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The spatial structure of economic activities in the Netherlands. Discussing regional specialisation trends.

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Abstract:

This thesis investigates differences in the industrial composition of employment and value added across COROP regions in the Netherlands for each year over the period 1995-2007. It is found that the direction of the regional specialisation trend – as measured by the Coefficient of Regional Specialisation – has fallen for employment but has risen for value added. This relation is further explored by decomposing the overall trend into different country parts and into separate sectors.

Key words: regional specialisation, geographic concentration, economic integration, the Netherlands, innovation policy

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Title Page

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Preface

This document is my final product after five years of studying. In many ways it represents the end of my student life and the last hurdle on the way to the start of a new life. I learned a great deal of things over the last years, both on an educational and on a personal level. My decision to come out to Lund to get my master degree has proven to have been the right one. That decision was mainly driven by a desire to broaden my horizon and to explore the benefits of a different environment. My time here is a valuable addition to my time in the Netherlands and Australia, where I studied during the first part of my education. The combination of knowledge and skills that I took from all of those places are combined in this master thesis.

The development of regions and the role that regions fulfill in a broader economic structure have always interested me and I knew that I wanted to write my master thesis on this topic. It still took me a while to narrowly define my research question though. Several ideas were explored but most of them were not feasible in the available time span or the required data could not be obtained. I eventually decided to focus on regional specialisation trends in the Netherlands. The versatility of this topic made it into a challenge in which I could relate to many of my interests. It is founded on a theoretical discussion, but yet it also has a quantitative side to it. And moreover, the results can be related to policy in a discussion, making it practically-oriented as well. The result is a master thesis that is a good representation of my interests as well as of the knowledge and skills that I acquired over the last years.

This would also be the right place to express my gratitude to those that helped me with this thesis. First of all, I would like to thank my supervisor Lars Coenen. His ideas and remarks helped from the beginning and he stayed supportive even though I changed my mind on the topic of the thesis quite a few times. Our meetings always helped me to structure my thoughts and I would leave them with renewed motivation. Lars also frequently pointed me to literature that was very useful and that without a doubt lifted the level of the final result. I also want to thank my friends and fellow students who helped me develop ideas and who I always found willing to shed their opinion on whatever it was that I was struggling with. Finally, I want to thank my parents for their support.

Steyn de Haas,

Lund, May 2011

CHAPTER 1

Introduction

Studying the disparities in the spatial structure of economic activities between regions has since long been popular among economists and geographers alike. Especially since Krugman (1991) reinvigorated the field by bringing both sciences closer together, there has been a lot of interest in measuring and discussing changes in regional specialisation and geographic concentration. Krugman did so by reviving the notion among economists that economies aren't dimensionless points in space and thereby he also showed some geographers that a quantitative analysis can be a valuable tool in explaining the development of regions (Krugman, 2010). This new approach was later dubbed 'New Economic Geography'. The research conducted over the last two decades has helped to develop a much better understanding of how the location of a business influences its competitiveness. This knowledge has also found its way to policymakers who are now actively trying to accommodate a program that is aimed at improving overall growth by focusing on the specifics of regions' economic structures. Recent spatial policy in the Netherlands has been concentrated on securing the future of already established core areas while simultaneously developing the specific strengths of some upcoming regions outside of the traditional economic core. In choosing this approach, the Dutch government is promoting the formation of clusters, arguably leading to increased regional specialisation. The purpose of this study is to determine how the economic geography of the Netherlands has changed during the last decades. The main focus is on trends in regional specialisation but several other aspects of the spatial division of economic activities are also addressed. These include industrial concentration and convergence and divergence trends between regions. It is important to study these kinds of developments because for purposeful policymaking; it is not only necessary to have a clear vision of the perceived goal, it is equally important to understand the current situation and how that has come to be. Only then can a well thought through plan be set in motion.

This study contributes to the available knowledge about the changes in the economic structure of the Netherlands and the different roles that separate regions play in that structure. It also serves a more academically oriented purpose for it is one of the first studies of its kind to explore to what extent the coefficient of regional specialisation depends on the used indicator of economic activity¹. Previous studies often measure regional specialisation trends solely based the distribution of employment (e.g. Hallet, 2000; Suedekum, 2006; Dixon and Freebairn, 2009; Cutrini, 2010). However, this study shows that the use of a narrower economic indicator, namely gross value added, uncovers partially different trends.

