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Trends, structures and patterns of inequality and growth in Swedish regions

An analysis of the spatio-temporal patterns in the development of inequality and income in Sweden 1990–2016

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Abstract

This thesis analyses the spatio-temporal patterns of inequality and income growth in Sweden during the time-period 1990–2016. It aims at answering the question of whether there has been increasing inequalities, if so where and why. The study is motivated by the ongoing debate on regional development in research, public policy and media which frequently raise questions on the ongoing patterns of income inequality and what would be the best cause of action. It bases the analysis on a multitude of recent economic geographic literature on uneven development, strongly positioned to answer the why and how behind income inequalities. In order to conduct this analysis, a set of inequality indices are computed based on Statistics Sweden's LISA-database. Furthermore, this thesis uses a variety of different scales in the analysis, ranging from detailed grids to generalised scales of NUTS-2. Findings suggest that Sweden experiences an overall increase of income inequalities. Moreover, the pattern of income inequalities are found to coincide with agglomeration economies and the structural growth cycles of the economy that increase wages for a set of professions. This is found to follow a centre-periphery pattern around the large urban areas which contain qualities that cluster knowledge-intensive firms and professions, creating both path- and place-dependency in income growth and income inequalities. This pattern is increasingly apparent in the spatial division of income and income growth within Stockholm which sees certain neighbourhoods performing well over the national average. It is found to create a 'patchwork metropolis' of winners and losers in terms of income which asks questions to the spill-over effects on welfare from agglomeration of wealth.

Keywords: Uneven development; Income inequality; Agglomeration economies; Structural growth theory; Path-dependency

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1. Introduction

There are few as politically debated, publicly discussed and academically researched concepts as inequality and the question of the division between the haves and the have-nots in terms of socioeconomic factors. Sometimes portrayed as cementation of divides where the have-nots increasingly find it harder to improve their welfare. Sometimes it is also seen as the effect of the richer percentages improving their welfare whilst the other percentages struggle to keep pace. The conclusions are nevertheless the same, there is a division in society and if left unchecked it can deal much harm to the society at large. Contemporary news coverage of this phenomena often deals with it as an increasing divergence and an increasing gap between groups in society. In Sweden this has not only been focused on by the media but also by the public, through civil unrest, and political parties through political actions. It is frequently put on the agenda through questions and the need for actions regarding the fairness of today's society where income inequality and lack of social mobility is but one aspect. The utmost proof would be the formation of vulnerable areas in Sweden, areas with low socioeconomic status and with risks of cementing exclusions, and the social unrest that occurred as a protest against the lack of possibilities of social mobility and fairness (Avellan, 2013). This developments has gotten recent news coverage stating that there is rising inequalities within Sweden (TT Nyhetsbyrån, 2018;2019).

The discussion of increasing inequalities is not only about vulnerable areas and how to ease their burden. It is at the core of discussions regarding progress, development and growth. There are several projects, ranging from local to EU initiatives, which seeks to counteract not merely interpersonal disparities but also interregional disparities, trying to mitigate the spatial division of prosperity. Here, actions try to work to increase growth in regions, hoping to improve financial capacities for individuals or to increase equity, aiming at decreasing the differences of welfare between individuals. Through time, policies on development focused on the first aspect, increasing growth in the regions by attracting or stimulating economic activity, hoping that it will give effect on the welfare of regions. The popularity of theories surrounding Florida's notion '*the creative class'* and the work done trying to adapt it in planning is evidence that these projects do not necessarily create growth or increase welfare (Florida, 2014;2017; Hansen & Niedomysl, 2008). Yet at the same time there has been a change in development strategies, see e.g. European Comission (2010a;2010b;2017), that shifted focus from accumulation of economic growth towards a broader definition of development. It is based on the lesson

that growth and development do not happen linearly nor do they continuously improve human welfare due to a geographically uneven distribution of benefits with a multitude of contrasting processes across scale (Feldman & Storper, 2018).

The cohesion policies that the European Union has enacted since its foundation has been about regional and national convergence within the Union. The work has, in general, tried to counteract the situation within the Union where there is a socioeconomic divergence between strong regions in the north-western parts and lagging regions in the south and east parts, a situation that traces its roots as far back as the renaissance (de Pleijt & van Zanden, 2016). Recent cohesion policies focused on what has been termed '*inclusive growth*' focusing not only on the GDP growth of countries and regions but also on the welfare of citizens and the quality of governance. What these policies make apparent is that Europe has different predispositions for growth and prosperity with struggling countries and regions (Iammarino et al., 2017; Rodríguez-Pose & Tselios, 2015). These reports and studies also show that there are seemingly strong regions with good inclusiveness and growth factors that are, from the European perspective, far from larger issues. Sweden is often associated with this category of strong regions in terms of growth and welfare. Together with the other Nordic countries and regions they are also frequently associated with strong institutions and innovative businesses that provide strong predispositions for growth and competitiveness. Researchers like Florida (2017) or Rodríguez-Pose & Tselios (2015) have stated that the Nordic countries and its regions are at the forefront of regional development in terms of equality.

Furthermore, Florida (2017) provides another side of the story. Over the last decades, Stockholm has experienced a rising economic inequality. According to Florida (2017), this is partly due to the global trend where these metropolitan regions increasingly take the role of drivers of economic growth. This also causes increasing disparities between winners and losers within and between the city and the remaining regions. Lundquist et al. (2008) show that the economic growth of Stockholm is due to the externalities present that attract businesses and that are contemporary drivers of growth. These externalities and establishment of innovative businesses are also, according to Florida (2017), a reason why these cities are attractive for the richest strata. It furthermore underlines spatial inequalities within these cities and increases disparities between the urban centres and other regions. What this research entails is not only an analysis of socioeconomic developments across space, it is also research that encompass different scales to form a deeper understanding of inequality and how it takes shape.

However, in order to perform such research, one needs data of the necessary detail in order to picture the situation. Most often researchers and policymakers are restricted to a limited set of spatial units, in the European context often NUTS-2. This creates limitations when trying to understand processes that do not follow the borders of these areal units. The limitations, mostly due to the availability and reliability of the data being particularly restricted over time, create difficulties in producing exhaustive conclusions on the processes of underlying growth and, in this case, equitable growth. Statistics Sweden can provide with such data at micro-level containing data on individuals' income levels making it possible to compute detailed inequality indices. This provides opportunity for further research on this area by allowing for more varied and exhaustive analysis of inequality and growth. It allows for two enquiries. Firstly, whether the patterns of growth and inequality are the same across scale that provide with insight on the advantages and disadvantages of different areal units. Secondly, it allows to question how valid the general conclusion on the status of Swedish regions are and if there are perspectives that are hidden at certain levels of details regarding the spatial distribution of inequality, which Florida (2017) & Iammarino et al. (2017) have termed as one of the major issues of today's society.

The topic of this research is to analyse the development of income inequalities in Sweden over a 27-year period that incorporates spatial patterns of inequality and income growth across different scales. The scales will range from NUTS-2, frequently used by the EU and researchers, to the more detailed level of 500 by 500 grid, a level of detail that in general has been rarely used in economic geography (Andersson et al., 2016; Andersson et al., 2019). This is done to further emphasise the role of scale in evaluating and analysing patterns of regional development, which has been lacking in overall research.

1.1 Research Question & Aim

The aim of this thesis is to study the spatial patterns of income inequality and income growth in Sweden using detailed economic data between 1990 and 2016. It was achieved by exploring various measurements frequently used in discussions on development. Different indices for inequalities have been calculated at these levels as a steppingstone towards reflecting upon the implications that these areal measurements have on the theoretical understanding of inequality and regional development.

The main question asked is whether income inequalities have increased in Sweden during the time period of 1990-2016, and if so where and why?

This question has been the framework of this research, out of which the sub-questions have been defined to further specify the aim and topic. These are as follows:

- To what extent does the spatial pattern of income inequality in Sweden and its change over time coincides with the theoretical understanding of regional development?
- What are the implications of scale in measuring and understanding spatial patterns of income inequality?

1.2 Disposition of the Thesis

The thesis will be structured as follows. It will initially describe the theoretical framework and previous research to provide the reader with an overview of the basis on which the research has been done and from where the questions arise from. Moving on from the theoretical framework, the methodology of this thesis will be presented starting with a reflection of the different perspectives and pathways that are valid in this line of research. The following subchapter then introduces the data that has been used to elaborate upon the main question together with the different aggregation that have been made. This part ends with a detailed account of the index and variables that have been used. From this position the thesis will present the results related to the main question. The findings will then be further analysed in a discussion section where the sub-questions will be highlighted and answered. Finally, the thesis will provide some concluding remarks that summarise the findings and reflect on possible implications and paths for further research.

2 Theoretical Framework and previous research

The first step in understanding the pattern of regional development in Sweden, the connection that economic development has with inequalities within and between regions, is to position oneself in theory on uneven development and regional development. Regional development is a complex topic with different connotations and meanings. Authors like Pike et al. (2007;2016;2017) and Feldman & Storper (2018) point out that development, even though it has often been the case, is not equal to economic development and growth but rather contains multiple aspects where no '*singularly agreed, homogeneous understanding of development of or for localities and regions exist*' (Pike et al., 2007:1255). These aspects are both quantitative and qualitative in nature and incorporate social, environmental and economic aspects with a more holistic view, including both quality of life and economic development (Pike et al., 2016). This approach is relatively new with recent works dating from the 1990s arguing for the importance of going beyond the focus on growth and wealth creation. A reason for this new stance can be seen in the structural changes that occurred in the economy. The transition into a post-industrial economy focusing on knowledge-intensive services made economic growth harder to achieve for certain regions, and policies had little effects in counteracting that trend. This created a justification to focus on welfare and well-being of individuals hoping to create sustainable regions where growth is not seen as the goal but rather as the mean to attain and retain well-being (Pike et al., 2007;2016; Rodríguez-Pose, 2018). Economic development still plays a large role as these researchers, despite their attempts to shift focus, continuously refer back to theories of economic development explaining both how uneven development occurs and what to do about it (Feldman & Storper, 2018; Iammarino et al., 2017; Pike et al., 2007;2016;2017; Rodríguez-Pose, 2018; Rodríguez-Pose & Tselios, 2015). The reason behind it can be explained with the cultural turn economic geography went through which not only deals with the direct causational factors of growth but also incorporates social, cultural and institutional factors enhancing growth and development (Boschma & Frenken, 2018; Pike et al., 2017; Scott, 2000). Economic geography thus stands well equipped to explain why and how uneven regional development occurs and what to do about it.

There are multiple streams of economic geographic theory that attempted to explain the patterns of uneven regional development and had various success in establishing themselves as an influencing factor. What will follow is an overview of these theoretical frameworks to bind it together in a structure that will work as the basis on which to reflect

and discuss upon the empirical material in this thesis. It will firstly go through an overview of the three major approaches that occurred in economic geography. Firstly, New Economic Geography (NEG) that has been influential in the development of current paradigms of economic geography. Secondly, Evolutionary Economic Geography (EEG) focusing on adapting evolutionary economics and then Institutional Economic Geography (IEG) focusing on cultural and social aspects of uneven development (Boschma & Frenken, 2006; Martin & Sunley, 1996; Scott, 2000). Based on these three approaches there is a need to briefly address what researchers imply when they refer to externalities which will form the second part. The fourth section will move on from the definition of externalities and the work of evolutionary economics and EEG to examine what can be labelled structural growth theory which empirical material and theoretical reflections have been mainly situated within the context of the regional economic development in Sweden. This research was spearheaded by the works of Lennart Schön (2013;2014). Following these four streams this section will recall and reflect upon the importance of scale in research of spatial patterns and its implications. To wrap up the theoretical framework, previous research on inequalities and uneven development, which either reflects upon the linkage between growth and inequalities or whose research use contexts close to this case. Finally, a concluding section will form the final framework that worked as the basis for this research.

Table 1: Overview of the different frameworks, its core characteristics and important divisions, that will be addressed in this thesis

Framework	*Important divisions*	*Important Concepts*
Major approaches	New Economic Geography	New growth theory Pecuniary externalities Centripetal and centrifugal forces Transportation costs & agglomeration externalities
	Evolutionary Economic Geography	Path- & Place-dependency Related & Unrelated variety Regional resilience
	Institutional Economic Geography	Institutions Embeddedness
Externalities	Marshall-Arrow-Romer (MAR) externalities	Specialisation Knowledge spillovers Industrial proximity
	Jacobs' externalities	Unrelated Variety Structural diversity Open-mindedness
	Urban externalities	Access to services Local market size
Structural Growth Theory	Core Ideas	General Purpose technologies (GP) Cyclic growth Creative destruction
	Applications in Economic Geography	Cycles of convergence and divergence Rationalisation and decentralisation Hierarchical structure of growth

This structure is meant to create a framework for reflecting, understanding and discussing whether, why and how regions experience different forms of development and different forms of struggles. This is not something new in Human Geography it has been there since the beginning, owing much to the core characteristics of geography focusing on the where, why and so what (Clark et al., 2018; Cresswell, 2013). Despite the rather sceptical treatment regions received, owing much to its dubious definition (Cresswell, 2013), it has an undeniable presence in research that has focused on long-term regional and national developments across space and time, see e.g. (Enflo & Henning, 2014; Myrdal, 1957; North, 2005; North & Thomas, 1970; Pike et al., 2017; Scott, 2000; Spiezia, 2003).

2.1 New economic geography

New economic geography is mainly characterised by the works of Paul Krugman (1991;1998) that attempts to bridge ongoing developments in economics with economic geography. In general the approach is concerned with creating a body of literature that both make spatial science attractive to mainstream economics as well as creating an interest in applying theories of economics for geographers (Krugman, 1998; Martin & Sunley, 1996).

The approach came in the wake of the '*three revolutions*' that had swept through economics at the time, the most noteworthy would be 'new trade theory' and 'new growth theory' (Krugman, 1998). Both used the notion of imperfect competition to model increasing return in trade or economic growth. NEG is extending these models to explain spatial structures where '*increasing returns and markets are characterized by imperfect competition'* (Krugman, 1998:10). In that approach economists take a stance against traditional economic theory of perfect competition and rationality, stating that given imperfect competition and the bounded rationality of actors there are no tendencies towards an even distribution of economic activity and development (Krugman, 1991;1998;2011). NEG uses models that adopt a general equilibrium stance where an invisible hand is deemed to steer the emergence of spatial structures. This means an assumption that there will be a strive for balance between supply and demand in goods and services. Additionally, individuals in their actions and especially regarding migration, will strive to maximise their welfare (Krugman, 1998). These models, as Krugman (2011) states, are meant to reflect upon principles and the 'what if' scenarios. It is not necessarily meant to form a realistic reflection of reality. For example, a recent self-critique by Krugman (2011:6) states that NEGs '*focus on tangible forces, seems less and less applicable to the actual location patterns of advanced economies*'.

However, its main relevance to the work of regional development is the focus it had on the uneven development of regions questioning why and how the spatial uneven localisation of economic activity occurs and how it comes to be entrenched in society. It sees the uneven development forming a centre-peripheral pattern from the equilibrium between centripetal and centrifugal forces. Centripetal forces are factors encouraging agglomeration through market-size effects with backward-forward linkages between firms, Marshall & pecuniary externalities. It creates a pull of firms and individuals seeking to maximise their gains which further entrench this pattern (Krugman, 1991;1998). This however is counteracted by centrifugal forces encouraging dispersion of industries to locate where transportation cost is manageable or where necessary resources are obtainable.

This can be exemplified by Krugman (1991:483) asking the question of '*how a country can endogenously become differentiated into an industrialised "core" and an agricultural "periphery"'*. Krugman identified three influential sources for regional divergence that could form the basis for models on uneven development: economies of scale, factor mobility and transportation cost (Krugman, 2011). Moreover, pecuniary

externalities, demand or supply linkages from co-location, were identified as a crucial part of economies of scale. The notion is that firms localise based on both population size of the market and the numbers of firms in the region, linking it to circular causation and backward-forward linkages. This was translated into two sources, the elasticity of substitution among products and the manufacturing share of the economy, which influenced wages and prices of products between regions, which either encouraged or discouraged dispersion. Transportation cost would also act in similar manner with higher transportation costs providing penalties that would outweigh benefits of concentration to one region. This means theoretically that a process that increases accessibility would lower the threshold for agglomeration to take place (Krugman, 1991).

What Krugman (1991) however showed was that the three parameters of elasticity of substation among products, the share of the economy and transportation costs, interacted in such a way that it could mitigate or inflate the effects of one another. For example, in cases of either low elasticity (indicated as strong presence of economies of scale) or high manufacturing share (causing strong backwards and forward linkages) there will be tendencies for concentration to a few nodes. Low transportation costs would inflate these effects whilst high transportation cost would mitigate the effects. However, in cases of both strong economies of scale and a well-established industry, high transportation costs would not be enough of a counteracting force (Krugman, 1991). The implications for an advanced economy, which has developed beyond the phase of early industrialisation, would be threefold. Firstly, with economic development increasing the importance of economies of scale, tangible or intangible, the boundary for agglomeration to take place will decrease. Secondly, as emerging industries and sectors mature and establish, the backwards and forwards linkages will influence factor mobility to encourage existing concentrations. Thirdly, with increasing communications and accessibility, the potential benefits of locating to the periphery will decrease as the peripheral market would increasingly be tapped from the centres.

Consequently, these centre-periphery patterns are not identified as stable. Instead, historical accidents, technological innovations or uncertainties regarding localisation of new industries and beneficial agglomerations would alter the existing equilibrium, creating a number of possible equilibria that could exist over time (Krugman, 1998; Martin, 1999; Martin & Sunley, 1996). Furthermore, this entails that without such events the uneven localisation of economic activity and the continued development of regions are highly path-dependent. This is due to the process of cumulative causation where the

areas with a strong cluster of established firms would get increasingly stronger, further entrenching the centre-periphery pattern (Krugman, 1991;1998; Martin, 1999; Martin & Sunley, 1996).

Responses to geographical economics

NEG faced critiques from the field of economic geography. It was viewed to not take geography seriously enough with research that '*contains too little region and too much mathematics*' (Martin, 1999:84). Furthermore, the approach mimics what has been done before through regional science. For economic geography this approach is viewed as a step backwards despite the methods being increasingly sophisticated. This is partly due to its focus on generalisable models based on suitable geographical theories, e.g. Weber's location theory or Marshallian externalities. It is also criticised for excluding data or approaches that are intangible and deemed hard to incorporate in the models (Krugman, 1998; Martin & Sunley, 1996). Scott (2000) therefore chooses to rather call it a 'new regional science', emphasising that most economic geographers choose to focus on more promising approaches that coincide better with recent developments in economic geography. These approaches focus on a more holistic view, combining both quantitative and qualitative methods, the intangible and the tangible. NEG then becomes difficult to fit into the research done by economic geography on regional development as it is rather closed to the input of the interdisciplinary research that economic geography has adapted (Boschma & Frenken, 2006; Martin, 1999; Martin & Sunley, 1996; Scott, 2000).

Despite the criticism from the field of economic geography NEG is a popular and valid theoretical field of research on regional divergence and convergence. Its relevance comes through its legitimacy in policies of economic development where it has established a focus on economic geography by using the venue of mainstream economics, which holds much more influence in policy circles than economic geography (Krugman, 2011). Charron (2016), for example, used it as a base to explain what causes regional inequalities when studying the role of governance in mitigating the effects of increasing communications to stronger regions. Krugman (2011:2) states that '*like it or not, the White House has a Council of Economic Advisers, not a Council of Geographical Advisers, The World Bank hires lots of economists and not many geographers, and so on*'. In this context NEG, using the methods accepted in economics, has successfully made geography a main concern (Krugman, 2011). Therefore one should, like Feldman & Storper (2018), Iammarino et al. (2017) and Pike et al. (2017), at least refer to it when

discussing regional development as it had an influential role in putting agglomeration economies into economics and geography into the discussion of development.

2.2 Institutional perspectives

A somewhat parallel development with NEG focused on developing a body of literature and theories that worked to understand regional development and economic activity as related to something more than quantifiable factors. By breaking away from the previously dominant regional science it focused on endogenous factors of regions and firms, emphasising the importance of qualitative particularities of regions as factors explaining economic activity (Boschma & Frenken, 2006; Gertler, 2018; Hassink & Gong, 2019; North, 2005; Scott, 2000). This, through authors like Gertler (1997;2003) or Henry & Pinch (2000), developed into a focus on structures, social and economic, at different scales, within firms, clusters, regions etc., that create pre-conditions for growth or decline. Examples of this research would be Saxenian's (1996) comparison between business structures of two regions dominant firms or Grabher's (1993) analysis of the Rhur area and why it struggled to create new growth paths when the dominant industry stagnated. This is said to be due to cultural and social structures that enable or constrain actors, trust for example is viewed as a crucial enabling force for the pre-conditions of growth (Boschma & Frenken, 2006; Gertler, 1997; Gertler, 2018; North, 2005; Rodríguez-Pose, 2013; Scott, 2000).

