = x_i' \beta_\theta + \mu_{\theta i}, \text{Quant}_\theta(y_i | x_i) = x_i' \beta_\theta \quad (4)$$

where y_i is the dependent variable x_i is a vector of independent variables, β_θ is a vector of regression parameters for the θ^{th} quantile. $\text{Quant}_\theta(y_i | x_i)$ denotes the conditional quantile of y_i conditional on x_i . Note that the distribution of the error term $\mu_{\theta i}$ is unspecified. The only assumption that is necessary regarding the error term is that $\text{Quant}_\theta(\mu_{\theta i} | x_i) = 0$. For the θ^{th} quantile of y_i ($0 < \theta < 1$), β_θ , which is the estimator of β_θ , solves:

$$\min_{\beta} \frac{1}{n} \left\{ \sum_{i: y_i \geq x_i' \beta} \theta |y_i - x_i' \beta| + \sum_{i: y_i < x_i' \beta} (1 - \theta) |y_i - x_i' \beta| \right\} \quad (5)$$

Linear programming can solve this minimization problem. Further details about the quantile regression can be found in Buchinsky (1998) and Koenker (2005). In this paper the quantile regression option in the STATA–software was used. Appendix A provides a correlation table for the variables included in the empirical model. In this table a strong correlation between regional population and share of high end service industries, university education and the variety measures was observed. Therefore, there are reasons to suspect problems with multicollinearity if including the population variable in the regression.¹³ Hence the population variable was dropped from the model.

4 Empirical findings

4.1 Which factors influence the regional resilience to displacements?

Table 3 presents the results from the quantile regressions for re-employments in the same region. Except for the quantile with lowest share of re-employment (Q10) the size of the closures in the regions is statistically significantly and positively related to re-employment. This is a somewhat surprising result since we expected large closures to be more difficult to absorb for the regional labour market. Some plausible explanations for this finding would be that larger companies facing a situation of displacement would have more resources to support their employees in the process of finding a new job. It may also be that the larger companies to a greater extent use the previously mentioned support offered by the employment security funds. There are also examples of that in case of large closures there are special initiatives taken together with the firm and local and government authorities to support the displaced workers, which may result in higher re-employment rates. Regarding the characteristics of the individuals in the region we observe that a higher share of university graduates is positively related to re-employment primarily in the lower quantiles. Furthermore, the share of individuals with foreign background in the region is negatively

¹³Running an OLS resulted in a VIF value >10 indicating problems with multicollinearity.

related to re-employment. Regarding this relationship it should be mentioned that many regions with low regional growth and outmigration tend to receive a higher amount of immigrants. In these regions there are, for example, housing available at a reasonable cost. At the same time several municipalities in e.g. the Stockholm region receive very few immigrants. Hence, the causality of this relationship may go in both directions regarding the characteristics of the regional industry the most interesting finding is that for all quantiles except Q80 and Q90 unrelated variety is statistically significantly and positively related to the share of re-employments in the same region. Hence, we can conclude that industry variety makes regions more resistant to displacements. The empirical results also show that the regional unemployment rate is positively related to re-employments. This is also somewhat surprising since we would expect high unemployment rates in the region to make it more difficult for displaced workers to receive a new job. One possible explanation to this finding could be that if the regional unemployment rates is high due to mismatch of competences of unemployed and the competence demanded in the regions, displaced workers may possess that competence and labour market experience which is still attractive in the labour market. Regarding the regional attractiveness, measured by the attractiveness of living index there is a statistically significant effect implying that for the regions that are able to absorb most displacements (Q40 to Q90) more attractive regions re-employ more displacements.¹⁴

Table 3 about here.

Table 4 presents the results from the quantile regression for the total re-employment of displacements. Firstly, we observe that the share of displacements is statistically significant and negatively related to the total reemployment rates for all quantiles. Hence, if the region has a high share of displacements it is unlikely to be able to employ displaced workers from other regions. Again the size of the displacements in the region is positively related to re-employment ability. However, in contrast to re-employment in the same region this finding primarily refers to the regions with the highest re-employment ability (Q40-Q80). Regarding the characteristics of the individuals in the region there are few statistically significant results without any strong patterns. In the category characteristics of the regional industry the share of high end service sectors is positively related to re-employment in regions with the highest ability to re-employ displacements (Q40-Q90). Again unemployment rate is statistically significant and positively related to re-employment. However, regarding regional attractiveness there is only weak support for that this factor matters for some regions with rather high ability to re-employ displacements (Q60-Q70).

