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How do regional economies respond to crises? The geography of job creation and destruction in Sweden (1990-2010)

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Abstract: By means of Swedish longitudinal micro-data, the aim of this paper is to analyse how regional economies respond to crises. This is made possible by linking gross employment flows to the notion of regional resilience. Our findings indicate that despite a steady national employment growth, only the three metropolitan regions show higher employment figures than before the recession of 1990. Further, we can show evidence of high levels of job creation and destruction in both declining and expanding regions and sectors, and that the creation of jobs is mainly attributable to employment growth in incumbent firms while job destruction is primarily due to exits and micro-plants. Although the geography of resistance to crises and the ability of adaptability in the aftermath vary, our findings suggest that cohesive (i.e., with many skill-related industries) and diverse (i.e., with a high degree of unrelated variety) regions are more resilient over time. We also find that resistance to future shocks (e.g., the 2008 recession) is highly dependent on the resistance to previous crises. In all, this suggests that the long-term evolution of regional economies also influences their future resilience.

Keywords: regional economic evolution, job creation, job destruction, crises, regional resilience

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Introduction

Despite national figures showing positive trends for employment and productivity, regional numbers tend to tell a much more diverse story about the evolution of the economic landscape, indicating increasing differences between leading and lagging regions (Lundquist et al., 2008; Gardiner et al., 2013; Essletzbichler, 2007; Martin, 2012). These persistent spatial differences are at the core of this paper.

Using the Swedish economy as an example, the aim of this paper is to analyse how regional economies responded to crises in the period 1990-2010. This is done to gain further understanding of how regional micro-processes influence regional resilience, or more specifically, the ability of *resistance* in times of recession and *adaptability* in the aftermath of recession. We thereby address the following questions: What are the driving forces generating and destroying regional employment? How are the regional differences in employment and the ability of resistance and adaptability to crises related to the structure of regional industries and plants?

We focus on employment changes over time to analyse the dynamics of resilience. This is motivated because, first, employment effects in relation to crises tend to be more persistent than output effects (Martin, 2012). Second, adaptability tends to be dependent on the characteristics of the regional labour force and the changing labour market conditions (Diodato and Weterings, 2014; Eriksson et al., 2014). Sweden is a particularly well-suited case for this type of analysis since the chosen time frame comprises three periods of crisis and two phases of recovery, ending in the latest 2008 recession. The massive shock during the recession of the 1990s, with an unemployment increase of almost seven percentage points, marked a transition from manufacturing towards more knowledge-based production. It was

also the beginning of a political move away from the traditional Swedish redistributive policies to more neoliberal modes of governance, as has been identified in many other advanced capitalist economies from the late 1980s and onwards (Harvey, 2005).

We claim to make two contributions to the literature. First, the availability of geo-referenced matched employer-employee data makes it possible to follow in detail the evolution of regional economies over time, and decompose net employment changes in gross job flows consisting of simultaneous processes of job creation and destruction. Thus, compared to the majority of studies analysing employment shifts based on net employment figures, this approach allows us to discern the driving forces generating and destroying employment (entries, exits and incumbents) over time and space (e.g., Essletzbichler, 2007). Second, in contrast to previous studies on gross employment flows, we frame the processes of job creation and destruction to the notion of regional cyclical sensitivity as proposed by Martin (2012). In so doing, we link the characteristics of the micro-processes to the outcomes at the macro level, and acknowledge the temporality of resilience. This is crucial, since the ability to both absorb shocks and develop new growth paths is fundamental for understanding the scope for re-orienting regional skills, technologies and institutions (cf., Boschma, 2014).

The remainder of the paper is structured as follows. Section 2 will provide the conceptual motivation for studying the geography of resilience from an evolutionary perspective, using both net employment changes and gross job flows. Section 3 consists of the empirical analysis, which explains the evolution of the Swedish economy from the 1990s and onwards, together with a description of data and results. Section 4 concludes the paper.

Theoretical framework

With diverging regional economic trajectories and diverse regional responses to severe global recessions (Lundquist et al., 2008; Gardiner et al., 2013; Rodriguez-Pose, 1999; Martin, 2012), the notion of regional resilience to shocks is gathering considerable interest in both policy and academic circles (Boschma, 2014; Hudson, 2010). The term *resilience* springs from the economic literature, and has mainly been referred to as an economic system that diverges as little as possible from the initial state; that is, a region's ability to resist or return to a pre-shock state (Christopherson et al., 2010). Hence, a resilient region would be one that does not change, thereby neglecting the role of space and time in the transformation of the economic landscape.

Boschma (2014) therefore identifies a need to understand transformation as a context-specific process, in which the context could be regarded as a complex composition of dynamic micro-processes composed of individuals, plants, relations, networks and institutions. Economic geographers have somewhat redeveloped the work on *resilience* towards a more evolutionary and spatial understanding, creating a framework that encompasses diverging and uneven spatial trends of resilience (e.g. Dawley et al., 2010; Pike et al., 2010; Martin, 2012; Boschma, 2014). In this perspective, regions are evolving on/through several different open-ended trajectories, whereby development is regarded as a process rooted in the present and formed by the past. These path-dependent transformations do not imply deterministic developments but give rise to continuity through the inertia of institutions and behavioural routines, while novelties through creativity and chance give rise to change and what Schumpeter (1951) termed 'creative destruction'. As these economic processes are both geographically and historically specific, the evolution of the economic landscape gives rise to enduring inter-regional differences and intra-regional similarities concerning both what is

being done and how it is being done (Rigby and Essletzbichler, 1997). The effects of regional institutions and micro behavioural routines will not be directly addressed in this paper, even though they are reflected in the changes as well as continuity that are visual in the regional outcomes. A brief account of the changing national institutions has been outlined in the third section. The focus in this paper is instead on the dynamics of regional resilience, to address how the region reacts in the phase of recession as well as in its aftermath.

Martin (2012) has addressed the critique of the static and non-spatial understanding of resilience by using the idea of 'hysteresis' developed by Romer (2001). Hence, as temporary economic turbulences can result in permanent changes and new development trajectories, Martin uses shocks to understand the temporality and spatiality of regional resilience and developments. Thus, by developing a temporal dimension for the notion of resilience we, in a similar fashion as Martin (2012), break down the resilience concept into the regional reaction, or *resistance,* to the initial phase of the crisis, and the later recovery phase after the shock, which is the region's *adaptability* to new conditions. *Resistance* is closely linked to the traditional usage of resilience, which is the magnitude of the immediate effect of the crisis on the region. The *adaptability* concept introduces a more complex understanding of how and when a region is resilient – including a severe economic downturn at the initial phase of the crisis but experiencing high post-recession growth due to, e.g., the renewal of a certain path or the creation of a new one (Martin, 2012). Coming to a greater understanding of the diversity of economic resilience is one of the primary objectives of this paper. We will also address the potential trade-off between resistance and adaptability, something Boschma (2014) argues is in great need of re-evaluation.

To empirically address the regional resilience (resistance and adaptability), in line with Martin (2012) we have chosen employment changes as our analysis unit. This is due to their tendency to have much greater difficulty than output in recovering, as well as the severe consequences the employment rate and labour market conditions have on the local economy (Massey and Meegan, 1982; Martin, 2012). As argued by Massey and Meegan (1982), these figures cannot be substituted with output because there is no simple and distinct relation between productivity and employment changes. The outcome depends on economic and political processes, as well as local institutions shaped by the interaction between economic and social actors and organizations (e.g., firms, labour unions and social movements). Net figures are the most common measurement of employment changes (e.g. Massey and Meegan, 1982; Lundquist et al., 2008; Martin, 2012; Simmie and Martin, 2010; Gardiner et al., 2013). However, as argued by Boschma (2014), to understand the dynamic complexity of regional resilience we need to understand the micro-processes at work. When one assesses the evolving landscape of labour, net employment figures seldom reveal the continuous creation and destruction of jobs. Studies on the manufacturing sector in the UK (Essletzbichler, 2007) and the US (Davis and Haltiwanger, 1999; Essletzbichler, 2004) show that small incremental changes in net employment conceal a high turnover of jobs and are therefore a poor approximation of the changing labour demand on the local labour markets. Davis and Haltiwanger (1999) found that, during an average quarter of the period they studied (1972-1993), the destroyed/created jobs equalled 6%/5.8% of all jobs in manufacturing. By including a spatial dimension, Essletzbichler (2004; 2007) reveals the highly geographical nature of gross employment flows, and further shows that UK regions depend on the creation and destruction of jobs from different plant changes (exit, entry, incumbent) to various degrees. Essletzbichler (2007) also concludes that intra-regional and intra-sectorial flows are much more important than is commonly identified in studies using net employment changes,

in which mobility is mainly assumed to be driven from declining to expanding industries and regions.