IEG has two main aspects. There are researchers like Bathelt & Glückler (2014), Currid (2007), Ekinsmyth (2002) or Henry & Pinch (2000) that emphasise on social practice and behavioural aspects of actors. It puts attention on how they are embedded in networks and how they provide opportunities for knowledge-sharing, innovation and competitiveness. Another perspective focuses more on the structural characteristics of institutions that form the constraints that shape interaction between actors. The latter approach can be exemplified through the works on innovation systems which have been used to explain the different forms of systems that can lead to innovations and new path creation within for example a region (Asheim et al., 2017; Grillitsch, 2016; North, 1991).

The latter approach has more influence in the regional development literature with Charron et al. (2014); Farole et al. (2010); Feldman & Storper (2018); Gertler (2018); Iammarino et al. (2017); Pike et al. (2007;2017); Rodríguez-Pose (2018) & Rodríguez-Pose & Storper (2006) viewing it as an essential part in understanding regional development as they facilitate "*negotiation and dialogue, mobilize stakeholders and integrate them into the development process*" (Pike et al., 2017:52). In that regard the

works of North (1991;2005) & North & Thomas (1970) have been influential in explaining how institutions have a detrimental impact on long-term development of economic activity and are a underlying factor behind uneven development. It is the level of trust and openness of localities that can either constrain or enable economic activity where a lack of trust would lead to opportunism and lack of interpersonal exchange (Boschma, 2005; Gertler, 2018; Rodríguez-Pose, 2013). In localities with good institutions, firms would enjoy in general lower transaction costs between firms and an environment that encourages knowledge spill-overs, interdependencies and skill acquisition (Farole et al., 2010; Gertler, 2018; Grillitsch, 2016). North & Thomas (1970) have shown that these factors have a significant impact on regional development, partially explaining the historical divergence in Europe. Yet it is not a simple one-way process where for example Putnam (2001) shows the dangers in having too much 'bonding' social capital as it produces inertia and exclusion, which is also shown in the analysis of Boschma (2005) regarding institutional proximities.

Institutions, mainly through the focus on structures, have made headways into the field of EEG. It has created a perspective on the co-evolution of actors and institutions where historical processes, external and internal factors, provide ways where both actors and institutions can go through changes. Institutions then, in the eyes of EEG, impact the resilience of regions with increasing or hampering the adaptive ability where it could have enabling effects, promoting productive activities, skill acquisition, and transfer of innovation and technology between firms (Martin & Sunley, 2015b; North, 2005). This notion has a lot of similarities with the path- and place- dependency of evolutionary economic geography that could, as stated by Boschma & Frenken (2006) and Boschma & Frenken (2018), be combined to widening the understanding of economic development.

Finally, IEG is a rather loosely connected stream of literature which shares both the same focus and methodological ground. Firstly, it uses a qualitative toolbox of inductive approaches using mainly case-studies to explain either the differences in economic development between localities or the economic development of a locality. Secondly, it does not apply a priori to models that assume that individuals act with the same goal across space, it forms the main critique against NEG (Boschma, 2015; Boschma & Frenken, 2006; Gertler, 2018; North, 2005). Instead they see agency as embedded in structures, enabling or constraining, heavily linked with the institutional and cultural

settings of actors, and that in their view necessitates a deductive approach (Boschma, 2015; Farole et al., 2010; North, 1991;2005; Rodríguez-Pose, 2013).

Furthermore, there is an overall consensus that IEG provides with a complex nature of theory that '*remains difficult to appropriately capture*' (Grillitsch, 2016:22). The challenge of measuring the impact of institutions relates both to the qualitative approach employed and to the lack of a generalizable framework which one can study and test the impact of institutional factors on regional development. Institutions and cultural aspects of regional development are as such evasive to study as they incorporate different factors from different scales, neighbourhood to global institutions (Boschma, 2005; Farole et al., 2010; Gertler, 2018; Grillitsch, 2016; Rodríguez-Pose, 2013). Furthermore, Esping-Andersen (1990) or Rodríguez-Pose & Tselios (2015) have concluded that Sweden in general, e.g. with its form of social welfare, has strong nation-wide institutions in place to reduce inequalities and to further education and human capital improvements. Furthermore, these institutions emphasising on meritocracy for their employees are also setting good foundations for trust and openness (European Comission, 2017). These institutions made the nation at large well-positioned in the post-industrial economy with a strong transition from traditional industrial sectors to a focus on knowledge-intensive industries and services (Esping-Andersen, 1990; European Comission, 2017). These nation-wide policies associated with good institutional frameworks with few differences across the country would indicate that local institutional effects on regional development or inequalities are hard to capture on this scale, especially over time, as it would require an in-depth analysis of each region's institutional development.

2.3 Evolutionary economic geography

Evolutionary economic geography evolved as an alternative to the aforementioned NEG and IEG. The basic notion is that '*the system is by itself not moving towards any sort of balance between forces, but is constantly on the move away from such a situation*' (Myrdal, 1957:13). EEG frequently uses Schumpeter as a base by acknowledging that the economic system is not by default seeking equilibrium but frequently goes through changes like that of 'creative destruction' which reshape the system (Boschma & Frenken, 2006;2018; Frenken et al., 2007; Ljungberg, 2016; Myrdal, 1957; Schumpeter, 1983). As such the field applies evolutionary theory, asking why and how the spatial structure of the economy goes through '*processes of change* [that] *are themselves path- and place-dependent'* (Boschma & Frenken, 2018:214).

What clearly differentiates it from the other two approaches is that it forms a middle ground between the very qualitative methods of IEG and the pure quantitative methods of NEG. It is different from IEG, using more quantitative and mixed methods focusing on factors that can be traced over time or that would explain how actors adapt to change. Furthermore, it differentiates from NEG and the critiques it received by positioning the quantitative methods away from assumptions of general equilibrium and individual maximisation. It also sees, contrary to NEG, agency as contextual in space and time. It therefore not only focuses on the evolution of firms and regions but also on their foundations in the agency of actors with an openness to more qualitative methods (Boschma, 2015; Boschma & Frenken, 2006;2018; Hassink & Gong, 2019). Furthermore, the field of EEG uses a multifaceted approach by frequently incorporating different streams of research, the most noteworthy being the notion of path-dependency, with e.g. complexity theory being incorporated in the framework to conceptualise how self-organisation, emergence and adaptation influence uneven development (Martin & Sunley, 2006;2007).

The major influence EEG has had on regional development and understanding uneven development is through the development of theories regarding path- and place-dependency, e.g. through the notion of lifecycles and the resilience of regions (Boschma, 2015; Boschma & Frenken, 2018; Martin & Sunley, 2006;2015a). These theories focus on explaining spatial patterns of economic activity, e.g. agglomerations or centre-periphery pattern, by linking to the spatial conditions of regions that are place and path-dependant (Andersson et al., 2019; Boschma, 2005;2015; Boschma & Frenken, 2006;2018). Lifecycle theory implicates that industries, both individual firms and clusters, go through stages of emergence and maturity. During early stages there is a lot of related variety that decreases as the cluster matures due to networking, co-operation or competition, resulting in convergence and less variety (Boschma & Frenken, 2018). Neffke et al. (2011) show that firms go through similar processes relating to the benefits they get from different externalities. Emerging firms rely more on product innovation, which benefits from Jacobs' and Urbanisation externalities, but as they mature the focus shifts towards efficiency and competitiveness in price levels, MAR externalities and specialisation then become more important.

Maturity also brings a need for renewal for industries and clusters, as they otherwise risk stagnation with increasingly fewer possibilities for new path creations and transformation (Boschma, 2015; Boschma & Frenken, 2018). The process of renewal is in itself path-

and place dependent as found by Simmie & Martin (2010) it is linked with the resilience of the regions firms and clusters. The resilience of a region relies both on firms and existing structures of regions, e.g. institutions, which influence the ability to retain knowledge and industries during recessions. This proves to be vital in two ways. Firstly, innovation and new path creation occur through spin-off processes from existing sectors. Secondly, firms generally do not locate in regions where they lack related sectors or technologies (Martin & Sunley, 2015a; Neffke et al., 2011; Simmie & Martin, 2010). Therefore, the notions of knowledge-spillovers, endogenous sources for knowledge and the institutional environment in regions become important factors in a region's resilience where exogenous led growth tends to decrease resilience (Simmie & Martin, 2010).

Furthermore, EEG also contributes with a dynamic reflection upon the constraining factors of local structures, e.g. not using the notion of proximities as a linear enabling force. Instead it is a complex system where different sources of proximities can enhance or mitigate each other (Boschma, 2005; Boschma & Frenken, 2018). Through what Boschma (2005) identified as cognitive, organisational, social, institutional and geographical proximities the conclusions are that too much of these proximities can lead to inertia while having to little would cause too little interaction, also causing inertia. Geographical proximity is thus treated as one of these factors shown, through e.g. Grillitsch & Nilsson (2015) or Andersson et al. (2016), to not be as detrimental to innovation and firms performance as NEG states it to be. As such EEG links up with IEG with the notion that economic actors operate differently between and within regions depending on the structures they are embedded in (Andersson et al., 2019; Boschma, 2005;2015; Boschma & Frenken, 2006;2018; Grillitsch et al., 2017).

What EEG often concludes is that regional development relies on existing structure which are hard to drastically change. It is partly due to these structures being dynamic in nature as actors continuously adapt to changes within and outside of their region (Boschma & Frenken, 2018; Simmie & Martin, 2010). What EEG has been lacking, though this has somewhat changed lately, is a discussion on inequalities within regions. The main body of literature has focused on asking questions related to uneven development between regions, seen in the focus of using NUTS-2 or municipalities as units of measurement. Therefore, it has looked past questions regarding how well the performance of firms and clusters can speak of the development within the region and whether the effects of clusters and firms are benefiting the entirety of the region. Consequently, there has been a lack of debate on the scale used and if it is appropriately used when discussing the development

of a region, which was something Martin Andersson emphasised in his recent works (Andersson et al., 2016; Andersson et al., 2019). This also means that there is a need to question how these processes influence inequalities within regions as well as between them, reflecting upon where and why the uneven development is the largest and whether it is linked with the performance of local industries.

2.4 Externalities

These approaches share a common reference towards external factors that influence actors. For example, in NEG this is influencing actors' decision to relocate due to goal maximisation. These factors, referred to as externalities, have been extensively researched and written as part of agglomeration economies, factors encouraging firms to cluster together. Typically, agglomeration economies are divided along the axis of specialisation (localisation) and diversity (urbanisation). In this section specialisation will be looked at in terms of MAR externalities and diversity in terms of Jacobs' externalities. This will provide an overview of these two divisions and their consequences on uneven development according to the literature, see table 2. However, there are classifications of externalities that have been used outside of these divisions, e.g. pecuniary externalities in NEG. Furthermore, some research like Lundquist et al. (2008) & Neffke et al. (2011) treat urbanisation economies from two lenses, benefits due the diversity of a city and benefits that occur due to the size of the city. Therefore, this section will mention the importance of e.g. market size as a separate externality.

Table 2: Overview of the impacts of externalities on firms in the region (Andersson et al., 2016; Boschma, 2015; Lundquist et al., 2008; Neffke et al., 2011)

Structure	*Enabling*	*Constraining*
Jacobs' externalities	Cross-sectoral knowledge combinations Industrial & knowledge diversity Potential high adaptive ability of firms	Lack of specialisation & focus Fewer tailor-made services
MAR externalities	Local specialisation of labour and suppliers Knowledge spillovers Cost saving environment	Lock-in Potential low adaptive ability
Urbanisation externalities	High access to services Local market size Proximity to global markets	Higher factor costs Higher operation cost

Urbanisation economies relate strongly to the works of Jane Jacobs and is interchangeably termed Jacobs' externalities (Groot et al., 2016; Neffke et al., 2011). Jane Jacobs (1969) states that one of the important sources for growth and performance of firms lies in the presence of diversity. Diversity is based on the existence of a wide variety of actors in a region, related or unrelated, something that often necessitates urban environments that can sustain such diversity (Groot et al., 2016; Neffke et al., 2011). As such, an increase

in the size of urban environments would suggest a potential increase in diversity and variety. This would furthermore result in a positive effect on economic activity since the variety of a region influences innovative capabilities of firms. This is due to the positive effect that diversity in structures and actors has on encouraging the emergence of new growth paths. This diversification increases the possibilities for e.g. novel combinations of knowledge from unrelated sources (Frenken et al., 2007; Grillitsch et al., 2018; Lundquist et al., 2008; Neffke et al., 2011). Furthermore, it helps creating opportunities for cross-industrial innovation and production improvements which benefit firms and increase the potential for diversity in different paths of economic growth, avoiding regional lock-ins and increasing competitiveness in the long term (Boschma, 2015; Boschma & Frenken, 2018; Grillitsch et al., 2018). However, there are uncertainties about the extent of which firms would benefit locating in environments with unrelated sectors and knowledge. A potential drawback is that the lack of specialisation and relatedness would constrain the performance of actors (Neffke et al., 2011). The implication of these constraints is still discussed with e.g. Grillitsch et al. (2018) stating that knowledge sharing is not necessarily reduced by variety since knowledge sharing is a highly complex process that relates strongly to the structure of the region where related or unrelated variety plays just one role (Asheim et al., 2017; Grillitsch et al., 2017).

Localisation economies, on the other hand, are the increase of productivity of economic activities occurring through specialisation, often labelled MAR externalities. This happens through the existence of a well-established industrial sector. As such, a region with MAR externalities has an established cluster of related firms that experiences economic benefits through co-location. Furthermore, benefits also arise from support infrastructures, suppliers and public actors, specialised to meet the demands of the sector. These factors not only create an environment where firms have lower costs arising from these specialisations, but also create a pull to locate in the cluster, creating an influx of business and growth (Andersson et al., 2016; Andersson et al., 2019; Lundquist et al., 2008; Neffke et al., 2011). The risk with a specialised region and environment is that it can cause lock-ins or lower resilience to economic shocks, threatening long-term economic growth (Boschma, 2015; Boschma & Frenken, 2018; Grillitsch et al., 2018; Simmie & Martin, 2010).

There are however, as shown by the works of Krugman (1991;1998), other externalities that are not expressively linked with either specialisation or diversity that provide important benefits for firms and give cause to agglomerations. These factors, often

included in the division of urbanisation economies, are focused on benefits relating to the density of an area in terms of population and services, something Krugman (1991;1998) identified as a crucial factor in centripetal forces. It provides firms with greater proximity and potentially better access to several services, e.g. government services or education, as well as direct access to a larger local market and a larger local labour pool. Furthermore, cities often have closer proximities with other cities and their markets, providing firms with better access to other markets and services (Andersson et al., 2016; Lundquist et al., 2008; Neffke et al., 2011). As such, this form of externality, focused on the impact of local market-size and proximity to other markets on firms performance, is similar to what Krugman (1991) and NEG identified as pecuniary externalities, i.e. market-size effect and other firms impact on the demand of goods for specific firms (Krugman, 1991; Martin & Sunley, 1996). However, this form of urbanisation economies has drawbacks in increased costs in terms of wages, rents and high land-values.

An example relevant to this research, is that there is an overall agreement that urban environments have become the driver for growth. It has been put forward by Andersson et al. (2019), on a background of various researchers, that these environments are responsible for around 80% of the GDP generated globally. A situation that has led e.g. Florida (2017) to conclude that it is the only environment with the possibility to thrive in today's economy. The cause behind this conclusion is not the generalisable fact that urban environments equals growth, rather it is due to what economic geography has termed the agglomeration economy, the positive effects of externalities and clustering that these environments can provide (Andersson et al., 2016; Boschma, 2015; Boschma & Frenken, 2018; Martin & Sunley, 2015a; Neffke et al., 2011; Pike et al., 2017). The important point is, stated by Pike et al. (2017:48), that '*patterns of agglomeration vary widely depending on the mix of local circumstances and sectors, and the role of historical path dependencies in the evolution of regional economies'.* As such they are the underlying processes with structures and networks, active in the environment, that are influencing firms performances and capabilities (Feldman & Storper, 2018; Lundquist et al., 2008; Neffke et al., 2011).

Finally it is important to remember that these effects, as theorised by Lundquist & Olander (2001); Lundquist et al. (2008); Neffke et al. (2011), have varying importance relating to the stage of the economic and the industrial life cycle as well as the technology in question. This means that new path development do not necessarily follow the logic of these externalities in causing agglomeration to certain areas but can also, as shown by

Enflo & Henning (2014), lead to decentralisation and dispersion over time. This implies that externalities do not have a clear causal relationship with regional development and performance of firms (Groot et al., 2016). It is a complex relationship contingent on varying processes across space and time which requires research not to treat it as static factors but a dynamic process (Groot et al., 2016; Neffke et al., 2011).

2.5 Structural theory of growth

The notion of structural cycles in economic growth is not a new idea, rather it relates back to older research. The works of Joseph Schumpeter (1983) in '*The theory of economic development'* laid the basis for this research that has much in common with evolutionary economics. The basis is that economy has a cyclic structure, shaped like a wave between expansion and recession, stability and instability. The implication is that crises are unavoidable in this economic system and that creative destruction is a vital part in the emergence of new technologies (Lundquist & Olander, 2001;2009; Lundquist et al., 2008; Schön, 2013). Schön (2014) associates this with Dahmén's (1988) notion of development blocks to construct a notion of cyclic patterns of general purpose technologies (GP) which moulds the potential growth paths in each cycle. These GP will emerge through radical innovations changing the economic structure providing with foundations for new path creations. When that happens, older GPs will still be in effect but matured beyond the point of being drivers of growth (Ljungberg, 2016; Schön, 2013;2014).

The aspect that links this with regional development is that systemic transformations are contingent, resulting in uneven geographical emergence in each cycle (Enflo & Henning, 2014; Enflo et al., 2014; Enflo & Rosés, 2015; Ljungberg, 2016; Lundquist & Olander, 2001;2009; Lundquist et al., 2008; Neffke et al., 2011). It positions the theory, as Lundquist & Olander (2001;2009) stated, in close linkage with previously mentioned evolutionary economic geography as EEG also incorporates life cycle theory in understanding the emergence and maturity of firms and clusters through time and space (Martin & Sunley, 2011; Neffke et al., 2011; Simmie & Martin, 2010). Moreover, it follows the same notion that actors continuously adapt to current situations as firms would re-evaluate their location as their need for different forms of externalities would change at different stages of the economic cycle (Lundquist & Olander, 2001;2009; Lundquist et al., 2008; Neffke et al., 2011). Furthermore, the approach states that the transition between relatively stable existence of firms and the economy at large to stages of crisis and transformation is unpredictable across time and space. As such it emphasise that these processes are contingent on factors across space and time which beyond creating

unpredictable patterns also evolve through adaptations (Lundquist & Olander, 2001;2009; Lundquist et al., 2008).

The approach identifies that the economy, not only firms, goes through stages where certain externalities and spatial structures are more beneficial than others (see figure 1). In the first two firms, crisis & transformation, benefit most from Jacob's externalities with institutions and conditions that allow quick adaption and multiple knowledge-combinations. Over time, the GP develops and matures, increasing the need for efficiency and MAR-externalities. At this stage, growth slows down and rationalisation take effect. Furthermore, Lundquist & Olander (2009) identified that regions further down in the hierarchy have, at these stages, increased competitiveness since they possess better opportunities to compete regarding MAR-externalities. It is important to note that this literature stretched the proposition that there are different growth patterns for different kinds of regions at certain stages of the economy. This does not necessarily implicate that different stages of the economy provide with periods of convergence or divergence, yet it has been found that regional mobility is larger in the transitions between stages and GPs (Enflo & Henning, 2014; Enflo et al., 2014; Lundquist et al., 2008). Empirical results have also indicated, together with Neffke et al. (2011), that convergence and divergence of regions are linked with different stages of the economy with rationalisation and the maturity of industries causing spillovers to smaller regions (Lundquist & Olander, 2001;2009; Lundquist et al., 2008).

