Rural-urban interdependencies

The role of cities in rural growth

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Niclas Lavesson

LUND
UNIVERSITY

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Rural-urban interdependencies – the role of cities in rural growth

Abstract

A massive population growth in cities is currently being witnessed in most countries around the world. As urban populations grow, cities eventually expand geographically into what was considered countryside and nowadays distinguishing between what is city and what is countryside is getting increasingly difficult. In many Western countries, it is being observed that areas near cities seem to capitalize from urban proximity by experiencing strong growth in population and employment. By contrast, remotely located areas appear to be in fast decline, observed not least in the ongoing trend of rural depopulation. In the European context, and more specifically in Sweden, research is relatively scarce on these issues. The aim of this thesis is to examine rural–urban interdependencies and the role of cities in rural growth.

Over the last decades, having spatial linkages with cities appears to have increased in importance for rural areas. Much can be learned from studying how interdependencies with nearby cities influence rural growth. Increased knowledge on the topic may be useful, not least in formulating policies aiming at, for example, increasing rural employment and counteracting rural depopulation.

The findings in the thesis strongly suggest that interdependencies with nearby urban centers are not necessarily positive. In fact, it is shown that proximity to urban centers of any size is detrimental to local employment growth and entrepreneurship in rural Sweden. Rewards from urban proximity are only visible from interdependencies with the largest urban centers. This suggests that there is a threshold of urban (population) size that needs to be reached for positive agglomeration spillovers to outweigh adverse effects following from urban proximity, for example from urban competition for local jobs, consumers and rural resources in general. Importantly, though, there is a significant heterogeneity in relationships across space. Implicitly, this means that a change that would be positive in one place may be very negative in another.

A strong positive association is also observed between rural-to-urban commuting and rural employment growth. Therefore, it is concluded that increasing rural-to-urban commuting could be a way to achieve growth in the countryside. Also, stimulating urban employment growth could be a way for rural areas to maintain and perhaps even grow their local population. This follows from the observation that rural residents increasingly are engaging in rural-to-urban commuting and that the common pathway into this type of commuting is from rural residents changing to urban places of work. These are also individuals who are younger and better educated than their rural neighbors and contribute more than average rural workers to the local economy, by enhancing tax incomes or strengthening local purchasing power.

Key words: Rural-urban interdependencies, entrepreneurship, long-distance commuting, rural-to-urban commuting, rural firm start-ups, necessity-opportunity entrepreneurship, Sweden, regional growth

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Niclas Lavesson

Abstract

A massive population growth in cities is currently being witnessed in most countries around the world. As urban populations grow, cities eventually expand geographically into what was considered countryside and nowadays distinguishing between what is city and what is countryside is getting increasingly difficult. In many Western countries, it is being observed that areas near cities seem to capitalize from urban proximity by experiencing strong growth in population and employment. By contrast, remotely located areas appear to be in fast decline, observed not least in the ongoing trend of rural depopulation. In the European context, and more specifically in Sweden, research is relatively scarce on these issues. The aim of this thesis is to examine rural–urban interdependencies and the role of cities in rural growth.

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IV. How does distance to urban centers influence necessity- and opportunity-based firm start-ups? (Lavesson, N)

List of Abbreviations and Acronyms

2SLS	Two-stage least squares regression model
EU	European Union
DNUC	Distance to nearest urban center
FAD	Firm and establishment dynamics (database)
GPT	Growth pole theory
GWR	Geographically weighted regression
HTKIS	High-tech knowledge-intensive services
HTM	High-tech manufacturing
IV	Instrumental variable
KIFS	Knowledge-intensive financial services
LISA	Longitudinal integration database for health insurance and labor market studies
LKIS	Less knowledge-intensive services
LMA	Labor market area
LTM	Low-tech manufacturing
MKIS	Knowledge-intensive market services
NEG	New economic geography
OLS	Ordinary least squares regression model
OKIS	Other knowledge-intensive services
RUC	Rural-to-urban commuters/commuting
RULDC	Rural long-distance commuters/commuting
SBA	Swedish Board of Agriculture
SCB	Statistics Sweden

Preface

This is a compilation thesis consisting of four articles: two single-author papers that have been published in peer-reviewed journals, a coauthored paper that was recently submitted to a journal, and a coauthored book chapter for the Routledge Studies in Human Geography series.

The first part of the thesis (Chapters 1–6) is a general introduction (in Swedish, a *kappa*), where the aim of the thesis is presented, research questions are formulated and the contributions of the thesis are highlighted.

In the *kappa*, previous research is presented, and definitions, research design, data and methods are also discussed. Finally, a concluding chapter closes the *kappa*. Key findings from the thesis papers are summarized and, in combination with previous knowledge, the research questions are answered.

1 Introduction

1.1 Background

A global trend in most countries around the world is a massive population growth in cities. This is no less true for Sweden and, as in many other countries, there is an emerging concern about rapid rates of urban population growth. The concentration of the population in cities implies that the boundaries of cities will change over time. Larger populations require more land use, and eventually cities begin to expand into what once was considered countryside. Most Western countries are currently witnessing a countryside in change, often characterized by a significant heterogeneity in population and employment growth between places (see, for example, Westholm and Waldenström 2008; Niedomysl and Amcoff 2011; Westlund and Pichler 2013). A growing body of literature attributes these growth disparities to intensified rural–urban interdependencies, often visible in the commuting of people between the countryside and cities (see, for example, Partridge et al. 2010). A key finding in this strand of research is that places within daily commuting distances to cities generally experience strong growth (see, for example, Ali et al. 2011). Places like these are likely attractive to work and live in as they seem to offer a rural lifestyle with, for instance, lower housing prices and scenic environments, combined with better jobs and higher wages within reach of nearby cities (see Renkow and Hoover 2000; Partridge et al. 2010). From this perspective, proximity to cities seems to play an important role in maintaining and enhancing growth for parts of the countryside.

A view, dominant for a long time, was that cities grow at the expense of the countryside. This view was fueled by arguments that cities are responsible for the depopulation of large parts of the countryside. However, as described previously, areas near cities seem to capitalize from that in terms of higher population and employment growth. These opposing views raise several questions. How, and why, are areas influenced differently by cities? Is it because access to cities differs between areas? Or is it the size of cities that determines how, if and to what extent their surroundings gain or lose out from

such proximity? Could it even be that areas have different abilities to respond to influences from nearby cities? And, perhaps most importantly, are areas currently emerging around cities still part of the countryside or are they simply extensions of cities in change?

Rural-urban interdependencies are changing and making a distinction between cities and countryside is increasingly difficult. In the literature, many terms exist that, to a varying extent, seek to grasp current trends of urban growth and expansion. Some pertinent examples are suburbanization, counterurbanization and 'urban sprawl'. Nevertheless, these concepts are neither conceptually nor empirically easily separable from each other. In the literature, sub- and counterurbanization are rather consistently defined as population movements from urban areas to suburban and rural areas (see Champion 2001 for an overview). However, there is a strong disagreement about how 'urban sprawl' should be defined and what it really is. In a review of previous literature, Galster et al. (2001) notice that 'urban sprawl' is used when referring to patterns, causes or consequences of certain land use or processes of land development. Some scholars consider urban sprawl a stage in the urbanization process, while others use the concept without defining what it means. The point raised is that these concepts are problematic to distinguish.

Leaving the discussion of definitions aside, another way of viewing interdependencies is in terms of spread and backwash effects. Spread effects refer to positive externalities transferred from one geographical area to another, while backwash constitutes negative externalities (Myrdal 1957; Hirschman 1958).[1] The intellectual origin of the spread–backwash framework dates back to Gunnar Myrdal's (1957) theory of cumulative causation, as well as the work of Albert Hirschman (1958). Initially, the spread and backwash concepts were used to better understand relationships between developed (core) and underdeveloped (peripheral) countries. The rationale of Myrdal (1957) and Hirschman (1958) is that economies are driven by forces in developed countries, which in turn impact underdeveloped countries; plainly and simply, this implies that changes in one area trigger changes in other areas. For example, an increase in demand for goods and services in developed economies may nourish new industries in underdeveloped economies. This may result in workers seeking employment in these new industries, eventually causing an expansion of underdeveloped economies. An appealing property of the spread–backwash framework is that different geographical scales can be

[1] In Hirschman (1958), the corresponding terms for spread and backwash effects are, respectively, trickle-down effects and polarization.

studied using the same line of reasoning. The framework has been applied in research examining rural–urban relationships (Barkley et al. 1996; Henry et al. 1997; Partridge et al. 2009, 2010). In that context, urban areas are considered developed while rural areas are thought of as underdeveloped.

The existence of interdependencies, sometimes referred to as spatial linkages, is a common denominator of the concepts of urban sprawl and sub- and counterurbanization. Most notably, flows of people between rural and urban areas are continually recurring, mainly as migration or commuting but also in forms of shorter visits, for holidays or business reasons. Much can be learned from examining rural–urban interdependencies and how these are manifested spatially, whether in the mobility of people or in the movement of resources across space. Some examples follow using the conventional notion of Myrdal (1957) and Hirschman (1958). Urban spread effects, accruing to the countryside, follow from urban residents' migration to the countryside or rural workers commuting to an urban workplace. Rural population growth follows from urban in-migration, while rural-to-urban commuting may strengthen local purchasing power – rural-to-urban commuters enjoy higher urban wages, potentially stimulating local rural demand. Eventually, an expansion of the local economy may follow. Conversely, if migration flows go in the opposite direction – that is, rural residents migrate to cities – rural depopulation follows, which constitutes a backwash effect for the concerned areas in the countryside.

Sound commuting ties between rural and urban areas may at a first glance seem beneficial for the countryside. Most certainly, rural residents can reach urban jobs, but commuting ties also open up the rural job market for urban residents (see Renkow and Hoover 2000; Renkow 2003; Moss et al. 2004; Polese and Shearmur 2006; Partridge et al. 2010; Ali et. al 2011). A phenomenon that is quite rare, but still possible, is that urban residents take rural jobs and cause unemployment in the countryside. This is considered a backwash effect for the countryside. Urban competition, but for consumers rather than for jobs, may harm local rural firms if rural residents make daily grocery purchases in cities. Consequently, running a local grocery store in the countryside is less profitable. This example illustrates how one individual's backwash may be someone else's spread effect. On the one hand, the rural population may benefit from urban firms accessing rural consumer markets, for example by accessing a larger supply of goods and services but also by enjoying lower prices. But, on the other hand, for the rural business owner it constitutes a backwash effect owing to the competition and declining demand that follow.

In practice, spatial linkages identified early in the literature are still relevant today. However, societal changes could of course not be predicted by researchers in the 1950s and 1960s. The Internet, high-speed trains and emerging professions where attachment to workplaces is reduced have had an impact on interdependencies between areas. Equally, today's researchers cannot predict the impact of future innovations on rural–urban relationships. The introduction of driverless cars (and trucks) is in its making (Transport Analysis 2015) and, indeed, these have potential to alter urban–rural interdependencies. That said, while interdependencies are created from innovations, they also preexisted them. Driverless cars and trucks may replace some occupations – often ones that require less formal education. The phenomenon of new occupations replacing old ones is by no means new – there have been several examples throughout history where technology has replaced workers. However, at the time of writing this thesis, little can be said about the associated societal implications of these innovations and how spatial relationships are influenced.

In Sweden, like in many other Western countries, issues related to rural growth are highly topical and policymakers are actively working toward strengthening vulnerable areas. Recently, the Swedish government appointed a committee (*Landsbygdskommittén*) with the explicit purpose of formulating a coherent policy to ensure employment, sustainable growth and prosperity in rural Sweden (SOU 2017:1). In Sweden, the debate has recently focused on questions concerning uneven growth between regions in Sweden. A governmental investigation proposed that Sweden should be divided into six to eight areas of similar populations to reduce frictions that potentially hamper local competitiveness (SOU 2016:48). However, this proposition was never realized owing to weak political support. These are just some examples of the increasing interest in the countryside and rural–urban interdependencies. Despite its current interest, the present knowledge of rural–urban interdependencies and the role of cities in rural growth is fairly limited.

Contemporary studies focusing on interdependencies have to a large extent been conducted in North America (see, for example, Barkley et al. 1996; Partridge et al. 2007a, 2007b, 2009, 2010; Ali et al. 2011). The result of these studies, taken together, documents that rural population and employment growth is determined by places' relative location to cities, that is, by the extent of rural–urban interdependencies (Partridge et al. 2007a, 2007b; Portnov and Schwartz 2009; Partridge et al. 2009, 2010; Ali et al. 2011). A pertinent question is whether stylized results from studies performed in other Western countries since the mid-1990s are transferable to the Swedish context.

Empirical observations suggest that this may be the case, and several similarities exist – for example, the rural–urban distinction is increasingly blurred and the countryside is characterized by uneven growth in population, employment and incomes. Often, areas of high growth are observed within commuting distances to cities.

Yet, there are strong reasons to challenge whether findings from the recent studies apply in the Swedish case. Sweden differs much from Canada and the US. Cities are smaller in Sweden, both in population and in geographical size, but they are also less numerous. In fact, it could be that the impact that Swedish cities have on their surroundings is negligible. Wage differentials in general, and rural–urban wage differences in particular, are more substantial in North America than in Sweden. The wage compensation of commuting may be lower in Sweden owing to 'too small' wage differences in taking rural or urban employment. In the studies performed in North America (see Partridge et al. 2010 and Ali et al. 2011), positive effects from rural-to-urban commuting on rural economies have been observed. Plausibly, owing to lower wage compensation of commuting, these effects may not arise in Sweden. Moreover, the countryside in North America and Sweden is vastly different. Rural areas in Sweden are small compared to their US and Canadian counterparts. It is fully plausible that small rural areas are influenced differently than larger areas are.