Based on these contributions, this paper focuses on the micro-dynamics of gross employment flows, because in contrast to net changes this acknowledges the complexity of the spatiality and temporality of labour demand. A second reason is that, in contrast to classical economics where labour tends to be simplified into a commodity, employees are both place-bound and idiosyncratic (Castree et al., 2004). It is thus not only radical changes in net figures that will have an effect on workers; changes at the micro-level will also have an effect on the everyday life of the workforce, which through the interdependent becoming with other workers and institutions (re)produce behavioural routines. As these are 'region-specific relational assets' (Storper, 1997:137), relationally (re)produced norms, skills and ambitions change the labour characteristics and qualities through a path-dependent evolution and spatial division of labour (Storper and Walker, 1989). The (re)production of labour is not an isolated local process, however. Strambach and Klement (2012), studying the role of place and space in micro-knowledge dynamics, found no accounts of any 'production' of innovations without extra-regional cooperation. The local is thus combined with the national and international societal and economic processes, which implies that even though regions would face the same interconnections or temporal pressure, they process these in different ways, ending up with different outcomes (Castree et al., 2004). These strategies and outcomes are one of the main concerns within resilience research.

What has been found in previous studies is that different regional resources matter differently in different phases of the shock. While the resistance in the first phase is dependent on regional embeddedness (i.e., persistent local buyer-supplier relationships) and strong ties

between agents, the phase of adaptability depends not only on network structures, institutions and the relational position towards other regions, but also on the industry mix and particularly industry relatedness (Boschma, 2014: Pike et al. 2010; Diodato and Weterings, 2014; Eriksson et al., 2014). While diverse regions are less exposed to sector-specific shocks, a diverse region with many related sectors can also absorb laid-off workers due to the transferability of their human capital resources (Frenken et al. 2007). This would mean that a region with a combination of industries that are 'close' in terms of these human capital resources would be a region that is cognitively *cohesive* and that facilitates adaptability in times of crisis. Using 62 case studies in 22 European regions, Strambach and Klement (2012) identify a qualitative shift in the labour markets toward combinatorial knowledge and a wider range of heterogeneous economic actors with highly specialized knowledge. Different regional trajectories, and the continuous process of minimizing and narrowing the function of a worker, could thus lead on the one hand to a further advancement of specialization and qualitative development of the regional knowledge base, but on the other hand to too much homogeneity, with a decline in novelty and variation. Specialization therefore tends to increase vulnerability to sector-specific shocks (Diodato and Weterings, 2014; Eriksson et al., 2014) and hamper employment growth as compared to more diversified regions (Boschma et al., 2014). This implies that different policies will lead to diverse effects in the different phases of a recession. According to Pike et al. (2010), a single focus and strategy to foster the initial resistance that is currently happening in the form of privatization and marketization might only be a short-term solution that results in institutional homogenization. As exemplified in Grabher's (1993) study on the Ruhr area, too much homogeneity and inflexible industrial structures could lead to lock-in and subsequent regional decline.

To improve our understanding of what it is that makes regions resistant and adaptable, there is a need to understand not only national trends but also the diverging regional economies, and the dynamism of local labour markets. This is addressed in this paper by analysing the aggregated micro-processes of gross employment changes at work in Swedish regions over time as well as in different phases of recessions. This is important because employment growth cannot be understood without an understanding of the creation *and* destruction of jobs and the spatial as well as temporal dimensions of these processes.

Explaining uneven regional development

Data

To be able to examine gross employment flows, we have used longitudinal matched employer-employee data. These data, originating from Statistics Sweden (SCB), make it possible to connect information on the number of employees at each plant, and then follow that plant over time. To analyse gross employment flows, we follow the definitions of Essletzbichler (2007) (see all definitions in Table 1 below). *Net* is job creation (JC) minus job destruction (JD), while *gross* is the sum of job creation and job destruction. All figures on creation and destruction are shown as percentages of the total number of jobs. Each plant was defined as *exit*, *entry* or *incumbent*, following SCB's official definitions of firm survival[1]. The final step was to define the extent to which the different types of plants were subject to job creation or destruction. Following Essletzbichler (2007), this was done by defining job creation as the sum of all created jobs at a plant, defined as entry or expanding incumbent (in t compared to t-1), and job destruction was defined as the sum of jobs destroyed at a plant categorized as an exit or a declining incumbent. Official employment figures were gathered in November and were defined as the number of people employed during this observation, while the total number of jobs is the number of employees connected to that plant during the whole

year. Thus, short-term positions are also included in this definition, which is useful for our purpose of examining the labour demand and the characteristics and conditions on the labour markets.

Table 1 about here

Since previous studies highlight the importance of industry mix for understanding regional differences in resilience (Diodato and Weterings, 2014), we address this in the form of related and unrelated diversity and regional specialization. Related variety is based on the skill-relatedness concept developed by Neffke and Svensson-Henning (2013), in which they argue that high proportions of labour flows between two industries (given differences in wages as well as in growth) are a probable indicator of cognitive proximity since this captures how transferable human capital is between sectors. Similar to Neffke et al. (2011), we then summarized the number of plants in each region that were skill-related as a ratio of all plants present in the region. This sum was then used as a measurement of the intra-regional interconnections, or *cohesion*, which reflects a high degree of related variety in the region. Unrelated plants are those that are not in the same sector or related (as defined above). We thereby define *diverse* regions as those having a high ratio of unrelated plants. The definition of regional *specialization* is based on the so-called Krugman Specialization Index (Krugman, 1991), whereby the relative number of plants in industry i in region r is compared to the national share of that industry (except region r). The index takes the value 2 if the region has no sectors in common with the remaining national economy (strong specialization), and 0 if the region has an industry structure identical to that of the nation. According to previous studies (e.g., Frenken et al., 2007; Boschma et al., 2014), we expect that specialized regions are less likely to be well protected from sticky unemployment in cases of shock due to a

relative shortage of other employment opportunities in the region, while more diverse regions are more capable of withstanding asymmetric shocks due to portfolio effects providing employment opportunities for redundant labour in a wide array of regional sectors. The influence of cohesiveness (relatedness), however, is expected to differ depending on the type of shock. Diodato and Weterings (2014) find that cohesive regions are better at absorbing sector-specific shocks as this enables a better matching between sectors that are skill-related, while it may be less protective for general shocks affecting the entire region since in such cases all skill-related sectors are likely to be affected.

Two different regional levels have been used for the analysis (see Figure A1 in Appendix). The smallest regional unit is the Functional Analysis regional division (FA regions, mapped with grey borders) created by the Swedish Agency for Economic and Regional Growth (2011). These 72 FA regions are constructed from labour-commuting patterns between municipalities, and, by also incorporating historic growth trends, are intended to represent functional labour markets that are somewhat persistent over time. The larger regions are based on the European Union's hierarchical administrative units Nomenclature des Unités Territoriales Statistiques 2 (NUTS 2) regions (Eurostat, 2012), but have been altered in this paper and are referred to as the NUTS8 (black borders). Minor modifications have been made so that the NUTS8 will work with the FA regions, while a major change has been made in the north of Sweden to reflect a coast-inland divide; a prominent difference in matters such as the proportion of highly educated and developments in population growth as well as employment, since the coastal areas house all the major regional centres and expansive hinterlands while the inland regions are sparsely populated and face population decline (e.g., Holm et al. 2013).

Background

Before we turn to the empirical findings, some notes on the evolution of the Swedish economic landscape are warranted. The period from the early 1950s to the early 1970s was a time of extraordinary growth for the Western world. With a strategy later referred to as the *Swedish model,* welfare politics were put at centre stage during this period, with large state investments in social reforms, strong unions, solidaristic wage system, low unemployment and a more encompassing social security (Movitz and Sandberg, 2013). This meant a shift in living conditions for the average Swedish citizen; low unemployment figures followed by strong unions decreased income differences, and consumption increased dramatically among the majority of the population. The result was a major structural transformation with a decline in agriculture and an expansion of the manufacturing and service sectors, which affected the geography of people and production in the form of an intensified urbanization. A period of growth followed the oil crisis in the 1970s, with new political strategies referred to as 'the third way', a step towards the later prominent substitution of welfare with workfarism (Peck and Theodore, 2001), focusing on the supply-side by increasing profitability for firms. This was done through currency devaluation and stagnated wages. Ultimately, this led to an overheated Swedish market and a major macroeconomic recession at the beginning of the 1990s' (Magnusson, 2002). During the 1990s crisis, the GDP fell by 6% and unemployment rose to a level of 8.2% in 1993 (1.5% in 1989-1990). The recession hit the economy hard and, as shown in Figure 2, it took a long time before Sweden had managed to recoup an employment level with a magnitude similar to that of the late 1980s. Like in many other Western societies (e.g. Bristow, 2010), the 1990s also marked the start of a shift towards more knowledge-intensive production as this was assumed to secure the future competitiveness of regional economies.