¹ The only other study to measure specialisation trends based on multiple indicators that I am aware of is a study by Amiti (1999).

² The word "industry" in this thesis refers to any general group of economic activities, e.g. *the banking industry*

The main goal of this thesis is to get an understanding of the extent to which the spatial structure of the Dutch economy is characterised by region-specific production structures. To what extent have Dutch regions specialised themselves in a specific group of economic activities? And is the production structure of regions becoming more or less alike over time? Answering these questions gives an indication of the importance of localised clusters in the Netherlands. And it contributes to the knowledge about specialisation trends in general, adding new evidence to the discussion around the question if the ongoing globalisation leads to increasingly specialised regions. The main goal of this thesis can be divided into different aims.

The first aim is to measure the pattern of regional specialisation in the Netherlands and analyse how it has changed between 1995 and 2007. A region's degree of specialisation is defined here as the extent to which its economic structure differs from the national average. A measure called the coefficient of regional specialisation is used to compare the values between regions and to compute an overall value for the degree to which Dutch regions are specialised. The choice for the timeframe is based upon the availability of suitable data. Both employment and value added per industry and region are used as economic indicators. The extent to which the degree of specialisation depends on the indicator that is used is also addressed. Finally, it is argued that the average specialisation degrees for the country as a whole hide much of the underlying regional and sectoral differences. Both aspects are divided into subgroups that are analysed separately to get a more detailed picture of the spatial restructuring of economic activities in the Netherlands.

The second aim is to gain an understanding of the processes behind the observed specialisation trends. The main views of economic geographic theories that discuss the distribution patterns of economic activities explain the forces behind the concentration and dispersal of firms. Applying these concepts to the results of the empirical analysis helps to understand the observed patterns and trends. But less generic processes like regional economic policy and path dependency also explain part of the results. The findings from the analysis are discussed both in terms of general theory and the specific Dutch context.

Finally, the observed specialisation trends in the Netherlands between 1995 and 2007 are put into a broader context by relating them to the findings of previous empirical studies. Studies measuring and discussing changes in regional specialisation have been conducted for several other countries as well as for the European Union as a whole. This section outlines the main findings of those studies and later they are compared with the results of this study to find out in which respects the Dutch case is similar or different from other cases. One interesting aspect of the comparison is the question if observed specialisation trends depend on the observed scale level. More specific, do the processes that restructure the spatial division of economic activities manifest themselves the same way between countries as within countries?

The remainder of this thesis is structured as follows. The theoretical framework is presented in the chapter 2. It was already mentioned that the work of Krugman (1991) stood at the start of a new approach to studying the spatial structure of economic activities. But there nevertheless remains a general gap between the way that economists and the way the geographers think about this topic. In many ways the 'conflict' revolves around a desire to model reality to where predictions can be made under a certain set of circumstances on the one hand and a strong view that each region is so different that no set of assumptions can grasp the reality in a meaningful way on the other hand. Both strands of theory are discussed

with respect to what they have to say about regional specialisation and concentration. The terms specialisation and concentration are both used a lot throughout this thesis. They are closely related but specialisation entails a relatively large share of a region's economy to consist of activities in a particular industry². Concentration on the other hand implies that a specific industry is unevenly distributed across space. So where specialisation focuses on the characteristics of a region, concentration focuses on the characteristics of an industry. The emphasis in this thesis lies on specialisation patterns. Where it focuses on the concentration of industries, it is mostly to explain the observed specialisation.

After outlining the main views of the general theories about specialisation, the Dutch context is described in chapter 3. Studies discussing the economic geography of the Netherlands and recent regional economic policy are presented. Chapter 4 revolves around the data and the adopted methodology. Chapter 5 presents the results of the empirical analysis. A discussion about how the findings can be interpreted follows in chapter 6. This discussion critically assesses the results and the applied methodology and concludes what can and what cannot be derived from the outcome of the empirical analysis. Finally, conclusions are drawn and a scope for further research is suggested.

² The word "industry" in this thesis refers to any general group of economic activities, e.g. *the banking industry* or *the chemical products industry*. It therefore does not necessarily only refer to industries within the manufacturing sector.