Table 4 about here

4 Conclusions and suggestions for future research

In this paper we have studied to what extent i) the characteristics of regional closures, ii) the characteristics of the individuals in the region, iii) characteristics of the regional industry iv) the characteristics and v) regional attractiveness of the regional economy influence the regional resilience to displacements in terms of the ability to re-employ displaced employees either within the same region of displacement or in terms of total displacements. We find no evidence of regions being less resilient to adapt to displacements if the firms closed down are larger, rather the contrary. From a policy perspective this should be an interesting finding

¹⁴ Remember that the index ranges from 1-290 where 1 refers to the most attractive region to live in.

which may attract more interest to the dynamics of small firm closures which are seldom discussed on the policy agenda or in media. Interesting to policymakers should also be the finding that regional industry variety here measured by unrelated variety, makes most regions more resilient to shocks induced by displacements. Obviously there is a tension between the advantages that regional specialization may have and the possible consequences of establishment closures if the region have less industry variety. However, it should be noted that we did not find related variety to influence either re-employment in the same region or total re-employment levels. Furthermore, regional attractiveness, in terms of attractiveness of living, makes regions among regions has a certain amount of resilience to displacement. For the least resilient regions regional attractiveness doesn't seem to matter. We also find that regions with a high share of displacements are unlikely to be able to employ displaced workers from other regions i.e. lower total re-employment rates.

For further studies of the labour dynamics induced by firm closures it would be interesting to get a deeper understanding of the processes that could shed light on our finding that regions with larger closures to a greater extent manage to re-employ these displacement in the same region. It would for instance be interesting to compare the consequences of large closures in regions where very active policy support has been with regions with less developed strategies for coping with large closures.

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Table 3. Re-employment of displacements in the same region results from quantile regressions

	q10	q20	q30	q40	q50	q60	q70	q80	q90									
Characteristics of regional closures																		
Displacement share	-0.132	(2.396)	-2.087	(2.446)	-1.919	(2.713)	-0.523	(2.601)	-0.620	(3.034)	0.377	(3.224)	0.490	(3.139)	-0.327	(2.859)	-1.649	(2.939)
Average size of closure	0.009	(0.009)	0.015*	(0.008)	0.018***	(0.006)	0.016**	(0.005)	0.020***	(0.006)	0.023***	(0.007)	0.027***	(0.010)	0.028***	(0.008)	0.038***	(0.010)
Average age of closure	0.011	(0.008)	0.012*	(0.006)	0.012*	(0.006)	-0.001	(0.005)	0.001	(0.007)	-0.003	(0.005)	-0.006	(0.005)	-0.004	(0.006)	-0.011	(0.007)
Characteristics of the individuals in the region																		
University education	1.124**	(0.447)	0.826**	(0.389)	0.778*	(0.437)	0.605	(0.444)	0.310	(0.317)	0.559*	(0.332)	0.220	(0.349)	0.245	(0.398)	0.142	(0.302)
Foreign background	-0.214	(0.156)	-0.261*	(0.153)	-0.289**	(0.125)	-0.341**	(0.112)	-0.343**	(0.138)	-0.174	(0.147)	-0.266*	(0.160)	-0.075	(0.170)	-0.052	(0.187)
Characteristics of the regional industry																		
Entry rate	1.433**	(0.671)	1.780	(1.093)	0.896	(1.170)	0.980	(0.709)	0.824	(0.834)	0.674	(0.999)	0.900	(0.872)	0.678	(0.947)	1.168	(1.019)
Manufacturing sector	0.518	(0.430)	0.226	(0.592)	0.265	(0.500)	0.350	(0.435)	0.104	(0.500)	-0.176	(0.557)	0.027	(0.473)	-0.127	(0.393)	-0.300	(0.308)
Low end service sector	-0.345	(0.337)	0.007	(0.253)	0.248	(0.305)	0.013	(0.348)	-0.212	(0.283)	-0.416*	(0.226)	-0.443**	(0.217)	-0.455*	(0.257)	-0.598*	(0.322)
High end service sector	0.022	(0.394)	-0.088	(0.348)	-0.058	(0.415)	-0.139	(0.386)	0.126	(0.282)	-0.176	(0.268)	0.113	(0.290)	0.151	(0.349)	0.189	(0.318)
Public sector	0.206	(0.366)	0.439	(0.306)	0.634	(0.399)	0.542	(0.376)	0.577	(0.443)	0.581*	(0.299)	0.411	(0.251)	0.339	(0.299)	0.009	(0.338)
Unrelated Variety	0.200**	(0.095)	0.286***	(0.087)	0.261**	(0.091)	0.256**	(0.081)	0.219***	(0.080)	0.286***	(0.094)	0.124*	(0.073)	0.069	(0.094)	0.147	(0.101)
Related Variety	0.108	(0.047)	0.073	(0.042)	0.053	(0.047)	0.022	(0.064)	0.025	(0.073)	-0.033	(0.059)	-0.031	(0.054)	-0.034	(0.062)	-0.140**	(0.066)
Characteristics of regional economy																		
Unemployment rate	0.011***	(0.004)	0.012***	(0.004)	0.009**	(0.004)	0.011**	(0.005)	0.010**	(0.005)	0.011**	(0.005)	0.009***	(0.003)	0.014***	(0.004)	0.014***	(0.005)
Regional Attractiveness																		
Attractiveness of living	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	-2.333*	(0.000)	-2.285*	(0.000)	-1.958*	(0.000)	-3.014	(0.000)	-3.622*	(0.000)	-3.770*	(0.000)
							10^{-3} **		10^{-3} **		10^{-3} *		10^{-3} ***		10^{-3} ***		10^{-3} ***	
Constant	-0.694**	(0.288)	-0.962	(0.262)	-0.879	(0.289)	-0.595	(0.257)	-0.383	(0.238)	-0.371	(0.263)	0.178	(0.182)	0.363	(0.211)	0.467	(0.261)