During this period the turbulent employment change was mainly due to the job destruction of open-ended contracts, and in ten years (1990-2000) the number of fixed-term contracts (temporary work) rose by 50%. The higher unemployment figure since then is primarily caused by higher rates of temporary work and thereby the end of fixed-term periods, rather than a more insistent spell of unemployment (Holmlund and Storrie, 2002). These changes are due to both economic and political reasons. Sweden is increasingly experiencing a neo-liberal new public management accompanied by an intense privatization, a union density that keeps decreasing, decreased unemployment benefits, stronger local regulation even among unions, and cuts in taxes (Bruhn et al. 2013; Movitz and Sandberg, 2013). Since 1993 the national employment numbers have never dipped as low, and continue to work their way up, apart from small temporary bumps. However, these accumulated figures conceal disperse regional trajectories and reactions as depicted in Figure 1. For the NUTS8 regions, it is only those containing the three metropolitan regions (Stockholm, South with Malmö and West with Gothenburg) that have seen an overall positive trend that has led to a total employment level in line or above that of the starting year of 1990. The Northern Inland, on the other hand, fell the deepest and continued on a development path with negative employment growth even after the recession, never managing to reach even the employment figures of 1993. The inland regions, which have mostly specialized in primary and secondary sectors, have faced great difficulties catching up after the 1990-1993 recession, while the metropolitan regions on the other hand have managed the structural transformation towards more service-oriented sectors much better. This confirms previous findings of increasing regional disparities in Sweden (Lundqvist et al., 2008) and that 'new economy sectors', such as knowledge-intensive business services, compared to manufacturing mainly agglomerate in the largest Swedish regions, leaving the more sparsely populated regions less space for renewal and development (Eriksson and Hansen, 2013). Thus, as depicted in Figure 1, although the national numbers

indicate an overall job growth, there are great regional disparities in where the jobs are created. The potential micro-foundations behind these numbers will be analysed in the following section.

Figure 1 about here

Exploratory Results

Gross job changes and regional, sectorial and plant characteristics

Table 2 shows the gross employment flows from 1990-2010 for the whole Swedish economy, and further decomposes the flows into expanding/declining regions (reg) and sectors (SNI), measured by the size of the labour force. We use the Functional Regional Families, constructed by the Swedish Agency for Economic and Regional Growth (2011), to divide the regions into *large* and *small regions*. This typology is primarily based on population size (larger than 100,000) and the presence of higher education institutions (i.e., metropolitan regions and large regional centres). This division has been included as earlier findings state that the primary factors determining resilience are human capital, centrality and diversity, and thereby also the size of the region (e.g. Polèse, 2010). Apart from addressing differences across expanding/declining regions and sectors, the second part of the table shows the components of gross flows for the manufacturing[2] and knowledge-intensive business[3] sectors (KIBS). These two groups of industries have been chosen to show the creation and destruction of jobs in relation to the qualitative transformation of the economy, towards what is often referred to as the 'learning economy'. This is of particular importance in the Swedish case, which has seen a strong manufacturing economy move toward a greater emphasis on sustaining a productive edge in knowledge-based sectors.

Table 2 about here

As shown at the top of Table 2 an average of about 478,672 (11.38%) jobs were created each year, and 480,580 (11.42%) jobs were destroyed. Manufacturing had a lower gross than the national average, while KIBS experienced the highest. However, both groups and the national average show high figures, which is an indication of significant labour flows between plants in the whole Swedish economy. If these gross employment flows were primarily the movement of people from declining to expanding regions/sectors, the activities in the declining parts would mainly consist of job destruction while the expanding ones would mainly experience job creation (Essletzbichler, 2007). However, Table 2 clearly shows that there are high levels of job creation *and* destruction in both expanding and declining regions and sectors, suggesting that net changes at the regional or sectorial level would be insufficient to explain labour demand at the regional level. For the same reasons, we can also not identify a general shift of employment from small to large regions. The difference in net employment between small and large regions instead suggests that destroyed jobs in small regions are simply phased out and never replaced, rather than shifting to urban areas.

In an assessment of how different types of plants may influence employment, the figures on plant change show that incumbent plants are the main contributor to the creation of jobs during the whole period studied (1990-2010), and the destruction of jobs from exits exceeds the destruction of jobs from incumbent contraction. This is in line with the study by Essletzbichler (2007), who also found that incumbents are the main source of job creation and that exits are the main source of job destruction; and partly with that of Davis et al. (1996), who discovered that the majority of created jobs are due to the expansion of incumbent plants.

There does not seem to be a so-called 'red tape' towards new entries, but rather a major problem of surviving and growing (Audretsch and Fritsch, 2002; Bartelsman et al., 2005). Entries can however have an indirect positive effect on incumbent developments, but that tend to be positively correlated with population size (Fritsch and Noseleit, 2013). In terms of plant size, micro-plants have the highest gross compared to SMEs and large plants, and the rate of job destruction greatly exceeds the number of jobs created during the period. The number of entries is high, but the bulk of them become exits. While SMEs are the main source of employment growth, large plants experience a negative net employment growth from 1990-2010 – but less so compared to micro-plants. While micro-plants never manage to produce a positive net, the contribution from larger plants changes with region and time (see Table 4 below).

The second section of Table 2 shows the gross employment changes in manufacturing and KIBS to more directly assess potential qualitative differences between expanding and declining sectors. Both large and small regions have experienced a substantial employment decline in manufacturing. However, the job destruction rate is greater in the larger regions, which indicates the noticeable shift of manufacturing away from the larger cities. In manufacturing, it is the large plants that experience the smallest decrease in net employment growth. This indicates that larger incumbents are an important stabilizing factor for employment in smaller regions. What is interesting is the very high rate of job creation at micro-plants – mostly due to new entries – accompanied by an even higher rate of job destruction – mainly due to exits. There seems to be an incentive for small start-ups in manufacturing, but a very low survival rate. As anticipated, for KIBS we find the highest rate of gross employment flows, but also a high rate of net employment growth. For this group of sectors, micro-plants contribute to a positive net employment growth, but it is the SMEs that

are the dominant source of jobs and the large plants that have the highest net developments since the 1990s.

To control for whether these processes are driven by specificities of the Swedish economy or are more general processes attributable to other economies, Table 3 shows the pairwise correlation coefficients for the main gross employment variables. The table shows a positive correlation between net and gross, but only at a 90% confidence level. This implies that even though this study is set in Sweden and looks not only at manufacturing but also the whole economy, the same conclusions can be drawn as in Essletzbichler's (2007) study on the UK. High turnover is not the most essential mechanism for net employment growth.

Table 3 about here

Diverse geographies of resilience

These gross employment flows have been the average figures for a period of time in which two whole cycles of recession growth have occurred: the macro-recession of 1990, and the more specific dotcom bubble of 2000. As we argue for the importance of understanding the dynamics of resilience in analysing the development of local economies and the shifts in regional trajectories (Boschma, 2014), we have plotted the period of crisis against recovery in Figure 2 (1990-1999) and Figure 3 (2000-2007). Similar to Martin (2012), the y-axis shows the resistance to the recession by comparing the employment rate at its very low point to its peak before the recession (1993 indexed on 1990; 2003 indexed on 2000). The x-axis shows the annual average growth in the period of recovery. The reference lines are the median for each axis for each time period (note that the scale is different in the two figures). The further up a region scores on the y-axis, the lower the impact the recession had on employment,

which is a sign of high resistance. The further to the right a region scores on the x-axis, the higher the average annual growth it will have experienced after the crisis, which is a sign of adaptability, according to Martin (2012).