1.2 Aim and Research Questions

The overarching aim of this thesis is to examine rural–urban interdependencies and the role of cities in rural growth. The intensity in rural–urban interdependencies is largely reflected by distances between rural areas and nearby cities, where geographical proximity allows for intensified interdependencies. Rural–urban interdependencies in general are considered in the thesis – primarily since interdependencies are difficult to treat in isolation from each other (see, for example, Greenwood et al. 1986; Khan et al. 2001). However, as it is one of the most obvious spatial linkages between the countryside and cities, rural-to-urban commuting is devoted extra attention. Taken together, this is notable in the papers in this thesis, where rural–urban interdependencies are considered more generally, measured as distance to urban centers but also in terms of rural-to-urban commuting.

Rural growth covers several aspects of economic development – often related to population, employment and wages. In the thesis, and in the papers, specific attention is devoted to rural employment growth and rural entrepreneurship (measured as firm start-ups). This is largely motivated by the fact that employment growth and entrepreneurship constitute key factors in keeping local economies going, not least by securing jobs for residents but also since job opportunities are a crucial factor in attracting new residents (see, for example, Niedomysl 2011). How and where these new jobs arise – that is, whether jobs are created locally, arise in nearby cities or perhaps generated from rural firm start-ups – is of less importance. Against this background, the overarching aim of the thesis is formulated in four interrelated research questions:

1. How does distance to urban centers influence rural growth?
2. Is there a spatial heterogeneity in how rural growth is influenced by distance to urban centers?
3. Is increased rural-to-urban commuting a viable strategy for rural growth?
4. What characterizes rural-to-urban commuters?

These research questions are important to examine for several reasons. First and foremost, it is important to establish whether it is rural–urban interdependencies, and proximity to cities, that drive rural growth. From a policy perspective, that information constitutes a valuable basis for decision-making. As stated previously, strong rural–urban interdependencies are not necessarily beneficial for the countryside – some areas may be harmed from urban competition and others face increased vulnerability with a strong reliance on, for example, urban employment opportunities. More knowledge on the topic facilitates the formulation of protective measures for areas that may be harmed from interdependencies with cities. A second motivation relates to the possibility of coming up with concrete proposals that increase rural employment. Two ways in how this may occur is through rural-to-urban commuting and rural entrepreneurship, which are also two central topics in this thesis. A third and final motivation concerns the ongoing depopulation of parts of the Swedish countryside. A central and debated issue for a long time has been whether acquiring a ‘vibrant countryside’ is possible. It should by no means be ruled out that place-specific characteristics in the countryside push rural residents to migrate to cities rather than cities attracting rural residents away from the countryside. That said, a fully plausible scenario is that rural

residents need to leave if possibilities to generate employment opportunities on local resources are limited.

As raised previously, research exists on rural–urban interdependencies. This is particularly the case in an international context (see Gaile 1980 for an early overview) but there is also related research in Sweden (see e.g. Godlund 1954; Lewan 1967; Wärneryd 1968; Falk 1976; Malmberg and Persson 1981). Yet, systematic research on these questions is scant. Much of the previous research was conducted in the early 1950s and 1960s and may to some extent be out of date, largely following from changes that society has been through since then. One is the transition from the 'industrial age' to the current 'information age' following the advent of the Internet. Moreover, current literature on, or studies related to, rural–urban interdependencies too often treat spatial relationships as homogenous across space. Studying spatial phenomena with 'too little' consideration of spatial variation makes little sense, especially since that same research is often motivated by observations of a relationship that varies geographically. This critique, although partly unavoidable, follows from previous studies using aspatial models, based on averages, and/or analyzing both rural and urban areas within the same framework without making a clear separation of what is analyzed. In addition, and somewhat unfortunately, (many) previous studies spend little thought on how areas are impacted by their surroundings, whether surrounded by cities or the countryside. Indeed, and taken together, little can be said from that about spatial heterogeneity.

Importantly though, prior research should in no way be belittled. Findings about average effects are important contributions to the literature but, from a policy perspective, formulating policies and making decisions from that type of information could be misleading, mainly since there is a significant heterogeneity in relationships across space. Areas differ but so too do their surroundings (site versus situation). A change that is positive in one place may be directly harmful in another. Often, this is an aspect that is not considered to the extent it deserves. An ambition of this thesis is to cover these important aspects to the largest possible extent. The intention is to account for rural–urban interdependencies with nearby cities when examining rural growth – considering not only distance to cities as a potential deterrent to growth but also how the size of nearby cities may matter (in terms of population) for rural growth. In the thesis, different distance measures are used to pick up these rural–urban interdependencies. Also, when appropriate, the surroundings of rural areas are considered in the papers.

1.3 Disposition

The thesis is structured as follows. In the next chapter (2), the Swedish geography and how this is defined in the thesis are discussed. In Chapter 3, a definition is provided of rural–urban interdependencies. It is discussed how these are manifested, and how interdependencies have changed over time but also why keeping spatial linkages to cities may be of particular importance for the countryside. The following chapter (4) is devoted to previous research on, or related to, rural–urban interdependencies. A literature review of Swedish studies, as well as international studies, is provided. The thesis papers are placed into the research fields and knowledge gaps in the literature are identified. Chapter 4 is closed with a brief summary of theories and concepts that is used in the thesis. In Chapter 5, the research design is formulated. Here, the data material that was used when producing the papers is discussed, alongside the methods and estimation techniques used in analysis. Finally, in Chapter 6, the thesis is tied together. The individual papers in the thesis are summarized and the research questions are addressed.

2 What is Rural? What is Urban?

A pertinent and central issue is how to define and make a distinction between rural and urban – that is, to distinguish between what is countryside and what is city. It can be argued that such distinctions vary between individuals and an ideal classification of places may therefore consider how individuals perceive their surroundings. For practical reasons, asking people about their perceptions of places is often not possible – it would not only be time-consuming but also a complex task since individuals likely perceive their surroundings differently (cf. Lundblad and Ulfgren 2014). For example, some individuals might consider natural characteristics, such as forested areas, an indicator of rurality. In that case, a forested area located 30 minutes from central Stockholm would perhaps be considered countryside by some individuals. Others may put a high value on economic opportunities – like access to jobs. The very same forested area, which has a lot of jobs within 30 minutes' reach, would in that case probably not be considered countryside. A related issue to that of defining urban and rural is where to draw the line, that is, where the urban area ends and the rural begins. Again, it is possible to ask people where this might occur, but there will most likely still be a significant heterogeneity among the answers.

The point raised here is that, while defining geographical areas into urban or rural is conceptually possible, it is very difficult in practice. An overwhelming amount of information needs to be processed, and, certainly, there is no guarantee that the outcome becomes useful for research purposes. With this said, for the making of this thesis, an operationalization of geographical areas is needed when defining urban and rural. How this is best achieved is far from straightforward and there are additional matters in making the geography accessible for analysis. For example, no formal definition of cities exists in Sweden but the notion of built up areas (*tätorter*) is sometimes used to describe cities. How urban areas are defined differs significantly between classifications. For example, Statistics Sweden defines urban areas as 'contiguous' areas with at least 200 residents (SCB 2016). The former National Rural Development Agency (Glesbygdsverket) used to define urban areas as areas with at least 3,000 residents within five minutes of commuting time (cf. Growth Analysis 2010). In a recent geographical classification of the Swedish

Association of Local Authorities and Regions (SALAR 2017), entire municipalities are grouped into cities of different types. Seemingly, cities are difficult to define and the same is true for the countryside as this is often defined as a residual once cities are 'identified'.

In the papers of this thesis, growth and aggregates of employment and firm start-ups are investigated and, for this task, municipalities were determined to be an appropriate level of analysis. Using municipalities to classify and operationalize space into urban and rural areas is, however, not ideal. For example, both densely and sparsely populated areas usually exist within most municipalities. That is, they contain areas that might be classified as both urban and rural. On the other hand, municipalities in Sweden comprise the smallest unit of analysis with administrative rights, and decisions that could influence employment growth, commuting and entrepreneurship locally are partly taken here.

In Sweden, there are 290 municipalities and several definitions are offered in how to categorize them. Two broader categories of rural and urban municipalities (197 rural and 93 urban) are identified using a definition from the Swedish Board of Agriculture (see SBA 2013 and Chapter 5 for further discussion). Preferably, to serve the purpose of this thesis, rural municipalities should be assessed on their degree of interdependencies with urban centers. Information is therefore added on rural municipalities' distances to urban centers – this yields a continuous definition of the countryside with urban centers as points of reference. Moreover, the urban municipalities need to be defined – not least to allow urban centers to impact their surroundings differently – that is, to allow 'size effects'. For this purpose, an urban hierarchy is constructed by grouping the 93 urban municipalities into urban centers of different sizes (based on population thresholds).

How the urban hierarchy is constructed is highly context-dependent. Urban municipalities as defined by SBA are not, in any given situation, necessarily urban centers in the sense of providing spillovers to their surroundings. Municipalities are sometimes defined as urban owing to high dependency on employment in nearby cities. Basically, few jobs exist locally and for this reason rural employment interdependencies are not expected with these urban municipalities. Therefore, these should not be considered urban centers in such an examination. However, for rural entrepreneurship, these urban municipalities may serve as important consumer markets and may be best defined as small urban centers. The construction of urban centers and related issues are discussed further in Chapter 5.

Even with an operationalization of geographical areas, it should be made clear that, although simplifications are necessary, they are not free of problems. For example, it could be argued that the local industry structure is an important factor to consider when defining municipalities and constructing urban centers. Consequently, without considering local industry, urban centers of the same size may influence their surroundings differently. Namely, when defining urban centers, population is only one of many aspects that may be considered. Likewise, two rural municipalities may receive urban spillovers differently owing to local characteristics. Rural municipalities may have a more or less 'appropriate' industry structure to that in a nearby urban center. Municipalities where local firms are suppliers to industries in nearby cities may benefit from increased interdependencies due to existing input–output linkages. On the other hand, municipalities with a service-intensive industry may be harmed from increased interdependencies with urban centers. For example, local trade and wholesale may decline as residents make daily purchases in nearby cities instead of locally. However, with the use of regression techniques, some of these local characteristics are controlled for in the papers in this thesis.

3 Rural–Urban Interdependencies

3.1 Definition

Spatial linkages have been considered in earlier research, not only as interdependencies as raised before but also in a nonsymmetrical view with little focus on mutual interests between areas (such as reciprocal flows of goods, services and other resources). This is not least visible from the dominant popularity of growth pole theory (GPT) in the 1960s and 1970s (see Perroux 1955 and Section 4.3 for further discussion). The rationale of GPT is that dominant core (urban) areas exert impulses on noncore (rural) areas – these impulses occur unidirectionally from core to noncore areas. Little attention is devoted to the mutual part of spatial relationships in GPT. Growth in noncore areas is argued to follow from increased production in dominant (propulsive) core industries. As core firms demand more inputs, strong backward linkages in the production system make input-supplying firms in the noncore respond by increasing their production. However, the nonsymmetrical view of spatial linkages is increasingly relaxed, although this began in the 1980s (see, for example, Gaile 1980). It has gradually been recognized that spatial linkages are bidirectional – that is, spatial flows take place in two directions and, put in this context, impact both rural and urban areas. With application of more sophisticated spatial analysis, interdependency relationships between places are to an increasing extent being considered in contemporary research.

Employment and population interdependencies exist between rural and urban areas. These are often expressed in terms of flows of goods, services, money, employment and people across space (see, for example, Gaile 1980; Barkley et al. 1996). These flows are by no means mutually exclusive but, in fact, intrinsic connections exist between them. They not only occur simultaneously but may also trigger each other. An example of simultaneity is that between commuting and spending. When people commute to work, they also spend money when traveling. Flows of people and spending appear to walk hand in hand. Commuting also makes an example of how one type of flow may trigger others. For example, rural-to-urban commuting may provide

rural residents with higher urban wages that in turn may strengthen local demand. While a consistent definition of rural–urban interdependencies is not provided in the literature, they can be summarized in the following way:

Rural–urban interdependencies refer to ***mutual relationships*** *expressed as* ***spatial flows of resources*** *between* ***actors*** *in rural and urban areas. The intensity in these relationships is mediated by the* ***proximity*** *of actors.*

In previous research, 'mutual relationships' largely correspond to joint interests in population, employment and wages (see Ali et al. 2011; Barkley et al. 1996; Henry et al. 1997). Other examples in the literature refer to cultural, institutional and legal dependency relationships. However, the focus in this thesis is mostly on rural–urban employment interdependencies viewed from the countryside. The term 'spatial flows of resources' refers to how rural–urban interdependencies are manifested through spatial flows (bidirectionally, that is, going in both directions, to and from places) of goods and services, people, money, information and technology and employment (Gaile 1980; Barkley et al. 1996). In the thesis, the 'actors' of interest in this thesis are households and firms in urban and rural areas but there is also some attention devoted to public authorities.

'Proximity' is measured as the geographical distances between rural and urban municipalities, as touched upon earlier. The rationale for this is that geographical distances are closely associated with the intensity of rural–urban interdependencies. Conceptually, it makes sense that areas with short distances to urban centers are more integrated with these, that is, stronger interdependencies prevail (consider commuting flows, for example). By contrast, remotely located municipalities have fewer interdependencies with urban centers. The interpretation of distance appears at first to be rather straightforward but, in fact, distance has a variety of meanings. Geographical distance is just one way in expressing relationships between firms, households and individuals. Other examples are social, economic, cognitive and environmental distances – all usable but in different contexts. Issues related to distance measures used in the papers are discussed in detail in Chapter 5.