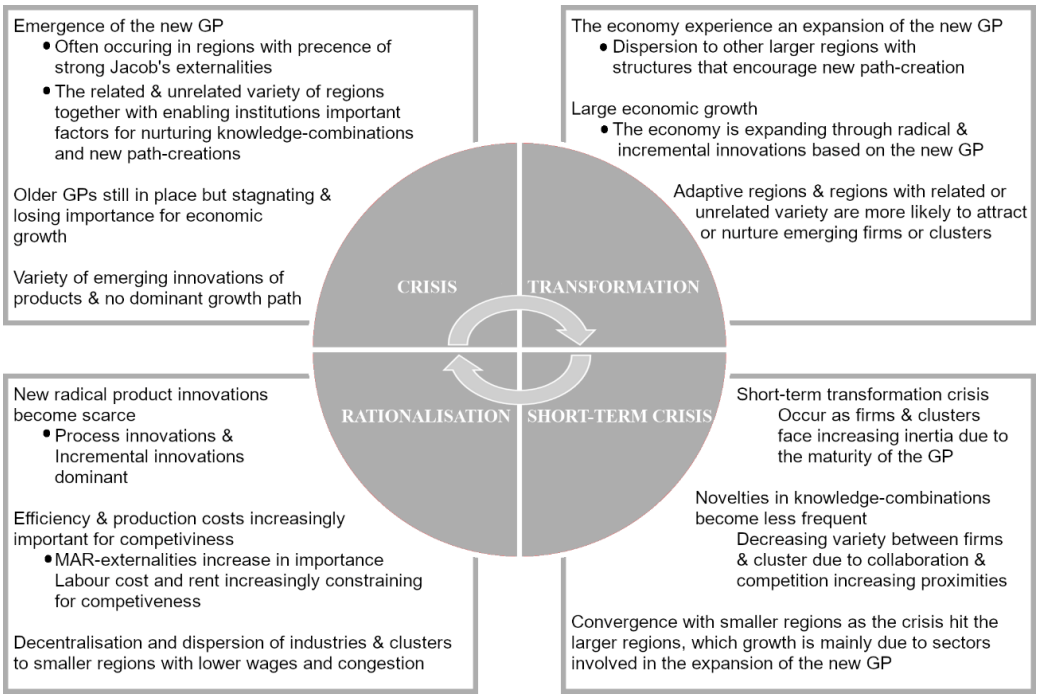

Figure 1: The structural growth theory and its regional implications (Lundquist & Olander, 2001;2009; Simmie & Martin, 2010)

Based on this research, studies on regional convergence in Sweden have stretched back to the mid-19th century concluding that economic transitions and larger changes to the economy have led to an overall regional convergence. However, the last decades starting around the 1980s, have experienced an increasing divergence which, according to Lundquist & Olander (2001;2009), coincided with the start of the current growth cycle characterised with knowledge-intensive services. As it matured and started rationalising one would expect convergence but the findings from Enflo & Henning (2014) & Enflo et al. (2014) indicate an entrenchment of the regional hierarchy and weaker regional mobility. Furthermore, Lundquist & Olander (2009) observed that despite there being an overall convergence in the economic performance of regions, the smallest regions struggled catching up and are instead lagging behind.

This stream of research has though been limited in its scope of research, focusing on regions' productivity (Enflo & Henning, 2014; Enflo et al., 2014) or sectoral productivity between regions (Lundquist et al., 2008) to prove both the cyclic pattern of growth and decline and when and where to expect convergence or divergence. What has not been done is move that research further analysing income and disparities within regions, linking how different growth paths at different stages can relate to increasing disparities within and between regions,

2.6 The importance of scale

Recently there has been a growing body of literature that has examined previous research on economic development. The focus of this examination has been about the scale that previous research used to construct an understanding of economic development. Martin Andersson et al. (2019) identified it as a shortcoming of the field to have focuses on administrative units as it implicitly assumes that the studied socioeconomic processes also operate at the same spatial scale. This is problematic in that quantitative studies on regional development will not account for the '*frequently contrasting processes happening at the same time across contiguous neighbourhoods, cities, regions, and counties*' (Feldman & Storper, 2018:145). In the wake of these examinations a growing body of literature started using geographical data on a higher resolution to expand the empirical foundations for economic geographic theories which were previously using a combination of functional or administrative units (Andersson et al., 2016; Andersson et al., 2019).

This rather new approach deals with a quite old issue in geographical studies, scale. Scale is an important factor for geography due to different reasons. Firstly, it relates to the

foundations for theoretical conclusions from both deductive and inductive research since one need to consider what distance the phenomena are active within and position the research at the appropriate scale. In other words, one need to consider what scale is appropriate when collecting data and testing theories to avoid that the conclusion is based on results that are not representative of the phenomena (Hall, 2002). This can be exemplified by the works in regional development where there is a consensus that patterns of convergence and divergence can occur at the same time, e.g. recent research state that whilst there is a convergence between European countries the disparities within these countries has increased (Iammarino et al., 2017). Secondly, it relates to what has been termed the Modifiable Areal Unit Problem (MAUP). It is seen as a statistical challenge for social sciences. The challenge is that the process of setting boundaries and aggregating observations in space creates a source for statistical error and bias. Gehlke & Biehl (1934) was one of the first recognising the challenge for spatial sciences and it saw further attention when Openshaw (1984) and Openshaw & Taylor (1979) explored the issue to find potential solutions. However, its presence in the field of research that developed the aforementioned theories has been limited to mainly be about the first issue. Recent works, through the works of Andersson et al. (2016) & Andersson et al. (2019) have provided with reflections but in general there is an absence of such reflection in the main body of literature on regional development.

The importance of reflecting on scale is due to the tension between the object of study and what is studied. Bohr (1948) states that we design our own results with the design of the instrument measuring the phenomena. Scale then becomes an instrument of research that determines the outcome of the study since the method of aggregating to areal units often combines points of data in a way that does not necessarily adhere to the characteristics of the phenomena. This is not only about the level of detail on the aggregation but also about the number of possible ways to draw these discrete units to which the aggregation of points is made. Figure 2 shows that how we draw these borders creates different descriptions of the area which also renders different results from analyses of these areas. In other words the modifiable areal unit can create variance in how the phenomena are perceived, measured and acted upon (Fotheringham & Wong, 1991; Openshaw, 1984; Openshaw & Taylor, 1979; Wong, 2009).

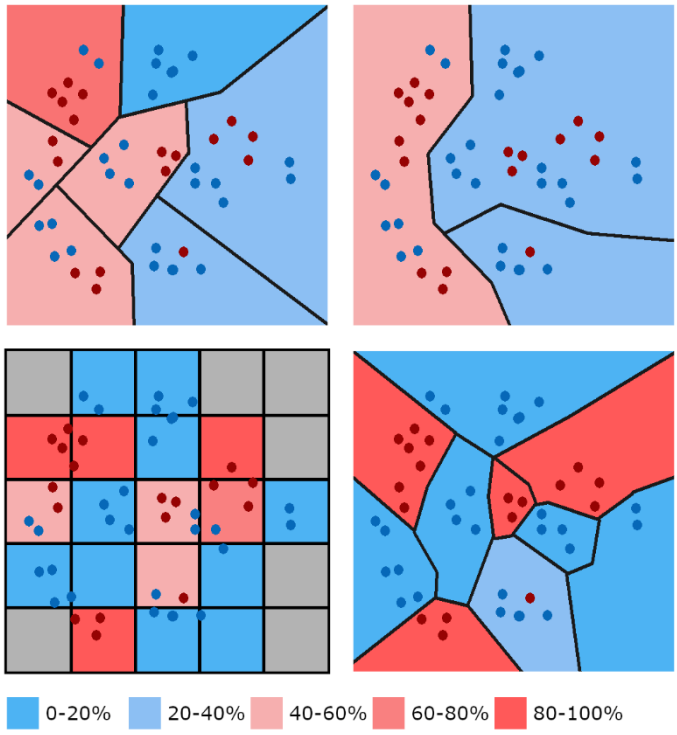

Figure 2: The effects of Modifiable areal units on the interpretation and distribution of a phenomena in space.

The presence of MAUP, according to Fotheringham & Wong (1991), creates a situation where one should be sceptical of the reliability of the results as it would be likely to vary depending on the level of aggregation, the scale problem, and the configuration of the areal unit, the zoning problem. The temporal factor is further adding to the issue of both problems. It is apparent in the methods of Enflo & Henning (2014) that the administrative areal units used for the aggregation would change over time, due to it being dependent on other functional and political conditions. This creates issues in how to deal with the zoning problem. Dealing with this would mean dealing with different forms of aggregation to form an aerial unit that is not changing over time, a solution that would potentially create issue with the scale.

Fotheringham & Wong (1991) have proposed a solution to MAUP where instead of using predefined areal units, one should use what is termed natural areal units. These areal units are based on the characteristics of the studied phenomena where boundaries and scale are defined by its patterns. This implies that these areal units are redefined as the pattern changes across space or time and as such result in lesser risk of the areal unit impacting the data analysis by creating a skewed reflection of reality. For this research the limitations on the data at hand make this solution unachievable but nevertheless the acknowledgement that there is a solution is important when reflecting both on the research done and on the second factor, that of what scale is appropriate for this form of research.

The Administrative or functional units used as a base for this analysis deal in varying degree with the scale and zonal problem. It all shares similarities in zonal issues as municipalities are drawn within the boundaries of counties and NUTS-2 are essentially counties joined together. What sets them apart is the scale used that would alter the impact of the zonal issues. NUTS boundaries are drawn to get comparable regions in area and population size. For NUTS-2 the minimum population size is 800 000 and maximum 3 000 000 (European Comission, 2018). The implication is that it encompasses large areas that do not necessarily share the same conditions, causing internal variations across space, which is cause to be cautious drawing conclusions from computed averages, see figure 2. Counties are much smaller and often found to reflect one or several labour market regions that encompass much of the inhabitants commuting patterns (Enflo & Henning, 2014; Montfort, 2008; Tillväxtverket, 2018). This suggest that the aforementioned implications are much smaller for counties. However, it still contains urban and rural divides. It would especially be the case for larger counties that contain multiple labour market regions. Municipalities, on the other hand, deal to a lesser degree with urban/rural divides within its boundaries. However, they tend to cut through commuting patterns, which mean that the computed averages and inequality indices would not either speak of the general performance of the labour market region. However, it would give a larger indication of spatial disparities within labour market regions. Nevertheless, there is a large variation between municipalities in terms of area, population size and density. This means that there are some uncertainties regarding the extent of which one can draw conclusions from comparisons between them. For that reason there have been classifications made that would better allow for such comparisons, see Åhlvik & Gillingsjö (2016).

Grids is the only areal unit that are not related to the other ones. As such they deal differently with the zonal issue, mainly in that the boundaries are equally shaped and sized across space, see figure 2. This implies that one area would be directly comparable to another as there will be no significant differences between them after excluding unpopulated areas. Moreover, the small size of this grid would mean that the scale issue is marginal and that it could even be a drawback as it would contain few observations, limiting the possible statistical analyses that would generate significant results. Furthermore, also indicated in figure 2, the boundaries risk cutting through neighbourhoods, since they do not follow settlement patterns, which is cause for some arbitrary computations reliant on where one started drawing the grid (Wong, 2009). Nevertheless, the grids have the benefit that they stay unaltered over time whilst Sweden's

municipalities and counties frequently go through changes in their boundaries (Enflo & Henning, 2014).

2.7 Identifying inequality in research of economic geography

In addition to these approaches that focus on explaining both uneven economic development and the spatial patterns of economic activity, there are researchers focusing on policies and what to do about region divergence and inequalities. These does not necessarily put themselves in either of the aforementioned approaches but try to encompass theories that could suggest how to overcome uneven development. Authors like Florida or Rodriguez-Pose focus their work on not solely explain economic activity in space but to identify patterns in regional developments and underlying causes for divergence. The works of Rodriguez-Pose, especially, also focus on what to do about it in terms of policies (Di Cataldo & Rodríguez-Pose, 2017; Farole et al., 2010; Florida, 2014;2017; Iammarino et al., 2017; Pike et al., 2007;2016;2017; Rodríguez-Pose, 2013;2018; Rodríguez-Pose & Di Cataldo, 2014; Rodríguez-Pose & Tselios, 2015; Rodríguez-Pose & Storper, 2006).

A commonality among this research is that there is a general consensus that the mainstream theoretical approaches, mentioned above, provide with no clear guidelines to what extent one could start dealing with regional divergence (Iammarino et al., 2017; Pike et al., 2017; Rodríguez-Pose, 2018). On the one hand theories form a dominant narrative, like that of NEG or Glaeser (2011), which view '*uneven development […] as a price to be paid for better overall economic performance'* (Iammarino et al., 2017:22). It is based on a view that convergence is a symptom of a stagnating economy and divergence, i.e. rising inequalities, is a sign of an accelerating economy due to wealth being generated for individuals and regions involved in firms that are expanding (Storper et al., 2016). Currently the divergence is increasingly seen through the process where '*[…] the most profitable industries, which used to be spread across many smaller and medium-sized cities, increasingly concentrate in a few superstar behemoths*' (Florida, 2017:18). This pattern has been evident since the 1970s where the current growth paradigm, with knowledge-intensive sectors being crucial, have caused strong urban environments to increasingly contain the world's economic activity and as such its growth potential (Andersson et al., 2016; Andersson et al., 2019; Iammarino et al., 2017; Rodríguez-Pose, 2018).

An identified cause has been the interplay between accelerating globalisation and technological change that has increased the weight of agglomeration forces as the driving

force for growth or lack of, something both NEG and EEG emphasise with varying weight on causes (Iammarino et al., 2017; Martin, 1999; Pike et al., 2017). Therefore, this approach views the increasing performance due to urban density and agglomerations as a cause for policies to not counteract these processes. The line of argument is that the increase in growth, competitive advantage and innovation that are provided by concentrating economic activity and people should be encouraged as they allow individuals greater opportunities to attain better welfare (Iammarino et al., 2017; Rodríguez-Pose, 2018). This approach, focusing on efficiency, is further fuelled by the lack of impact equity policies had in changing the course for lagging regions (Iammarino et al., 2017; Rodríguez-Pose, 2018). NEG, for example, provides with a critical view of how well improvements in peripheral regions can cause convergence, especially if it increases connectivity to growth-centres which will only enhance the centripetal effects as mobility improves (Krugman, 1998; Martin, 1999).

On the other hand, this narrative has not a solid empirical background when it forms its conclusion. First of all, both EEG, IEG and Florida (2005;2014;2017) frequently stress that it is the characteristics of places that influence economic development of localities and not the size per se that warrants increasing economic performance, even if it increasingly seems to matter (Rodríguez-Pose, 2018). It is also frequently the case that the mobility of individuals is not equal but relates to the skill of the individual. The prospering clubs of cities and metropolitan areas are mainly attracting highly skilled individuals whilst the lower skilled are mostly moving between the less prosperous areas (Florida, 2017; Iammarino et al., 2017; Rodríguez-Pose, 2018). What can be labelled the 'creative class' increasingly dominates the productive and prospering cities. This forces the rest of the population to face a situation where they increasingly live where the 'creative class' choose not to live, often in the periphery or delimited areas of cities (Florida, 2017).

This causes two identified side-effects. Firstly, it creates a territorial divide between prospering cities and lagging areas, forming an increasing spatial division of people based on qualities, i.e. education & income, since the highly educated and well-paid increasingly move towards innovative cities where the jobs are located (Florida, 2014;2017; Iammarino et al., 2017; Rodríguez-Pose, 2018). Secondly, due to what Florida (2017) terms '*winner-takes-all-urbanism',* urban areas increasingly experience a patchwork of prospering and less prospering areas where class is connected to the place people live in. The advantaged creative class increasingly clusters in areas with close

access to the urban core, transit networks, knowledge-based institutions and natural amenities. The poorer strata then face the situation where they need to live in areas with lesser access to economic opportunity, jobs, good education and with lack of natural amenities. Therefore, they also face challenges with health and well-being (Florida, 2017). Factors that hamper upward mobility and questions the spill-over effects of concentrated economic activity (Florida, 2017; Iammarino et al., 2017; Rodríguez-Pose, 2018).

Both side-effects create an issue where one lives or is being raised increasingly dictates their future, trapping individuals in a situation not of their own choosing and with fewer opportunities to change it (Florida, 2017; Iammarino et al., 2017; Rodríguez-Pose, 2018). This has been argued to be threatening stability as these rising disparities between people and regions threatens to leave out people from the economy and society, seriously hampering innovative capacity, demand, economic performance, trust and cohesion (Andersson et al., 2016; Bilbao-Osorio et al., 2012; Charron, 2016; European Comission, 2010a;2010b;2017; Feldman & Storper, 2018; Iammarino et al., 2017; Pike et al., 2017; Rodríguez-Pose, 2018).

2.8 Summing up the theoretical framework

The streams of research and the discussion that has been presented have provided us with insights to the development of regions. It has answered why uneven development occurs, how it takes shape across space and time. The section has presented with different approaches giving an overview of the complexity of analysing regional development and inequality. It should be now evident that it is not a question that could easily be given an exhaustive answer. Frequently, the scope of research has been termed as complex since it is dependent on context with structures and agency constantly co-evolving and adapting to endogenous and exogenous input. Nevertheless, EEG and structural growth theory stand well positioned to study an historical process of regional development with its focus on dynamic processes across time. Yet there are a couple of important inputs the other approaches give that would explain uneven development over time. The following contributions forms the basis for analysing the findings:

- Clustering forces, or more accurately agglomeration economics, are one of the main underlying processes behind the prosperity and growth of certain areas. So much is ascribed to it that it lead Florida (2017:13) to state that '*thanks to the clustering force, the most important and innovative industries and the most talented, ambitious, and wealthiest people are converging as never before […]*'.

- Externalities are one of these clustering forces and there is a consensus that these have a strong impact on uneven development. NEG shows that externalities form part of the centripetal forces that provide a continuing pull for firms and individuals. This causes existing patterns of economic activity to be further entrenched if no structural changes in the economy occur that would change these patterns.
- The structural changes leading into the post-industrial era have seemed to mostly benefit certain large urban areas. Florida (2014;2017) identifies that these urban areas contain externalities and institutions that pull the drivers of growth, firms and individuals to more and more locate in its vicinity. Furthermore, it causes smaller regions and especially regions in the periphery to experience less participation in the growth and development of the economy with less upward mobility (Enflo & Henning, 2014; Lundquist & Olander, 2001;2009).
- From IEG and EEG we should take note that actors do not benefit equally from the environment but relate strongly to how it is embedded in its locality (Andersson et al., 2016; Boschma, 2005; Gertler, 2018; Grillitsch et al., 2017). This has been shown by Florida (2017) to also have repercussions in that inequalities are existing within regions, between its core and periphery, and within the core that relates to the observation that certain areas within cities are more successful than others in benefiting from the current knowledge economy.
- Regions and localities, as shown by structural growth theory, do not benefit equally from new path creations or innovations, instead growth trajectories of regions are both relying on the different stages of the economy as well as the different conditions regions have. Therefore, one could expect that divergence is happening during times of growth as certain regions are stronger in developing new products or GPs.
- Convergence in income between regions would be symptom of an economy slowing down and should be an expected pattern during time-periods of crisis. Structural growth theory also suggests that convergence could be expected in the latter stages of the economy as regions lower in the hierarchy would be in a better position for competition (Lundquist & Olander, 2001;2009; Lundquist et al., 2008).

3 Methodology

There are a number of different approaches when studying regional development. Feldman & Storper (2018) state that there is a valid discussion on which measurements should be used in order to accurately analyse progress in regional development, whether it is qualitative or quantitative methods. This paper focuses on studying regional development in Sweden using quantitative measurements. It follows the praxis of using quantitative data to measure historical and on-going development of regions. Quantitative data are frequently used in policy papers by e.g. the European Comission (2010b;2017) and as such it is relevant to use the same or similar methods to answer the sub questions of this research. In other words, using quantitative methods aligns well with the aim of this paper to reflect upon the implications for research and policies in regard to the scale issue.

This section will start by situating the methods in a consideration of different possible ways to measure uneven development. From there, it will discuss the data used for this research and then move on to a presentation of the variables and indices used to construct the analysis.

3.1 Methodological considerations

The study of regional development could justifiably have different disciplinary approaches with the most obvious dichotomy of approaches being qualitative vs. quantitative, or intensive versus extensive (Sayer, 2000). The different ways regional development has been measured and could be measured in quantitative approaches, see e.g. Florida (2017), Iammarino et al. (2017), Montfort (2008), Pike et al. (2017) and Rodríguez-Pose & Tselios (2015), imply that the notion of inequality within and between regions can have different accurate approaches. At the core are the questions of what inequality is and what does development entail.

Furthermore, these questions are part of defining the object of study and understanding the nature of it. In combination with ones intention with the object of study, as argued by Sayer (2000), they form the foundation of which one selects research methods. As such the abstraction used to determine the definition of development and regional equality is vital as it relies on an academic understanding of the phenomena.