Figures 2 and 3 about here

For the regions containing the three metropolitan regions (Stockholm, Malmö in South and Gothenburg in West) the crisis of 1990 had very different effects. As shown in Figure 2, Stockholm would be the most resilient NUTS8 region, with high resistance (the smallest per cent decrease in employment comparing 1993 with 1990) and post-recession growth. Region West, on the other hand, did enjoy the second-best post-recession growth, but only after the most encompassing employment destruction. Of the three metropolitan NUTS8 regions, South was the one with the lowest post-recession growth; it is still above the median, however. These differences might be explained by the characteristics of their industry portfolios. While Stockholm had already started evolving from manufacturing to service, Gothenburg was still highly reliant on manufacturing and was therefore hit harder. The Malmö region, on the other hand, was hit hard by the shipyard crisis of the 1980s and struggled for a long time to enter a new successful development path. The region that has experienced the highest employment decrease during the entire period studied (1990-2010) is the Northern Inland, which was the only one with a negative post-recession growth. All regions below the median in terms of post-recession growth are located in the northern part of Sweden, and are the areas that are less populous and have higher shares of specialized regions (see Figure A1 in Appendix). As noted in previous studies (e.g., Lundqvist et al., 2008), these findings point to the fact that the economic core regions have been more successful in rebounding from the crisis while the economic peripheries have faced greater difficulties,

especially since less emphasis in policy circles has been on redistribution, with a preference for more supply-side policies aiming to increase the competitiveness of already strong industries and regions (cf. Bristow, 2010).

The crisis of 2000 (Figure 3) was a quite different recession, less encompassing and more targeted towards certain areas of the economy – IT, telecom and the financial sector (Doms, 2004). The higher median speaks to this, as does the fact that some of the NUTS8 regions actually have higher employment at what is supposed to be the 'bottom' of the recession. Neither South nor West is hit especially hard employment-wise, while Stockholm has the mirrored position to that in the 1990s crisis and is the least resistant region of all. One explanation for this is, of course, the agglomeration of sectors with crisis-specific vulnerability. The Northern Inland is also positioned at the bottom, but compared to its position during the first recession it has experienced a notable post-recession growth. This could be a sign of breaking the negative employment trend or 'path' it has been on since 1990, which can also be seen in Figure 1. The mining boom during the 2000s halted the negative employment trend in many local areas in the north (Knobblock and Pettersson, 2010), and could be a cause of the overall development changes.

Resistance and Adaptability

There hence seem to be somewhat different reactions to the different recessions, as argued by, e.g., Martin, (2012), Pike et al. (2010) and Dawley et al. (2010). There are regions that have managed to stay on a successful path, like Stockholm, while others have shown indications of breaking a lock-in – i.e., a negative trajectory – and have managed a reorientation or renewal of their path, such as could be seen for the West in 1993 and the Northern Inland in 2002. Others seem to be stuck in the status quo, like the Northern Middle, which has seen only

minor negative impacts from both recessions but shows no tendencies of growth (see Figure 1). We claim that all these regions show different forms of resilience, which need to be understood based on micro-processes over a period of time. Therefore, using the resilience scatterplot and the median divider we are able to define four different groups of regions that responded very differently to the crises. The two squares, or groups, in the upper half of Figures 2 and 3 are more resistant to crises, and would be defined as resilient in the more classical sense. The regions to the left have lower post-recession growth (Stable group), while those in the upper right corner experience high post-recession growth (High-High group). The two groups at the bottom half both experience low resistance to recessions, but while the regions in the left corner have low post-recession growth (Low-Low group), those in the right enjoy high post-recession growth (Turbulent group) and exhibit another form of resilience. Hence, by using the concepts of *resistance* and *adaptability* we end up with three different ways to look at resilience: resistant (Stable), adaptable (Turbulent) or both (High-High). However, the NUTS8 areas are large geographical units containing a diverse set of regions. Instead, we use the FA regions grouped together according to how they are positioned in the resilience scatterplot[4]. As the median was used as divider, the different groups consist of more or less equal numbers of FA regions (see Appendix for a mapping of FA regions in resilience groups).

Table 4 displays information on the components of employment change in these different resilience groups for the two periods. The first column displays the mean value, while the following columns display the destruction and creation of jobs grouped on sectors and regions. Gross figures are not shown in the table, but the main sources of job creation and destruction are similar to what was identified in Table 2. To analyse how the more specialized, diverse and cohesive regions perform in terms of resilience, the top 25% in the

whole country have been categorized as such. The figures on these are then included as separate rows in the resilience group where they end up in the crises[5].

A couple of key features of the table should be highlighted. First, the Low-Low and Turbulent groups, which exhibit low resistance, tend to be dominated by small regions, which implies that regional size is related to degree of resilience (cf., Polèse, 2010). Second, some interesting differences according to plant size emerge. The micro-plants for each group in both periods do not experience a positive net employment growth as could be seen for the national average in Table 2, and the decline after the recession in 1990 is severe. The SMEs are the ones that in each resilience group employ the most people in the starting year, and comprise the type of plants that experience the best resistance and adaptability during both periods. In particular, the regions defined as the least resilient (Low-Low) are those that seem to have the highest rate of people employed at micro-plants in both periods, while the differences between SMEs and large plants across resilience groups is less noticeable. This is an indication that the gains from micro-plants are highly dependent on the regional context.

Table 4 about here

Third, the type of sector is also related to regional resilience. In 1990, all regions experienced a severe decline in manufacturing. KIBS, on the other hand, had a positive net for both periods. The sector composition in the different resilience groups thus means that the impact on the regional economies is very different. Even though KIBS' development is positive in each group, the two groups with high adaptability (Turbulent and High-High) have the highest rate of employees in KIBS, and also have the lowest in manufacturing for 2000. The Low-Low group is not only more dependent on the manufacturing sector, but also had a less

resilient manufacturing sector in both crises. This is in line with Simmie and Martin (2010), who found that regions less successful in transforming their economy also are less resilient.

Fourth, it is not only the relative dominance of different types of plants (size) or industries (manufacturing or KIBS) that is related to resilience; the degree of regional specialization, diversity and cohesion also matters for explaining resilience. By comparing the means across groups it is possible to conclude that the least resilient regions (Low-Low) are the most specialized ones, while the most resistant ones (Stable and High-High) are more cohesive in their industry structure (i.e., a high degree of related industries) than the least resistant groups (Low-Low and Turbulent). In particular, the most resilient regions (High-High) score the highest on both cohesion and diversity.

These are crude figures and large heterogeneous groups, but our findings are however in line with the literature on industry mix and resilience. As specialization is due to the agglomeration of similar activities, the effects will primarily be incremental changes and process innovations leading to higher productivity rather than employment growth (Frenken et al., 2007). When it comes to recessions, specialized regions – where many actors are dependent on the same resources and demand – tend to be more vulnerable, since a shock might disturb the whole economy (Diodato and Weterings, 2014; Eriksson et al., 2014) and hence influence employment negatively (Boschma, 2014). A more diverse region, but still related, is on the other hand less exposed to sector-specific shocks and can absorb those who have been laid off due to the relatedness of their human capital resources. A region's industry mix could then be the difference between becoming locked in to a negative development trajectory or being able to adapt. On an aggregated level, Sweden experiences a slight increase in cohesion at the peaks of the two recessions (1993 and 2003), compared to the pre-

recession years (1990 and 2000) and post-recession growth peaks (1999 and 2007). This might be an indication that unrelated plants in the region are more sensitive and are destroyed in greater amounts, not only in general as shown by Neffke et al. (2011), but particularly during recessions. In periods of growth the creation of new plants generates novelty and variation, which is why the figures on cohesion decline.

The path-dependency of regional resilience

By adding a correlation table, we can further link the results on resilience with the micro-dynamics of gross employment flows. Table 5 shows the pairwise correlations between resistance and growth in 1990 and 2000, and each region's level of specialization, cohesion and diversity as well as population size and plant structure. The available data make it possible to add the regional outcome of the latest crisis (2008), but not for the following period of adaptability.

A couple of outcomes should be noted. First, the industry mix of regions does influence both resistance and adaptability. It is only high diversity that can explain resistance in 1990, while growth in 1990 as well as resistance in 2000 and 2008 is positively correlated with both cohesion and diversity, and negatively associated with specialization. This confirms earlier studies (e.g. Frenken et al., 2007; Boschma et al., 2014; Diodato and Weterings, 2014) claiming that diversity generates portfolio effects that protect for unemployment while specialization tends to be more sensitive to sticky unemployment. Moreover, the two crises in 2000 and 2008 were more specific in terms of which sectors were affected (dotcom on the one hand, and finance together with some highly export-oriented sectors on the other), which also explains why cohesive regions with many skill-related industries were relatively more resistant compared to the 1990s crisis.