3.2 Distance, the Information Age and Transportation Costs

Over time, as innovations and technological advancements occur, rural–urban interdependencies, and also how these are manifested, change – present spatial linkages may still be relevant while new ones could arise. Since the 1950s, the most influential breakthroughs have involved the rise of the digital age, the introduction of personal computers, the advent of the Internet and more recently the increasing use of smartphones. These innovations, together with governmental investments in rural broadband access, have caused significant societal changes and it is often claimed that we currently are leaving the 'industrial age' to live in an 'information age'. Unarguably, flows of information between households, firms and authorities are more important now than they have been before. An emerging IT sector offers people not only a broader supply of services, whether already existing or new, but also new types of occupations. Using Schumpeter's notion of 'creative destruction' (Schumpeter 1942), existing firms may close and be replaced with new ones. A series of events follows – 'old' industries change and are replaced with new industries, while 'old' occupations die out and new ones are born.

Some pertinent examples of new emerging industries replacing old ones involve the music industry, video rental businesses, newspapers and travel agencies. Music, movies and other media can be reached through online streaming services such as Netflix, HBO and YouTube. Music can be listened to on the Internet using services like Spotify and Soundcloud, while nowadays newspapers are commonly read online. A plethora of online booking services is available on the Internet, which reduces the need for travel agencies. Further recent examples exist. Banking transactions can be performed using a personal computer, or a smartphone, while grocery purchases can be made online, with the goods delivered directly to consumers' doorsteps. This may result in the closure of firms within these services, whether occurring in the countryside or the city, but they also raise new types of occupations. As an example, consider the increasing usage of smartphones – whether intended for listening to music, making grocery purchases or conducting banking transactions – a demand for mobile applications follows and app developers are needed.

The attractiveness of the 'information age' is that people presumably have a greater freedom to choose where to live and work without compromising on products, services and employment opportunities (Cairncross 1997). Undeniably, with innovations and new occupations arising, the locational

decisions of firms and individuals are altered. An increasingly observed phenomenon in Western countries is people working from home (see International Labour Office 2016). This could mean fewer traveling days to work during a working week and may enable people to reside in areas that they formerly could not have done. Basically, the attractiveness of some rural areas may increase following from commuting becoming less burdensome for individuals. Flows of people, in terms of commuting, increase in importance for these rural areas. At the same time, flows of people potentially lose some importance in cities as money flows from rural to urban areas are reduced with less rural-to-urban commuting. Firms' locational decisions may also change as a result of innovations. Firms that are less dependent on local markets, for instance in IT-intensive sectors, could potentially operate from the countryside. Sound broadband provision makes that possible, with the potential to exert meaningful impact on rural growth (see, for example, Whitacre et al. 2014).

Altogether, irrespective of the consequences, it can be concluded that rural–urban interdependencies change with innovations and with new types of occupations emerging. Indeed, the role of distance in rural growth has also changed. This is a topic that has been debated intensely over the last decades – whether distance matters (on a variety of aspects, such as on locational decisions of firms and individuals, rural growth in population, employment and incomes among other factors). On one side of the debate, some scholars argue that distance has reduced in importance; they propose 'the death of distance'. The 'death of distance' hypothesis got its breakthrough with work by Frances Cairncross (1997). One of the cornerstones that the hypothesis builds on is that nowadays information transactions cost nothing with the enormously efficient information flows that the Internet offers its users. The idea is that radical improvements in long-distance communication will eventually create a world with free movement of goods, services and people. In such a world, managers can find information to operate a business from one part of the world while utilizing resources and information from another part. Similarly, consumers can choose among products and services around the world. Thomas Friedman (2005) made similar arguments in line with the 'death of distance' and claimed that distance is increasingly irrelevant and that advantages of proximity (to, for example, larger cities) eventually vanish (Friedman 2005).

However, 'the death of distance' hypothesis has received criticism. Brown and Duguid (2002) and Olson and Olson (2000) raise some of the pitfalls of 'the death of distance' hypothesis. Three common criticisms are summarized here. The first critique is that the centrality of information is exaggerated by proponents of the 'distance is dead' hypothesis. Information is often treated

not only as a necessary condition for economic development but also as a sufficient condition. Other central spatial linkages that contribute to changing interdependency relationships may be overlooked. Undeniably, information matters and has increased in importance. Yet, it is far from everything. A second critique concerns the argument that information flows freely since this can be strongly questioned on several grounds. For example, corporate secrets hinder the spread of information – more generally speaking, legal hindrances deter information flows. In addition, individuals do not necessarily move information across space owing to their differing abilities to communicate that information. As raised in Brown and Duguid (2002), there is a possibility that people who need certain information may either not find it or, if found, not be able to utilize it for one reason or another. Another factor, although not mentioned in Brown and Duguid (2002), is that people speak different languages, which could reasonably hamper information from flowing freely.

A third and final criticism of the 'death of distance' hypothesis relates to the leakiness and stickiness of information and knowledge. In Brown and Duguid (2002), an example is provided referring to the research center at Xerox in Silicon Valley. The knowledge necessary for making a computer is created within the firm. That same information may get stuck in the firm and not travel to other parts of the corporation, for example to production and engineers in other parts of the US. Rather, that information leaks or travels with individuals to competitors in Silicon Valley, such as Apple, Adobe and Microsoft – reflecting both the leakiness and stickiness of information. Glaeser (2007) emphasizes that face-to-face interaction mediates the exchange of information between people – that is, long-distance commuting and face-to-face connections are complements rather than substitutes. Face-to-face interaction is also suggested to be essential to most innovative firm behavior (McCann 2007). Spontaneous face-to-face interaction cannot be (fully) substituted by the use of Internet services or mobile communication. In this example, information was intelligible for a group of people within Silicon Valley while not reachable for people in other geographical areas. Even if individuals have the necessary expertise, there is a chance that they never reach it owing to distance (for example, following from a lack of face-to-face interactions). Also, even if they have hands-on knowledge, most people would likely not be able to utilize it owing to their lack of technical expertise.

Brown and Duguid (2002) propose that knowledge starts to spread first when it is standardized, for example when realized into a product (such as a personal computer). Knowledge spreads as products are practiced. Brown and Duguid (2002) claim that the type of knowledge that has traditionally fueled

growth neither spreads nor scales easily, especially not in its most productive stage, for the reasons mentioned above. Tentatively, there are many arguments that distance is not dead and that households and firms are likely to continue to cluster geographically. This is also suggested by some empirical studies. Olson and Olson (2000) argue that virtual interaction never will replace face-to-face interaction. In an empirical study conducted in the US, Partridge et al. (2008a) find that distance matters and even could increase in importance over time.

Unarguably, the role of distance in spatial relationships has changed dramatically over the last decades. Equally obvious is that distance still plays a key role. Transportation costs are another aspect related to distance that has received much attention in research, especially since the 1990s and the development of new economic geography by Krugman (1991). Transportation costs have long been recognized as a key driver of cities and clustering/agglomeration of individuals, firms and resources but also as a determinant of locational decisions (von Thünen 1826/1966; Christaller 1933; Alonso 1960; Mills 1967; Muth 1968; Krugman 1991). A parallel may be drawn between transportation costs and the 'death of distance'. Reduced (or no) transportation costs remove the potential advantages of agglomeration in a similar fashion that improved long-distance communication does, according to the 'death of distance' hypothesis. Basically, in both cases, firms and individuals may utilize resources at a marginal cost close to zero. Theoretically, zero or very low transportation costs may abolish distance as a barrier of moving goods, services, people, information and other resources across space. However, it can most certainly be claimed that clustering of economic activity depends on the existence of transportation costs (see, for example, Dumais et al. 2002). Still, households and firms face a tradeoff between transportation costs and the benefits of accessing resources offered in cities. This is similar to the conclusion that distance still matters.

3.3 The Countryside and the Significance of Spatial Linkages to Urban Centers

Cities have long been, and still are, incubators of innovations and transmitters of ideas and constitute engines of growth in countries. Yet, in this thesis, little attention has been devoted to the specific characteristics offered in urban areas relative to rural areas and why linkages to cities are of certain importance.

Depending on their positioning, scholars have different explanations of the existence and the continuation of cities. A military historian would argue that cities arose from people gathering for defensive purposes. From the sociologist's point of view, social interaction is one explanation for why people concentrate together. An economic geographer would likely focus on employment, the creation of jobs, locational decisions of firms and individuals and also on gains arising from people and firms being in the same location. This is the perspective that this thesis follows.

The fundamentals of cities, regardless of which perspective has been chosen, comprise concentrations of population, jobs and economic activities. These same concentrations generate certain productivity gains, so-called agglomeration economies, that make cities grow and survive over time. The notion of agglomeration economies dates back to Marshall (1920), Ohlin (1933) and Hoover (1937). Marshall (1920) recognized that firms may benefit from colocating with other firms of the same specialization. Industrial clustering enables firms to utilize the same (specialized) labor pools and input suppliers but also facilitates industry-specific knowledge and information spillovers. Productivity gains owing from the colocation of firms, also referred to as localization economies in the literature, are external to the firm but internal to the specific industry.

Later work by Ohlin (1933) and Hoover (1937) distinguished between localization economies and so-called urbanization economies. Urbanization economies refer to benefits that firms receive from concentrations of large and heterogeneous populations and industries. Large populations mean a large diversity in consumer preferences, also resulting in market capacity for firms to add more (diversified) products and services to urban consumer markets (Jacobs 1969). The local competitiveness of firms increases and competing on prices may no longer be worthwhile for firms. Consequently, firms are induced to innovate and become more productive than their competitors to ensure survival. This not only speeds up the introduction and adaption of new technologies but also strengthens local competitiveness between firms (Jacobs 1969; Porter 1990; Rosenthal and Strange 2004). Porter (1990) noted similar 'competition externalities'. Monopolistic markets strain urban growth while local competition favors economic growth through the diffusion and transmission of knowledge between firms (Porter 1990).

The benefits of urbanization economies may be manifested in a number of ways that accrue to both firms and individuals. Urban labor markets get 'thicker' when populations grow since urban in-migrants have different backgrounds, skills and experiences (Jacobs 1969; Florida 2003). Firms get

access to skilled and diversified labor pools while, at the same time, individuals get a better match in labor markets. Basically, as a variety of jobs are offered in the labor market, individuals may change jobs easier in cities and the 'right skills' are allocated to the 'right place' (Glaeser and Scheinkman 2000; Glaeser and Maré 2001; Mion and Naticchioni 2009). Productivity gains may follow and result in increasing wage levels as firms are forced to pay higher wages to their workers. In turn, the demand for goods and services, housing, offices and transportation may increase and stimulate the economy further.

Agglomeration economies are self-reinforcing in the sense that they arise from concentration while that same concentration assures their continuation. Unarguably, agglomeration economies have an impact on urban supply and demand for firms and individuals. This is perhaps most obviously manifested through the appearance of large and heterogenous labor and consumer markets found in cities. However, the concentration of economic activities is not only fueled by agglomeration economies. The sorting and selection of firms and individuals also contribute to agglomeration tendencies and further concentration. More – and better jobs – are offered in cities. Consider, as an example, knowledge-intensive firms. These often specialize in the highest skill-based sectors and locate in cities owing the potentials to gain from urban agglomeration economies. As a consequence, scientists, researchers and engineers are attracted to the area. More generally, people may find it easier to seek career advancements in cities.

Another example of sorting and selection is related to amenities offered in cities. For example, universities and education possibilities are often located in cities. That said, beyond attracting skilled workers, universities may induce individuals to attain education in cities. A related, yet criticized theory (see Hansen and Niedomysl 2009; Niedomysl and Hansen 2010) was developed by Florida (2003). Florida (2003) proposed that a certain group of people, referred to as 'the creative class' in the literature, is attracted to cities. These people move to cities because, as Florida argues, certain amenities are offered there. The 'creative class' is believed to be an incubator of innovation, based not only on the individuals' personal characteristics but also on the type of jobs they have. However, while widely criticized, some studies find support of growth deriving from 'creative class occupations' (see, for example, Boschma and Fritsch 2009). However, as raised in Boschma and Fritsch (2009), it is difficult to distinguish whether this effect stems from 'creative class occupations' or is an artifact following from higher education within these occupations.

Cities strongly impact the distribution of jobs, population and resources within countries. Education levels in cities are higher than in the countryside,

whether this derives from agglomeration economies or from people and firms seeking better opportunities in cities. Firms and workers in cities are more productive than their rural counterparts (see, for example, Glaeser and Maré 2001; Duranton and Puga 2004). Wage levels are higher than those in the countryside. Indeed, some attributes are offered in the city that cannot easily be found in the countryside. This suggests that keeping links to urban centers offers rural firms and individuals access not only to agglomeration resources found there but also to the large urban consumer and labor markets. For example, rural residents may take jobs in the city and earn higher urban wages, while firms in the countryside may utilize resources found only in cities.

Urbanization and localization economies tend to coincide in urban areas. Rural areas may experience agglomeration economies, but only as a result of firm localizations. Recall that these externalities arise as firms within the same specialization cluster together, that is, based on the local industry composition. Urbanization economies derive from large and heterogeneous populations and are concentrated to a limited geographical area – that is, the city. Undoubtedly, urbanization economies cannot occur locally in the countryside. However, whether stemming from agglomeration economies or markets, resources in cities may be accessed by rural firms and households. However, the ability to reach these varies considerably across the countryside. This is not least reflected by the variability in the distances to larger cities for different parts of the countryside. Previous studies highlight not only that these effects increase in magnitude with the size of the city but also how far across space these reach (see e.g. Partridge et al. 2007a; Ali et al. 2011).

4 Existing Knowledge and Gaps in the Literature

4.1 Previous Research

The lack of systematic research on rural–urban interdependencies is strongly reflected in the efforts to summarize previous studies. The literature on rural–urban interdependencies is scattered widely over different fields of research – ranging from studies in geography, economics, sociology and transportation to the field of environmental studies, to name a few. Some scholars use the notion of interdependencies, while others call them spatial relationships, connections, linkages, interactions, transmissions, spillovers, reciprocities or simply integration. The literature is fragmented, and indeed there are many possibilities of connecting literatures touching upon interdependencies.