Following the studies of Archer et al. (2013), Bhaskar (2010) and Sayer (2000), it becomes important to situate regional development and inequality as an open system with multitude of causal structures and mechanisms, which the phenomena are contingent

across. It is something that goes well with research done on regional development. In the works of Feldman & Storper (2018), Florida (2017), Iammarino et al. (2017) and Rodríguez-Pose & Tselios (2015), regional development is presented as the general well-being of a region in terms of actors, defined as more than quantitative measurements of growth. It is not mere firm creation and growth, it also deals with the cohesion of a region, the equity within and its position in relation to other regions.

Researchers, in their work, have defined regional development as something larger than economic performance and growth which has caused the notion of inequality to be used in juxtaposition with regional development (Feldman & Storper, 2018; Florida, 2017; Pike et al., 2017). This in turn, see e.g. Feldman & Storper (2018), Iammarino et al. (2017), Pike et al. (2017), Rodríguez-Pose (2018), Rodríguez-Pose & Tselios (2015) & Tselios (2009), has roughly been defined as the inequality of opportunity and capacity between individuals. To then understand the patterns of inequality of opportunity and capacity research would lean towards what Sayer (2000) defines as extensive research with statistical analysis, since intensive research with qualitative analysis would not answer these questions. The limitations will be the explanatory penetration of the results and to what extent one can understand the underlying relations that goes beyond the formal.

3.2 Data

In the case of Sweden there exist a detailed database of high quality, well positioned for studies on income inequalities, that can be used for labour-market studies. This database is called the Longitudinal Integrated database for health insurance and labour market studies (LISA) and is maintained by the Statistics Sweden (SCB). It is an annual register of individuals and firms containing data from the year 1990 and onwards. Individuals aged 16 and older, as of the 31st of December every year, are included in the database. It combines a multitude of registers from different government agencies including information about individuals' educational level, connection to the labour market, its uses of social welfare etc. Even though individuals are the prime focus of this database it also stores information on firms regarding number of employees, investments, revenues etc. However, most of the data on firms are on a shorter time span which limits the timeframe of the research. This data has been processed using STATA and R-studio.

This micro-data requires some ethical considerations in its use. The main consideration is that the use of this database comes with restrictions. Foremostly, no extraction from the database should contain information that would make it possible to identify individuals.

This thesis did not under any part of the process identify individuals in their region of residence and did the necessary generalisations in order to prevent this possibility by excluding areas with fewer than 10 observations. Secondly, the geographical localisation of individuals is only known at grid level of 500 by 500 meters. This creates restrictions in how fine-grained the analysis can be, both in terms of the need of aggregation in order to be extracted and in terms of which areal units it can be extracted to. As such the research will, from the start, deal with the issue of MAUP regarding both scaling issues and issues of boundaries of polygons since the data available would need to be modified to fit these predefined areal units. Transforming individual data for it to be generalised means that the research is losing data quality in the transformation.

The main implication is that the solution posed by Fotheringham & Wong (1991) to MAUP, forming natural boundaries based on point data, is not available and as such there is a valid criticism that this research is replicating the errors that it identified as weaknesses in previous works. What this research does to counter this weakness is using multiple scales, with the 250 square meters grid being the lowest (see table 3). This scale encompasses such a small area that going beyond it would not generate any significant patterns as it would imply too few observations for statistical analysis. Moreover, the use of lower scale than the administrative units minimise the issue of scale regarding MAUP which provides this research with better quality than previous research.

Table 3: Overview of the areal units that are used in the study

Scale	*Number of units*	*Possible subgroups*
NUTS-2	8	Counties, Municipalities & grid
Counties	21	Municipalities & grid
Municipalities	284*	Grid
0.25 km²-grid		N/A

**1990s division of counties*

Furthermore, using the classification provided by the Swedish Association of Local Authorities and Regions (SKL), the municipalities can be grouped together by the general characteristics (Åhlvik & Gillingsjö, 2016). The classification, presented in table 4, in general gives an overview of the status of that municipality and allows the analysis of the data on municipalities and grid to involve a qualitative perspective. There is value in using this method even though it is just a classification for a certain time-period. The first, according to research by Enflo & Henning (2014), Enflo et al. (2014) & Lundquist & Olander (2009), being that regional hierarchy seems to remain stable over time with a few large changes. The second is that the use of population size of the largest urban area within the municipality and the commuting pattern of that municipality means it can work as a

proxy for measuring centripetal forces using labour migration and market-size as a base (Krugman, 1998; Martin & Sunley, 1996).

Table 4: An overview of SKLs classification of municipalities (Åhlvik & Gillingsjö, 2016).

Group	*Code*	*Classification*
Large urban municipalities	A1	>200 000 inhab. In the largest Urban area
Commuting municipalities neighbouring large urban municipalities	A2	>40% commuting to A1 municipalities
Urban municipalities	B3	>50 000 inhab. & >40 000 in the largest Urban area
Commuting municipalities neighbouring urban municipalities	B4	>40% commuting to B3 municipalities
Low commuting municipalities neighbouring urban municipalities	B5	<40% commuting to B3 municipalities
Small urban municipalities	C6	>15 000 inhab. & <40 000 in the largest Urban area
Commuting municipalities neighbouring small urban municipalities	C7	>30% commuting to C6 municipalities or >30% of labour commutes from other municipalities
Rural municipality	C8	<15 000 inhab. & <30% commuting to other municipalities
Rural municipality with tourism industry	C9	Rural municipalities with at least two criteria for tourism fulfilled

3.3 Variables

Based on the data available from the LISA-database there are different possible approaches to measure convergence and development. One variable often used to measure convergence of regions is GDP per capita. Other variables are also important as Florida (2017) identifies by using a dissimilarity index, over for instance education level or employment status, to measure segregation. This database offers the luxury of being able to select variables and indices to compute in order to measure convergence and it also makes it also necessary to justify the selection of variables.

This research will not make use of GDP per Capita due to its weakness in adequately measure development in detailed scales, where migration across boundaries will be more frequent (Montfort, 2008). It will neither deal with the non-parametric data that Florida (2017) uses for the dissimilarity index as it would not give a comprehensive indication of a region's productivity and the overall development of that area. Instead the variable that will be used is the *taxable earned income*, the reasons for which are twofold. It can, as shown through Rodríguez-Pose & Tselios (2015), be used as a proxy for social cohesion and welfare, measuring the interpersonal disparities, as well as it can be, as argued by Montfort (2008) & Tselios (2009), used as a proxy for economic development. The notion behind it being a proxy for welfare and social cohesion for both is that income, as shown by Sen (1974;2008), reflects the capacity of individuals to obtain their needs and wishes, where a great inequality also means a larger difference in capacity of action for

individuals to attain their goals, and a nation with good welfare would ensure that their citizens have an overall good opportunity to do so. In regard to economic development there is a simple logic behind it being used as a proxy, individuals' salaries are linked with the economic capacity of the workplace and region. In other words, a poor performing industry or region will not be able to pay the salary that well-performing firms and regions could, linking back to agglomeration economies.

3.4 Indices

The need to construct indices is to move beyond the mere description of the distribution of the raw data and extend through transformations and theoretical foundations to say something about the greater picture, in this case regional development. It would not be enough to look at the variable of taxable earned income to make extensive conclusions on the process of regional development and inequality. Montfort (2008) states that there are complexities in measuring convergence which is down to two major factors. Firstly, there are multiple ways to measure convergence that use different definitions of convergence and have different interpretations from the same raw data. Secondly, as a continuation of the first argument there is no approach that would provide an all-inclusive measurement of all aspect regarding convergence, hence the need to use multiple indices to get different perspectives on convergence.

In this research three indices, see table 5, will be used to measure regional and personal variation in income. However, there are other equivalent indices of equal quality in mean logarithmic deviation (MLD) and Atkinson index that use the same variables to form a picture of income inequality (Shorrocks & Wan, 2004). Nevertheless, the selection is based on two factors. First, these indices are popular measurements for inequality in research and public organisations (see e.g. Enflo & Henning, 2014; European Comission, 2017; Montfort, 2008; Shorrocks, 1980;1984; Shorrocks & Wan, 2004). The Gini index, for example, is one of the most common ways to measure inequalities (Montfort, 2008). Moreover, it has frequently been used in Amartya Sen's (1974;1976;1992) extensive research on welfare economics and development policies, where Sen's Welfare index incorporates the Gini index as a weight for the average income to create a measurement of general human development. Secondly, the Theil index and the half of the squared Coefficient of Variation index are selected on their characteristics, together with MLD, of being general entropy indices. This means that these indices are decomposable so that the total sum of the index is divided into two components, the average variation within subgroups and the variation between subgroups (Montfort, 2008; Shorrocks & Wan,

2004). Furthermore, the between subgroup component have been found to be highly correlated with each other, implying that there are little differences between indices. This leaves the within subgroup component where the MLD gives increasing weight to gaps between observations in the lower-tail of the income distribution (Montfort, 2008). Which makes it less interesting to use in the Swedish context with strong wage equality and relatively low standard deviation (Esping-Andersen, 1990). In contrast, the Theil index gives equal weights across the income distribution and the Coefficient of Variation is sensitive to changes around the mean (Montfort, 2008). The latter is particularly interesting as it signals increasing variations in the middle-income strata in Sweden, which has been shown to contain a large share of the population across occupations (Esping-Andersen, 1990).

Table 5: An overview of the measurements used for calculating development patterns in inequality

Index	*Formula*
Gini Index	$G_{it} = \frac{(0.5 - A_{it})}{0.5}$
Theil Index	$T^k = \sum_{j=1}^{k} \frac{n_j}{n}\frac{\bar{y}_j}{\bar{y}} \ln\left(\frac{\bar{y}_j}{\bar{y}}\right) + \sum_{j=1}^{k} \frac{1}{n_j}\frac{\bar{y}_j}{\bar{y}} \sum_{i}^{n_j} \frac{y_{ij}}{\bar{y}_j} \ln\left(\frac{y_{ij}}{\bar{y}_j}\right)$
Half-Squared Coefficient of Variation	$half\ CV^2 = 0.5\left(\sum_{i=1}^{k} \frac{n_i}{N} CV_i^2 + \sum_{i=1}^{k} \frac{n_i}{N} \ln\left(\frac{\mu}{\mu_i}\right)\right)$

3.4.1 Gini index

The Gini-coefficient is a measurement of inequality that uses the Lorentz-curve to show the difference between the income distribution of a population and perfect equality. Values closer to 0 indicate a more equal distribution of income and values closer to 1 indicate that the population suffer from large inequalities in the distribution of wealth. The Gini-coefficient is written

$$G_{it} = \frac{(0.5 - A_{it})}{0.5} \quad (1)$$

where A_{it} is the area under the Lorentz-curve in the ith region at time t. The area under the Lorentz curve is calculated to be the difference between the observed curve of cumulative income from the poorest to the richest observation and the curve of perfect equality. A curve of perfect equality is a straight line as each observation would have the same income. Ideally this would mean that one uses individual data to compute the curve since the Gini-coefficient due to the nature of the Lorenz curve would be influenced by the amount of divisions in the dataset. Furthermore, the Gini-coefficient is shown to be

poorly made for decomposability, yet it is also shown to tell a rather different perspective than the other inequality indices and is therefore interesting to include as a measurement (Shorrocks, 1980; Shorrocks & Wan, 2004).

3.4.2 General entropy indices

The weakness of the Gini-index, poorly made for decomposability, is mainly due to the popular question asked when studying inequality. Namely, to what extent can the inequality value in the total population be ascribed to the income differences between the subgroups of the population, being gender, place or education. The additively decomposable entropy indices provide researchers with this ability by providing indices that '*can be expressed as weighted sum of the inequality values calculated for population subgroups plus the contribution arising from differences between subgroup means*' (Shorrocks, 1980:613). Shorrocks (1980;1984) provides with a general formula for these indices where a decomposable inequality measure, for a population of N individuals divided into K subgroups with n_i indiviudals having the mean income of each subgroup being μ_i, can be written

$$I(y) = W + B = \sum_{i=1}^{k} \frac{n_i}{N} I(y_i) + \sum_{i=1}^{k} \frac{n_i}{N} \ln\left(\frac{\mu}{\mu_i}\right) \quad (2)$$

For these indices it then becomes possible to use different subgroups, as seen in table 3, to analyse the changes to the between value (B) for the inequality index. This would help answering questions about where and when interregional disparities are the largest, but also which scale has experienced the largest increase of inequalities between subgroups. However, when examining the values of the between value one should have in mind that Shorrocks & Wan (2004) identified two important characteristics. Firstly, the size of the between value in equation (2) is influenced by the number of subgroups used (*k*), where an increase in *k* would yield the expected result of between value becoming a larger share of the total index value. Secondly, the between value in general is the smallest share in studies using these indices, with studies in the European context seeing it ranging from around 0-1% for Switzerland to about 25-31% for Russia. A likely reason for it to be the smaller component was argued by Shorrocks & Wan (2004) to be national wage-setting institutions that mitigates regional divergence of income. Furthermore, the divisions that sees the largest share for the between value is subgroups incorporating the urban/rural divide linking back to the theoretical framework on uneven development.

Theil index

The Theil index, presented in table 5, is a measurement of inequality including inequality between groups and within groups (Montfort, 2008). The Theil index is for this purpose, a popular entropy formula where the foundation of the index can be written

$$T(y,n) = \frac{1}{n}\sum_{i}^{n}\frac{y_i}{\mu}\ln\left(\frac{y_i}{\mu}\right) \tag{3}$$

for a population of n observations where μ is the mean income of the population and y_i is the income of individual i. When partition this in subgroups using the outlays of Shorrocks (1980) & Novotný (2007) the Theil index becomes a measurement of total inequality expressed as the sum of the inequality within and between subgroups, where the within-group value is a weighted sum of the sub-groups inequality value. This can be written

$$T(y,n) = T(y^1,\dots,y^k;n) = w_j^k T\left(y^j;n_j\right) + B \tag{4}$$

where w_j^k will be the weight given to each subgroup, in this case areal units, inequality with B being the between group inequality. In this case the weight will be the proportion of the income in each areal unit expressed as $\frac{\bar{y}_j}{\bar{y}}$, where $\bar{y}$ is the total mean income and $\bar{y}_j$ is the mean income of the jth region in an observation of k regions. This create a within term equalling

$$W = \sum_{j=1}^{k}\frac{1}{n_j}\frac{\bar{y}_j}{\bar{y}}\sum_{i}^{n_j}\frac{y_{ij}}{\bar{y}_j}\ln\left(\frac{y_{ij}}{\bar{y}_j}\right) \tag{5}$$

where n_j is the number of observation in the jth region, y_{ij} is the income of the ith individual in the jth region and $\bar{y}_j$ is the mean income of jth region and $\bar{y}$ is the total mean income. Using equation (2) the Theil index can then be expressed as

$$T(y,n) = B + W \tag{6}$$

where, using the equation of Novotný (2007), the between group term for k regions can be written

$$B = \sum_{j=1}^{k}\frac{n_j}{n}\frac{\bar{y}_j}{\bar{y}}\ln\left(\frac{\bar{y}_j}{\bar{y}}\right) \tag{7}$$

Where $\frac{n_j}{n}$ is the proportion of the total population in the jth region. This creates a total Theil index that can be expressed as

$$T(y,n) = B + W = \sum_{j=1}^{k} \frac{n_j}{n} \frac{\bar{y}_j}{\bar{y}} \ln\left(\frac{\bar{y}_j}{\bar{y}}\right) + \sum_{j=1}^{k} \frac{1}{n_j} \frac{\bar{y}_j}{\bar{y}} \sum_{i}^{n_j} \frac{y_{ij}}{\bar{y}_j} \ln\left(\frac{y_{ij}}{\bar{y}_j}\right). \quad (8)$$

Coefficient of Variation

The Coefficient of Variation is a measurement of the dispersion of a probability distribution which is popularly used for measuring regional convergence (Montfort, 2008). The dispersion is measured as the ratio of the standard deviation to the mean of a distribution. This aims at indicating inequality between observations as a larger ratio between the standard-deviation and mean would indicate a larger dispersion in the population. The Coefficient of Variation of region i at time t is written

$$CV_{it} = \frac{S_{it}}{\mu_{it}} \quad (9)$$

where S_{it} is the standard deviation at time t in region i and μ_{it} is the mean of region i at time t. This means that the Coefficient of Variation is a relative standard deviation of a distribution and as such there are some weaknesses with the measurements. First of all the index then become vulnerable to changes in the mean value of a sample (Montfort, 2008). Secondly, the Coefficient of Variation has the quality of being aggregative but not additive decomposable which makes it less interesting to use than the Theil Index (Bourguignon, 1979). However, rather than using the Coefficient of Variation one can resort to the half squared Coefficient of Variation that has the characteristic of being additive decomposable (Shorrocks & Wan, 2004). The additive decomposable half-squared Coefficient of Variation for K subgroups can then be written

$$half\ CV^2 = 0.5\left(\sum_{i=1}^{k} \frac{n_i}{N} CV_i^2 + \sum_{i=1}^{k} \frac{n_i}{N} \ln\left(\frac{\mu}{\mu_i}\right)\right) \quad (10)$$

where CV_i^2 is the squared Coefficient of Variation for the ith areal unit. As such it shares the possibilities for different forms of analysis as earlier pointed out for the Theil index. There are although some drawbacks to use Coefficient of Variation that has been put forward by several authors, see e.g. Kolm (1976), Love & Wolfson (1976) & Shorrocks (1980), where the conclusion is that it is very sensitive to changes in the upper tail of the variable, in this case income, leading to scepticism on the applicability as an inequality measurement due to the weight it can put on small transfers from the upper tail. Yet it is as proved by the works of Breunig (2001), Enflo & Henning (2014) & Montfort (2008) still used as valid measurement for convergence.

3.5 Analyses

These indices in themselves are working as indicators of regional development but in order to statistically test patterns of regional development there are some interesting analyses that can be conducted to answer this thesis research questions. Firstly, spatial autocorrelation of Moran's I index across the aggregations are interesting to further analyse if there is a spatial clustering in the indices produced and if that changes over time, a high Z-value would indicate that the spatial clustering is unlikely to be a random pattern (Mitchell, 2005). Based on that result the spatial patterns can be analysed with a cluster analysis using GIS to find clusters of different compositions. This can be done with Anselin's (1995) cluster and outlier analysis that uses Moran's I index to find clustering of different composition of high and low values. For the analysis of Stockholm's clusters, the distance band was set to 6500 meters. This was the value where the Z-value peaked at when running the spatial autocorrelation for average income in Sweden at the year 1990.

Finding the variations across space using these techniques would give indications of spatial concentration of income inequality and how it changes across time. There are however limitations that relates to the MAUP issue of scaling. The low number of areal units in both regional level, 21 units, and NUTS-2 level, 8 units, in Sweden creates problems with the reliability of the outcome since it would, especially for the NUTS-2 level, inaccurately generate concentrations as there will be a small difference between the amount of neighbours and the total amount of features, leading to either an underestimation or overestimation of the concentration (Mitchell, 2005; Montfort, 2008).

4 Findings

The methods were selected to answer the questions about whether income inequalities have increased during the time-period of 1990–2016, if so where and why. The first step in answering those questions is getting an overall view of the temporal development of Sweden, locating trends in the overall development of Sweden to provide an understanding of the patterns to be expecting. From that background the results can focus more on the spatio-temporal patterns of income growth in Sweden, answering questions of where there has been a strong income growth and a strong increase in inequality and whether the growth of income has influenced inequalities. From both these perspectives, a case study of Stockholm will be presented to bridge the arguments towards a discussion of the aspects of whether and why regional development increases inequalities.

4.1 Temporal Patterns of Inequality and Growth

During the period 1990-2016 Sweden went through a set of economic events that influenced the structure and performance of regions. These changes can be seen through the inequality indices. These values fluctuate over time with periods resulting in increasing or decreasing disparities (see figure 3). Despite these fluctuations in indices Sweden has overall, as seen in figure 4, been experiencing a steady increase of income with an income per capita increase of ca. 72%, from 204 300 (1990) to 352 267 (2016) SEK. The inequality indices in contrast have been far more stable with the Theil Index left rather unchanged and the half-squared Coefficient of Variation experiencing a smaller increase of around 36%, from 0.189 to 0.26. Thus, at this stage there seems to be rather weak relationship between income growth and increasing income inequalities.

Figure 3: Changes in Theil inequality index (1990=100) & half-squared Coefficient of Variation (1990=50) between 1990–2016, moving averages of 3 years.