* p<0.10, ** p<0.05 and *** p<0.01. Bootstrap errors in parentheses

Table 4. Total re-employment of displacements: Results from quantile regressions

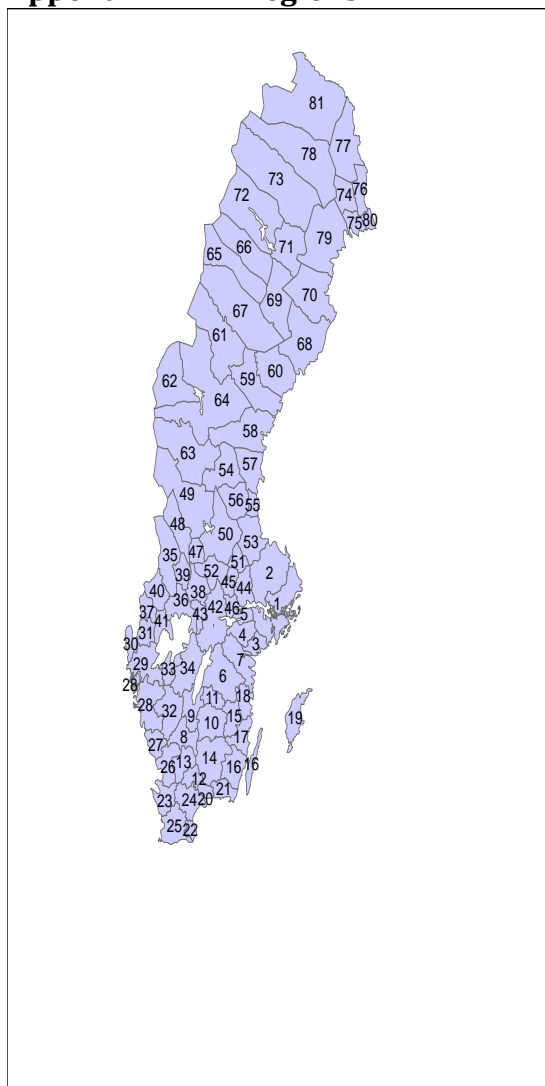
	q10	q20	q30	q40	q50	q60	q70	q80	q90	
Characteristics of regional closures										
Displacement share	- 11.195** *	- 12.202** *	- 11.695** *	- 15.346** *	- 14.804** *	- 15.806** *	- 17.685** *	(5.704)	-17.733** (7.851)	-17.087* (10.284)
Average size of closure	0.015 (0.012)	0.010 (0.007)	0.018 (0.011)	0.028** (0.014)	0.027** (0.013)	0.032** (0.015)	0.038** (0.016)	0.041** (0.020)	0.045 (0.032)	
Average age of closure	-0.004 (0.011)	-0.001 (0.012)	0.009 (0.012)	-0.006 (0.008)	-0.006 (0.008)	-0.007 (0.008)	-0.011 (0.011)	-0.015 (0.017)	0.007 (0.033)	
Characteristics of the individuals in the region										
University education	0.568 (0.406)	-0.214 (0.353)	-0.339 (0.452)	-0.730* (0.430)	-0.663 (0.417)	-0.988*** (0.310)	-1.328*** (0.470)	-1.445*** (0.408)	-1.109 (0.766)	
Foreign background	-0.147 (0.204)	-0.289 (0.197)	-0.337** (0.148)	-0.305** (0.165)	-0.289 (0.221)	-0.096 (0.225)	-0.114 (0.245)	0.066 (0.277)	-0.133 (0.297)	
Characteristics of the regional industry										
Entry rate	1.808 (1.151)	1.558 (1.199)	1.180 (0.942)	0.368 (1.202)	0.481 (1.097)	0.492 (1.013)	0.445 (1.164)	-1.068 (1.571)	-0.915 (2.825)	