A natural point of departure is to provide an overview of previous research from Sweden. Malmberg and Persson (1981) examine rural–urban interdependencies with a focus on four (rural) areas in Sweden – these are chosen based on their distance to urban centers and the 'amount' of local resources. Dependency relations indeed are place-dependent according to the case study of Malmberg and Persson (1981) and it is illustrated that interdependencies with urban areas differ in importance between rural areas. A result from Malmberg and Persson's study (1981) is that rural areas seem to be rewarded for their urban adjacency by experiencing a higher growth in population following from urban-to-rural migration.

Malmberg and Persson (1981) found that all of the four areas experienced positive effects from increased interdependencies with nearby cities. This may seem remarkable since two of the places were found outside what are usually considered reasonable commuting distances to cities – owing not only to long distances between the places, but, according to Malmberg and Persson (1981), also to poor infrastructure. However, in the more distant areas, effects from increasing interdependencies are less pronounced (Malmberg and Persson 1981). There are several explanations for this finding. In remoter rural areas,

fewer firms exist but there are also fewer local innovators and lower levels of entrepreneurship. One interpretation is that opportunities to reap the benefits of urban growth are poor in remote areas (Malmberg and Persson 1981). Yet, their study suggests that urban growth reaches outside common commuting sheds of urban areas.

Lewan (1967) examines rural–urban interdependencies in the county of Scania (Skåne) in Sweden and shows that the 'urbanization of the countryside' was already emerging in the 1940s. Lewan (1967) ascribes this to increased car use and to significant increases in rural-to-urban commuting (see also Godlund 1954 on this topic). In Lewan (1967), a strong positive relationship is found between population growth and proximity to urban centers. Lövgren (1986) is another Swedish study that focus on the relationship between cities and their surroundings by examining barriers influencing the expansion of cities. Whether physical (like water, mountains and topography more generally) or related to laws and regulations (legal barriers) or to patterns in human land use, barriers as such are not interdependencies as per the definition in Chapter 3. But, still, barriers are important in shaping interdependencies. One example refers to topography – this may impact possibilities of commuting and places' ability to interdependencies with their surroundings.

Taken together, findings from Lewan (1967) and Lövgren (1986), suggest that cities expand differently across space, not least due to local conditions, but also because of that barriers around cities differ. Similar findings are provided in Wärneryd (1968) in an examination of interdependencies in urban systems. In addition, Wärneryd (1968) highlights that mutual interdependencies are important to consider in regional development, and more generally, that 'no phenomenon in society should be considered in isolation' (Wärneryd 1968:118). Leaving the Swedish context for a moment, Lewan (1967) provides an excellent overview of similar case studies in Europe. Lewan (1967) refers to studies in the Nordic context, in Denmark, Finland and Norway, but also highlights research performed in Switzerland, the Netherlands and Germany.

Recent Studies on Rural–Urban Interdependencies

The studies of Gaile (1980), Higgins (1983) and other scholars at the time appear to have marked the end of an era of studies on rural–urban interdependencies. According to Gaile (1980), in his review of previous research, most studies conducted until 1980s found very limited positive spillovers from urban growth – not only limited in the magnitude of the spillovers but also limited to small geographical areas. However, in the 1990s, studies on rural–urban interdependencies experienced a resurgence in research

(see, for example, Barkley et al. 1996; Henry et al. 1997; Henry et al. 1999; Schmitt and Henry 2000; Henry et al. 2001; Renkow et al. 2001; Renkow 2003; Feser and Isserman 2006; Schmitt et al. 2006; Partridge et al. 2007a, 2007b, 2008a, 2008b, 2010; McArthur et al. 2010; Ali et al. 2011). Largely, this increasing interest followed from empirical observations of significant growth in areas near cities.

Recent research on rural–urban interdependencies has mostly been devoted to interdependencies in population and employment (see, for some examples, Barkley et al. 1996; Henry et al. 1997; Partridge et al. 2010). Most of these studies use a spread–backwash framework in their analysis – where spread effects refer to positive spatial spillovers from urban areas while backwash constitute negative spillovers. Often, and reflected in previous studies, interdependencies are difficult to analyze separately since they tend to coincide. For example, Greenwood et al. (1986) found that growth complementarities exist in population and employment, and accordingly, a population increase of one individual generate half a new job locally. Khan et al. (2001) studied similar relationships within, and between, US counties. Complementarities, according to Khan et al. (2001), exist not only locally but also regionally between counties.

Rural–urban population interdependencies are studied in Barkley et al. (1996) and Partridge et al. (2007a, 2008b). Together, these studies summarize the literature on population interdependencies fairly well. Barkley et al. (1996) found that places located near urban areas in the US experience population growth from interdependencies with nearby urban centers. On the other hand, the same study shows that population growth in more remotely located areas are harmed by urban growth. Partridge et al. (2007a, 2008b) found similar results. Rural population growth is influenced positively by growth in nearby urban centers and there seems to be a significant premium from urban adjacency in rural areas. Partridge et al. (2007a) found that an average rural area in Canada (located 61 kilometers from an urban center) experienced 18 percent less 1991–2001 population growth than if it had been located immediately adjacent to an urban center. This is a significant indication that remoteness from urban centers has a negative effect on rural population growth. Also, it is shown that these negative effects amplify with the (population) size of the urban centers – this is consistent with the idea that interdependencies with larger cities have a stronger impact on rural areas – an insight following from traditional agglomeration theory.

Another type of rural–urban interdependency, perhaps of most interest for this thesis, is that on labor markets and employment. Employment is a source

of retention and growth of populations – both locally (cf. Greenwood 1986), as previously suggested, and at a regional level following from complementary growth between areas (cf. Khan et al. 2001). Moving people from unemployment into employment has therefore long been an objective for policy and allowing rural residents to access urban jobs is a strategy that could counteract rural unemployment (Berry 1973; Henry et al. 1997; Renkow et al. 2001; Renkow 2003; McArthur et al. 2010). Later studies from the US, Canada, Denmark and France suggest that there are, to a varying extent, rewards from urban adjacency on rural employment growth and on rural labor force participation (Henry et al. 1997, 1999; Schmitt and Henry 2000; Schmitt et al. 2006; Partridge et al. 2009, 2010).

Ali et al. (2011) examined how urban-to-rural employment spillovers occur with city size in Canada. Their findings suggest that spread effects on rural employment are larger from urban centers than from smaller urban centers – these findings are in line with the ones on rural population growth in Partridge et al. (2007a, 2008b). Also, these effects attenuate with increased distance to urban centers (Ali et al. 2011). Partridge et al. (2010) found similar results – average rural areas in Canada are penalized with, on average, 3.7 percent lower employment growth from not being in immediate urban adjacency. In a study using US county data, Feser and Isserman (2005) show that urban employment growth induces spread effects on labor markets in rural counties. In another study, also using US county data, Partridge et al. (2007b) found a significant (spatial) heterogeneity in employment growth and distances to urban centers (from rural counties). This is also indicated in Barkley (1995) and Terluin (2003). Taken together, findings from previous studies suggest that there may be rewards of urban adjacency on rural employment but that these relationships differ across space.

A pertinent question is how far into the countryside the urban spillovers reach. Partridge et al. (2007a) found that positive agglomeration effects stretch up to almost 200 kilometers beyond urban centers in Canada. Similarly, Feser and Isserman (2005) found that spread effects from urban centers extend outwards by a radius of around 73 kilometers from counties' population centroids. Similarly, Khan et. al (2001) suggest that growth complementarities between US counties are usually found within about one hour of commuting time. However, increasing interdependencies are not necessarily beneficial on rural areas since urban areas may cast growth shadows on their surroundings (see Krugman 1991). This means that distance protects parts of the countryside from exposure of cities, and without that 'distance protection' some rural areas would suffer from backwash effects incurred from urban growth. For example,

firms in rural areas may avoid (some) exposure of urban competition because of large distances, and fewer interdependencies, with cities.

Rural-to-Urban Commuting and Rural Entrepreneurship

In the following section, specific attention is devoted to rural-to-urban commuting and rural entrepreneurship. Some research exists that focuses on commuting between rural and urban areas and how this influences rural employment growth (see Partridge et al. 2010; Ali et al. 2011 for North America and Moss et al. 2004 and Lehtonen et al. 2015 for the European context). In this literature, two main competing hypotheses are offered on how rural-to-urban commuting may influence the countryside (see Partridge et al. 2010). One hypothesis is that rural-to-urban commuting is the first step toward rural decline – rural-to-urban commuting may be a temporary solution for individuals before moving to their urban place of work (Sandow and Westin 2010). A competing hypothesis is that rural-to-urban commuting fosters rural prosperity – for example, contributing to growth in population, employment and wages in the countryside (see Partridge et al. 2010).

Empirical studies from Canada find support that rural employment growth may be stimulated by rural-to-urban commuting (Partridge et al. 2010; Ali et al. 2011). This may occur either directly or indirectly. Directly, following from rural residents' additional incomes from commuting, this could be by strengthening local purchasing power and in enhancing rural tax revenues (cf. Shearmur and Motte 2009).[2] Indirectly, rural-to-urban commuters' higher urban wages may stimulate consumer demand for goods and services in the countryside (Shearmur and Motte 2009; Partridge et al. 2010). Eventually, new rural job opportunities may arise locally – not only new jobs in wage employment, following from firms hiring labor, but also jobs arising from opportunities of firm start-ups in the countryside.

In Partridge et al. (2010), spread effects from rural-to-urban commuting on rural employment growth were separated from those of rural–urban interdependencies more generally (expressed as distances to urban centers). A strong relationship is found between 1991 rural-to-urban commuting and subsequent 1991–2006 employment growth. Similarly, Moss et al. (2004) found a significant dependence on urban employment opportunities in rural areas in Ireland. These intensified interdependencies are attributed to a

[2] This is contingent on that income taxation partly occur at the commuters' residential municipalities – the taxation system in Sweden follows this convention.

declining agricultural sector. According to Moss et al. (2004), this has resulted in people seeking employment opportunities outside their residential area.

The literature review suggests that rural-to-urban commuting seems to be associated with spread effects on rural labor markets. Therefore, increasing commuting may constitute a viable tool to increase rural employment (see, for example, Partridge et al. 2010). However, it should be noted that most studies have been performed in Canada. In a study in Finland, Lehtonen et al. (2015) found that rural-to-urban commuting did not significantly contribute to the spread effects from urban growth to the countryside. However, Lehtonen et al. (2015) proposed that spread effects from urban growth are present in rural areas but that these are limited to places close to urban core areas. In their study, it was also indicated that spread effects are overshadowed by backwash effects after 30–40 kilometers (measured from the core of urban areas).

Turning attention to rural entrepreneurship and rural–urban interdependencies, a large body of literature exist that deals with rural entrepreneurship (for some examples, see Gladwin et al. 1989; Wortman Jr 1990; Goetz et al. 2010; Eliasson and Westlund 2013). An insight from previous research is that entrepreneurship is a driver of growth in both urban and rural areas (see Stephens and Partridge 2011; Rupasingha and Goetz 2013; Stephens et al. 2013). Firm start-ups are, however, expected to be higher in cities than in the countryside – largely explained by better supply and demand conditions of firm start-ups but also from the existence of agglomeration economies. Access to urban resources is argued to impact the spatial distribution of firm start-ups (cf. Bosma and Sternberg 2014). However, there are few studies that explicitly examine rural entrepreneurship and rural–urban interdependencies (see, for example, Stephens and Partridge 2011; Stephens et al. 2013 for exceptions).

A dimension of entrepreneurship that has often been studied in previous research is that of distinguishing between the opportunity and necessity motivations of entrepreneurs. By definition, opportunity entrepreneurs start firms on a more voluntary basis – for example, by identifying and exploiting a business opportunity. Necessity entrepreneurs, on the other hand, are defined as individuals who operate firms to fill a need, which could be to achieve autonomy, to earn an income or due to job dissatisfaction (Sarasvathy 2004; Giacomin et al. 2007). Making a distinction between firm start-ups based on necessity and opportunity motives is motivated by it seeming to be an important determinant in the performance of firms. For instance, previous studies suggest that firms created by necessity entrepreneurs contribute less to economic development than those started by opportunity entrepreneurs (see

Acs and Varga 2005). Also, necessity-based firms appear to create fewer jobs and survive for shorter times than opportunity-based firms (see, for example, Reynolds et al. 2002; Zali et al. 2013). Moreover, Stephens and Partridge (2011) show that larger shares of so-called opportunity entrepreneurs locally augment the positive effects from local entrepreneurship on growth.

The type of firm start-up seems to matter for the performance of economies. Previous studies have found that the type of firm start-up – whether started out of necessity or opportunity – is determined by local characteristics. Opportunity-based firm start-ups are more likely to occur in urban areas – the demand and supply are better there, for example, following from larger and more diversified consumer markets (cf. Bosma and Sternberg 2014). Necessity-based firm start-ups are expected in rural areas, and in places characterized by weak supply and demand conditions (cf. Bosma and Sternberg 2014). Reasonably, against this background, interdependencies with urban areas should be mirrored in the distribution of firm start-ups across space. This means that areas that can reach urban centers easily should have a distribution of firms similar to that in nearby cities. Also, as the degree of interdependencies decrease, firm start-ups are expected to be not only less numerous but also more necessity-based than opportunity-based.

Compelling and contradicting evidence exists of firms surviving longer in the countryside than in cities (Fritsch et al. 2006; Brixy and Grotz 2007; Plummer and Headd 2008). This goes against the expectation of new firms being necessity-based in the countryside while opportunity-based in cities (since previous studies show that necessity-based firms survive for shorter times than opportunity-based firms). Also, recent studies find that the same indicators of agglomeration economies increase the probability of firm start-ups in both rural and urban areas (see Artz et al. 2016). Taken together, this raises doubts whether agglomeration benefits, as argued in previous studies, determine the nature of firm start-ups when the opportunity–necessity distinction is used.