Before focusing on the relationship between income growth and income inequalities, it is worth addressing these different events that seem to cause fluctuation in the inequality indices seen in figure 3. Both the changing patterns of income (figure 4) and the changing values of inequality indices (figure 3) stagnate or decrease at certain intervals in time. These intervals seem to coincide with the economic crisis that affected Sweden during this time-period (table 6). Furthermore, looking at the time-interval between the end of the financial crisis at the beginning of the 1990s and the dot-com crisis at the beginning of 2000s, it is evident that there was an era of strong economic growth, which coincides with the dot-com bubble. This growth period also seems to influence inequality indices as they indicate an increasing variation of income between individuals and regions.

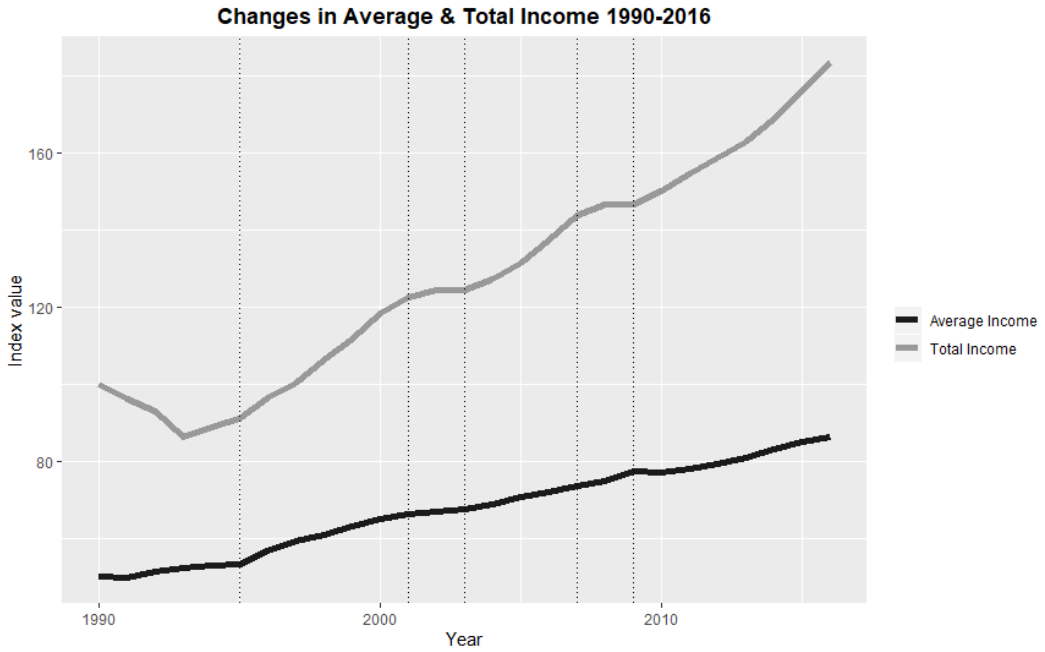

Figure 4: Changes in average and total income between 1990–2016. Values have been indexed with the year 1990 as point of origin being 100 for total income and 50 for average income. Dotted lines demarcate transitions between overall periods of growth and crises.

The important result from this section is that the growth trajectories of income and inequality seem to go through similar patterns over time that coincides with periods of economic growth or stagnation. These time-periods can be categorised, using data from figure 3 & 4, into six periods of overall growth or stagnation of income or inequality (see table 6).

Table 6: The time period between 1990 & 2016 categorised in periods of growth and crises using total & average income together with inequality indices to identify transitions.

	Category	*Comment*
1990–1995	Crisis	Swedish financial crisis
1995–2001	Growth	Dot-com bubble, growth for IT businesses
2001–2003	Crisis	Dot-com bubble crash
2003–2007	Growth	Intermediate era with growth
2007–2010	Crisis	Global financial crisis that had a relative low impact on Sweden
2010–2016	Growth	Aftermath of the financial crisis with lower growth than previously

The first years in the data, Sweden suffered from a financial crisis which can be strongly seen by the decline of the total income, from 793 billion (1990) to 685 billion SEK (1993), and the decreasing Theil index value, from 0.175 to 0.156 over the same time-period. The fact that average income does not follow the same decline is due to the reduction of employment by 14% going from ca. 3 900 000 (1990) employed to 3 200 000 (1993). As Sweden got out of the financial crisis the average income, employment and total income

rose until the years around 2002, the year after the dot-com crisis hits with growth rates of 28%, 12% and 24% respectively (see figure 4). During the dot-com crisis, total and average income growth stagnated over a couple of years, but they did not go through much of a decline contrary to the financial crisis before or after. Instead, what stands out is the reduction of variation in income with standard deviation decreasing from 204 000 (2001) to 188 000 SEK (2003) and the inequality indices going through a stage of decline where half the CV^2-index going through the sharpest decrease from 0.285 (2001) to 0.232 (2003), a decrease of 18 % (figure 3).

The time-period after the dot-com crisis is more difficult to draw general conclusions from. The total income follows the same pattern with a strong increase until the global financial crisis 2007/2008, with stagnation during the crisis followed by a period of growth. Figure 4 further shows that average income does not go through the same increase during the growth periods after the dot-com crisis with a 15% increase until the financial crisis of 2008 and then 12% in the years after. However, similarly to previous periods of crisis, the financial crisis did not affect average income as much as the other factors of total income or inequality, owing to the similar reduction of employment from 3 800 000 (2007) to 3 700 000 (2009). Instead, average income at best saw a small reduction during this time-period that otherwise saw a constant increase.

Crisis in Sweden and Inequality

As previously indicated, the inequality indices also went through similar stages of increase or decrease as that of income and employment. Furthermore, it seemed to have gone through more fluctuations than income (figure 3). This was observed using the sum of income inequalities within subgroups and the difference of average income between subgroups, see equation (2). However, the same equation allows the examination of each of these two values separately that would allow to both see the temporal development of interregional and interpersonal disparities of income, using different areal units.

When examining the variation between regions, an increase of the value between subgroups would indicate an increasing variation in terms of these subgroups´ average income, see equation (2) & (7). Indeed, the value for income inequality between regions seems to increase with growth indicating divergence and increasing variation (figure 5). Overall the pattern for income inequality between regions, see figure 5 & 6, shows convergence and divergence happening at different intervals that coincide with the time-periods identified in table 6. Figure 5 shows, using NUTS-2 as subgroups, that the sharpest increase of variation between regions was the dot-com bubble that increased the

index value by 105%, from ca. 0.002 (1993) to ca. 0.004 (2001). In comparison, the interpersonal income inequality within the NUTS-2 areas saw an increase of 15% over the same time-period, from ca. 0.154 to ca. 0.177. Since then the figures 5, 6 & 7 show an overall pattern of convergence with few intervals of increasing variation, e.g. the years leading up to the financial crisis of 2008.

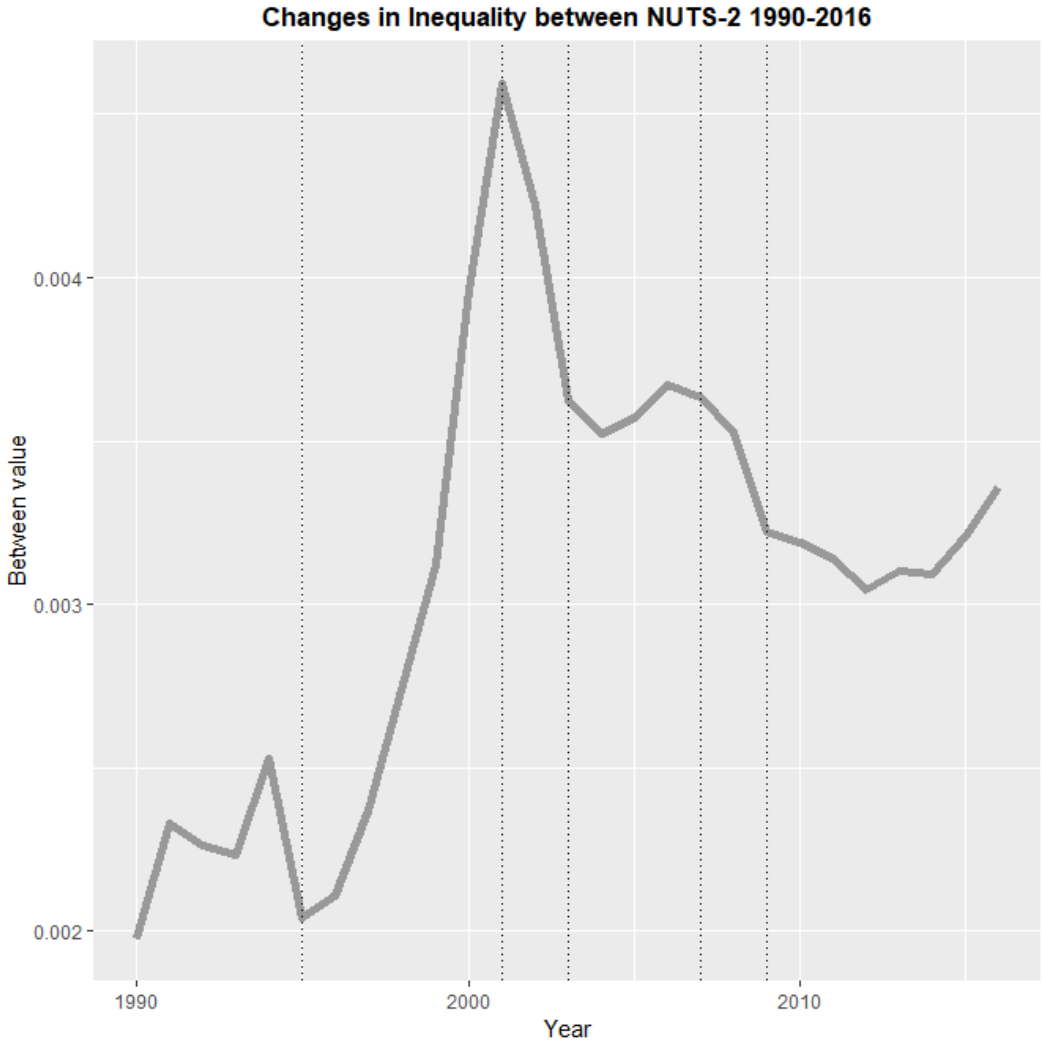

Figure 5: Changes in interregional disparities 1990–2016 for the Swedish NUTS-2 areas using Theil Inequality Index.

Furthermore, the pattern stays the same when looking at different areal units as subgroups (figure 6). However, it seems that detailed areas, grids and municipalities, have a much higher variation between subgroups. This relates back to the conclusions of Shorrocks & Wan (2004) who found that the number of subgroups influenced the value of variation between subgroups in relation to inequalities within subgroups. Nevertheless, using grids as subgroups and examining the variation between them in terms of average income it becomes clear that it fluctuates more over time and goes through an increase of 11%, from ca. 0.02 to ca. 0.022 in the later stages, something the other areal units do not show (figure 6).

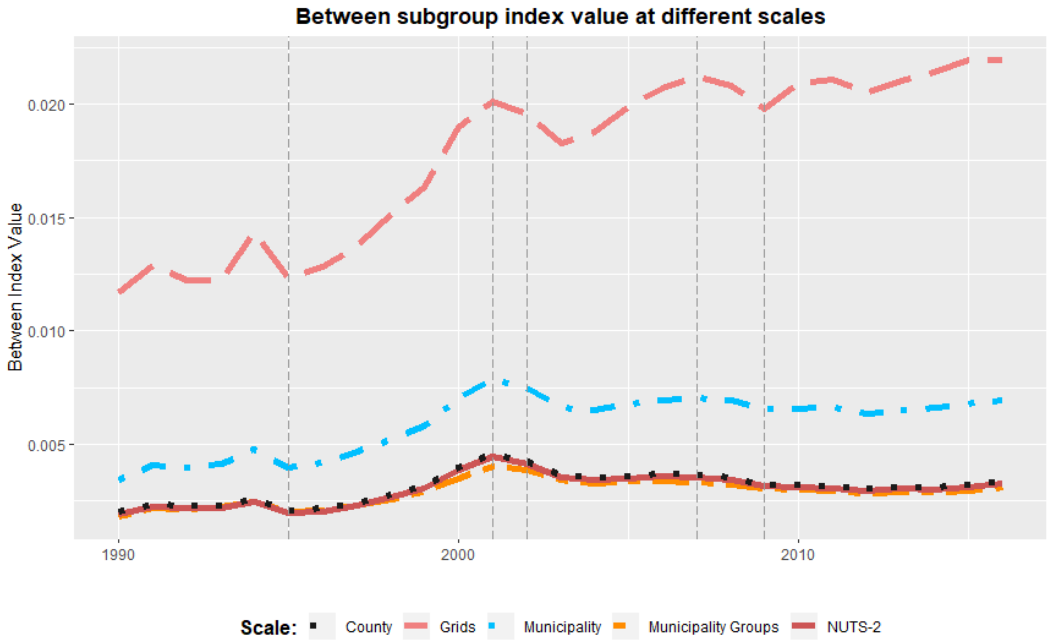

Figure 6:Changes in interregional disparities 1990–2016 across different areal units using Theil Inequality Index.

On the basis of these patterns on interregional disparities, the share of the index measuring interpersonal disparities within the areal units follows a similar pattern of convergence during crisis and divergence during growth periods (figure 7). However, the interpersonal inequalities within subgroups are less smoothly following the identified periods of growth and crisis. Interpersonal disparities converged strongly during the financial crisis of 1990-1995 and the following two periods of crisis. They also followed the same pattern where the dot-com bubble was the period with strongest growth rate with ca. 30-50% in comparison to the growth rate of ca. 12-19% in the interregnum between the dot-com crisis and the financial crisis of 2008. However, the size difference between the variation within subgroups and between subgroups is significant. On NUTS-2 level the between value corresponds to 1.6% of the total index value of half the CV2-index whilst grid, with the highest variation between subgroups, has the between subgroup variation being 9.7% of the total index value.

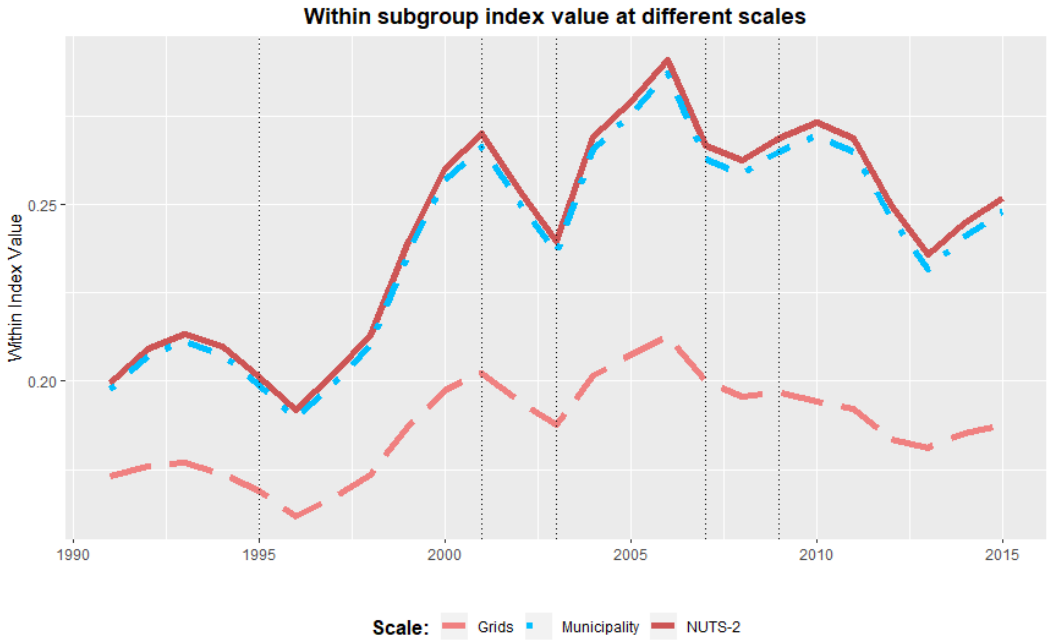

Figure 7: Changes in the within subgroup inequality indices for half-squared Coefficient of Variation using moving averages of three years

The conclusion from those numbers would be that income inequalities and uneven development are mainly a phenomenon within areal units. However, since Shorrocks & Wan (2004) noted the tendency for lower between values in these indices, and that the marginal share the between value is relative stable despite changes of the number of subgroups, it suggest a careful approach in drawing conclusions from the relative difference in size. Furthermore, the variation between regions shows a much larger increase over this time-period, ca 70-90%, than the variation within regions, ca 13-37%, indicating interregional disparities are increasing in comparison to interpersonal disparities within these regions. Indeed, when looking at the ratio of average income between the hierarchical groups of municipalities, see figure 8, the conclusion would rather be that there seems to be a tangible income inequalities between the large urban areas (group A) and the rest of Sweden (group B & C). These patterns furthermore follow similar patterns from the inequality indices (figure 5 & 6) which show that there are tangible variations in income growth between regions. It is also worth noting that the way the between value is calculated, using population size as weight to both the distance between the national average, the regional average and the individuals income to the regional average, would create a bias towards the populated areas, see equation (2). Therefore, with Stockholm constituting about 22% (1990) and 26% (2016) of the working population in Sweden, the strong centre-periphery pattern would work in lowering the size of the between value and inflate the within inequality value.

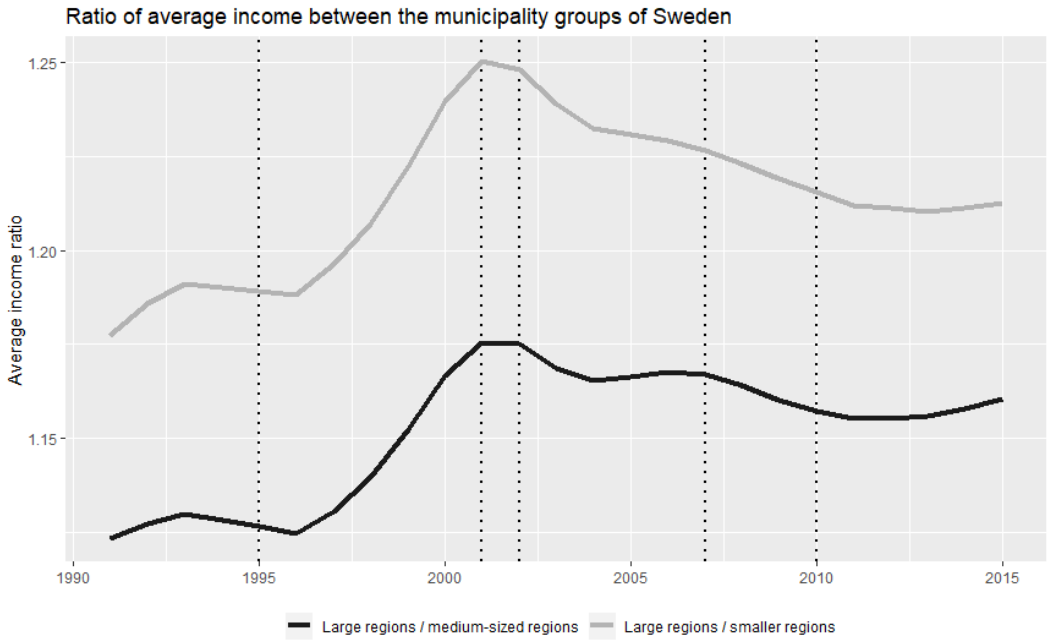

Figure 8: Moving average of the ratio between average income of municipality groups using SKL's hierarchical classification. Large regions uses the average of A1&A2, medium-sized regions the average of B3,B4 & B5, smaller regions the average of C6, C7, C8 & C9, see table 4.

Most importantly, what figure 8 show, which was indicated in the inequality indices (figure 6 & 7), is that there seem to be two stages in the variation of average income between regions. A stage of increasing variation ended around the 2001 with the dot-com crisis and a following stage of convergence that mitigated what would otherwise be a much larger increase of variation. However, the convergence pattern saw more fluctuations with some periods of increasing variation, e.g. the interregnum period between 2001 and 2007, that made the pattern less obvious than the divergence pattern.

4.2 Spatial aspects of growth in Income and inequality

Whilst an earlier section stated how the patterns of income growth and inequality changed over time it also showed that these patterns are not equal across space. Looking further into these spatial disparities it become apparent that there seems to be a divide between the large urban centre and the rest of Sweden (see figure 9). Findings show that both counties and municipalities experience a concentration of high income to regions linked with the large urban areas of Stockholm, Gothenburg, and Malmö. In figure 9a the findings suggest that these areas also diverge from the less populated areas of northern Sweden. This is further suggested by figure 9b that finds that there is a further concentration to these large urban areas whilst low income outliers for municipalities are decreasing, implying that the rest of Sweden undergoes convergence.