Second, population size does indeed seem to matter when explaining resilience, but in contrast to previous research, our findings show that size is not the sole explanation for resilience. While positively correlated with adaptability in 1990, which confirms the findings in Figure 1 that the large regions bounced back from the recession, it is also positively correlated with resistance in 2008. Thus, larger regions did manage to withstand the latest crisis, but size *per se* is not the primary determinant, for two main reasons. First, the correlation coefficient between adaptability in 1990 and resistance in 2008 is slightly higher for diversity (as well as for cohesion in 2008) than for population. Second, it could be argued that diversity is a function of size (i.e., larger regions are more diverse); but this is not the case, since the correlation is about 0.56 between size and diversity and 0.55 between size and cohesion. Thus, rather than regional size, the industrial composition and plant structure of the regional economy seem to be important components in analyses of how a region manages to be both resistant and adaptable.

Table 5 about here

Third, as previous tables have been hinting at, the structure of plants in regions influences employment. Again, micro-plants seem to be negatively associated with both adaptability (1990) and resistance (2000), while SMEs and large plants are positively correlated with resistance in 2000 and 2008 (large plants only). However, plant size has no relation to resistance in 1990, which points to the fact that this crisis was very widespread. We also find a pattern of vulnerability among micro-plants and high rates of start-ups, which lead to exits and employment decline. Resistance in the 2008 crisis, however, is positively correlated with

the rate of new entries. This might be due to the selectivity of the latest crisis, which primarily hit export-oriented sectors hard while some industries and regions were largely unaffected.

Fourth, the relation between resistance and adaptability is far from straightforward. There is no significant correlation between resistance and adaptability in 1990. In 2000, however, there appears to be a negative correlation between resistance and growth, which could owe to the fact that the most resistant regions continued on the same development path while the larger ones that were hit relatively harder also managed to bounce back almost immediately. This finding confirms the literature arguing for the complex and different natures of the initial stage of resistance and the following period of adaptability (e.g. Boschma, 2014: Pike et al. 2010; Diodato and Weterings, 2014; Eriksson et al., 2014), and Pike et al. (2010) debating the necessity of understanding these differences when determining policy implementations. There is also not a significant correlation between the resistance in 1990 and that in 2000, which confirms the different natures of the two crises. However, resistance to the latest crisis in 2008 has a positive significant correlation with both earlier periods of resistance – which could imply that the nature of the last recession shared common features with both prior ones. It might be that it affected the whole economy like the crisis of 1990 on the one hand, but on the other that it had similar characteristics to those of the dotcom bubble due to its financial character.

Consequently, these findings suggest slow changes over time. Although it is not recorded in the table, resistance in 2008 is positively correlated to both diversity and cohesion in 1990 and 2000, and negatively correlated with specialization in each year of observation. Thus, while the different crises exhibit clear temporal and spatial differences, it is also possible to

conclude that the industry mix almost 20 years back in time influences the resistance in later crises.

Conclusions

The objective of this paper was to analyse how regional economies respond to crises. This was made possible by linking gross employment flows to the notion of regional resilience in Sweden from 1990-2010, a period comprising three different periods of recession and two periods of recovery. We have thereby contributed with an analysis of gross employment flows of the whole economy; not only in manufacturing, as has been done in previous studies (e.g., Essletzbichler, 2007; Davis and Haltiwanger, 1999). Still, our results confirm previous findings from the US and UK on the driving forces behind regional employment change, despite quite different institutional frameworks and the much more regulated labour market in Sweden. We have shown not only that there are great regional disparities of net employment growth during the period studied, but also that incremental changes in net employment conceal high levels of creation and destruction in both expanding and declining regions as well as sectors. This, in turn, influences the extent to which regions are able to absorb and adapt to crises.

In particular, our results highlight that there does not seem to be a so-called 'red tape' towards new start-ups, but rather difficulty for new entries and micro-plants to survive, which implies that such firms have a negligible effect on the employment in regions (Fritsch and Noseleit, 2013). Instead, incumbent plants, particularly SMEs and large plants, are the main source of employment growth. This, however, varies across space and over time. When relating processes of gross employment flows to the evolution of regional economies and how they respond to crises, we have shown that the contribution to regional employment by micro-

plants is not primarily a cyclical issue. It is negatively correlated with both the resistance in the crisis as well as the ability to adapt in the aftermath. There are also signs that a high level of new entries is not enough to secure a positive employment growth after crises, and at times it even has a negative effect on the ability to recover. Overall, it seems to be that some regions, but far from all, are able to transform high rates of gross to a positive net.

Further, apart from placing processes of gross employment flows in a temporal context, a key contribution of this paper is the finding on the impact of regional industry mix on resistance and adaptability. Compared to specialization, high regional cohesiveness and diversity are beneficial characteristics for both regional resistance and adaptability. In fact, the composition of industries is the single most important driver for resisting shocks but also for adaptability, even compared to the impact of size *per se.* This is in line with earlier notions stressing the portfolio effects of diversity compared to urbanization (e.g. Frenken et al., 2007) and the role of cohesiveness in regional renewal (Neffke et al., 2011). However, no previous study has explicitly been able to show this in relation to resistance and adaptability. It is notable that one of the major differences between adaptive and less adaptive regions is how well the region manages to transform from manufacturing towards a 'learning economy'. The different dependencies on KIBS and manufacturing in each resilience group confirm that regional disparities have increased in Sweden, owing to the dismantling of the manufacturing sectors and an increased focus on knowledge-intensive services in policy circles (Eriksson and Hansen, 2013).

Even so, the regional development trajectories are diverse and the ability to absorb shocks and develop new growth paths is, as our findings suggest, greatly dependent on the internal structure of regional economies. By explicitly focussing on the micro-dynamics of regions,

rather than aggregates as previous studies on regional resilience have done (e.g., Martin, 2012), we do find that the industry mix and the composition of plants have different levels of influence depending on the qualitative characteristics of the region. We also find that resilience in terms of resistance to shocks is greatly dependent on the past. If a region is able to resist previous shocks its likelihood of absorbing future shocks is higher, while more sensitive regions are also more vulnerable to future shocks. The study also shows that it is important to understand resilience as a dynamic phenomenon. In the macro-economic recession, it is evident that what was needed in the regional resistance in the initial phase did not involve the same characteristics as those needed to be able to adapt and renew the economy in the later growth phase. The broader implication of this study is that policies aiming for development based on the assumed traits of specialization, entrepreneurs and new start-ups may benefit some regions at the expense of others. Due to high levels of turnover, a continuously changing economy and the present development towards a more knowledge-intensive labour demand, a more generic education would benefit the individuals and the region in the creative destruction of transformation. While we have shown that start-ups *per se* are not enough for a sustainable long-term growth, they are an important part of the evolution of the economy, in the creation of novelties and mutations. Meanwhile, the rate of new start-ups does not seem to be the problem; policies should rather aim at fostering local institutions and support systems in increasing their rate of survival. To create a resilient region, planners should avoid strategies that focus too much on regional comparative advantages, leading the region onto a road of increased specialization. Rather, policy should encourage related diversification to introduce further variety in, particularly, small regions. Larger and especially more diverse regions tend to be better equipped to withstand past shocks and thus also future ones.

A limitation of this study is its sole focus on the broader picture when explaining the resilience of Swedish regions. Future studies could certainly pay more attention to processes at the local level, and to further analysing the micro-processes in relation to the different phases of resilience. By grouping regions together we gained some knowledge of the overall trends, but lost a deeper understanding of the diversity and relational mechanisms that come together in each region depending on the specific context. Paying more attention to the impact of shocks on firms and workers, future studies could address how some regions are able to find a new development path and re-orient their local skill base, and what role different local and national institutions and ownership structures play in this process. Given the indications presented here, that the industry mix matters in times of crisis, it would be interesting to gain further understanding of the extent to which related variety and unrelated variety may influence the creation and destruction of jobs, and their effects on the resilience of regions, especially given the role of relatedness in regional branching processes (Neffke et al., 2011). For future studies, it is important to also acknowledge that it is not only the impact that is different in different locations; how this is dealt with in a region also depends on local characteristics such as the employer-employee relationship and local institutions. This implies that changing occupational structures not only between but also within industries could be an important aspect. It is not only a question of the creation of jobs, but also of the quality of those created and the potential to match regional labour supply and demand. A high turnover may not imply high quality for an employee who needs to rely on short-term contracts. This signifies the importance of future studies on individual outcomes by following the trajectories of workers in contracting industries across space and time (Eriksson et al., 2014).