Research also suggests that agglomeration economies are only a small part of the story in explaining entrepreneurship. For example, in a study by Monchuk et al. (2009) it was shown that innovative firms, sometimes those that are very small, can be successful in remote areas that by definition lack (urbanization) agglomeration economies. In fact, Stephens and Partridge (2013) emphasize that it is the influx of entrepreneurs that matters in generating local economic growth. Tentatively, this raises the question of the relevance of separating entrepreneurs on the basis of necessity or opportunity motivations. Although previous studies have used the distinction with success (see, for

example, Acs and Varga 2005), concerns arise that this might just be an artificial definition, rather than a relevant dimension in explaining rural growth. Also, strengthening the concerns is that most entrepreneurs start firms out of mixed motivations – that is, when necessity and opportunity motivations are simultaneously present.

4.2 Positioning of the Papers into the Research Field

In the following section, the thesis's papers are positioned within the research field and existing gaps in the literature are discussed. The papers in the thesis are positioned into the research field in two blocks. The first block, comprising Papers 1 and 2, on rural-to-urban commuting, fits into the growing body of literature on rural–urban interdependencies. As commuting is one of the most obvious manifestations of rural–urban interdependencies, and perhaps the most important contributor in connecting places, increased knowledge about it is of vital importance – not least in formulating policies. The second block of papers (3 and 4) fits into the literature on rural–urban interdependencies and rural entrepreneurship.

Paper 1 examines 1990–2009 trends in the growth and significance of rural-to-urban (long-distance) commuting and examines who is and who becomes a rural-to-urban commuter in Sweden, but also the pathways into commuting (whether occurring owing to changes in residence or changes in places of work). Rural-to-urban commuters are compared with two reference groups in the paper – (i) rural residents and commuters' (ii) working colleagues in urban municipalities. Paper 1 seeks to better understand rural-to-urban commuters and what characterizes them, but also what makes these individuals different from other parts of the labor force (in the countryside and in the city). There is related literature that examines questions similar to those raised in Paper 1. Swedish contributions to that body of literature comprise studies by Öhman and Lindgren (2003), Sandow (2008) and Sandow and Westin (2010), to mention a few. Öhman and Lindgren (2003) study who are long-distance commuters – however, their focus is on long-distance commuters in general, not to rural-to-urban commuters. Sandow (2008) studies individuals' propensity to commute longer distances – her study is a case study of sparsely populated areas in northern Sweden. Sandow and Westin (2010) examine the

duration of long-distance commuting. None of these studies focuses solely on rural-to-urban commuting flows, which are those of interest in this thesis.

In Paper 1, rural-to-urban commuters are defined as individuals who live in a rural residence at least 100 kilometers away from their urban place of work (defined as the three metropolitans in Sweden – Stockholm, Malmö and Gothenburg). Defining commuters based on significant distances between rural home and urban work is believed to capture the 'marginal' commuter. Basically, commuters who travel 100 kilometers to work in metropolitan areas are likely willing to travel over shorter distances, while the opposite is not necessarily true. Paper 1 is limited to rural-to-urban commuters as individuals, while little information is provided on the economic influence from rural-to-urban commuting on rural areas.

Paper 2 is about how and when rural-to-urban commuting influences rural employment growth. Previous research, admittedly to a large extent limited to Canada and the US, documents that rural-to-urban commuting could be a way for rural regions to maintain and secure population and employment opportunities (and, indirectly, maintain local wages). Rural-to-urban commuting is often defined broadly in these studies – as net commuting flows instead of real rates of 'rural out-commuting' – but are also treated as a homogenous group of people. However, there are reasons to believe that economies are influenced differently by different types of commuting. For several reasons, and as argued in Paper 2, an important aspect to consider is individuals' education levels. Previous research identifies that these not only determine traveling times to work but also the wage compensation of commuting (Johansson et al. 2002; Rietveld and Van Woudenberg 2003; Johansson et al. 2003; Mulalic et al. 2013). Generally, higher-educated commuters are willing to travel longer distances to work, but also experience more pronounced wage compensation from commuting (and from benefits of agglomeration more generally), than individuals with less education (see, for example, Wheeler 2001; Glaeser and Resseger 2010).

The fact that higher-educated individuals earn higher wages, and that they are willing to travel longer distances to work than less-educated commuters, should reasonably have an impact on how rural-to-urban commuting influences rural labor markets. First, local rural demand may be stimulated more from higher-educated commuters (owing to their higher wages, not only in general but also from the wage compensation of commuting). They have the potential to spend more locally and, as individuals spend, local firms respond by hiring labor. Therefore, in Paper 2, it is hypothesized that positive effects on rural employment growth are augmented by commuting of higher-educated

individuals. This effect should be visible in local services and retail sectors (as proposed in Partridge et al. 2010). Second, and as theorized in Paper 2, potential effects on rural employment growth may stretch over longer distances for commuters with higher education levels. This hypothesis is based on the fact that higher-educated people are willing to take longer commutes to work than commuters with less education.

Paper 2 offers a number of contributions to the literature on rural–urban employment interdependencies. First, commuters are separated by their levels of education. As previously discussed, there are convincing arguments that education is an important determinant in the relationship between commuting and rural employment growth. Second, rural employment growth is divided into tradeables (manufacturing and agriculture) and non-tradeables (services and retail). In Partridge et al. (2010), it is argued that employment growth in service and retail firms may benefit from commuting. However, in that paper, no sectoral distinction is made. In fact, few previous studies examine the relationships between rural–urban interdependencies and employment growth by sector (see Schmitt et al. 2006 for an exception). There is likely a difference in how different sectors are influenced by commuting. For example, heavy manufacturing firms whose goods are exported to international markets are likely not influenced by commuting to the same extent as firms providing services to local consumer markets. Third, urban spillovers from rural-to-urban commuting on local employment growth is separated from spillovers from to distance to urban centers (as an overall expression for rural–urban interdependencies). Previous studies seldom make this distinction (for an exception, see Partridge et al. 2010). Fourth, the rural–urban hierarchy is accounted for – the effects of distance to cities of different sizes (interdependencies) on rural employment growth are considered (following previous work; see Partridge et al. 2010). Fifth, few studies exist in the European context on this topic.

In the second block of papers, that is, Papers 3 and 4, focus shifts from rural-to-urban commuting and rural employment growth to rural entrepreneurship in terms of new firm start-ups. Paper 3 provides a full record of new firm start-ups in Sweden during 2008–2012. Firm start-ups are divided into two dimensions: by firm type (of which one is self-employment, studied explicitly in Paper 4) and by sector. The distribution of firm start-ups over the entire rural–urban hierarchy is examined – all 290 municipalities in Sweden – covering areas from ‘the most urban’ to ‘the most rural’ using the rural–urban definition from the Swedish Board of Agriculture. Paper 3 is mainly a descriptive paper and constitutes a useful background for Paper 4. However, a

handful of insights that are useful in the making of Paper 4 are provided in the study. Some of these insights involve the assessment of the sorting of firms and individuals to urban regions – these aspects are highly relevant for, and intricately connected to, the type of firm start-up that occurs locally – not least on the necessity–opportunity distinction discussed in the previous literature review.

Paper 4 focuses on how distance to urban centers, and therefore the degree of rural–urban interdependencies, influences rural firm start-ups. A large body of literature exists on entrepreneurship in general – both urban and rural – where entrepreneurship is identified as a key factor of economic growth (see Davidsson et al. 1994; Acs and Varga 2005; Andersson and Noseleit 2011). In Paper 4, firm start-ups are self-employment separated out by whether the motivation for the start-up is on the basis of necessity or opportunity. Previous studies have examined the necessity–opportunity distinction before (Acs and Varga 2005 for countries; Bosma and Sternberg 2014 for the regional level) and this is not a novelty in itself. The novelty lies in the fact that Paper 4 is, as far is known, unique in the sense of providing a full examination of regional patterns of necessity- and opportunity-based firm start-ups within one country – and also over a fairly long period of time (2004–2012). Another aspect, not treated in previous studies, is the examination of distance to urban centers when analyzing entrepreneurship based on necessity and opportunity motivations. However, in a few cases, distance has been used before as a measure of interdependencies in studies on entrepreneurship (see, for example, Stephens and Partridge 2011; Stephens et al. 2013; Tsvetkova et al. 2016).

Several suppositions underlie Paper 4 – many of these with reference to studies on rural–urban interdependencies but some also come from studies with a focus on regional entrepreneurship and on agglomeration economies. In Paper 4, it is assumed that the influence from rural–urban interdependencies on rural firm start-ups is a function of distance – mainly with reference to previous studies showing such a relationship between distance to urban centers and local population, employment and wages in rural areas. The same relationship is assumed to be true for entrepreneurship: areas close to cities are assumed to show not only similar characteristics in the distribution of firm start-ups as cities but also, as distance to urban centers increases, that the effect of urban adjacency attenuates irrespective of whether the influence is positive or negative. Largely, this assumption follows from the fact that agglomeration economies attenuate with distance, but also that accessing urban supply and demand becomes increasingly difficult with larger distances between places.

In a similar way to Paper 2, gaps in the literature can be identified using combinations of knowledge from other studies, not necessarily limited to research only on entrepreneurship but much inspired by the work of Bosma and Sternberg (2014). Often, firm start-ups are expected to be higher in urban regions. Reasonably, remoteness to cities can be expected to be harmful to rural firm formation. However, this is not necessarily true, for reasons found in other studies – for example, Artz et al. (2016) find that agglomeration benefits exist in both urban and rural regions. Moreover, there is a chance that rural areas may be protected by distance (see, Krugman 1991; Partridge et al. 2009). To a large extent, urban competition in local consumer markets decreases with large distances between places. In fact, difficulty in reaching cities may benefit local firm start-up rates in the countryside. However, exceptions exist when rural firms cannot be protected by distance. In Section 3.2, the example was provided of banking: most transactions can be performed online nowadays and rural firms cannot be protected from increased Internet usage.

Recall that necessity- and opportunity-based firms seem to perform differently in many crucial aspects of economic growth – for example, in survival rates and the generation of long-term employment opportunities. The literature review showed that necessity-based firm start-ups are assumed in places with poor supply and demand for entrepreneurship, but also in places lacking agglomeration economies. Mainly, but not necessarily, this characterizes parts of the countryside. On the other hand, opportunity-based firm start-ups rely largely on urban resources – this should be visible in the start-up rates of opportunity-based firms. For example, owing to their strong dependence on opportunities found on urban consumer markets – such as a large and heterogeneous demand, it is hypothesized that opportunity-based entrepreneurship is harmed by increased remoteness from urban centers. Unarguably, empirical contradictions exist, which calls for research on these questions. Firm start-ups in the countryside are expected to have particular characteristics, like lower survival rates. This is however not always the case as raised previously – several studies observe that, for example, survival rates of rural firms are higher than in the countryside (see Fritsch et al. 2006; Brixy and Grotz 2007). Undeniably, this warrants further investigation.

Previous studies on rural–urban interdependencies indicate a significant spatial heterogeneity in most relationships across space (see Barkley 1995; Partridge et al. 2007b). A geographically weighted regression (GWR) model is used in Paper 4, to get an idea of the distribution of the net effects from distance to urban centers on necessity- and opportunity-based firm start-ups. Therefore, a statement is possible on the heterogeneity in the relationship

between distance to urban centers and rural firm start-up rates across space. This has not been done in this context before. However, as noted previously, studies exist where the effects of accessibility to resources on firm start-ups are examined (see, for example, Grek et al. 2011 for the Swedish context). Accessibility measures that have been used in previous studies are not appropriate to use in Paper 4. There are two reasons for this. First, these measures concerns accessibility to resources in total – whether found in rural or urban areas. In this thesis, and in Paper 4, focus is on accessibility to urban resources. Second, accessibility measures are constructed using wage sums at different geographical scales. One implication is that endogeneity issues may arise. To some extent, wages are explained by the performance of the labor market (where firm start-ups comprise one important aspect). The accessibility measure could be merely a reflection of the labor market. Also, accessibility measures are difficult to interpret; for example, an intuitive interpretation associated with a unit increase in accessibility is difficult to assess.

4.3 Brief Comments on Theories and Concepts

Chapter 4 closes with a discussion on the theoretical underpinnings used in the papers. Indeed, focus is on rural–urban interdependencies – emphasized more explicitly in this introductory text than in the attached papers. By and large, following from convention and from recent studies (for a pertinent example, see Partridge et al. 2007a), a framework of spread and backwash effects was partly used when producing the papers. Furthermore, inspiration was drawn from Irwin et al. (2009) and Dawkins (2003). Several theories are raised in Gaile (1980), Dawkins (2003) and Irwin et al. (2009) and from previous work of rural–urban interdependencies (see, for example, Ali et al. 2011; Barkley et al. 1996; Partridge et al. 2007a). In general, the literature stretches across research fields and in its applications – obvious relationships exist between most theories underlying the research but there are also contradictions in how theories relate to each other. In this thesis, spatial growth models are used, comprising a combination of theories in location theory (like Christaller 1933 and Lösch 1954) and growth and development theories (for example, Perroux 1955, Myrdal 1957, Hirschman 1958).

An essential theory for this thesis is that of central place theory (CPT), advanced by Christaller (1933) and Lösch (1954). In CPT, cities are ordered from the smallest to the largest in urban hierarchy. Places are divided into tiers,

based on the provision of goods and services to their surroundings. The idea in CPT is that goods and services provided in a higher tier are not provided in lower-tier places. Basically, the diversity of goods and services offered in a central place determines that place's position in the urban hierarchy. The main criticism of CPT is that it is static and needs aid from other theories to become more dynamic; for example, development in central places cannot be explained by CPT. Lösch's (1954) contribution to CPT was to introduce transportation costs and scale economies as determinants of firms' relative market sizes.