Manufacturing sector	-0.109 (0.494)	-0.075 (0.645)	0.087 (0.701)	-0.024 (0.742)	0.127 (0.603)	-0.275 (0.503)	-0.391 (0.829)	-0.689 (1.086)	1.125 (1.728)	
Low end service sector	-0.445 (0.335)	-0.182 (0.331)	0.149 (0.378)	0.132 (0.332)	0.020 (0.225)	-0.180 (0.254)	-0.413 (0.276)	-0.119 (0.455)	0.151 (0.522)	
High end service sector	-0.048 (0.428)	0.627 (0.436)	0.502 (0.489)	1.067** (0.426)	0.868** (0.348)	1.015*** (0.392)	1.259** (0.514)	1.495** (0.762)	1.793** (0.904)	
Public sector	0.132 (0.519)	-0.147 (0.427)	-0.105 (0.538)	-0.336 (0.506)	-0.178 (0.464)	-0.297 (0.507)	-0.491 (0.679)	-0.644 (1.045)	-1.901** (0.812)	
Unrelated Variety	0.296** (0.130)	0.232 (0.178)	0.252 (0.159)	0.070 (0.149)	0.189* (0.110)	0.074 (0.097)	-0.045 (0.143)	-0.247 (0.205)	-0.419 (0.297)	
Related Variety	0.070 (0.077)	0.041 (0.086)	0.044 (0.075)	-0.007 (0.078)	-0.077 (0.069)	-0.074 (0.077)	-0.062 (0.073)	-0.163** (0.075)	-0.287*** (0.100)	
Characteristics of regional economy										
Unemployment rate	0.016*** (0.003)	0.011** (0.005)	0.011** (0.005)	0.012*** (0.004)	0.007** (0.003)	0.009** (0.004)	0.009 (0.007)	0.007 (0.009)	0.001 (0.012)	
Regional Attractiveness										
Attractiveness of living	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-3.072* 10 ^{-3**} (0.000)	-3.868* 10 ^{-3*} (0.000)	0.000 (0.000)	
Constant	-0.399 (0.433)	-0.085 (0.482)	-0.245 (0.457)	0.569 (0.364)	0.400 (0.302)	0.894 (0.372)	1.431 (0.585)	2.287 (0.723)	2.955 (0.997)	