CHAPTER 2

Literature review

Researchers have given a lot of attention to changes in the spatial economic structure of countries during recent years. It is often presumed that high-value added industries increasingly form clusters in core areas while peripheral regions are specialising in low-tech businesses, leading to rising inequality between regions (Cutrini, 2010). Which theoretical foundations lie at the base of these expectations follows from section 2.1. For that section outlines the most important theoretical views about the processes behind the constant restructuring of economic activities over space. Later, in the discussion part of this thesis, these theories are contrasted with the empirical evidence from the Netherlands to see which views best describe the developments in the spatial aspect of the Dutch economy. Another comparison tool that can be used to put the empirical results into a context is the findings from previous studies. Because similar studies to this one, also measuring changing degrees of regional specialisation have been conducted for other countries. The most relevant ones of these studies are summarised in section 2.2. Not only the findings are of interest but also the method that was applied to reach them. Because it is argued that the methodological choices that are made can have a considerable effect on the outcome of the study. Finally section 2.3 integrates the theory with the empirical literature and some questions about the expected outcome of the empirical analysis are raised, based on that synthesis.

2.1 Theoretical views on clustering and regional specialisation

Scholars have put forward arguments that plead for and against the specialisation of regions and the concentration of industries across space. The way that globalisation affects the patterns of specialisation and concentration is discussed. The structure of this section is as follows. The first part presents the key processes that are argued to lead to an increased clustering of related economic activities in space. These processes are sometimes called centripetal forces (Huang and Levinson, 2008). Second, the main counter arguments – those forces that lead to the dispersion of industries – are outlined. Afterwards, Krugman's view on specialisation patterns is discussed, starting with his early New Economic Geography works and following the development of his thoughts up until recently. The section will be concluded with the expectations that can be deduced from the theory.

2.1.1 Centripetal forces

The increasing globalisation that the world has witnessed over the last decades has changed the way how economic activity is organized throughout the developed world. An open market economy in combination with lowering transport costs and improved global communication

have created an environment in which businesses increasingly have to deal with international competition (Neary, 2009). The disadvantage of relatively high wages in developed countries has already led to the outsourcing of many labour-intensive, low-tech industries to developing countries and peripheral regions (Marin, 2006). Businesses in developed countries like the Netherlands have to draw on other competitive advantages to remain economically viable. Competitive advantage is defined here as an advantage that a firm has over its competitors, allowing it to generate greater sales or margins and/or retain more customers than its competition. There can be many types of competitive advantages including the firm's cost structure, product offerings, distribution network and customer support.

The location of an economic activity is argued to play an important role in the creation and the maintenance of this competitiveness. Some regional characteristics that partly determine a company's competitive advantage are the presence of a highly educated and specialised workforce, natural resources and convenient transportation (Huang and Levinson, 2008). Other centripetal forces include an elaborate network of suppliers (backward linkages) and customers (forward linkages) and external economies such as knowledge spillovers (Huang and Levinson, 2008). The extent to which these factors are available and required, differs per region and industry, making particular regions more suitable for activities within a particular industry. Most scholars agree that innovativeness is an important requirement for the generation of sustainable economic growth in developed countries (e.g. Freeman, 2002; Fagerberg, 2005). This awareness has stimulated extensive research into the process behind the creation of innovations. Especially the role of knowledge exchange between related companies and the importance of the presence of the right conditions for a specific industry are stressed by many such studies (e.g. Zeller, 2004; Boschma, 2005). Research has also shown that spatial proximity as a facilitator of other proximities is important for innovativeness (Johanson and Lundberg, 2007). This idea flows from the concept of tacit and codified knowledge. Communication technologies such as the internet make codified knowledge easier accessible. This increases the importance of tacit knowledge for innovativeness and competitiveness (Maskell & Malmberg, 1999). And tacit knowledge is best spread through face-to-face contacts between actors that trust each other (Asheim & Gertler, 2005). A shared social background – consisting of commonalities such as language, communication conventions and personal familiarity through earlier collaboration or non-business channels – helps build this trust (Asheim & Gertler, 2005).

2.1.2 Centrifugal forces

All of the factors mentioned above can be argued to lead to increased specialisation. The integration of markets and the improvements in transportation and communication technologies decrease companies' need to be located within the spatial vicinity of the consumers. Businesses therefore have more room to tap in to the benefits from being located in a cluster. But on the other hand there also are factors that limit the tendency towards increased specialisation. Those factors can be called centrifugal or balancing forces (Huang and Levinson, 2008). The spatial concentration of (similar) companies can be harmful in several ways. From an innovation-based point of view, the position of a firm within a network of local suppliers, customers and competitors, can lead to a so-called state of lock-in. A lock-in can arise in many forms, but a certain way of doing things, a paradigm, that has become so dominant that it keeps local actors from renewing their processes always is at its core

(Boschma et al., 2002, pp. 64-65). An established pattern might have been successful in the past, but as the circumstances change, so do the ‘best practices’ (Pemberton et al., 2001). The realization of a new paradigm asks for a different combination of activities, one that might only be found by players with another network in a different location (Bathelt et al., 2004). A lock-in is an example of an intangible centrifugal force. Tangible effects like the competition for labour, land and a market share can also cause firms to scatter (Krugman, 1996).