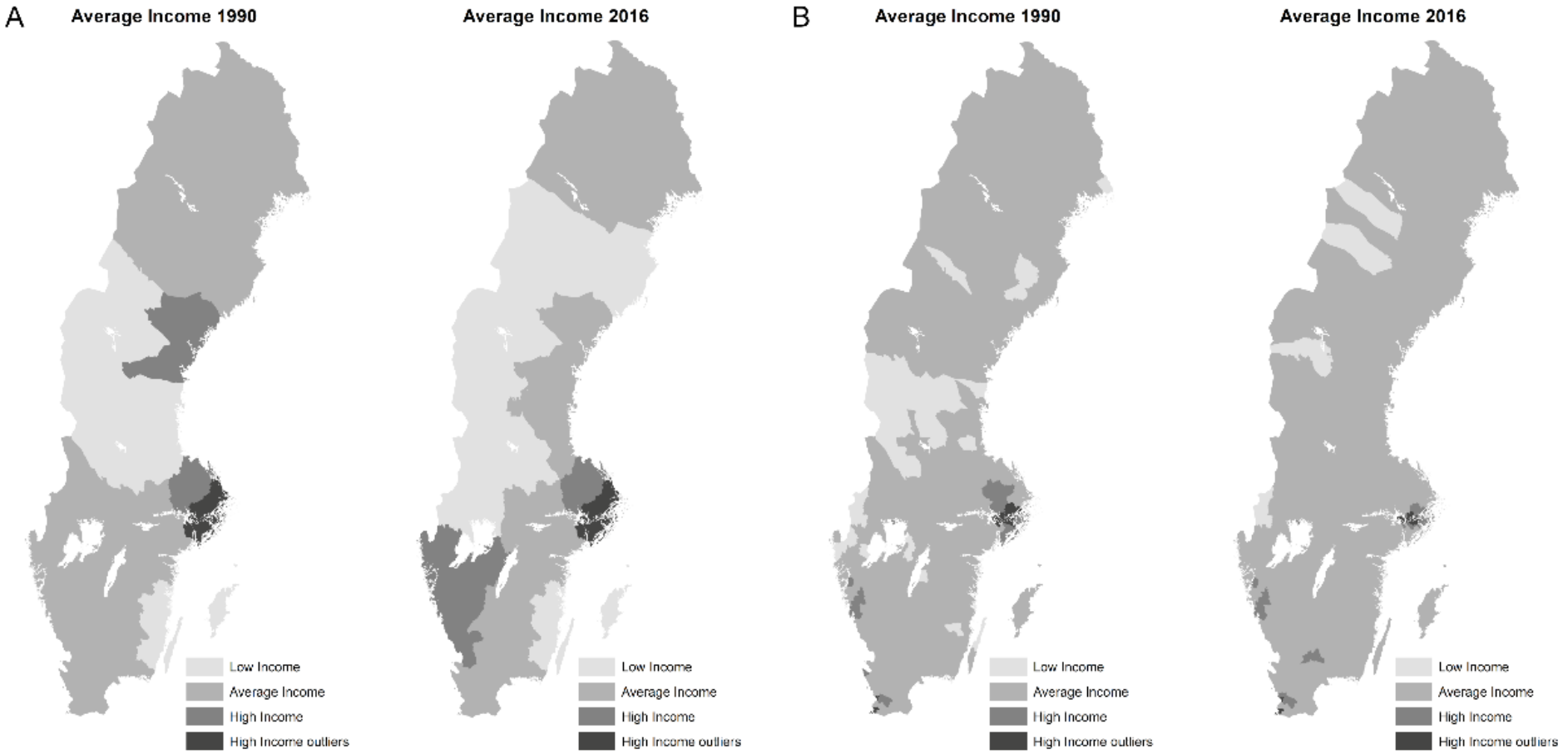

Figure 9: Average income of counties (A) and municipalities (B) 1990 & 2016 categorised using the national average of that year. High income outliers are regions far away (>1.5 std.) from the average or with a relative large distance from other municipalities.

Figure 9 also tells us that there seem to be differences between scales regarding the measurement of income growth. Table 7 shows that a more detailed scale shows a less homogeneous pattern and at neighbourhood level there seems to be no correlation at all between growing interpersonal disparities in the area with either population size or income growth.

Table 7: Correlation between Gini-index growth and population size/Income growth 1990-2016 between areal units. Population size uses the average population during this period.

Areal Unit	*Population Size*	*Income Growth*
NUTS-2	0.90	0.83
County	0.84	0.63
Municipality	0.35	0.49
Grids	-0.05	-0.01

Plotting the areal units on scatterplots, see figure 10, shows how the correlations can be so different. NUTS-2 areas (figure 10a) seem to follow a linear relationship between the categories whilst the pattern becomes more diverse and shows less linearity for counties (figure 10b). At municipality level the correlation seems to have been dissolved. However, by identifying the well performing municipalities, figure 10c, the results then also include hints of spatial differences observed on NUTS-2 level, figure 10a, and in figure 9. The municipalities around Stockholm with Danderyd, Lidingö and Nacka are areas with increasing inequalities and with the largest increase of average income during this time-period. Lomma municipality, a high-income suburb of Malmö, also belongs to this category with strong income growth and relatively high inequality growth. In contrast the municipalities of Pajala, Ragunda and Gällivare, located in northern Sweden, are far away from any urban centres. These Municipalities are rather different, going through a convergence of income while still experiencing growth. Therefore, it seems that growing income inequalities are mainly an urban phenomenon.

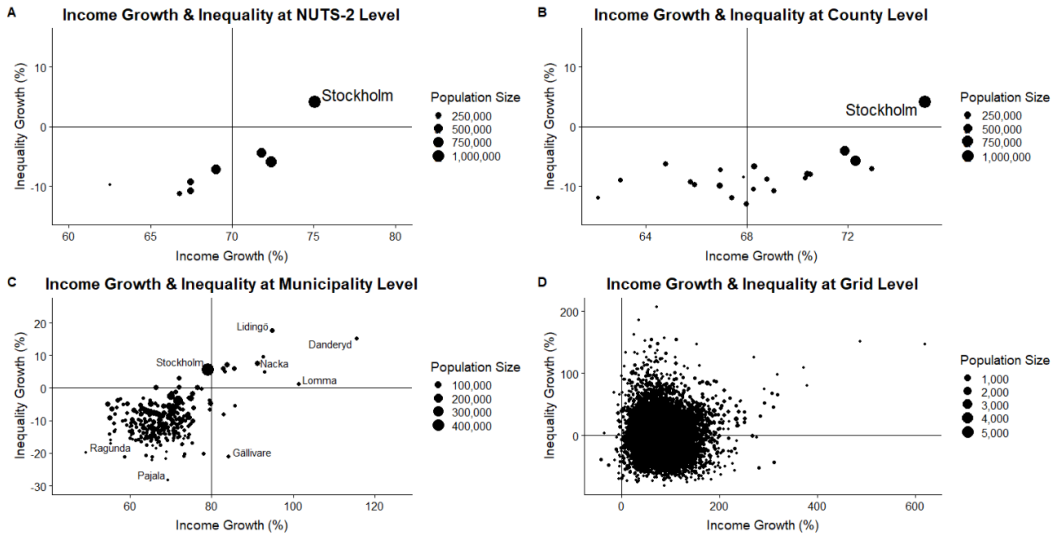

Figure 10: Changes in Income and Inequality 1990–2016 at different scales, moving from changes at NUTS-2 regions (A) to 0.25 km^2 grids (D). Size of the dots represent the average population of the area during this time-period.

Before moving on it, it is worth mentioning that Gällivare (see figure 10c) is an interesting outlier with strong income growth whilst experiencing decreasing income inequalities. Its situation in northern Sweden means a lack of proximity to large urban areas but also implies that it is one of the centres, together with Kiruna, in the region. Furthermore, the presence of a strong mining industry would also cause it to stand out among similar municipalities, a similar situation is also true for Kiruna (Tillväxtverket, 2018).

The centre-periphery pattern of income inequality and income growth becomes even more apparent in figure 11. Figure 11a that uses municipality groups show how the large urban areas together with its suburbs are the only areas experiencing growing income disparities and that their vastly larger growth rates can be cause for the pattern seen in figure 9. Looking at Stockholm (figure 11b), that constitute one of these areas, further show how proximity to large urban areas is influencing this relationship. The municipalities of Stockholm can be roughly divided into areas of decreasing disparities and less income growth (bottom-left) and increasing disparities with high income growth (top-right). The next section will show that these two division can roughly be translated into two categories of proximity to the city centre where the common denominator for municipalities in the top-right sector is their close proximity to the urban core of Stockholm (see figure 13).

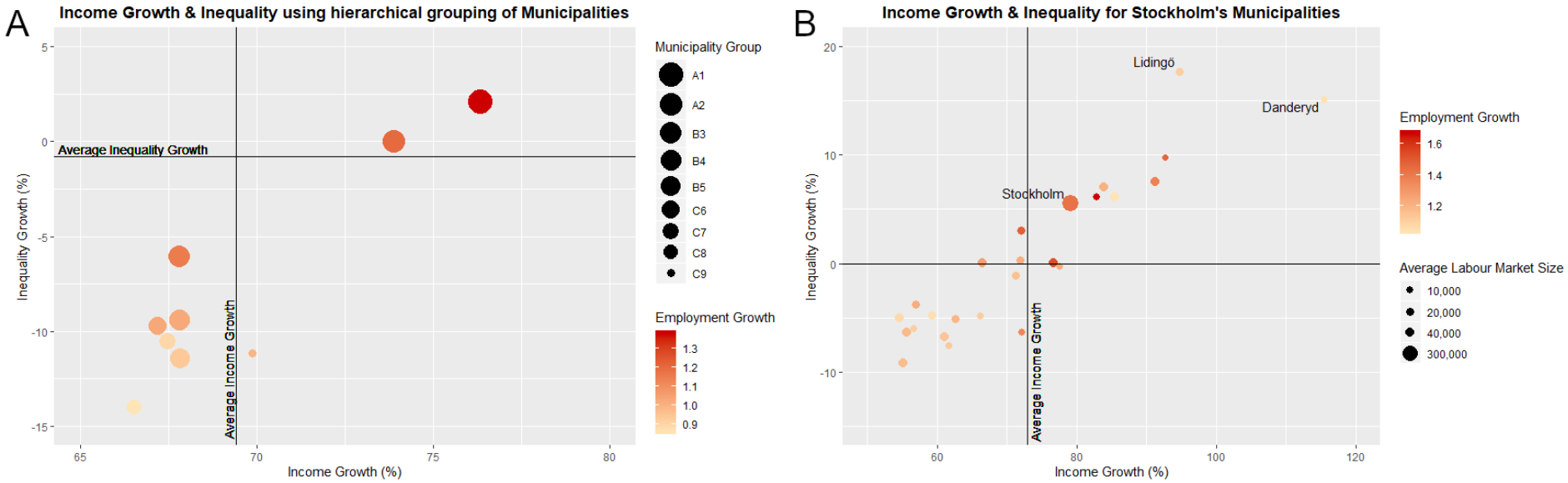

Figure 11: Scatterplot of income growth, employment growth and changes in inequality between 1990 & 2016 using SKL's classification of municipalities (A) and the municipalities of the county of Stockholm (B). Employment growth is calculated from average labour market size 1990–1995 compared to average labour market size 2011–2016.

4.3 Spatial patterns of Income and Inequality in Stockholm

Stockholm, the largest area in Sweden in terms of population and income per capita, is not only a strong outlier in figure 9 & 10 but also have a relatively high influence on the inequality indices for Theil index and half squared Coefficient of Variation, see equation (2). Its position at the top of the hierarchy is not only regarding these indices but also shows in the comparison between regions. Figure 10 shows that as a county it outperforms other areas in both the level of inequality growth and level of income growth. In combination with the situation at the beginning of the time-period, with Stockholm being an outlier in both categories, it meant that Stockholm further diverged from the other regions. As such the performance of Stockholm, the rising inequalities within the region and the location of these drivers of growth is an interesting cornerstone in understanding the question of whether and why.

4.3.1 Income inequality in the county of Stockholm

In an overall view of the county, the spatial pattern indicates that Stockholm has a strong performing core with most areas within and around the vicinity of the city performing above the national average (figure 12). Here the municipalities of Danderyd and Lidingö with income growth far above the national average together with the municipality of Stockholm forms the growth core. However, this strong income growth also seems linked with increasing income inequalities. The two patterns do not fit perfect together in that inequality are higher in the urban core whilst income growth predominantly concentrates in the eastern parts. This core seems to be the cause for Stockholm performing so differently comparing to other counties as areas further from the city in general underperform in relation to the national average (figure 11 & 12).

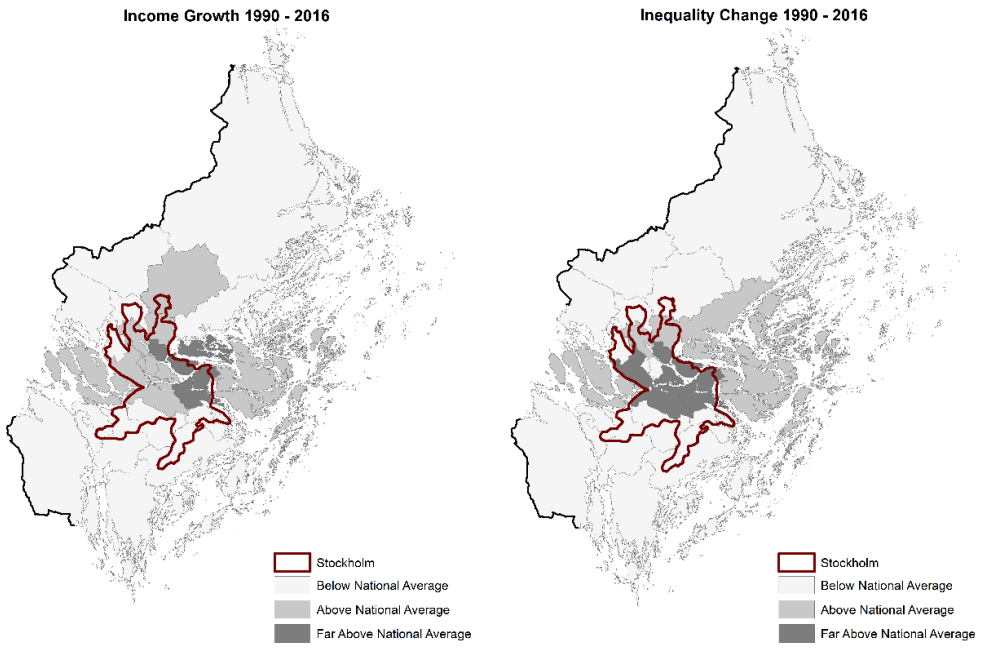

Figure 12: Spatial patterns of Income Growth and Changes in Theil Inequality Index 1990–2016 in the county of Stockholm.

A bivariate map of the two variables, see figure 13, further shows both that the pattern is not necessarily overlapping and that the area close to the urban core of Stockholm is a national outlier. The general trend is still here, the periphery is in its own category with values below national average in income growth and stable or decreasing inequalities. This differs from the central part of the county which, despite being in general a national outlier, is more diverse with some municipalities having values below national average in inequality growth whilst still having strong income growth and others experiencing the reversed effect. The municipality of Stockholm has an interesting development with an increasing inequality far above the national average whilst in relation to neighbouring municipalities having lesser increase in average income.

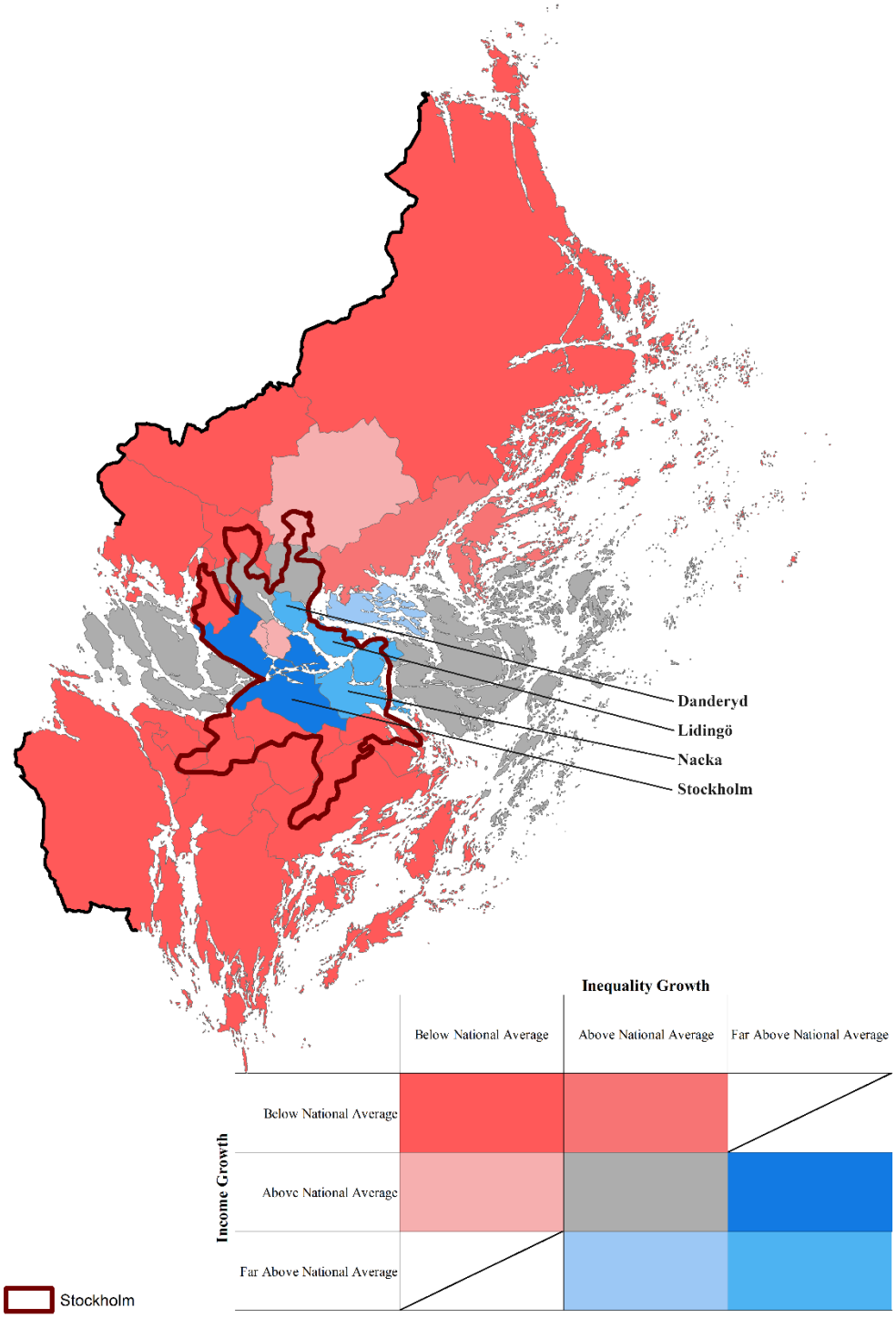

Figure 13: Bivariate map of inequality growth (Theil inequality index) and Income growth categorised by being below, above or far above the national average (>1.5 std.)

4.3.2 The city of Stockholm

At the municipality level, presented in figure 13, the pattern of income and inequality growth in the city of Stockholm hinted to significant variation within its boundaries. This variation becomes further visible when moving to a more detailed view of the cities districts (see figure 14). It shows a city with a patchwork of well-off and struggling neighbourhoods. The clusters of high income follow the pattern of figure 12. However, figure 14 shows that this cluster also extends to the city-centre all the way to Bromma, whilst the poorer areas with lesser income growth are located in the north-west with the district of Rinkeby-Kista and in the southern part of Stockholm.

The important message is the connection between these patterns. The areas that see raising inequalities within its inhabitants are also areas with strong income growth. Areas with smaller income growth are not experiencing such increase in inequality, and in some cases a decrease which indicates by comparison a cementing situation in these areas. This is further confirmed if one compares the richest neighbourhoods with the poorest, see figure 15. Since the start of the time-period the distance between these two has been increasing with convergence only happening at periods when the economy is slowing down. Despite a steady growth of average income in the poorest neighbourhoods the increase was outpaced with the large increase of the richest neighbourhoods.