* p<0.10, ** p<0.05 and *** p<0.01. Bootstrap errors in parentheses

Appendix A correlation table

Re-employment in same region	1.0000																
Re-employment total	0.4011	1.0000															
Displacement share	0.1172	-0.3054	1.0000														
Average size of closure	0.2627	-0.1600	0.7103	1.0000													
Average age of closure	-0.0119	0.0101	0.0006	0.0886	1.0000												
University education	0.3541	-0.0064	-0.0477	0.1264	-0.2587	1.0000											
Foreign background	-0.0751	-0.0951	0.0837	0.0327	-0.1162	0.1776	1.0000										
Entry rate	0.1800	-0.0556	0.2228	0.0256	-0.3084	0.3141	0.0402	1.0000									
Manufacturing sector	-0.1268	0.0774	-0.1770	-0.0056	0.2041	-0.4104	0.1076	-0.3171	1.0000								
Low end service sector	-0.1121	-0.0280	0.0949	0.0306	-0.2296	-0.0179	0.1178	0.2023	-0.1270	1.0000							
High end service sector	0.2946	0.0194	0.0299	0.1629	-0.2862	0.8486	0.3383	0.3843	-0.3096	0.1956	1.0000						
Public sector	0.0905	-0.0307	-0.1327	-0.0762	-0.1072	0.2189	0.0868	0.0098	-0.2057	-0.0162	0.2377	1.0000					
Unrelated Variety	0.3066	0.0813	-0.1341	0.1673	-0.0322	0.4625	0.0499	0.0868	0.0740	0.0587	0.5080	-0.1601	1.0000				
Related Variety	0.3370	-0.0091	-0.0585	0.2185	-0.1592	0.7572	0.2065	0.1266	-0.2058	0.0233	0.7094	-0.0086	0.7203	1.0000			
Unemployment rate	-0.0063	-0.0491	0.0879	-0.1399	0.0286	-0.2340	0.0646	-0.0951	-0.0835	-0.1679	-0.2573	0.3106	-0.4336	-0.2884	1.0000		
Population (ln)	0.3728	0.0511	-0.1381	0.2265	-0.1630	0.7931	0.2217	0.1584	-0.0942	0.0750	0.7979	0.0713	0.7743	0.9049	0.4113	1.0000	
Attractiveness of living	-0.2019	-0.0803	-0.0542	-0.0556	0.0190	-0.2686	0.1477	-0.2614	0.0241	0.0014	-0.1972	0.2731	-0.3024	-0.1493	0.4044	-0.2154	1.000

Appendix B: LM-regions



Labour market	Region	Labour market	Region
1	Stockholm	41	Säffle
2	Uppsala	42	Örebro
3	Nyköping	43	Karlskoga
4	Katrineholm	44	Västerås
5	Eskilstuna	45	Fagersta
6	Linköping	46	Köping
7	Norrköping	47	Vansbro
8	Värnamo	48	Malung
9	Jönköping	49	Mora
10	Nässjö	50	Falun/Borlänge
11	Tranås	51	Avesta
12	Älmhult	52	Ludvika
13	Ljungby	53	Gävle
14	Växjö	54	Ljusdal
15	Vimmerby	55	Söderhamn
16	Kalmar	56	Bollnäs
17	Oskarshamn	57	Hudiksvall
18	Västervik	58	Sundsvall
19	Gotland	59	Kramfors
20	Karlshamn	60	Örnsköldsvik
21	Karlskrona	61	Strömsund
22	Simrishamn	62	Åre
23	Helsingborg	63	Härjedalen
24	Kristianstad	64	Östersund
25	Malmö	65	Storuman
26	Halmstad	66	Sorsele
27	Varberg	67	Vilhelmina
28	Göteborg	68	Umeå
29	Trollhättan	69	Lycksele
30	Strömstad	70	Skellefteå
31	Bengtstors	71	Arvidsjaur
32	Borås	72	Arjeplog
33	Lidköping	73	Jokkmokk
34	Skövde	74	Överkalix
35	Torsby	75	Kalix
36	Karlstad	76	Övertorneå
37	Årjäng	77	Pajala
38	Filipstad	78	Gällivare
39	Hagfors	79	Luleå
40	Arvika	80	Haparanda
41	Säffle	81	Kiruna