2.1.3 Krugman: The New Economic Geography in hindsight

Krugman (1991) did not go so far in his original studies as to incorporate all of the elements mentioned above. Rather, under the assumption of factor mobility he emphasized the centripetal force of economies of scale and the centrifugal effects of transport costs. These elements are easily quantifiable. The hypothesis that follows from his model is that a decline in transport costs leads to an increase in both specialisation and concentration, strengthening core-periphery inequalities (Hudson, 2006). The neglect of harder to measure economic forces such as lock-ins and path dependency that also influence specialisation patterns and region-specific circumstances in favour of being able to construct a mathematical model makes the New Economic Geography more like a New Geographic Economy. Over the years however, Krugman has kept on developing his theories and incorporated more elements along the line of thinking that is commonly found in the studies of economic geographers proper into his own work. Eventually, Krugman (2010) went so far as to call the New Economic Geography “*middle-aged*”. This label is based on the notion that “*a focus on advanced economies might suggest that it’s time to downplay the emphasis on tangible factors like transportation in favor of intangible factors like information spillover*” (Krugman, 2010, p. 3). In that study, Krugman also updates his thoughts about tendencies towards (de)specialisation, claiming that modern advanced economies nowadays are characterized by a much “*subtler*” form of specialisation than in the twentieth century. This development partly reflects a shift from manufacturing to service-driven economies (Krugman, 2010). Manufacturing companies generally do not deal with the final users of their products directly. Therefore they do not have to be located in close proximity to the market necessarily. The services sector on the other hand does deal with its customers directly. Service providers dealing with tangible goods (e.g. supermarkets, retailers) generally need to be located in proximity to their market. Some service providers dealing with intangible goods have become footloose (e.g. call centers, internet services, insurance companies), but many others still need to be located close to their customers (e.g. cinemas, health care providers, schools). Now that the non-traded services sector in developed countries is growing in size quicker than the manufacturing sector, a larger share of metropolitan areas’ economic structure is becoming similar between areas. This leads to subtler forms of specialisation (Krugman, 2010).

2.1.4 Linking the theoretical framework to the empirical analysis

So to sum up, the theory shows that the process behind the spatial structure of an economy is complex and driven by forces that sometimes oppose each other. The balance between centripetal and centrifugal forces differs over time and between regions. That the resulting spatial structure of economic activities changes over time seems clear. However, an obvious

question is at which scale level do these developments occur? The economy of a region cannot be understood apart from its surroundings. Extra-regional settings and inter-regional dependencies are to be considered when analysing a regions' production structure (Lundquist et al., 2008). And moreover, companies are located in a region but at the same time connected to a global network (Bathelt et al., 2004). Their competitive advantage draws from both scale levels so it is difficult to determine the geographic scope of factors like knowledge spillovers. The reality is that the spatial scale at which centripetal forces benefit 'local' actors depends on the region and the type of economic activity. Whether separate parts of the Netherlands clearly form distinct systems, leading to regional specialisation remains to be seen. Looking from an international scale, one could argue that the circumstances for regions in the Netherlands are so similar that it is best understood as a single region in a global market. After all the distance – not only geographical but also cognitive, institutional, organizational and social distance – between Dutch regions is limited. It is a country with a relatively small surface area with good connections, a common language and culture and the legislation is the same for all country parts. Does this mean that the economic strengths of regions within the Netherlands are similar nationwide? Because that would logically imply that the separate parts of the country are moving towards the same production structure, indicating a decrease in specialisation over time. Or do the centripetal and centrifugal forces that together affect the spatial structure of economic activities express themselves differently among Dutch regions? And if so, how does this affect regional specialisation trends? Finding an answer to these questions is the purpose of this thesis. The measuring of regional specialisation degrees in this study is not so much done to test any specific theory. The criticism that any strand of theory trying to explain the economic geography is faced with shows that no single theory is capable of capturing all the aspects that influence a specific region's economic development in a measurable way. Rather, the most 'realistic' theories are ambiguous in their expectations about specialisation and concentration trends. That is why the empirical analysis has to supersede just measuring specialisation coefficients and drawing conclusions from them. Those calculations are just a start and they do carry some basic indicative power. But in order to show understanding for the complex set of elements that together affect the changing geographic structure of economic activities, the analysis should go deeper than that. This can be achieved by distinguishing between different scale levels, indicators, and types of industries. At the same time it needs to be realized that the results of an empirical analysis could be different depending on which method is used, as section 2.2 shows. This means that the exact method has to be considered carefully and that the reader should have insight into the made choices. Chapter 4 gives that insight. By following these guidelines, the role of the empirical analysis in this study is to help to get an understanding of how the regional economic structure of the Netherlands has developed over time. But first, the results of other studies measuring specialisation trends are discussed. They already shed some light on the question of how specialisation patterns develop at different scale levels. And the results of the previous studies are later used to place the Dutch 'evidence' in a broader context.