Notes

1. To simplify the analysis we have only categorized plants as belonging to one of the three categories *entry*, *exit* or *incumbent*. Plants that are going through changes in their organizational structure (e.g., new ownership) are categorized as incumbents if they are still in operation, as it is reasonable to expect that the same jobs are still present despite changes in ownership. Explicitly highlighting the potential diverging processes of the creation and destruction of M&A compared to incumbents and exits would be a suggestion for future studies, as these processes are qualitatively different and for some firms M&A is seen as a successful business strategy (see e.g., Marsili and Weterings, 2015). However, this would require additional plant-level analyses, which are not in the scope of this paper.
2. Manufacturing: two-digit sector code between 15 and 17
3. KIBS: two-digit sector code between 72 and 74
4. We initially intended to plot the FA regions, but since using 72 different functional regions would imply difficulties in interpreting the graphs, especially when also adding information on their location, we first conducted separate analysis on area level (NUTS8) and then analysed in detail the impact at regional scale (FA region).
5. Of 72 FA- regions, 18 are categorized as specialized, 18 as cohesive and 18 as diverse. The numbers of these regions in each resilience group (1990:2000) are as follows: Low-Low – specialized 5:8, cohesive 3:1 and diverse 4:2; Stable – specialized 7:2, cohesive 5:4, and diverse 3:4; Turbulent – specialized 3:5, cohesive 3:3 and diverse 4:4; High-High – specialized 3:3, cohesive 7:10 and diverse 7:8.

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Table 1: Variable definitions

Variable	Definition/measurement
Employment	Official employment
Total jobs	Number of individuals registered at each plant
JC	Job creation (entry + expanding incumbents)
JD	Job destruction (exit + declining incumbents)
Gross	JC+JD
Net	JC - JD
INCDE	Jobs destroyed in decreasing incumbents
INCGR	Jobs created in growing incumbents
ENTRY	Jobs created in entries
EXIT	Jobs destroyed in exits
Small regions	Small regional centres and small regions (population less than 100,000)
Large regions	Metropolitans and large regional centres (population more than 100,000)
Cohesion	Degree of skill-related plants in a region
Diversity	Degree of unrelated plants (not similar or related) in region
Specialization	Relative regional specialization (Krugman index)
Resistance	Resistance to the initial shock, employment change from the peak before the recession to the bottom of the shock
Adaptability	Post-recession growth (average annual employment change)
Dec/Exp Emp	Declining or expanding employment in the region or sector, 1990 compared to 2010
Micro	1-9 employees at a plant
SME	10-249 employees at a plant
Large	250 or more employees at a plant

Table 2: Gross job flows in expanding and declining regions, sectors and labour markets in Sweden, 1990-2010 (N=72 functional regions)

	N	EMP90	NET	GROSS	JC	JD	INCDE	INCGR	ENTRY	EXIT
1990-2010 (SWE)	**72**	**4,104,899**	**-0.9**	**22.8**	**11.4**	**11.4**	**4.9**	**7.8**	**3.6**	**6.5**
Exp emp (reg)	13	2,167,337	8.4	24.0	12.2	11.8	4.8	8.2	4.0	7.0
Dec emp (reg)	59	1,937,562	-11.3	21.4	10.4	11.0	5.0	7.3	3.0	5.9
Exp emp (SNI)	246	1,954,380	54.0	23.5	12.8	10.7	4.4	8.6	4.2	6.2
Dec emp (SNI)	237	2,121,895	-25.4	19.7	9.0	10.7	5.3	6.6	2.4	5.4
Small regions	50	650,522	-11.7	21.1	10.2	10.8	5.0	7.2	3.0	5.8
Large regions	22	3,454,377	1.1	23.1	11.6	11.5	4.9	7.9	3.7	6.7
Micro	230,115	508,844	-67.0	68.1	32.2	35.8	9.8	14.5	17.7	26.0
SME	270,646	2,548,923	18.0	22.6	11.7	10.9	5.3	9.1	2.6	5.6
Large	1,670	1,047,132	-6.6	14.2	6.9	7.3	4.5	6.1	0.8	2.8
Manufacturing	**235**	**921,552**	**-18.4**	**16.5**	**7.7**	**8.8**	**5.0**	**6.0**	**1.7**	**3.8**
Exp emp (SNI)	69	188,446	5.5	17.4	9.3	8.1	4.6	7.1	2.2	3.5
Dec emp (SNI)	160	733,020	-30.2	16.2	7.1	9.1	5.1	5.6	1.5	4.0
Small Regions	50	190,866	-14.8	16.0	7.6	8.5	4.9	6.0	1.6	3.6
Large regions	22	730,686	-19.4	16.6	7.8	8.9	5.0	6.1	1.7	3.9
Micro	27,129	57,214	-93.5	62.3	27.9	34.4	11.2	14.3	13.6	23.2
SME	31,652	453,959	-15.5	18.8	9.0	9.9	5.7	7.4	1.6	4.1
Large	661	410,379	-13.6	11.5	5.3	6.2	4.3	4.7	0.6	1.8
KIBS*	**25**	**249,994**	**123.5**	**31.1**	**17.5**	**13.6**	**4.2**	**10.0**	**7.5**	**9.4**
Exp emp (SNI)	25	249,994	124.3	31.0	17.5	13.5	4.1	10.0	7.5	9.4
Small regions	50	18,836	119.7	30.1	16.9	13.2	4.5	9.8	7.1	8.7
Large regions	25	231,158	123.8	31.2	17.5	13.6	4.1	10.0	7.5	9.5
Micro	23,469	51,854	105.3	79.2	41.8	37.4	7.7	14.8	27.0	29.7
SME	22,970	165,702	150.7	30.2	17.4	12.8	4.7	11.9	5.5	8.1
Large	67	32,438	192.9	20.9	13.0	7.9	3.4	10.3	2.7	4.4

Note: Job creation and destruction in the table are shown as a percent of total jobs; GROSS is JC+JD. * There are no declining sub-sectors in KIBS.

Table 3: Correlations between regional components of employment change (N=72 functional regions)

	NET	GROSS	JC	JD
NET	1			
GROSS	0.21*	1		
JC	0.29**	0.96***	1	
JD	0.11	0.96***	0.85***	1

Note: * significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level.

Table 4: Gross employment changes in the four resilience groups, 1990-1999 and 2000-2007 (N=72 FA-regions)

	1990-1999				2000-2007			
	MEAN	EMP90	NET	GROSS	MEAN	EMP00	NET	GROSS
Low-Low	***n=18***	**543,283**	**-20.4**	**24**	***n=20***	**453,301**	**2.2**	**18**
Large regions	0.222	327,146	-22.5	24	0.015	233,160	3.5	18
Micro	0.453	65,916	-93.4	65	0.398	47,496	-12.2	64
SME	0.544	324,314	3.7	16	0.560	276,456	9.2	17
Large	0.003	116,016	-13.5	11	0.002	72,015	-8.0	9
Manufacturing	0.137	144,953	-23.7	19	0.100	126,198	-7.1	13
KIBS	0.057	17,814	33.8	34	0.082	23,545	20.5	29
Specialization	0.403	50,421	-18.9	24	0.439	17,967	0.8	21
Cohesion	0.684	246,071	-21.4	26	0.665	95,166	4.7	18
Diversity	0.474	349,112	-21.1	24	0.451	173,665	3.9	18
Stable	***n=18***	**572,584**	**-19.3**	**25**	***n=16***	**675,932**	**2.7**	**20**
Large regions	0.278	391,877	-20.9	25	0.313	550,567	2.8	20
Micro	0.466	66,802	-97.0	65	0.400	65,063	-16.9	66
SME	0.531	338,148	2.5	17	0.596	388,731	9.1	20
Large	0.003	127,333	-12.7	13	0.003	133,191	-1.3	12
Manufacturing	0.134	140,108	-24.9	19	0.087	158,793	-6.2	15
KIBS	0.065	25,464	27.6	33	0.113	54,108	17.0	30
Specialization	0.403	41,408	-20.4	26	0.344	8,768	2.3	21
Cohesion	0.710	396,227	-20.1	25	0.737	485,031	2.5	21
Diversity	0.468	251,135	-18.2	25	0.510	485,031	2.5	21
Turbulent	***n=18***	**900,966**	**-13.5**	**25**	***n=16***	**1,523,314**	**6.8**	**23**
Large regions	0.222	676,686	-12.6	25	0.250	1,416,459	7.1	23
Micro	0.456	103,692	-63.8	67	0.408	149,317	-0.8	72
SME	0.540	515,908	16.4	17	0.589	875,252	8.8	23
Large	0.003	218,827	-12.6	13	0.004	332,655	9.3	15
Manufacturing	0.119	224,535	-20.9	18	0.072	214,463	-4.1	16
KIBS	0.084	45,694	51.7	33	0.207	230,308	15.6	32
Specialization	0.379	22,361	-15.2	24	0.433	11,713	3.2	24
Cohesion	0.684	646,052	-11.2	25	0.654	1,301,065	7.3	24
Diversity	0.472	726,766	-11.7	25	0.449	1,416,459	7.1	23
High-High	***n=18***	**2,388,227**	**-10.7**	**27**	***n=20***	**1,786,340**	**8.2**	**20**
Large regions	0.500	2,058,668	-11.5	27	0.500	1,582,283	8.4	20
Micro	0.458	272,434	-50.9	70	0.403	176,964	-5.4	67
SME	0.538	1,370,553	17.4	19	0.595	1,066,764	12.4	20
Large	0.004	584,956	-0.9	15	0.003	311,781	10.1	10
Manufacturing	0.109	477,778	-16.1	20	0.085	354,948	0.3	14
KIBS	0.111	161,022	53.8	35	0.138	161,309	23.6	29
Specialization	0.343	35,830	-12.3	24	0.327	32,626	4.5	19
Cohesion	0.784	2,073,861	-10.5	27	0.818	1,534,937	8.3	20
Diversity	0.645	2,070,768	-10.9	27	0.630	1,446,373	8.6	20