Appendix C . Regional average displacements and re-employment rates 2001-2009

Labour market (LM)	Region	Re-employment share in the same region (%)	Total re-employment share (%)	Displacement rate (%)
1	Stockholm	69.31	78.44	2.08
2	Uppsala	53.81	77.50	1.19
3	Nyköping	53.96	86.26	0.90
4	Katrineholm	47.60	81.27	1.34
5	Eskilstuna	48.59	80.24	1.21
6	Linköping	61.37	80.22	1.24
7	Norrköping	58.27	82.80	1.33
8	Värnamo	57.51	82.07	0.71
9	Jönköping	61.13	86.00	0.93
10	Nässjö	59.62	82.50	0.92
11	Tranås	49.36	86.12	0.65
12	Älmhult	47.82	102.92	0.94
13	Ljungby	50.01	81.14	0.75
14	Växjö	61.63	83.05	1.15
15	Vimmerby	54.42	76.77	1.10
16	Kalmar	61.14	78.36	1.11
17	Oskarshamn	56.31	88.26	0.71
18	Västervik	53.28	78.21	1.55
19	Gotland	61.67	78.25	1.30
20	Karlshamn	41.30	72.90	0.81
21	Karlskrona	57.37	82.80	1.18
22	Simrishamn	47.19	77.14	1.32
23	Helsingborg	55.28	77.09	1.18
24	Kristianstad	54.30	77.99	0.95
25	Malmö	60.71	76.29	1.44
26	Halmstad	53.59	76.76	1.14
27	Varberg	52.78	82.36	0.84
28	Göteborg	61.60	76.32	1.29
29	Trollhättan	57.79	79.67	1.02
30	Strömstad	50.82	74.87	1.56
31	Bengtstors	48.99	86.28	1.84
32	Borås	53.63	78.44	1.01
33	Lidköping	54.64	89.36	0.95
34	Skövde	55.02	76.49	0.88
35	Torsby	56.60	79.71	1.22
36	Karlstad	57.73	76.80	1.34
37	Ärjäng	49.27	79.73	1.17
38	Filipstad	47.18	71.78	1.02
39	Hagfors	42.87	67.58	1.20
40	Arvika	53.66	75.14	0.95
41	Säffle	50.51	83.33	0.95
42	Örebro	59.55	78.01	1.07
43	Karlskoga	49.11	87.91	0.76
44	Västerås	54.97	79.31	1.22
45	Fagersta	49.29	81.80	1.53

46	Köping	47.58	88.76	0.72
47	Vansbro	48.99	82.11	1.91
48	Malung	51.37	81.86	1.61
49	Mora	53.86	81.33	1.04
50	Falun/Borlänge	57.27	76.92	1.30
51	Avesta	48.81	84.90	0.93
52	Ludvika	51.78	82.60	0.98
53	Gävle	59.49	79.49	0.97
54	Ljusdal	56.12	80.76	1.45
55	Söderhamn	47.00	72.53	1.84
56	Bollnäs	58.05	84.05	1.32
57	Hudiksvall	50.67	73.65	1.05
58	Sundsvall	62.31	79.58	1.28
59	Kramfors	55.42	76.98	1.32
60	Örnsköldsvik	64.42	86.66	0.93
61	Strömsund	47.83	74.08	1.11
62	Åre	49.37	80.94	2.73
63	Härjedalen	50.52	72.65	1.56
64	Östersund	59.10	75.36	1.98
65	Storuman	49.52	79.13	1.26
66	Sorsele	43.48	60.29	1.48
67	Vilhelmina	52.63	72.27	1.43
68	Umeå	62.88	80.65	0.92
69	Lycksele	48.35	84.22	0.85
70	Skellefteå	61.82	81.46	0.93
71	Arvidsjaur	61.39	95.51	0.93
72	Arjeplog	48.70	90.16	1.78
73	Jokkmok	50.62	71.34	1.89
74	Överkalix	44.44	66.68	1.40
75	Kalix	49.18	78.56	1.19
76	Övertorneå	43.78	68.89	1.10
77	Pajala	52.09	72.26	1.14
78	Gällivare	57.96	81.17	1.16
79	Luleå	63.76	80.42	1.13
80	Haparanda	46.07	58.76	2.07
81	Kiruna	62.58	78.20	1.34