2.2 Evidence from previous studies

Numerous scholars have already studied specialisation and concentration trends. The general findings of those studies that focus on Western countries are discussed in this section. A distinction is made between studies that focus on trends on a supranational level and those that focus on a subnational level.

Many of the studies measuring a change in specialisation levels between countries over time use (a part of) the European Union as a case study (e.g. Aiginger and Rossi-Hansberg, 2006; Amiti, 1999; Brühlhart, 2001; Ezcurra et al, 2004; Hallet, 2000). Europe is a great example of an area in which trade barriers declined over time and therefore makes for a good opportunity to test various theories with regard to their claims about expected specialisation trends. However, the evidence from these studies is not unambiguous. Results depend on many factors such as the countries compared, the period used, the indicator used to measure specialisation, the sectoral breakdown of economies, the method applied and so forth. One of the most complete ones of these studies is that by Amiti (1999). It provides an explanation for why some studies are measuring increased specialisation, while others (e.g. Hallet, 2000; Ezcurra et al., 2006) find that the economic structure of regions gets more alike over time. Amiti (1999) uses a dataset that contains information on 27 manufacturing industries for 10 countries between 1968 and 1990. The results indicate that manufacturing got more specialised between countries during that time. Portugal, Spain and the UK are the exceptions as they moved towards the average manufacturing structure. Amiti (1999) argues that the decrease in specialisation in those countries could be caused by their late accession to the European Union. The disappearing of trade barriers protecting their economy might have led to the decline of industries that those countries did not have a comparative advantage over (ibid.). The Netherlands also is one of countries that Amiti (1999) analysed. She found that the Dutch economy became more specialised between 1968 and 1980, after which it started to decrease steadily but ending up with a degree of specialisation in 1990 that was still higher than the original 1968 value. But it should be remembered that Amiti's study only looked at manufacturing industries and only at the Netherlands as a whole, compared with other European countries.

Other scholars did measure specialisation trends on a more detailed regional scale level. Sometimes for regions within a group of countries but other times focusing on only one country. Cutrini (2010) has, like Amiti (1999), measured specialisation of the manufacturing industry for ten European countries. But the difference is that Cutrini used subnational regions. For the Netherlands that meant that she analysed the twelve provinces. The results show that the Dutch provinces have been de-specialising from 1985 to 2001. Unfortunately, Cutrini (2010) only measured three points in time, 1993 being the intermediate year of analysis. Cutrini's study is different from mine because, among other things, she did not include the service sector and she looked at NUTS-2 level regions whereas I use NUTS-3 level regions, which I later argue to be a more suitable scale level for the Dutch case.

Finally, two studies that are particularly similar to mine are those by Suedekum (2006) and by Dixon and Freebairn (2009). Both encompass the entire economy of a country and both use relative employment shares per sector as an indicator for measuring specialisation. Suedekum, studying Germany, finds that there is no significant evidence for increased specialisation since the German reunification. Although some regions did get more specialised, the majority of German regions actually de-specialised. The same pattern is found for industrial concentration (Suedekum, 2006). Dixon and Freebairn (2009) placed their study in an Australian context and studied specialisation trends between 1985 and 2006. They too find that most regions' employment structures became more alike over time, indicating de-specialisation. Interestingly, Dixon and Freebairn (2009) argue that almost all of the de-specialisation can be attributed to the reorganization of manufacturing sector and that non-manufacturing industries remained at a steady average degree of concentration.