Note: **Low-Low**: Low resistance and low adaptability; **Stable**: High resistance and low adaptability; **Turbulent:** Low resistance and high adaptability; **High-High**: High resistance and high adaptability. Means are rate of plants, except for the industry mixes which shows the mean of specialization, cohesion and diversity.

Table 5: Correlations between resistance, adaptability and industry mix, population size and plant structure, for 1990-1999, 2000-2007, and the resistance in 2008 (N=72 functional regions)

		1990-1999		2000-2007		2008
		Resistance	Adaptability	Resistance	Adaptability	Resistance
Same period	Diversity	0.25**	0.33***	0.37***	0.11	0.35***
	Specialization	-0.02	-0.32***	-0.44***	-0.06	-0.31***
	Cohesion	0.19	0.24**	0.43***	0.08	0.34***
	Large	-0.14	0.00	0.33**	-0.15	0.20*
	SME	-0.14	-0.04	0.23*	0.12	0.04
	Micro	0.07	-0.31***	-0.44***	0.12	-0.04
	Incum	-0.17	-0.12	-0.13	0.01	-0.20*
	Exit	0.06	-0.19	-0.36***	0.23*	0.02
	Entry	0.14	-0.22*	-0.00	0.14	0.32***
	Population	0.16	0.32***	0.13	0.15	0.32***
1990-1999	Resistance	1	-0.02	0.01	0.30*	0.44***
	Adaptability	-0.02	1	0.04	-0.17	0.01
2000-2007	Resistance	0.01	0.04	1	-0.25*	0.33***
	Adaptability	0.30**	-0.17	-0.25*	1	0.05

Note: * significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level.

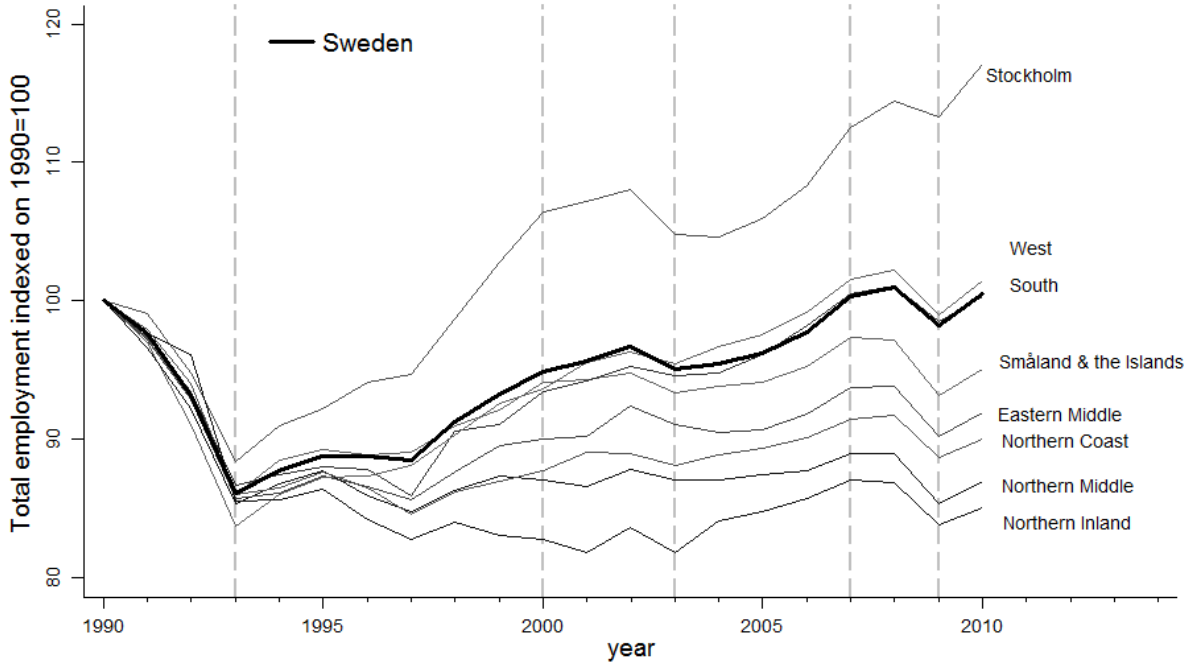

Figure 1: Employment changes in Sweden and NUTS8 regions (index = 1990)

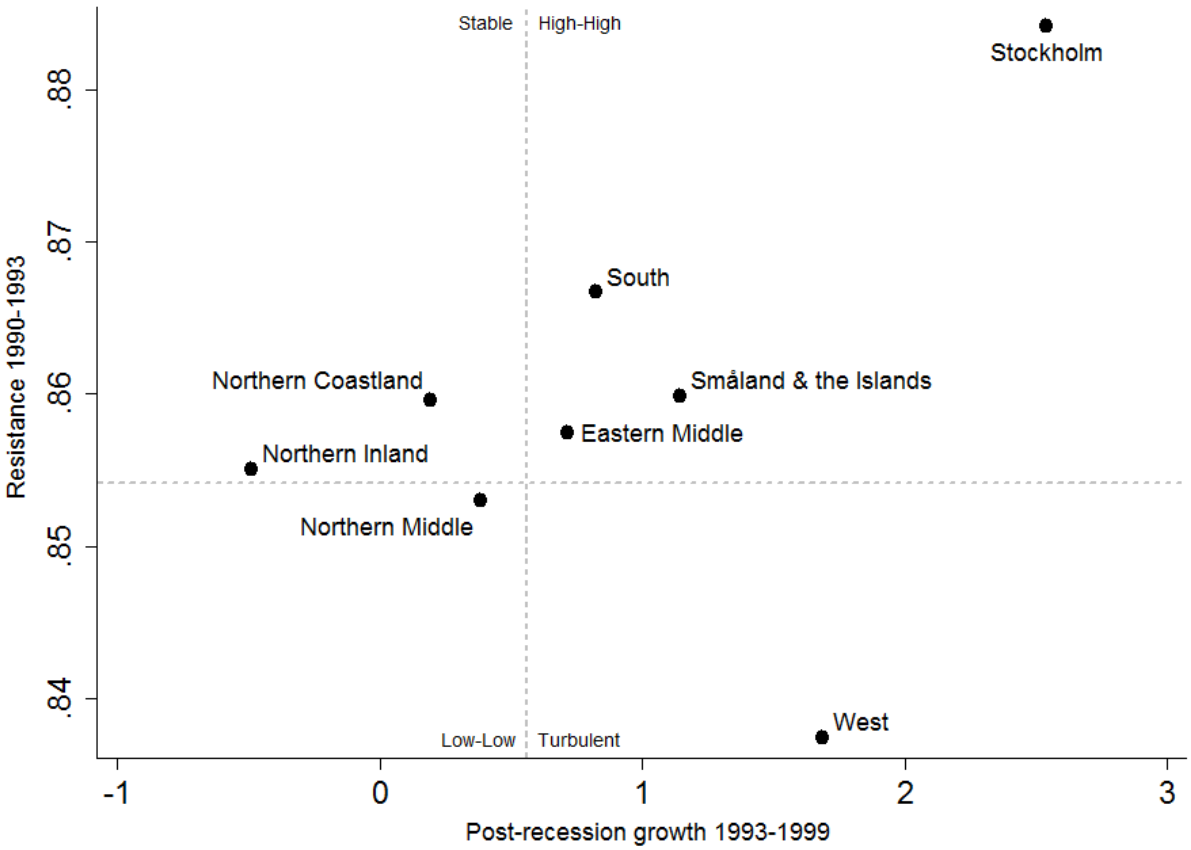

Figure 2: Resilience 1990-1999. Resistance on y-axis and post-recession growth on x-axis (N=8 NUTS8 regions). Dotted lines indicate median value.