Perroux (1955), Myrdal (1957) and Hirschman (1958) contributed to making CPT more dynamic – mainly by explaining growth and development from central places and how new central places may occur (Irwin et al. 2009). As briefly discussed in Section 3.1, Perroux's (1955) growth pole theory (GPT) championed the role of so-called propulsive industries in core places – these industries are found in certain growth poles and have backward linkages with industries in peripheral places. The idea of GPT is that expanding propulsive firms in core places could induce growth in the periphery – for example, (peripheral) firms (as input suppliers) may increase production as a response to demand for supply from propulsive firms in the core. Perroux (1955) partly explains increased production in growth poles using arguments related to Schumpeter's ideas of innovation, knowledge diffusion and innovative entrepreneurs (Dawkins 2003; Tekeli 1976). For example, increased productivity of firms in propulsive industries may follow from innovative activities.

Perroux's (1955) work on GPT considered the economic space rather than the geographical space, which makes this theory somewhat different from Myrdal's (1957) and Hirschman's (1958), where population movements are taken into account when examining spatial development patterns. Myrdal (1957) introduced the concepts of spread and backwash to the literature – a notion on core–periphery relationships.[3] The corresponding terms in the work of Hirschman (1958) are trickle-down effects and polarization. Spread effects correspond to the situation where the periphery experiences positive growth from core-led demand – for example, from firms demanding raw materials or individuals and households demanding agricultural products for consumption. Ultimately, peripheries eventually become self-sustaining, with the potential to diffuse core growth further. Backwash effects constitute negative effects

[3] Core–periphery is the terminology used in this thesis – a variety of different notations exist in the literature – for example, center–periphery or core–hinterland. In this context, Perroux's (1955) growth pole theory corresponds to core places in other theories using this terminology.

following from core growth, for example when people in peripheral areas are attracted to the core or when investment intended for the periphery is geared toward the core.

As stated above, Perroux (1955), Myrdal (1957) and Hirschman (1958) made CPT more dynamic – similarly, CPT contributed to these works by providing a theory for how to locate, and order, cores that have the potential to transfer growth to their surrounding peripheries. The growth and development theories of Perroux (1955), Myrdal (1956) and Hirschman (1958) marked a beginning of investment in core (urban) places to induce urban-led growth in the periphery (rural areas). A debate took place on which core places should be targeted by stimulating growth that could transmit to peripheral areas (see Berry 1970; Hansen 1970). Several population thresholds were suggested in the studies of Berry (1970) and Hansen (1970) but without any consensus on the places that are best targeted by policies stimulating core growth.

As discussed previously, research on rural–urban interdependencies waned during the 1980s. Irwin et al. (2009) mention the lack of appropriate tools for analysis, the population turnaround in the 1970s, where urban population declined in favor of the countryside, and also, as mentioned previously, weak and limited growth in urban surroundings (see, Gaile 1980 for an overview). Added to this, theories central at the time in explaining spatial development processes were subjected to criticism on several grounds. One criticism of GPT is that modern industries are based on human capital rather than on physical input–output flows (see, for example, Higgins 1983). Consequently, core growth may not stimulate growth in noncore areas as proposed by GPT – at least, not through input–output relationships between firms. In addition, Perroux (1955) received criticism for not considering geographical space and treating relationships as nonsymmetric and unidirectional. Perroux (1955) essentially viewed space as an economic space of firms involving relationships between firms. Boudeville (1966) attempted to ‘correct’ this by adding the geographic context. A chief assumption in Perroux (1955) was that two places could not be growth poles for each other. This was relaxed with the work of Boudeville (1966). Criticism was however directed toward Boudeville’s (1966) spatialization of GPT with doubts on the theoretical rigidity in attributing the characteristics of a growth pole, based on input–output relationships between firms, to a geographical location.

The works of Myrdal (1957) and Hirschman (1958) also received criticism to a varying extent. In Myrdal (1956), spread and backwash effects appear to be preexisting and reinforcing at the same time – spread effects foster further spread while backwash effects feed further backwash. This means that core

regions will keep their dominant position while lagging regions remain lagging. Basically, what Myrdal (1957) argues is that spatial inequalities are persistent. Even though this is fairly consistent with reality, exceptions exist and this is one criticism raised in the literature. Sometimes it is argued that Myrdal (1956) is built on the supposition of 'accidental factors' as factors initiating growth. That is, the theory fails to explain why growth begins in certain places and why these places become core. According to some opponents of Myrdal's work, agglomerating forces do not necessarily increase spatial inequalities between places – as argued in Myrdal (1956).

Hirschman (1958) rejected Myrdal's (1957) approach of cumulative causation. Primarily, Hirschman (1958) argued that spread (trickle-down) effects will eventually outweigh the negative impacts of backwash effects (polarization). This is the major difference between their views on core–periphery developments – and is also the reason why Myrdal (1957) and Hirschman (1958) may be viewed as opposing works. Hirschman (1958) emphasized the need for unbalanced growth – there is a chance that this evens out sooner or later. Hirschman (1958) argued that imbalances generate growth in economic systems – critics argue that no optimum degree of imbalance is provided by Hirschman (1958). Also, the same critics argue that there is a lack of fundamental resources in peripheral places, which may hamper their possibilities to catch up with core places.

The new economic geography (NEG) of Krugman (1991) achieved much attention in the 1990s. One of Krugman's (1991) important contributions was the finding that two initially similar economic regions develop differently if one has a comparative advantage over the other, for example in terms of production costs (Schmutzler 1999). Krugman (1991) analytically shows that the initially advantaged region develops to a core region, while the region that lacks cost advantages becomes peripheral. This knowledge is particularly useful in developments of how to analyze spatial relationships. Many theories after Krugman (1991) utilize these insights when developing new models and approaches of analyzing spatial relationships. Altogether, the review of theories in this chapter reflects that studies on rural–urban interdependencies apply several works in underpinning research efforts. Many of these are related in several ways – but most often not in very obvious ways. Indeed, other bodies of literature deserve to be mentioned – even though their relevance today (at least in Western countries) is limited, for example export-based models (North 1955), Friedmann's (1966) core–periphery theory, sector theory and stage theory (Rostow 1977). These theories often describe the temporal aspects of development – focusing on different stages in this process. By and large, Western countries have been through these stages, which makes these theories outdated.

5 Research Design: Data and Method

5.1 Data Material

In this thesis, a quantitative approach is adopted using detailed microdata from Statistics Sweden (SCB). The data cover all individuals (above age 15) and firms during the time period 1985–2012. Detailed information is available on the education levels of individuals, their job characteristics, how much they earn and where they live and work, while, for firms, data exist on, for example, industry belonging (SIC codes), reasons for entry and exit, and their employees. The data from SCB is complemented with information from other sources – such as from the Swedish Public Employment Services (in Swedish: Arbetsförmedlingen) – and with information on distances between municipalities, in minutes and kilometers (see, for example, Niedomysl et al. 2017).

Most factors in society are not possible to control for in analysis, and, as was discussed in Chapter 2, what is considered ideal conceptually is often not practical for research. Simplifications are necessary to make data accessible and, when it comes to making definitions and constructing variables for analysis, significant freedom and flexibility follow from the large amount of detailed data that SCB offers. This is perhaps most apparent in the papers in this thesis on entrepreneurship and firm start-ups. In Paper 3, using data on firms' SIC codes, new firms are separated into eight broader industrial categories as defined by Eurostat (2012). Firm start-ups are also separated into four broader types: self-employed, spin-offs, new firms by previously unemployed persons, and other new firms. In Paper 4, a distinction is made between necessity- and opportunity-based firm start-ups. Altogether, making these distinctions is possible since data exist on firms' organization numbers and labor force characteristics within firms, but also on the characteristics of individuals, for example on their previous labor force participation status.

Beyond offering many possibilities to define and construct variables, various types of robustness tests can be conducted.

5.2 A Hierarchical Order of the Geography and Application of Distance Measures

Chapter 2 offered an explanation of how Swedish municipalities are classified into rural and urban using a definition from the Swedish Board of Agriculture (SBA). However, the definition from SBA was devoted little discussion. In that definition, four types of geographical areas are distinguished; *metropolitan regions*, *city regions*, *rural regions* and *remote rural regions*. Metropolitan regions are areas where the entire population lives in an agglomeration; these are municipalities in the areas of Stockholm, Malmö and Gothenburg. Besides being located in an agglomeration (based on estimated commuting radiuses; see SBA 2013 for further reference), metropolitan-classified municipalities must have at least 10,000 inhabitants. City regions are municipalities with at least 30,000 residents and/or municipalities with an urban area of at least 25,000 individuals. Neighboring municipalities may also be considered city regions if least 50 percent of the labor force out-commute there. Concerning the countryside, two types of rural areas are distinguished. Rural regions comprise municipalities that do not belong to regions defined as metropolitan or city; these have population densities of at least five inhabitants per square kilometer. Remote rural regions are a residual post created once the other regions been defined.

An advantage of using the definition of SBA is that it is partly based on population flows, such as commuting, which may reduce the extent of spatial autocorrelation in the data. At the same time, functional patterns of how people actually move across space are considered. However, commuting is a fairly limited phenomenon, and these potential advantages should not be exaggerated. SBA provides a fairly broad categorization of municipalities, which was an advantage when producing the papers in this thesis; further categorization would likely provide little value but rather increase the complexity. The definition from SBA is however not without criticism. Municipalities within each category are likely fairly heterogeneous – not least following from where in Sweden they are located; for example, municipalities in southern Sweden are likely to have better access to cities and metropolitan areas, and more destinations.

Constructing the Rural–Urban Hierarchy

In Paper 1, rural residents refer to individuals in municipalities classified as rural regions, or remote rural regions, as defined by SBA, while an urban workplace refers to jobs found in metropolitan regions (called urban municipalities in Paper 1). In the more descriptive paper (3), municipalities are grouped as suggested in the definition of SBA, without any modifications. However, in Papers 2 and 4, rural and urban municipalities are hierarchically ordered. In these papers, there is an explicit focus on how urban centers, of different population sizes, impact employment growth and firm start-ups in the countryside.

Two broader categories of rural and urban municipalities (197 rural and 93 urban) are identified as a first step in constructing a hierarchical system of Swedish municipalities. Rural municipalities are identified by grouping rural regions and remote rural regions, as defined by SBA. Similarly, urban municipalities are identified by grouping metropolitan regions and city regions together. A continuous view of the countryside, with urban centers as points of reference, are achieved by adding information on rural municipalities' distances to urban centers. Stated differently, rural municipalities are assessed on their degree of interdependencies with urban centers. The distances, which are discussed more in detail in the next chapter, are measured from municipalities' population centroids – also referred to as mean centers or centers of gravity in a municipality.

Both pros and cons follow from measuring distances between population centroids. As a strength, it could be argued that average distances, for an average individual or firm, are captured with this practice of measurement. However, municipalities in Sweden differ considerably in land area, which raises concerns about the accuracy, and consistency, in comparisons between municipalities. The smallest municipality in Sweden (Sundbyberg) is roughly nine square kilometers in area and hosted 47,000 residents in 2015. The largest Swedish municipality (Kiruna) is about 20,000 square kilometers in size, with a population size of 23,000 residents according to data from the same year. The 'measurement error' between individuals' actual place of residence and the population centroid in a municipality is (likely) much larger in Kiruna than in Sundbyberg. This follows from fewer individuals residing in a larger geographical area in Kiruna.

As was touched upon briefly in Chapter 2, urban centers of different sizes are identified to allow 'size effects' on their surroundings. The theoretical underpinnings follow that of central place theory (CPT) by Christaller (1933) and Lösch (1954). CPT was initially developed to describe locational patterns

of cities, while, in this thesis, and in previous studies, the theoretical foundations are applied to identify urban centers. Municipalities are ordered into different layers of the hierarchy and, following from CPT, it is assumed that the most diverse goods and services are provided in municipalities in the highest tier of the hierarchy. Some of these goods and services cannot be found in urban centers found in lower tiers. Following from agglomeration theory, a greater diversity of goods and services follows with the size of urban centers. This also implies that diversity in jobs, consumer preferences and market demand increases with urban scale. Consequently, larger urban centers generate stronger agglomeration benefits than smaller urban centers, and are expected to exert a stronger impact on their surroundings.

How urban centers are defined depends largely on the context. In Chapter 2, an example illustrated that what counts as an urban center, assessed in terms of spillovers to its surroundings, may differ depending on what type of interdependencies are studied. In Paper 2, on rural–urban employment interdependencies, two types of urban centers are distinguished – small and large urban centers. Small urban centers are defined as municipalities, classified as urban, with population sizes within the range of 50,000–250,000 residents. Large urban centers comprise municipalities with at least 250,000 inhabitants. There are two reasons why municipalities, which are defined as urban, with less than 50,000 individuals are not considered urban centers in Paper 2. First, these are municipalities that to a large extent are defined as urban owing to a high dependency on urban employment. This means that there are relatively few local jobs and, for this reason, the countryside expects few employment interdependencies with these places. Second, municipalities classified as urban based on out-commuting flows may be relatively similar to large rural municipalities, for example in population size and also in that advanced occupations are most likely not found here. However, in Paper 4, where rural firm start-ups are examined, these municipalities are considered urban centers. The main reason follows from the fact that firm start-ups may benefit from larger populations and municipalities with populations of 30,000–50,000 individuals may constitute important consumer markets that could encourage rural firm start-ups.