2.3 Synthesis

To sum up, neither economic theories nor the empirical evidence about regional specialisation trends presented in previous studies unequivocally point in one direction. The main point to take from the theory is that the integration of markets and improved transportation and communication technologies cause companies to have to compete on a higher scale level. That means that the competition is tougher and that the distance to the resources, the market and to the network actors is less restricting. Faced with this situation, companies might react in different ways. On the one hand it could be argued that they all want to be located in the regions with the broadest supporting structure. But that might on the other hand imply high labour and congestion costs and it could lead to a lock-in of some kind. The resulting spatial pattern of economic activities depends to some extent on companies' needs, therefore differing between industries. Concentration tendencies also manifest themselves on different scale levels depending on the type of economic activity. This ambiguity is confirmed by the results of previous studies that have measured changes in specialisation and concentration patterns over time. They show that the results depend, amongst other factors, on the methodological considerations that have been made. The choices for a certain period, a set of industries, a specific measure, a determining indicator and a group of regions all affect the study's findings. Nevertheless, evidence from Australia and Germany suggests that subnational regions are de-specialising within countries. It is interesting to see if this trend also applies to the Netherlands. And how it differs between employment and value added as indicator. De-specialisation would, as becomes clear in the next chapter, oppose the direction followed by the recent Dutch regional economic policy, which has been focused on increasing region-specific strengths. However, Amiti (1999) found that countries that were late EU-joiners first encountered lowering levels of specialisation which suggests that declining industries affect the geographic structure of economies just as much as growing industries. Finally, it has become clear that a distinction between the manufacturing and the service sector has to be considered. These findings are taken into account when analyzing the empirical evidence from the Netherlands in chapter 5. After those results have been presented, they will also be contrasted with the findings by the studies that have been mentioned in this chapter. But first, chapter 3 outlines the recent history of regional economic policy in the Netherlands. Understanding how the Dutch government has been steering the economic structure of parts of the country is necessary to put the findings into the right context. And conversely, understanding how the spatial division of economic activities changes over time is important to discuss the adopted policy and to make recommendations for the future.

CHAPTER 3

Regional economic policy in the Netherlands

National economic policymakers are constantly busy harnessing economic growth and making decisions about the redistribution of wealth between people and regions. The way that regional economic policy is organised changes over time. It changes because the economy develops and politicians must react to those differing circumstances. As countries get wealthier, the priorities might shift from helping the backward regions to stimulating the core areas of the economy in order to maintain a competitive advantage. The chosen policy approach is also influenced by progressions made by academics in the fields of economics and geography. The popularisation of the cluster concept from the early 1990s onwards is an example of such a development that had its impact on regional economic policy in the Netherlands. This chapter outlines the different approaches that Dutch policymakers have adopted throughout the last decades and it assesses their effect on the regional economic structure in the Netherlands. Section 3.1 gives an overview of the key concepts and priorities of the policies that have been applied since the 1980s. Section 3.2 introduces some views of scholars criticising the purpose of the Dutch regional policies. Finally, section 3.3 concludes this chapter by hypothesising about how the spatial economic structure of the Netherlands has been reshaped under the impact of both policies and of external conditions affecting the economy and how these processes can be expected to show in the results of the empirical analysis.

3.1 Regional economic policy in the Netherlands

The increased understanding of the processes that underlie the geographic structure of economies has attracted the attention of policymakers who have revised programmes for regional economic development at different scale levels. Modern European policy is focused on backward regions more than on the most developed ones, arguing that the latter are better equipped to adapt to challenges themselves (European Commission, 2006, p. 2; Laissy, 2008, p. 2). The Dutch government, one of those developed countries within the EU, adopts a slightly different approach to regional economic policy than the European Commission does, focusing less on the establishment of convergence. During recent years, the main program designed to stimulate the innovativeness of Dutch companies was called “*Peaks in the Delta*” (Ministerie van Economische Zaken, 2004). The title of the program already hints to the difference with the EU’s regional policy. Instead of focusing on the catching-up of the weaker areas, the public authority in the Netherlands prioritises its ‘peaks’, a metaphor for the strongest sectors of the economy. The two drivers of the national economy, Schiphol airport and the seaport of Rotterdam were identified as mainports. That is, they are nodes at which