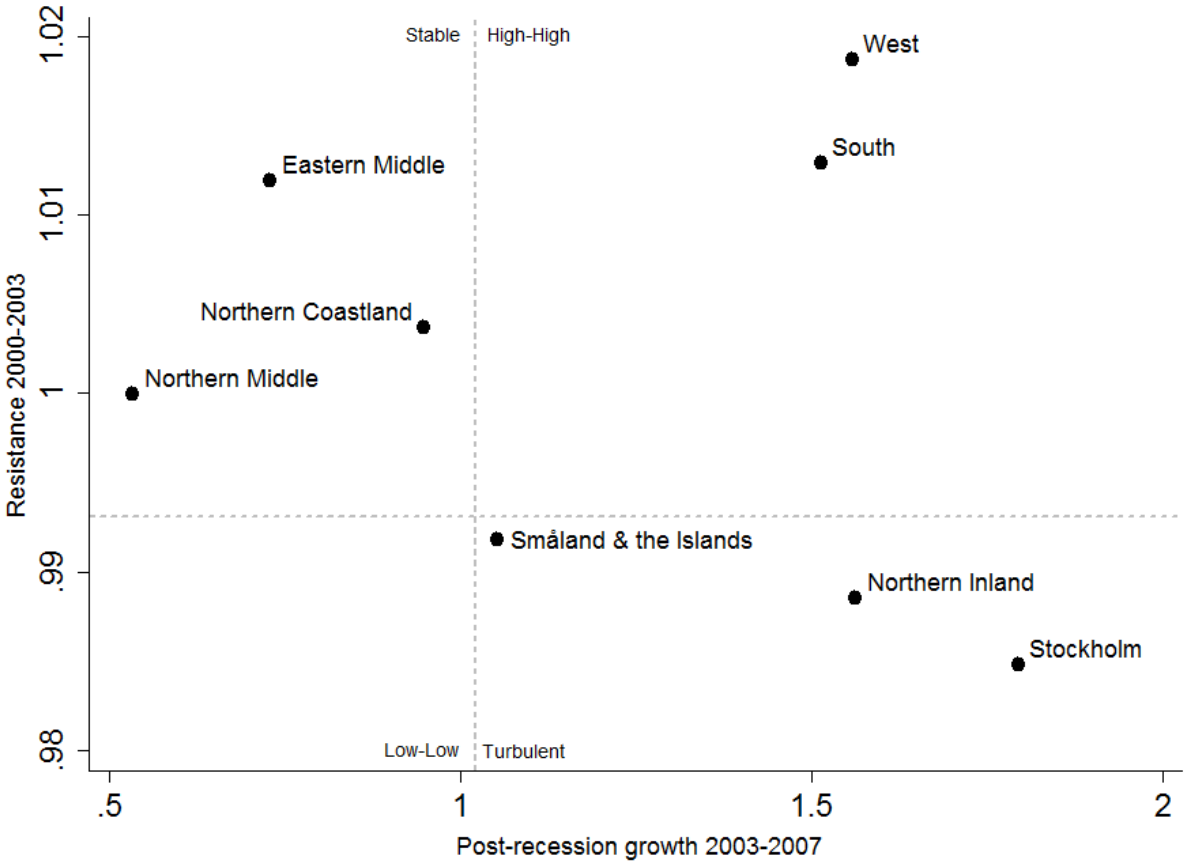

Figure 3: Resilience 2000-2007. Resistance on y-axis and post-recession growth on x-axis (N=8 NUTS8 regions). Dotted lines indicate median value.

Appendix

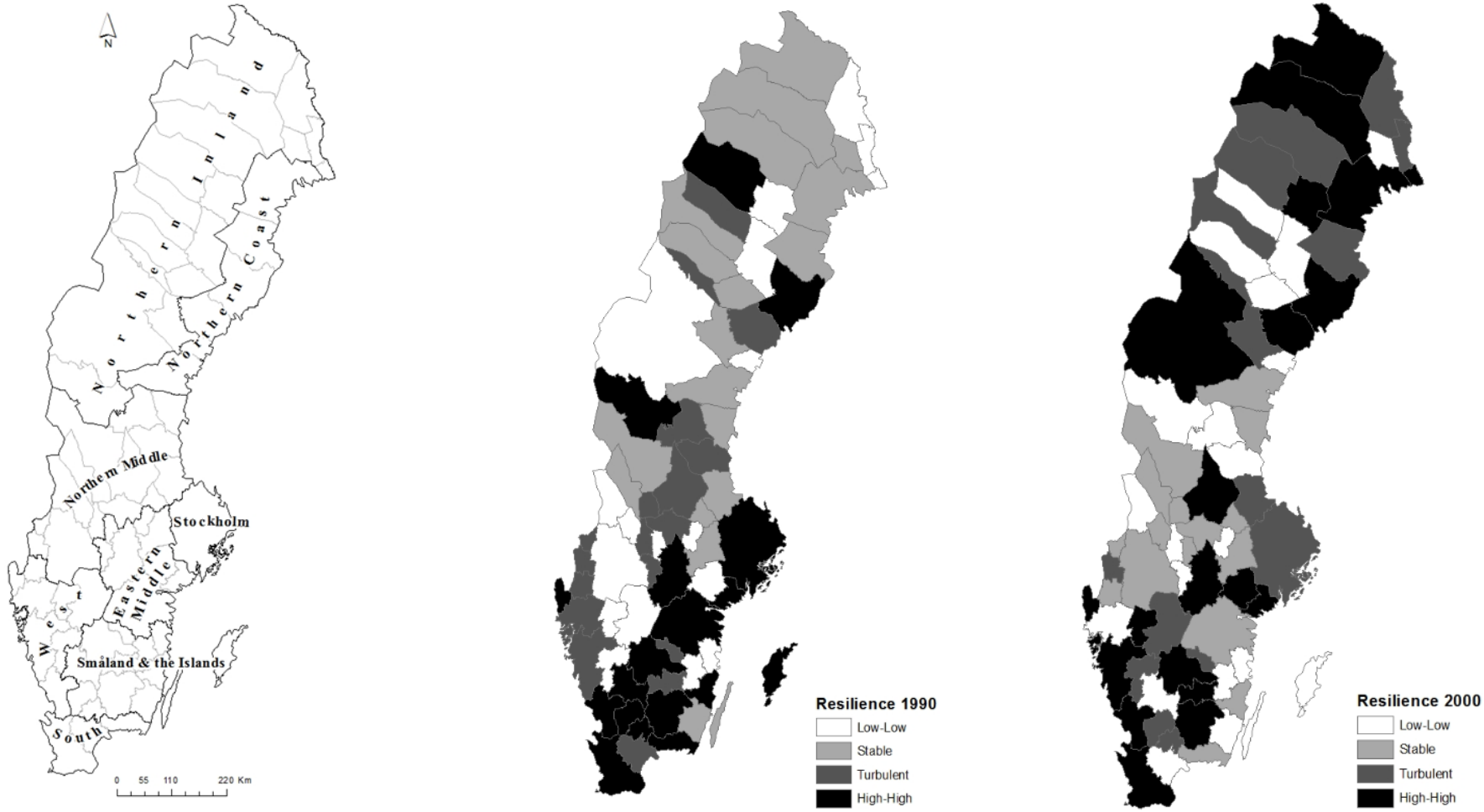

Figure A1: Maps of Sweden showing regional division (left), geography of reslilience groups 1990 (middle), and geography of resiience groups in 2000 (right).