The population cut-offs that separate urban centers from each other were chosen based on the type of interdependency that is studied but also following previous definitions of urban areas in Sweden. Population size is only one factor that may be considered when defining urban centers and, when it comes to previous geographical definitions of municipalities, various population cut-off points have been used. In Statistics Sweden, and in the recent definition of

SALAR (2017), cut-off points of 200,000 and 50,000 individuals are used when separating municipalities into different groupings of urban centers. Based on the population figures used in the papers, a cut-off at 200,000 instead of 250,000 would make no difference. By and large, following from that no municipalities enter the category of large urban centers (or similarly leave the category of medium-sized urban centers) by changing the population cut-off. However, based on population figures in 2017, the municipality of Uppsala would enter the group of large urban centers (since the population is currently above 200,000). However, and noted somewhat as an aside, this would likely make little difference, primarily since Uppsala and Stockholm are closely located to each other.

However, a more complex urban hierarchy could be achieved by considering additional factors; for example, SALAR (2017) considers local industry structures, commuting patterns and population size of urban areas within municipalities. However, this is believed to add little value to the analysis in the papers, largely following from an increasing complexity, although, in the making of Paper 3, contributions would likely follow by using the more detailed definition of SALAR (2017). The finer categorization in SALAR (2017), compared to that from SBA that was used, would likely make a better job in distinguishing municipalities with respect to their surroundings.

Different Applications and Measures of Distance

Distance to urban centers is a measure of rural–urban interdependencies and is of central importance in this thesis. As discussed in Section 3.1, distance can be interpreted and measured in a variety of ways. Scheurer and Curtis (2010) provide an excellent overview about views and measurements of distance. A conclusion in their work is that no one-size-fits-all measure exists that is perfect for any given situation, but instead how to measure distance is highly context-dependent. This thesis employs so-called *spatial separation measures*. Spatial separation measures are infrastructure-based and measure the travel impediment and the resistance between (in this thesis) the countryside and cities (Scheurer and Curtis 2010). There are several motivations for using spatial separation measures in this thesis. A first motivation is the established use of separation measures in similar studies (Partridge et al. 2008a, 2008b, 2009; Ali et al. 2011). A second argument is that distance, measured from origin to destination, provides intuitive interpretations. This may facilitate the formulation of policies, for example when compared to an alternative of using an index of accessibility to urban regions, when little information of real use is provided.

In the thesis, distance to urban centers is sometimes measured as Euclidean distances between rural municipalities' population centroids and the population centroid of the nearest urban center. From the data, it cannot be inferred what mode of transportation people use or how often trips are taken, that is, whether it is daily, weekly or perhaps a couple of days in a working week. Euclidean distances are used in Paper 1 and Paper 2. However, when time aspects matter, a distance measure that accounts for driving times is used – for example, by considering traffic congestion and speed limits. A time-distance measure is used in Paper 2, where commuting over shorter distances is examined and the time aspect increases in importance. In practice, whether using Euclidean distances or driving times makes little difference since these measures are highly correlated.

To capture nonlinear relationships in distance, a weighting scheme is constructed. This is mainly useful when considering impacts from municipalities' surroundings. In the regression framework, the weighting matrix is constructed as

$$W(\mathbf{u})_{rc} = \begin{bmatrix} w_{11} & \cdots & w_{1c} \\ \vdots & \ddots & \vdots \\ w_{r1} & \cdots & w_{rc} \end{bmatrix}$$

where each element in $W(\mathbf{u})_{rc}$ $w_{rc} = 1/distance_{rc}^2$ and the subscript rc indicates the distance between place r and c (in total a 290*290 matrix). The squared distance between r and c is used in the denominator to impose a distance decay. A threshold is set on distance – in this study set to 45 minutes, as found in some studies (see Johansson et al. 2002, 2003) – after this limit, effects from, for example, commuting vanishes. A pertinent example refers to Paper 2, where spatial lags are included in the analysis. For example, using the weighting scheme above makes the impact from surrounding municipalities decline the further away they are located.

5.3 Estimation Techniques

The analyses in the papers in this thesis are conducted using ordinary least squares (OLS) models with and without spatial lags, two-stage least squares IV-estimator, probability models (logit) and geographically weighted regression models (GWR).

Ordinary Least Squares (OLS)

The principle in OLS is that a dependent variable, that is, the one that needs to be explained is regressed on some independent variables. The independent variables are also referred to as explanatory factors. As an example, in Paper 4, the firm start-up rate is explained by distance variables and local factors that potentially explain the variation in firm start-ups across regions. The general form of an OLS is

$$y_i = \alpha + \sum_{k=1,m} \beta_k x_{ik} + \varepsilon_i \quad (1)$$

where y_i is the dependent variables and α is the intercept term. The subscript *i* refers to the unit of analysis (municipalities in this thesis). β_k is the parameter estimate for the *k*th independent variable, while x_{ik} is the *i*th observation of the *k*th independent variable. ε_i represents the error term. The error term contains all unexplained variations and is assumed to follow a normal distribution $N(0, \sigma)$.

There is a risk of spatial dependence in data that might cause over- or underestimation of the parameter estimates (Fotheringham 2002). Spatial lags are therefore when necessary added to OLS models (in this thesis) to mitigate potential bias from spatially dependent observations. An empirical example of spatial dependence (in Paper 2) is when employment growth in a municipality is influenced by surrounding labor markets. In that case, a series of spatial lags is added to the model ($\sum_{i=1,g} \theta_i \mathbf{W}\text{SPATIAL LAGS}_i$), where θ_i is the parameter estimate of spatial lag *i*. In Paper 2, where spatial lags are added to the regression model, **W** is the weighting matrix that is used to impose a declining impact from surrounding observations.

Instrumental Variable Estimation – the Two-Stage Least Squares (2SLS) Estimator

A problem when using regression techniques is the issue of distinguishing between causality and correlation. OLS measures the correlation between the dependent variable and the independent variable. More often than not, it is not plausible to determine direction of causality – that is, whether Y explains X or if it is the reverse. Often, it is only feasible to assume that a relationship occurs in a certain order; for example, event A causes event B, where the other order is illogical. However, to make causal interpretations and mitigate so-called endogeneity issues, an instrumental variable approach is used (cf. Paper 2). Endogeneity issues occur when one or more of the explanatory variables are

correlated with the error term. Three common endogeneity issues are reverse causality, simultaneity and omitted variable bias.

Some empirical examples best describe the different types of endogeneity issues. Reverse causality means that the order of influence between Y and X cannot be established. For example, in Paper 2, does rural employment growth cause rural-to-urban commuting or is it the other way around? In that paper, an instrument is needed to establish the effect (and the direction) of rural-to-urban commuting on local employment growth. However, finding usable instruments is a difficult task. When solving the reverse causality issues an instrument, often denoted Z, is used. To be useful, the instrument needs to be highly correlated with rural-to-urban commuting (the endogenous explanatory variable) but only have an indirect impact on employment growth (through its impact on commuting). Paper 2 employs a Bartik-inspired instrument (see Paper 2 for further information).

The second type of endogeneity is simultaneity bias. One type of simultaneity bias, again related to Paper 2, is when rural-to-urban commuting and local employment growth are jointly determined. Basically, a change in one of the factor induces a change in the other. An example in Paper 2 is when rural-to-urban commuting causes local demand for goods and services, which induces firms to employ labor (causing employment growth). These jobs are partly taken by rural residents who were previously commuting to urban places of work. Since both factors shift, the effect of commuting on employment growth is underestimated in that specific case. Because rural-to-urban commuting is a function of employment growth, and vice versa, simultaneity arises. An instrument for, in this case, rural-to-urban commuting, breaks that link and mitigates the simultaneity.

Omitted variable bias occurs when a key variable is missing in the model specification. This implies that the effect of the omitted variable is added to one or more of the other parameter estimates in the model or ends up in the error term. In worst case, the bias is that severe that it turns the sign of the parameter estimates that is exposed into the omitted variable. Omitted variables are difficult to find/identify and/or to measure. Whether the bias is small or large is difficult to assess. Inclusion of control variables is (almost always) necessary to avoid omitted variable bias.

The IV approach is often implemented using a two-stage least squares (2SLS) estimator. As the name suggests, two regression models are fitted. Given the OLS-equation

$$Y = \beta_0 + \beta_1 X_1 + \sum_{i=2,l} \beta_i X_i + \varepsilon$$

where X_1 is an endogenous variable that is instrumented by Z_1, the first stage is expressed as

$$\widehat{X}_1 = \gamma_0 + \gamma_1 Z_1 + \sum_{i=2,l} \gamma_i X_i + \omega \qquad (2a)$$

and the second stage as

$$Y = \beta_0 + \beta_1 \widehat{X}_1 + \sum_{i=2,l} \beta_i X_i + \tau \qquad (2b)$$

where Y is the dependent variable, $\widehat{X}_1$ is the instrumented (previously endogenous) regressor and the $X_{1\ldots l}$ are other l independent variables. τ is a composite error term that is uncorrelated with the other explanatory variables and $X_{i\ldots m}$ and with $\widehat{X}_1$, that is, uncorrelated with the fitted values from the first stage (equation 2a). β_1 is the parameter estimate of the instrumented (and formerly endogenous) variable $\widehat{X}_1$.

Probability Models

The family of probability models, for example probit, tobit and logit models, gives information on the probability of an event to occur given a change in one or more explanatory variable(s). Questions such as 'does age increase the likelihood of becoming a commuter' or 'does higher education induce firm start-ups?' can be answered. The dependent variable, also called a response variable, is binary (0/1) in probability models. A logit model is used in this thesis (Paper 1) to estimate the probability of an event (related to the dependent variable) based on a set of explanatory variables. The logit model is used in Paper 1 in this thesis and is expressed as

$$\log \frac{Prob(Y)}{1-Prob(Y)} = \alpha + \sum_{k=1,m} \beta_k x_{ik} + \varepsilon_i \qquad (3a)$$

where α, β_k and x_{ik} have the same denotion as in the OLS model. The error terms are assumed to be normally distributed as well, following $N(0, \sigma)$. *Prob(Y)* is the probability for event Y to occur and, to attain the relationship between *Prob(Y)* and the independent variables (x_{ik}), expression (2) can be rewritten as

$$Prob(Y) = \frac{e^{\alpha+\sum_{k=1,m} \beta_k x_{ik}+\varepsilon_i}}{1+e^{\alpha+\sum_{k=1,m} \beta_k x_{ik}+\varepsilon_i}} \qquad (3b)$$

Equation 3b is the predicted probability of event Y given a change in the explanatory variable(s). Odds ratios, such as the ones used in Paper 1, are obtained by taking the exponent of expression 3b.

Geographically Weighted Regression (GWR)

The advantage with a geographically weighted regression model (GWR) is that the effects from the explanatory variables are permitted to differ across space (Fotheringham 2002). This is a reasonable assumption in many cases and cannot be captured by a traditional OLS model (since it is based on deviations from the 'grand' average of the entire data material). For example, unemployment may have effects on self-employment in remote rural regions that are different from those it has in rural regions located close to cities (see Paper 4 for further discussion). The coefficients from the GWR can be plotted to visualize how the effects of the explanatory variables differs across space. The GWR is expressed as

$$y(\mathbf{u})_i = \alpha(\mathbf{u})_{i0} + \sum_{k=1,m} \beta(\mathbf{u})_{ik} x_{ik} + \varepsilon_i \quad (4)$$

where $y(\mathbf{u})_i$ is the dependent variables, while $\alpha(\mathbf{u})_{i0}$ is the intercept terms. $\mathbf{u}$ represents the sample of observations used in each local regression for municipality *i*. $\beta(\mathbf{u})_{ik}$ corresponds to the parameter estimate for the *k*th explanatory factor and x_{ik} is the *i*th observation of the *k*th independent variable. This reminds us much of the OLS model but with the major difference that the GWR provides n# of coefficients based on n# different subsamples ($\mathbf{u}$). The different subsamples can be chosen using a variety of methods. In this thesis, a bandwidth selection method is used that is based on an adaptive scheme. This adaptive approach dynamically adjusts the bandwidth for each GWR run based on the characteristics of the data. The sample that provides the smallest root mean squared error (RMSE) is chosen for each GWR run. The distribution of the geographical weighting function is the normal distribution.

6 Conclusions

6.1 Summary of the Papers

Paper 1 – Andersson, M., Lavesson, N. and Niedomysl, T. (2017). Rural to urban long-distance commuting in Sweden: trends, characteristics and pathways (*submitted*) – is an extensive examination of rural-to-urban long-distance commuting in Sweden during 1990–2009. The paper examines 'who is' and 'who becomes' a rural-to-urban commuter but also the pathways that individuals take into commuting, that is, whether long-distance commuting follows from a change of residence or a change of workplace. The paper shows that the proportion of rural-to-urban commuting as a share of all long-distance commuting increased only three percentage points over 1990–2009. However, despite a weak increase in rural-to-urban commuting, there are tendencies toward a stronger dependency in the countryside on employment opportunities in cities.

From the analysis on 'who is' and 'who becomes' a rural-to-urban commuter it is shown that rural residents are more likely to both be and become a rural-to-urban commuter if they are young, male, more highly educated or working in the private sector. Roughly 70 percent of all transitions into rural-to-urban commuting follow from rural residents who take urban jobs but keep their rural residences. Individuals who take this path into rural-to-urban commuting have attributes similar to those who are already rural-to-urban commuters (or will become). Rural residents are willing to take an urban place of work, while at the same time they potentially contribute more to the local economic base than other rural residents, for example by enhancing tax incomes owing to their higher urban wages.

In Paper 1, little is revealed about the impact from rural-to-urban commuting on rural economies. This is left for examination in Paper 2 – Lavesson, N. (2016). When and how does commuting to cities influence rural employment growth? *Journal of Regional Science*. Paper 2 examines how commuting, separated by commuters' education levels, influences rural employment growth in (i) local service and retail sectors, and in (ii) other local sectors (such

as manufacturing and agriculture). The paper makes use of Swedish data, compiled at the municipal level, stretching over the time period 1993–2009. In Paper 2, a positive relationship is found between rural-to-urban commuting and 1993–2009 employment growth in rural municipalities. Yet, and as expected, these positive effects attenuate with increased distances to urban centers. The empirical analysis reveals that rural municipalities that are located within approximately one hour's driving time to urban centers may benefit from rural-to-urban commuting. Somewhat unexpected, however, is that rural-to-urban commuters' education levels appear to matter less in enhancing rural employment growth and in how far rural-to-urban commuting influences rural employment growth.