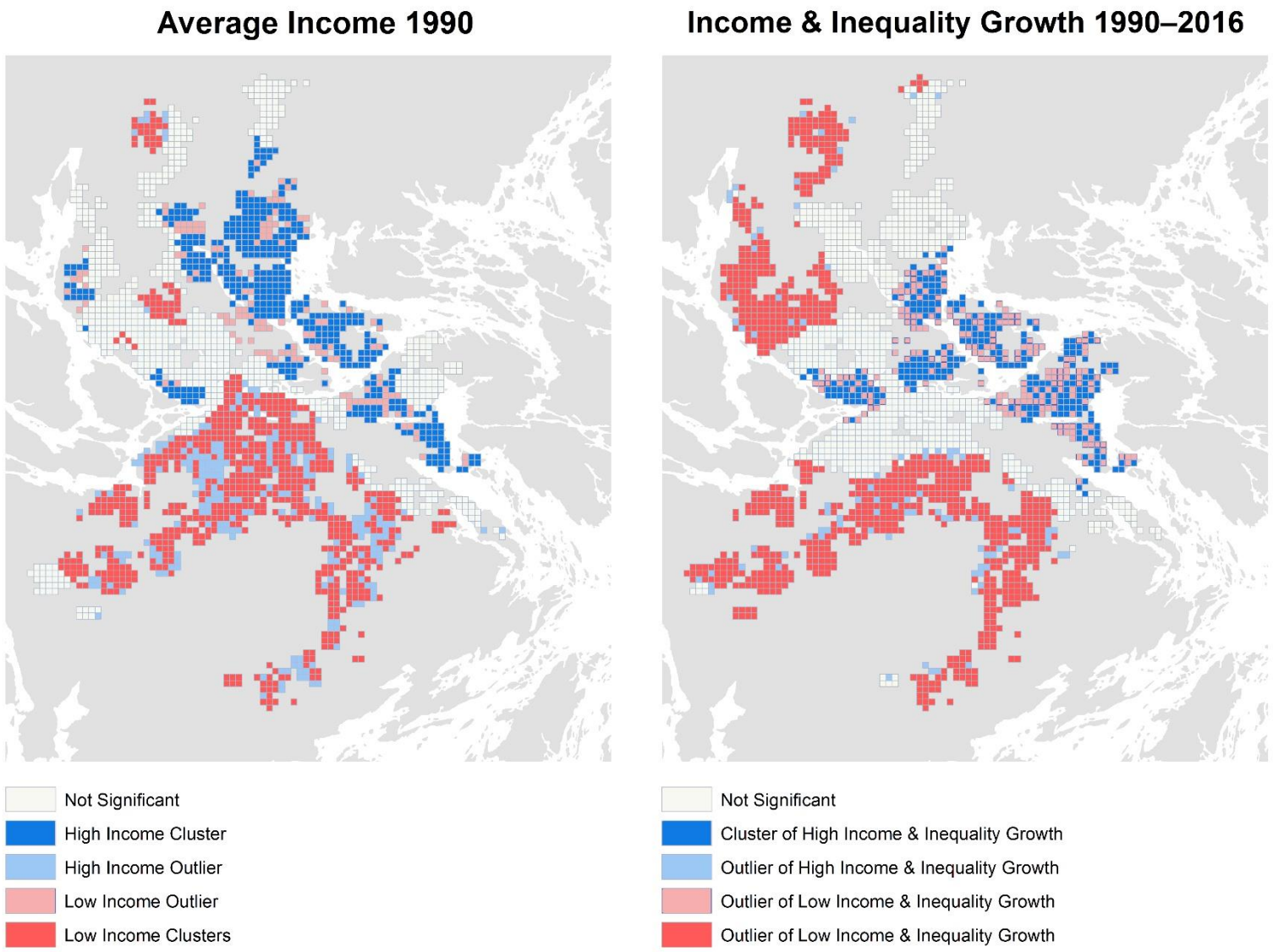

Figure 14: The spatial patterns of average income in 1990 (A) and the spatial patterns of changes in inequality (half of the CV^2) and average income (B) between 1990 & 2016, identifying clusters of using Anselin Index.

Lastly, one can observe in the development of these two groups a difference. The poorest neighbourhoods have a stable increase that is rather unmoved by either growth or economic crisis. The richest neighbourhoods on the other hand during this years have experienced much more fluctuation by having higher growth rates during periods between crises, at the same time they also went through decline during crises (figure 15). It is also at the richest neighbourhoods that Stockholm has a noteworthy difference with the rest of the country. The increase is much larger, and the crisis is also hitting them harder. The rest of Sweden is in comparison rather stable but also experiencing lesser growth. Therefore, one can conclude that the findings suggest that the increasing disparities in Sweden is attributed to the performance of large urban areas and that these are mainly caused by a few clusters of neighbourhoods whose inhabitants seem to be reaping the benefits from economic growth trends.

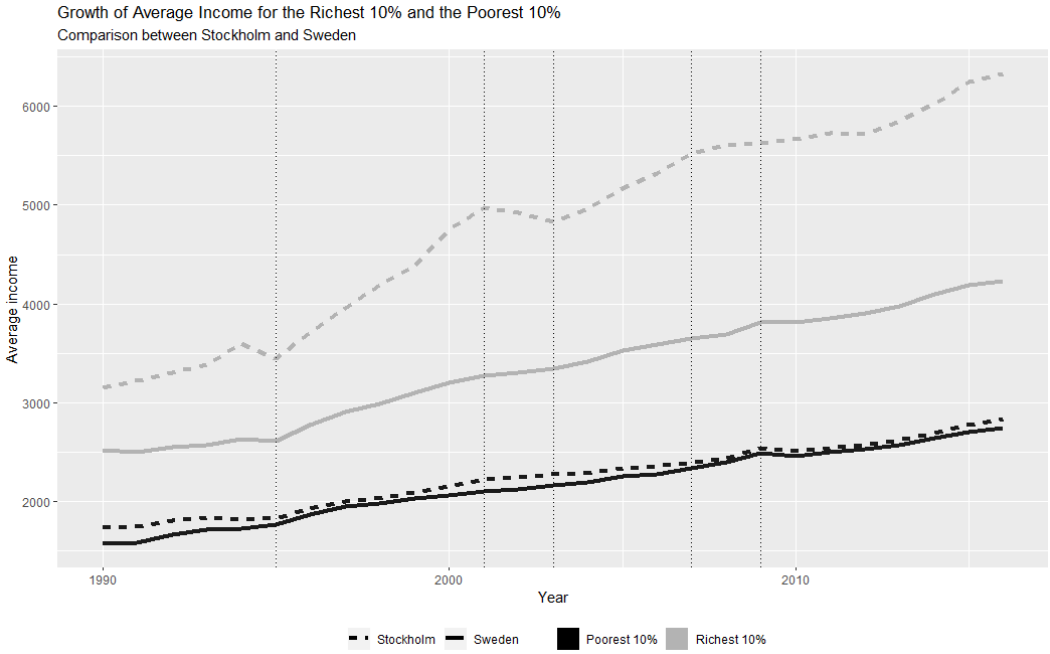

Figure 15: A comparison of the development of average income for the richest 10% of the neighbourhoods and the poorest 10% between Stockholm and Sweden.

4.4 Recapturing the results

What the results have shown, linking up with the introduction to this section, can be divided into six overall arguments that are important to remember.

- Sweden is overall experiencing an increase of welfare during these years with an increasing average income that outpace inequality indices. Only one of the three inequality indices are growing substantially, see figure 3.

- The impact of crises is mainly seen in the loss of total income, I.e. employment, and less regarding average income with only periods of stagnation occurring. The inequality indices show that crises reduce disparities, but the strength of the reduction varies a lot between the periods, see figure 3 & 6. Figures 6, 7 & 9 show that there seems to be a new stage in the economy after the dot-com crisis with reducing interregional disparities overall.
- Income growth and inequality are not equal across space. Larger urban areas and municipalities surrounding these are experiencing the largest income growth and inequalities. The inland areas of northern Sweden, with the exception of strong mining towns of Kiruna and Gällivare, are experiencing relatively lower growth rates but also tend to have decreasing inequalities (see figure 10).
- Whether the pattern of income growth, regional development, influences the pattern of inequalities in Sweden is unclear with different areas, see figure 10 & 11, having different relationships. In larger urban areas the connection seems to be stronger.
- The large urban areas, i.e. Stockholm, are facing internal inequalities with cluster of areas that are driving income growth, see figure 12 & 14. These areas are most often also experiencing a larger inequality growth than the rest. Areas with lower income growth are also somewhat clustered and are experiencing less of an inequality growth. The clusters create a patchwork of Stockholm between prospering neighbourhoods and struggling neighbourhoods.
- High income areas that experience high income growth also experience more effects from the economy slowing down or accelerating, see figure 15. These areas are furthermore outperforming the national equivalent.

5 Discussion

The question of whether income inequalities has increased in Sweden in the time-period of 1990–2016 has several possible answers. Looking only at figure 3, the answer could be that no clear increase of income inequalities has occurred during this time-period. On the other hand, the spatial patterns of income inequalities points towards a more careful answer. Income inequalities have increased but the extent of that increase is depending on the spatio-temporal context. During this discussion it will become apparent that the findings provided with a complex picture of the patterns of income inequalities in Sweden. Thus, to answer whether income inequalities have increased, it is crucial to expand the question to also incorporate questions of where and why.

The discussion will go through three arguments explaining why the answer is complex. Firstly, it will show that the pattern of income inequalities is not equally distributed in space but coincides with agglomeration economies. Secondly, the inequality indices show that both interpersonal and interregional income disparities go through stages linked both to economic crisis and the structural growth theories. This is mainly identified through the time-period before the dot-com crisis and the time-period afterwards, see figure 6 & 8. Thirdly, by looking at the hierarchical grouping of municipalities, see figure 11, and the larger interregional inequality values of grids, see figure 6, it become apparent that the pattern of income inequalities is mainly due to increasing inequalities within Stockholm and to some extent, to the other large urban areas.

These arguments will provide cornerstones to answer whether income inequalities have increased, if so where and why. Furthermore, based on the analysis of the findings and the formation of these arguments, there are some important insights on the debate about regional development, growth and inequality. These insights can be narrowed down to the finding that efficiency is not necessarily causing equity. Rather, besides concentrating wealth it also concentrates income inequality. Furthermore, findings suggest that decreasing inequalities together with stagnating income growth are linked with the efficiency pattern, where decreasing inequalities might be signs of the decrease in growth that stems from these areas.

Lastly, the silver lining of these arguments and the insights on the literature on regional development relate to the discussion of scale. The different scales used in this analysis have provided not only with different answers to the linkage between inequality and growth but also with valuable insights into the discussion on regional development. The conclusions drawn from the discussion and this section show that different aggregations

would be needed to adequately capture the essence of interregional and interpersonal disparities.

5.1 Spatial disparities of income and inequality

Throughout the empirical material a clear pattern emerges of interregional disparities in income and income growth linked to the characteristics of the area. The observed pattern can crudely be seen as a centre-periphery pattern where the centres enjoy both a better starting position and higher income growth. This centre-periphery pattern coincides with findings from previous research identifying a period of divergence started around 1980. It was identified as the period of emergence for the knowledge-intensive growth cycle that saw Stockholm outperform other regions (Enflo & Rosés, 2015; Lundquist & Olander, 2001;2009; Lundquist et al., 2008). Nevertheless, the findings suggest that this pattern have entrenched during this time-period with a growth of labour supply and demand in the large urban areas (cores) and the opposite taking place in peripheral areas (figure 11). The implication is threefold. Foremostly, it implies that growth of income in Sweden is contextual with cores experiencing dissimilar growth trajectories than the rest of Sweden. Secondly, as figure 11 shows, the relationship between development and internal inequality is not equal across space where growth of income in peripheral areas do not cause increasing disparities whilst it is the case in the cores. Thirdly, there seem to be factors causing increasing immigration of labour to the cores. Thus, the strong spatial connection of these patterns suggest that external forces influence the uneven distribution of income growth, the variety of income inequalities and the agglomeration of labour supply and demand. These three factors point towards agglomeration economies as a cause for why income inequalities between and within regions have increased.

However, the observed between subgroup component for inequality indices come with some important reflections. Foremostly, it is a small part of the overall inequality indices and whilst it has grown and taken up a larger share of the total inequality indices, it never became a significant part. Due to Sweden's position as a country with strong institutions for social welfare (Charron et al., 2014; Esping-Andersen, 1990; Rodríguez-Pose & Tselios, 2015), the small size of this component is pointing out the relatively strong equity between the Swedish regions at large. The relatively small between group component compared to the large within group component also suggests that there is a higher variation between occupations than there is variation across space. In that case the between group component would rather indicate spatial differences in occupations (Shorrocks & Wan, 2004). Therefore, it is not enough to note the small share that the

between group component holds. Instead one should also look at the growth rate of the component indicating that there is a larger urban divide of occupations, similar to the pattern envisioned by Florida (2017).This lead to the conclusion that while institutions and the overall development of Sweden leading up towards the situation of 1990 (Enflo & Henning, 2014; Enflo & Rosés, 2015), has laid the foundation for small regional variations of income per capita, the development since has been towards larger spatial disparities growing faster than inter-personal disparities. This would indicate that the time-period saw an increasing spatial divide of occupations due to agglomeration economies, see section 2.7.

Before focusing purely on the linkage with agglomeration economies, it is worth mentioning that there could be a multitude of factors influencing the centre-periphery pattern and its entrenchment. For example, the different social structures and institutions between localities could be explaining the different growth trajectories. Especially, it would explain the rising inequalities that some areas go through in wake of economic development (Gertler, 2018; Iammarino et al., 2017; Pike et al., 2016;2017). This thesis is not positioned to answer the question if there are different institutions at play between the regions of Sweden and whether they, in some areas. mitigate or enhance inequality caused by income growth, e.g. legislative differences in wages between industrial sectors. Nevertheless, the position of Stockholm as a global metropolis and top tier national region for growth, see Florida (2017) and Lundquist & Olander (2009), together with these findings, see e.g. figure 8, suggesting Stockholm as a national outlier in income and inequality indicates that there are at least some institutional differences. These institutional differences could be due to a number of reasons that would see Stockholm perform better in terms of economic development. The European Comission (2017) found that an underlying reason could be the variety of qualitive governmental or knowledge-focused institutions which sets Stockholm apart from the rest of Sweden. Furthermore, this relates to the different forms and levels of proximities that would be greater and more varied in Stockholm (European Comission, 2017; Tillväxtverket, 2018). This would enable increased growth as it effects the networks in which actors are embedded in or can enter into, enabling some localities in terms of prosperity whilst it also could hinder others (Farole et al., 2010; Florida, 2017; Gertler, 2018; Grillitsch, 2016; North, 2005).

Agglomeration economies and income inequality

Causes for uneven development in EEG, IEG and NEG repeatedly refer to agglomerations in one way or the other, as previously seen in the theoretical framework. In NEG the

observed centre-periphery pattern is viewed to be caused by strong centripetal forces that create path-dependency through e.g. cumulative causation. Centripetal forces which NEG mainly deals with in terms of localisation economies to which Pike et al. (2017) ascribe a set of factors leading to the observed pattern, see figure 9 & 11. Firstly, the further increase of a thick labour market that draws from not only the common improvement of public goods but also the common demand of skills across firms. Implying that agglomerations cause increasing returns through the improvement of public institutions and services and the specialisation of the labour force. Secondly, knowledge spillovers, through the greater intensity of communication between actors, contribute to an overall increase of innovation and developments (Pike et al., 2017). In a knowledge-intensive growth cycle this would translate into a highly educated and talented work-force of the 'creative class' with high income (Florida, 2017). These key factors would explain both the observed inter-regional variation, through concentration of the creative class, and the variation within cities, since agglomerations do not have a city-wide spill-over effect (Andersson et al., 2016). Instead, as figure 14 & 15 suggest, the income inequalities in the city show that the benefits from these agglomerations is mostly felt in a few clusters.

Additionally, the observed presence of the market-size effect, pecuniary externalities, observed in the hierarchical grouping of municipalities, see figure 11, suggests that urbanisation economies are actively causing these variations. Findings suggest that the size of a regions is linked with the relationship between growing income levels and inequalities. As such, linking up with the writings of Krugman (1991;1998), these larger urban areas with larger market-size, stronger pecuniary externalities and overall better geographical proximities to services and institutions, forming the backbone of centripetal forces, seem to cause the type of centre-peripheral pattern shown in figure 9. In addition, the urbanisation economies of scale will mainly benefit Stockholm in the long run with its advantages in labour market, size and variety. Florida (2017), for example, identifies that these externalities present in larger urban areas, the diversity even in related sectors, is crucial factors for uneven development where intangible externalities are increasingly vital in economic growth and consequently a cause for agglomerations of successful firms and talented actors (Krugman, 2011). Furthermore, the diversity and variety of firms and industrial sectors would be a cause for the higher internal variation in Stockholm since it means that regional firms will not follow the same growth trajectory and consequently employees of the firm would experience different growth of income.

5.2 Stages of growth, divergence, crisis and convergence

One of the clearest observations from section 4.1 is that, during the time-period 1990–2016, the growth trends of income and especially the changes in interregional and interpersonal income inequalities seems linked with different stages of the economy. So far it provides insights in the debate about regional development, see section 2.7, where it confirms that economic growth in the post-industrial economy sees the concentration of firms, individuals and wealth to the prospering clubs of cities, see figure 6, 13 & 15 (Florida, 2017; Iammarino et al., 2017; Rodríguez-Pose, 2018). Moreover, the patterns of convergence, decreasing variation between regions in income per capita, being so closely linked with periods of stagnation, slow income growth, provide a reminder that regional convergence, as shown by Pike et al. (2017) and Iammarino et al. (2017), is not a straightforward topic.

Reflections on structural growth theories

This do not, however, explain the apparent convergence that happened between regions during the later stages of the time-period, see figure 8. To find answers to this pattern, one could link the two stages with the notion of the lifecycles of firms, clusters and regions (Neffke et al., 2011). Figure 8, 10 & 15 show the presence of different growth cycles with the dot-com bubble in the late 1990s seeing Stockholm outperforming other areas. An explanation can be found from the works of Lundquist & Olander (2001;2009) where they identified that Sweden went through the start of the knowledge-intensive growth cycle in the 1980s. This growth-cycle has been found by a wide amount of literature to mainly see larger metropolis, such as Stockholm with its presence of urbanisation economies, becoming the drivers of economic growth where the enabling structures of locating in large urban areas outweighed the constraints associated with it, see table 2 (Enflo & Rosés, 2015; Florida, 2017; Glaeser, 2011; Lundquist & Olander, 2001;2009; Lundquist et al., 2008). Indeed, findings suggest that Stockholm was hit harder than other regions, which is also indicated by Lundquist et al. (2008). The remaining regions, which at this stage were not equally active in the knowledge-intensive economy but in a stage of transition, see Lundquist & Olander (2009); Lundquist et al. (2008) & Lundquist & Olander (2001) for a detailed record, were not equally affected. This would leave them in a situation with better growth patterns than Stockholm, something we see in figure 8.

However, from the dot-com crisis and onwards, the pattern of income inequality shifted from increasing variation of income between regions to convergence. This shift coincides

well with the identified transformation crisis that occurred around the beginning of the 2000s. Their findings then suggested that during the latter half of this time-period the Swedish economy went into a stage of transformation and in the end transitioned into a stage of rationalisation. It could be the case that the maturity of firms in general causes a decreased need to be in such a diverse environment or that the clusters in Stockholm went towards less variety between firms due to competition and networking (Boschma & Frenken, 2018; Neffke et al., 2011). In both cases it would lessen the enabling impacts causing the constraining structures to be a more present concern.

This would theoretically see a diffusion of the GP from the tier one region that is Stockholm, to smaller and in the long-run peripheral regions, potentially causing an overall convergence as other regions catch up. Indeed, some of the findings suggest that this can be the case with figure 6 and 8 pointing towards smaller regions closing in on Stockholm and the larger urban areas in terms of average income. As such it provides with an indication that there is a growing employment in knowledge-intensive industries in the small and mid-sized regions that is causing this convergence. However, to fully answer this line of thoughts one would need to combine these trends with data on regional labour markets, which was not within the scope of this thesis. Nevertheless, the apparent transition from a stage where the top tier groups would increasingly diverge from the rest to a phase of stabilisation and convergence, see figure 8, indicates that such a shift have occurred and that the economy indeed could be going through a stage of rationalisation (Lundquist & Olander, 2009; Lundquist et al., 2008). It is worth pointing out that convergence patterns do not necessarily follow a particular stage of the economy since the structural growth theory emphasise that different regions and firms compete differently at different stages of the economy (Lundquist & Olander, 2001;2009; Lundquist et al., 2008). To fully elaborate on the linkage between income characteristics of regions and the different stages of the economy further research would be required incorporating classifications of industrial sectors to fully capture structural shifts in and between regions.