Positive effects from commuting are only visible in in service and retail sectors, that is, in sectors that draw on local demand. This lends credibility to the idea that commuting in fact stimulates rural demand by, for example, increasing the overall purchasing power within a municipality. An important finding in Paper 2 is that the positive effects on rural employment growth are 'real' rather than an artifact. There are no tendencies of rural workers changing from occupations in rural manufacturing and agriculture to newly created jobs in rural service and retail sectors. Taken together this strongly indicates that increasing rural-to-urban commuting is a viable policy option to enhance rural employment growth – irrespective of commuters' education levels.

Another key finding in the paper is that the size of the nearest urban center determines whether rural municipalities benefit from urban adjacency. Increased distance to urban centers has a positive impact on rural employment growth – this suggests the presence of distance protection for local business in retail and trade sectors. However, additional remoteness from larger urban centers is associated with a distance penalty since remoteness from larger urban centers has a negative effect on rural employment growth in the service and retail sectors.

Paper 3 – Andersson, M., Koster, S. and Lavesson, N. (2016). Are start-ups the same everywhere? The urban–rural skill gap in Swedish entrepreneurship. In: Mack and Qian (eds) (2016). *Geographies of Entrepreneurship* – explores the heterogeneity in the characteristics of firm start-ups across the rural–urban hierarchy in Sweden. New insights to the literature are that the distribution of firm start-ups across the Swedish rural–urban hierarchy do not differ very much, and that the most common firm start-up in Sweden is in self-employment. A finding is that, to a significantly larger extent, knowledge-intensive services (KIS) are started in cities rather than in the countryside. The analysis shows that firms in KIS generate most new jobs, above firms in other

sectors, over the studied time period 2008–2012. This is posed as an explanation for why the impact of firm start-ups on local employment growth is stronger in urban than in rural municipalities.

The spatial sorting of higher-educated individuals into cities is suggested as a key contributor in creating an urban–rural skill gap. Firms started by university-educated individuals occur to a significantly higher degree in urban regions vis-à-vis rural regions. Paper 3 reveals that 50 percent of urban workers have a university education, while the corresponding share in rural regions is 20 percent of the labor force. This determines which firms are started locally – for example, firms in KIS are more likely started by higher-educated individuals. As higher-educated people gravitate toward cities, a natural consequence is a higher prevalence of KIS firms in cities.

Paper 4 – Lavesson, N. (2017). How does distance to urban centers influence necessity- and opportunity-based firm start-ups? *Papers in Regional Science* – is an examination of how rural–urban interdependencies, or, more generally, accessing urban centers, influence rural firm start-ups. The findings in Paper 4 suggest that there is a significant spatial heterogeneity between how firm start-ups are influenced from distance to urban centers. Geographically weighted regression models reveal that, after controlling for local rural characteristics, few places benefit from being close to urban centers. In light of the previous literature, this is the most novel finding in Paper 4, largely since in the literature proximity to cities and agglomeration economies constitute a central explanation of why start-up rates are higher in urban regions than elsewhere.

Rural places are protected from distance, and, in fact, firm formation increases with longer distances to urban centers. As for firm start-ups in general, necessity-based firm start-ups benefit from increasing distances to urban centers; however, this effect is not present for opportunity-based firm formation. This is a contribution to the literature on entrepreneurship, largely since accessing beneficial resources in urban centers is expected to enhance these firm start-ups, for example by accessing heterogeneous consumer markets in urban regions. Insights are learned when the urban hierarchy is considered in the analysis of new firm formation – that is, distance to urban centers of different (population) sizes. Adjacency to larger urban centers is beneficial for firm start-up rates – for necessity-based firm start-ups, this effect is present when medium-sized urban centers are considered (places with populations of at least 50,000 but less than 250,000) and insignificant for large urban centers (with populations larger than 250,000). For opportunity-based firm start-ups, the corresponding finding is that there is a premium for urban adjacency but only to large urban centers. Altogether, it can be concluded that

there is a certain threshold of urban size – that is, the extent of agglomeration economies – that must be reached to foster firm start-ups in nearby rural regions.

6.2 Concluding Discussion

The overarching aim of this thesis has been to examine rural–urban interdependencies and the role of cities in rural growth. Previous research exists on rural–urban interdependencies, or on issues related to these (see, for example, Gaile 1980 for an early overview), but as yet systematic research on these questions is relatively scarce. Research on rural–urban interdependencies waned in the 1980s following a weak performance of areas around cities but also from previous studies finding no, or very small, spatial spillovers from urban growth. Since the mid-1990s, there has been an emerging interest in rural–urban interdependencies. Much of this research has been conducted in Canada and the US, and a pertinent question raised in the introductory chapter of this thesis was whether findings from these studies apply in Sweden.

A first question examined in the thesis concerns how distance to urban centers influences rural growth, while a second, and related, question asked whether there is a spatial heterogeneity in such relationship. Generally speaking, rural growth covers many aspects of economic health. In the papers in this thesis, a certain focus has been devoted to rural employment growth and rural entrepreneurship (measured as firm start-ups), namely since these are key factors in securing jobs for rural residents but also since the population may be attracted by job opportunities. From previous studies recently performed in US and Canada, proximity to urban regions appears to be rewarding for rural growth – whether measured in population, employment or wages (see, for example, Barkley et al. 1996; Partridge et al. 2007a, 2007b; 2010; Ali et al. 2011). High-growth areas are often found within commuting distances of cities and appear to benefit from intensified interdependencies with nearby cities. Similarly, remoteness from cities seems to be penalizing to rural areas. This is not least shown in Partridge et al. (2007a), who found that an average-distance rural area in Canada – located 61 kilometers from an urban center – experienced 18 percent less population growth from that remoteness during 1991–2001. Similar characteristics are observed on rural labor markets (see, for example, Partridge et al. 2010; Ali et al. 2011). For example, Partridge et al. (2010) found that average rural areas in Canada are penalized with, on

average, 3.7 percent lower employment growth from not being in immediate urban adjacency.

From the papers in this thesis, conducted using data on Swedish municipalities, it can be concluded that previous insights from US and Canada are only partially transferable to Sweden, depending largely on the size of the urban centers. The findings in the papers suggest that there are no rewards from urban proximity on rural growth in Swedish municipalities when considering urban centers (of any size). In fact, rural municipalities are disadvantaged from urban proximity – increased remoteness is associated with gains in rural growth. According to findings in Paper 2, rural employment growth in service and retail increases by 0.3 percent for every additional minute of traveling time from urban centers of any size. For an average rural municipality in Sweden, with a traveling distance of 53 minutes to an urban center, this means approximately 16 percent higher 1993–2009 employment growth. A similar conclusion can be drawn for firm start-ups. In Paper 4, an average municipality in Sweden experienced 2.7 more firm start-ups per 1,000 workers during 2004–2012 from not being in immediate urban adjacency. This seems to be a small figure but, considering that the average size of the working-age (20–65) population in rural municipalities during 2004–2012 was roughly 9,200 individuals, this corresponds to a reward of 25 new firms on average in Swedish municipalities (merely following from less exposure to urban centers). Taken together, this is in sharp contrast to what is found in US and Canadian studies (cf. Barkley et al. 1996; Partridge et al. 2008a, 2008b, 2010; Ali et al. 2011).

However, once the 'size effects' of urban centers are accounted for in the analysis, important insights are learned from the papers. Most importantly, it is shown from the papers that rural municipalities are rewarded by urban proximity but only from urban centers of larger populations. Basically, it is not distance to urban centers per se, or interdependencies with nearby cities in general, that are crucial for rural employment growth and rural firm start-ups. Rather it is the size of urban centers that determines how rural growth is influenced. A rather fundamental explanation, following from agglomeration theory, is that small urban centers in Sweden may lack the critical level of concentration to generate agglomeration benefits strong enough to have a positive impact on their surroundings. Small urban centers may also lack urban supply and demand factors that would be expected to foster firm start-ups. This was also raised in the introduction as one a reason to challenge whether findings from the US and Canada are transferable to the Swedish context. This also stands as an explanation of why rural municipalities experience 'distance

protection' from competition in urban centers of any size, while gains follow from having interdependencies with larger, and more populated, urban centers. Basically, when considering rural municipalities' interdependencies with smaller urban centers, the negative aspects of urban competition outweigh the benefits of agglomeration economies.

Rural residents make (some) daily purchases of goods and services in cities instead of locally, for example on their way to or from their work in the city. Basically, there is a leakage of rural demand to nearby cities. For rural employment, the consumer demand that leaks to cities may result in fewer local job opportunities. This may be reflected in employers not hiring new staff but could also be connected to lower rates of firm start-ups. For example, urban competition could make self-employment a less viable alternative for rural residents. Fewer firm start-ups not only mean that some potential entrepreneurs are unemployed or take a job outside their home municipality but also that employment opportunities created in local firms are foregone. Crucially, to benefit from interdependencies with nearby cities, rural municipalities must experience offsetting positive effects from resources offered in cities, for example from rural residents accessing urban employment opportunities.

A central question in the thesis concerns spatial heterogeneity in the relationship between distance to urban centers and rural growth. Previous studies in Sweden suggest a variation in these relationships across space (Lewan 1967; Malmberg and Persson 1981) and internationally, not least in studies by Barkley (1995), Terluin (2003) and Partridge et al. (2007b). Indeed, from the analysis in Paper 2, little can be said about whether there is spatial heterogeneity in employment growth and distance to urban centers. However, in the examination of rural firm start-ups, it can be concluded from a GWR that the relationships between firm start-ups and distance to urban centers look fairly different across space. Most rural municipalities experience distance protection from urban centers of any size but exceptions exist. This finding, together with insights from previous studies, emphasizes the need for case studies where relationships can be studied in more detail. But, taken together, it can be concluded that the relationships between firm start-ups and distance to urban centers vary spatially.

Two questions related to rural-to-urban commuting have also been examined in the thesis and concern whether rural-to-urban commuting could be a strategy to maintain and generate rural growth; this also relates to the characteristics of rural-to-urban commuters. Previous research indicates that commuting could be a way for the countryside to experience growth from urban centers. For example, Partridge et al. (2010) show that commuting is

associated with gains in employment growth. Rural-to-urban commuters have higher wages, not only from the wage compensation of their commuting but also from higher general wage levels in cities. Therefore, increased rural-to-urban commuting strengthens local purchasing power in the countryside and may have a positive impact on local demand. Eventually, as a response to an increasing demand for goods and services, rural firms are induced to hire labor. All in all, rural-to-urban commuting may stimulate demand and generate job opportunities. According to the findings in Paper 2, rural-to-urban commuting appears to have a positive influence on rural growth. This is most visible from the convincing relationship between the 1993 initial shares of rural-to-urban commuting and 1993–2009 employment growth in the service and retail sectors.

In Paper 2, it was hypothesized that higher-educated commuters may augment the positive impact from commuting on rural employment growth. An additional wage effect was expected, owing to their higher education, that could have an additional impact on local demand and on employment growth that may follow. However, this could not be verified in Paper 2. Yet, other positive impacts may follow from commuting of higher-educated labor, for example on local tax incomes. In Paper 1, characteristics of rural-to-urban commuters are examined. An insight from this paper is that rural-to-urban commuters are younger, are better educated or earn higher incomes than average rural workers. Also, from Paper 1, it is learned that the common pathway into commuting is rural residents changing to urban places of work. Taken together, stimulating employment growth in urban regions may be a way to increase rural employment but also to maintain and secure population in the countryside. It is a rather small phenomenon, but rural residents are engaging in rural-to-urban commuting to an increasing extent. Indeed, it is also a sector of the population that contributes more than average rural workers to the local economy, by enhancing tax incomes or, primarily, from strengthening the local purchasing power. In Paper 2, the positive effects from rural-to-urban commuting on rural employment growth are shown to reach up to an hour of traveling time from urban centers. This provides clues that areas, within this spatial reach, can potentially increase commuting as a way to increase employment and maintain the population. However, further investigation is needed – not least since increasing commuting also means increased exposure to urban centers and that areas are influenced differently as a result of increased commuting.

From the papers in this thesis, little can be said about how other measures of economic health are influenced by distance to urban centers and rural-to-

urban commuting. Insights from previous studies in the US reveal that population and employment interdependencies walk together (cf. Greenwood et al. 1986; Khan et al. 2001). Also, and as discussed previously, the relationship between distance to urban centers and rural growth, whether assessed in population or employment, is fairly similar in the US and Canadian context. Most likely, and as a reasonable guess, this relationship is different in Sweden. It is well-known that population growth does not increase with increased remoteness from urban centers. Rather the opposite prevails – remoteness is often associated with rural depopulation. Against this background, research is most certainly warranted on how rural–urban interdependencies influence population growth in rural Sweden.

Another topic that is left for future research is the net effects on employment opportunities created by rural-to-urban commuting and from rural firm start-ups. This thesis provides little information on the number of jobs created – directly by rural residents accessing urban centers and also through stimulating local demand. Also, the relationships between jobs created by firm start-ups is uncertain – although firm start-ups increasing with distance to urban centers, there is a chance that the quality of firm start-ups could differ across space. For example, firms close to cities may generate significantly more new jobs than firms started in more remote parts of the countryside. This requires more in-depth analysis.

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Author biography

Niclas Lavesson has participated in the PhD program in Human Geography at Lund University. *Rural-urban interdependencies – the role of cities in rural growth* is his doctoral thesis. Niclas has a background in statistics (BSc) and economics (MSc). His research interests are in the areas of regional science, economic geography, spatial econometrics/statistics and data analysis.

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