5.3 The inequality within Stockholm

Moreover, the larger between subgroup component for grids, see figure 6, shows that the largest spatial difference is seen between neighbourhoods, not regions. As mentioned in section 5.1, it can be seen in the neighbourhoods of Stockholm. Here the spill-over effects from the agglomeration and income growth, caused by the clusters of the knowledge-intensive industries, seems limited to a set of areas, see figure 14. These areas were

already, at the start of the time-period in a strong position and despite of stages of convergence or divergence it has increased their distance from the remaining areas of Stockholm and Sweden. The time-period of this research limits the ability to conclude on the impact neighbourhoods got from the structural change in the economy, it occurred a decade earlier, and as such it is not positioned to distinctively say if the structural changes caused the divide by hampering income growth for certain neighbourhoods. What it can say, based on previous research stating that the structural change has caused the creative class to benefit more than others, is that particular areas which have certain social structures in place would also experience higher income growth (Enflo & Rosés, 2015; Florida, 2005;2014;2017). As such, the structural characteristics of areas seem to be an underlying factor for the inhabitant's ability to participate in the economy. These structures would be an access to such knowledge-focused institutions that give them the tools necessary to participate in the economy as part of the 'creative class'. The lack of those in certain areas would then provide us with the findings seen in figure 15 that shows both the presence of place- and path-dependency. It also would show through the 'patchwork metropolis' pattern, outlined by Florida (2017), creating urban divides between occupations. Something which would explain the vastly different income patterns in Stockholm where path-dependency would cause these differences to widen, something which these findings also suggest.

This brings us to inter-personal disparities within neighbourhoods. These patterns have shown to follow roughly the same pattern as income growth. It entails that internal inequalities speak of the economic mobility of the neighbourhood, Shorrocks & Wan (2004) associate the internal disparities to wage differences between occupations. As such, areas with increasing disparities tell us there is increasing differences between occupational wage-rates in this area. This can either be that certain occupations experience wage-reduction that see it fall behind others in the area or that there are occupations linked with booming industries, experiencing higher income growth. Figure 13 & 14 provide with findings that suggest the latter occurs within Stockholm and causes the relationship between increasing income and increasing internal disparities. Therefore, the opposite could also be probable, that decrease in internal disparities and findings of relative lower income growth indicate that an area is participating to a lesser degree in creating, or benefiting from, economic development. This would also risk the upward mobility in these areas due to cumulative causation. Therefore, one could argue, in line with Storper et al. (2016), that these convergency patterns in urban areas or peripheral areas are not a good sign but show that they are less and less participating in the economy,

while increasing participation would show either a growing average income or a larger dispersion of income within the area.

5.4 Development policies from the perspective of Sweden

As elaborated in section 2.7, recent studies on development policies have been asking how one should approach this seemingly close relationship between agglomeration of wealth to large urban areas and the economic performance of the country (Iammarino et al., 2017; Rodríguez-Pose, 2018). Findings suggest that the differences between the larger urban areas and the rest of the country has increasingly been entrenched, especially during growth periods. Therefore, this link seems to remain strong despite the presence of strong institutions mitigating these effects (Esping-Andersen, 1990). As such it furthers the point that Storper et al. (2016) made, that disparities are a necessary part of today's economic structure. The progress of certain businesses in the wake of new-path creations and knowledge combinations will create income growth for one strata of the population setting them apart from the rest, increasing disparities, which seems to be the case looking at figure 15.

Furthermore, the growth of individual's income has been rising in every region and there seems to be no evidence of regions struggling in these terms, where disparities in the lagging regions seem to decrease over time. Therefore, one could argue that the increasing interregional disparities do not necessarily cause much harm to other regions. Following the argumentation of Glaeser (2011), they should be encouraged since they bring an overall increased welfare thanks to spill-overs and labour mobility. Indeed, labour mobility can be, in light of Krugman (1991;1998;2011), causing decreasing disparities in the peripheral regions and cause a general increased welfare as it would mitigate what could have been increasing unemployment in rural and peripheral areas and increases wages in the periphery as labour supply would not drastically outgrow demand. The consequence however is the observed process where the periphery increasingly becomes depopulated, see figure 11. Furthermore, findings from within Stockholm question the extent of the benefits from spill-overs from agglomeration of labour and economic activity, see figure 14 & 15. This has already been indicated by Florida (2017) who sees this form of urbanisation creating an urban divide between individuals that obtain benefits from this knowledge-intensive system and individuals mainly belonging to traditional working and service occupations that are struggling in comparison. Indeed, such a divide is observed and furthermore it seems to follow the same extent as on the national level,

where areas with decreasing internal variations seems linked with an overall exclusion from the spill-overs of economic growth, see figure 14 & 15.

What this entails is further noting the importance Iammarino et al. (2017) have put on enabling local stakeholders to participate more strongly in the economy. The findings question the effects of efficiency, concentration of labour and economic activity, in creating spill-over effects enhancing individual's welfare overall and show the importance of a place-based development policies. Whilst the country at large saw economic development, the case study of the neighbourhoods of Stockholm shows that the agglomeration economy and efficiency argument do not hold. It shows that regions face different challenges as convergence or divergence are happening simultaneously in different places and at different scales. The neighbourhoods of Stockholm, despite their geographical proximity to economic development and institutions, face different challenges in their ability to participate which are related to the increased spatial division based on occupations (Florida, 2017). This pattern further emphasises the potential risks of cementing income inequalities across urban space, that excludes areas and individuals from participating in society, which have repercussions on long-term sustainable development (Iammarino et al., 2017). When where you are born increasingly influence your future opportunities, it not only limits innovative and economic capabilities but also risks lowering quality of governance and trust towards institutions when meritocracy becomes less prevalent (Charron et al., 2014; European Comission, 2017).

5.5 The importance of scale in these findings

The previous discussion of the findings and the findings themselves is not limited to one scale or one time. Each explanation is in different ways using a multitude of scales to explain the pattern of development and its impact on disparities. The importance of the use of scales for the analysis and following conclusion show through the different findings that could be produced if one was limited to one scale or one time period. Firstly, figure 10 show different correlations between inequality and growth depending on scale. Whilst, as stated earlier, the general scales of counties or NUTS-2 show more clearly the centre-periphery pattern and coincide well with theories of agglomeration economies they also leave out the complex spill-over effects of these agglomeration. Grids in that regard show how benefits from income and the linkage to economic development are due to structures rather than geographical proximities to agglomerations, going in line with conclusions from previous research (Andersson et al., 2016; Andersson et al., 2019; Florida, 2017). Municipalities on the other hand provide a middle ground showing patterns of

agglomeration economies if you look at the spatial context of the municipality, see figure 13, as well as it indicates the importance of endogenous effects in causing the variation of income growth and inequality, seen in figure 10. This points at the importance in not treating each scale as an appropriate reflection of regional development but rather as a piece of the puzzle. Doing so would both mitigate the risk of limiting the insights on endogenous effects and the extent of intraregional disparities on economic development that would occur using only counties or NUTS-2 and position local and regional patterns in a larger perspective that would only be suggestive if only using detailed scales.

Secondly, this thesis has been limited by only using administrative units and grids to which the agglomerations was made. As such, the limitations have been that on detailed levels the neighbourhoods are not constructed to reflect upon local income patterns, and they limit the understanding of the disparities in Stockholm. On a less detailed scale, analysing the disparities between regions using administrative regions limit how agglomeration effects are captured. The differences of patterns between figure 9a, 9b & 15 show that the use of counties or municipality is not adequately framing the issue. In this regard there is a need for further research to create natural units, using the solution posed by Fotheringham & Wong (1991), reflecting the patterns of economic development on appropriate scales to provide better foundations for discussions on the potential causes and effects.

6 Conclusions

Finally, there are some concluding statements regarding the findings of this thesis which have tried to answer the question of whether income inequalities have increased, if so where and why. To answer whether income inequalities have increased this thesis showed that one cannot exclude the question of where. At a national level, Sweden has, to some degree, experienced increasing inequalities but at different stages. The first half of the time-period saw increasing interpersonal and interregional disparities together with strong economic growth whilst the second half underwent a stabilisation and trend towards convergence. This was found echoing previous research that identified a transformation crisis occurring at the same time as Sweden went from increasing disparities to convergence patterns. The patterns of the first half of the time-period can be ascribed to three factors. Increasing differences between larger urban areas and the remaining regions of Sweden, increasing inter-personal disparities within these cities and an overall acceleration of the economy causing wage differences. The reason behind these factors has been the focal point of the discussion that linked it to a set of causes. Firstly, the increasing importance of urbanisation economies that sees cities as the driving force for economic growth in the knowledge-intensive growth-cycle, causing both agglomeration of labour and wealth. Secondly, the spatial differences of occupations which experience different levels of benefits from economic growth with the drivers of growth seeming to cluster in certain neighbourhoods in Stockholm. This causes increasing wage differences between Stockholm and remaining regions as well as increasing differences between neighbourhoods.

These findings further suggest that the efficiency argument in regional development is lacking due to the limitations of spillovers to working or service class employments. Furthermore, evidence from Stockholm suggests that, whilst a convergence occurred during the latter half of the time-period, disparities between the poorest and richest neighbourhoods of Stockholm further increased. This is further showing that whilst the economy might be in an overall convergence the richest neighbourhoods of Stockholm are moving further away from the remaining areas, especially the poorer areas with predominantly low-skilled occupations. Hence, whilst Sweden overall has not experience large growth of income inequalities the increasing spatial divides within the metropolitan regions are a tangible development that has potentially negative consequences to society at large with decreasing trust and openness, also risking increases in populism and unrest (Iammarino et al., 2017).

To conclude this thesis, it is worth to put some final words regarding the last sub question asked, on the implications of scale. Scale has had an underlying and implacable impact on the results. If we had only looked at one of these scales, counties for example, the findings would only provide with a partial perspective. Not including grids for example would have had the consequences of missing out the twofaced pattern of convergence occurring since the transformation crises, falsely leading to the easy conclusion of decreasing disparities.

Further research

The findings from this research, especially regarding Stockholm, provide a steppingstone in possible ways to further the research on inequality and economic development. This research was limited to explaining general trends and possible causes. Further research in this area could use these findings to go further. A potential pathway would be asking questions about how structures of neighbourhoods, using dissimilarity indices, effect both the mobility of individuals and their ability to access to e.g. spill-overs, institutions or employment. If so, asking further questions how the dissimilarity of a city's neighbourhoods is influencing the economic development of these cities. For this to be done one would need data on the socioeconomic structures of neighbourhoods, something the LISA database of Sweden is positioned to provide.

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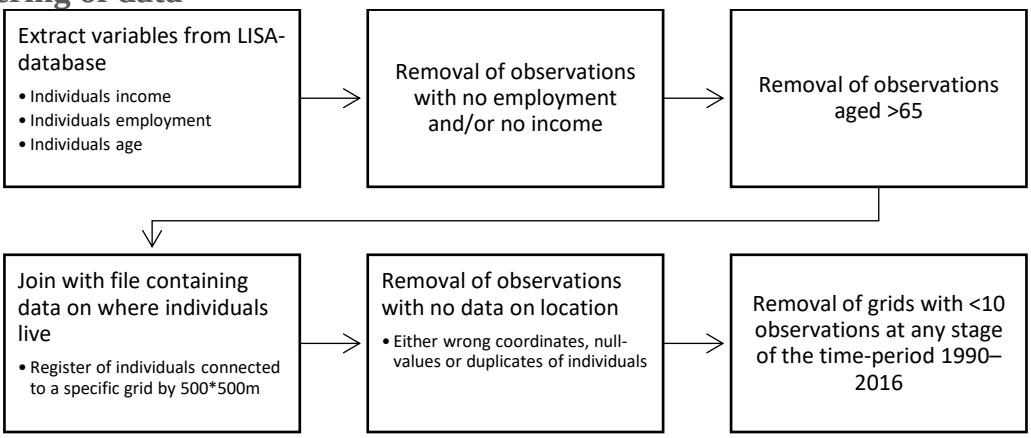
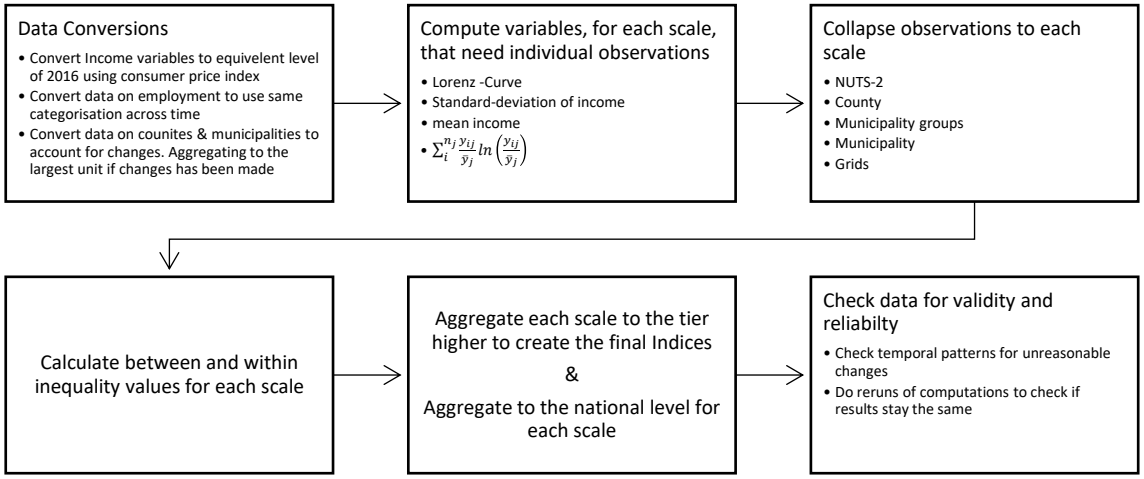
Appendices

A. Workflow

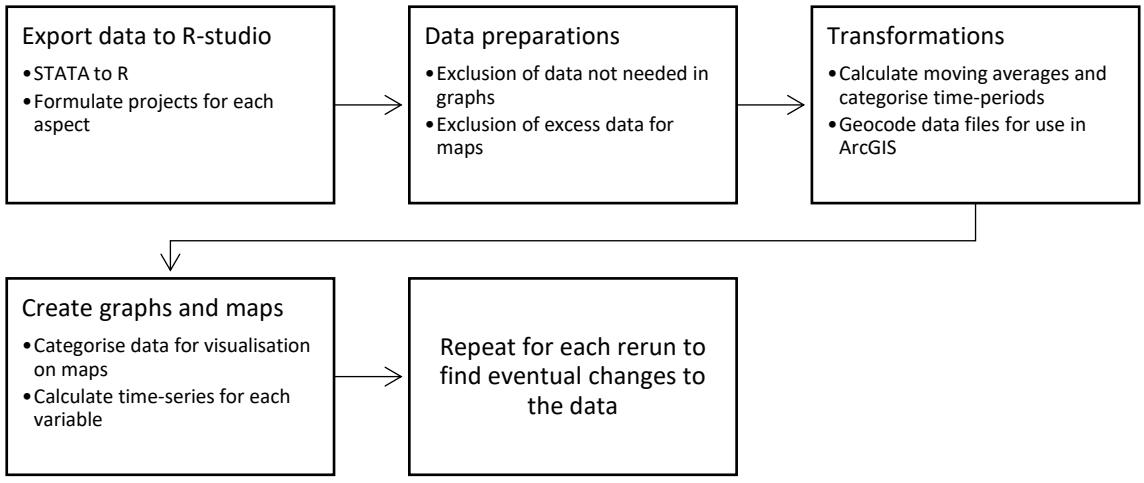
Gathering of data



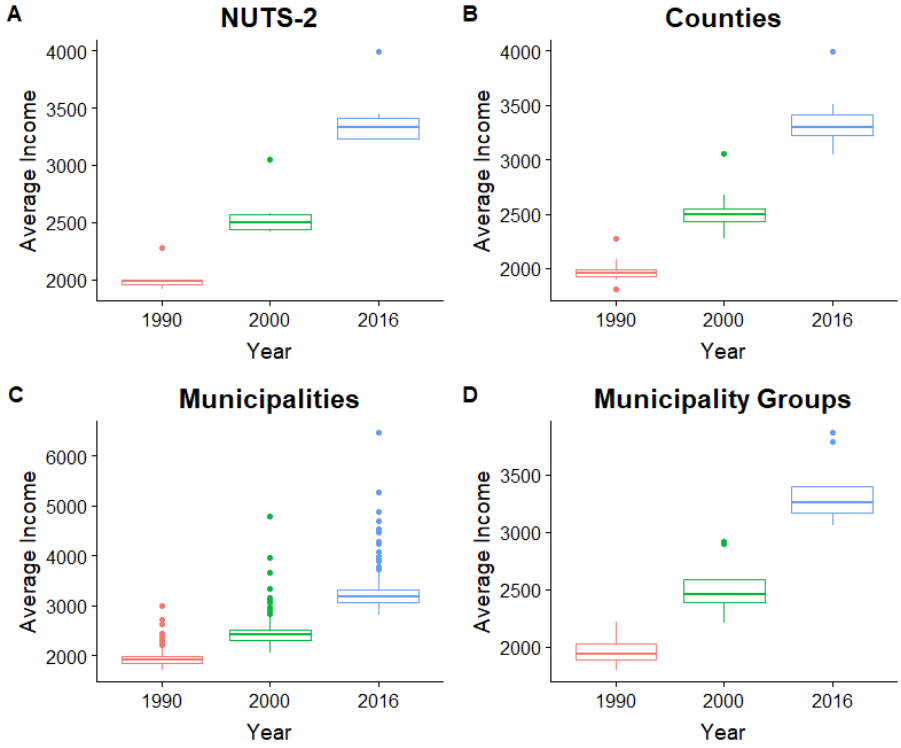
Data analysis



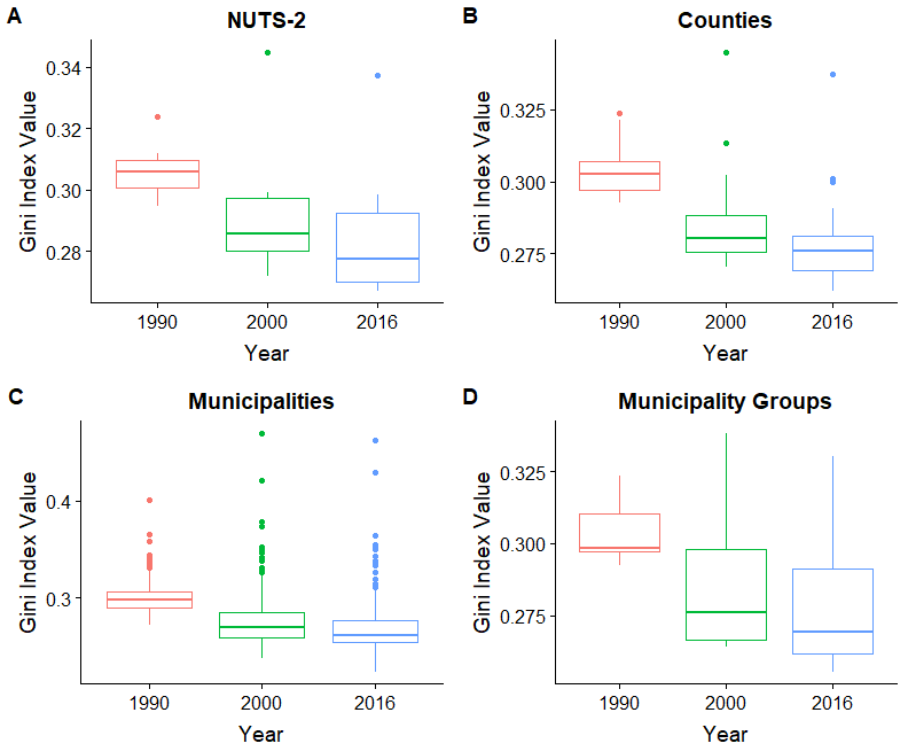
Data visualisation



B. Boxplots of average income & inequality



Boxplots of the distribution of average income 1990, 2000 & 2016 in Sweden between scales



Boxplots of income inequalities 1990, 2000 & 2016 in Sweden within different scales

C. Map of Income and inequality growth in Stockholm