national and international transportation networks meet each other. Securing their role for the future by giving them space to grow was one of the key priorities of “*Peaks in the Delta*”. Six other peaks were identified in the form of regions with exceptional competences in one or a few industries. Two of them are located in the traditional economic core in the west of the Netherlands and four of them are located around regional centers that show promise for the future in a particular field. So “*Peaks in the Delta*” was stimulating increased regional specialisation with the purpose of creating an internationally competitive economy based on region-specific strengths. However, budget cuts caused the policy programme to be terminated in 2010 and the decision was made to slowly transfer more responsibility over regional economic policy to governmental organizations at provincial and municipal levels (Ministerie van EL&I, 2011a; Ministerie van EL&I, 2011b). Meanwhile the main goal of the national policy remains facilitating an innovative environment that gives entrepreneurs the required space to develop new products and ideas. The government strives to achieve that aim by identifying and removing bottlenecks and by investing in research and development (Ministerie van EL&I, 2011c).

However, “*Peaks in the Delta*” does not cover the entire time span that is studied in this thesis. Besides, regional economic policy can be expected to affect the spatial division of economic activities for some time after its implementation and for those reasons, previous policy aims are now shortly outlined. The following description of past Dutch policy aims is entirely based on the study by Raspe and Van Oort (2007). Before the 1980s, the main priority of regional economic policy was to support regions that were economically weak. In that sense it was very similar to the policy that the European Commission uses nowadays. This type of support stayed popular during the 1980s but the idea of focusing policy on industry-specific needs with an emphasis on technology gained attention for the first time. At the same time, rough economic circumstances in the early 1980s caused measures to be taken to secure declining industries from disappearing; only later in the 1980s did the regional economic policy fundamentally change. It was for the first time that the importance of ensuring the future chances of the core economic regions was recognized. But the traditional support to backward regions was not completely abolished right away and both philosophies existed simultaneously for a while. The 1990s were characterised by an emphasis on innovation and competitiveness inspired by Michael Porters publications. The policy aimed at convergence between regions was reduced even more. Only the north of the Netherlands still received financial support to stimulate a catching-up process. A report from 1995³ highlighted the ongoing transition from a manufacturing economy to a knowledge-based economy. With this philosophy and the knowledge that the European Union was going to get increasingly integrated in mind, the policy was now aimed at facilitating the right circumstances so that clusters could emerge and develop. The emphasis on the formation of clusters can be seen as an initiative to stimulate regional specialisation. The main role of the government in this process was to remove limiting factors, allowing businesses to maximize their potential. Finally, after the turn of the century, it was decided that all measures focusing on decreasing the disparities between regions were going to be stopped. Rather than trying to diminish the regional inequality, new policy initiatives shifted to the goal of ensuring maximum growth of the economy as whole. This idea was reflected in “*Peaks in the Delta*”. The next section discusses scholars’ view on these policies.

³ This report is called “*Kennis in beweging*” and it was presented by the ministers of Economic Affairs; Education, Culture & Science and Agriculture, Nature & Food on the 21st of June, 1995.

3.2 Policy discussion

Policymakers that formulate practical plans based on theoretical knowledge are being closely watched by academics who critically examine their ‘translations’ from theory to practice. That also goes for the Dutch regional economic policy that has been outlined in the previous section. One scholar that has studied the spatial structure of the Dutch economy and the related policy a lot is Frank van Oort. Two of the publications to which he contributed are discussed in this section to get an idea of what the recommendations and limitations for regional economic policy are according to him and his colleagues.

The previously mentioned report by Raspe and Van Oort (2007) not only summarises the course of policy in the Netherlands, but it also critically examines it. The main argument that they put forth is that the blurry concept of a region – indeed, economic processes and knowledge exchange take place at several scale levels – makes it unwise to invest in region-specific strengths. Rather, so they argue, a generic approach should be adopted, leaving region-specific policy to decentralized levels of government as much as possible. This principle of subsidiarity – devolving decisions to the lowest practical level – is now actually also going to be implemented as was mentioned in section 3.1.

The main reason why policy aims at regional specialisation and the formation of clusters is that it is believed that the short spatial distance between related companies stimulates the exchange of knowledge, leading to innovation and ultimately increased average wealth. However, research has shown that the extent to which companies rely on a local network of knowledge exchange, differs greatly according to the type of industry it is in (Raspe and Van Oort, 2007). And moreover, the relation between local knowledge exchange and innovativeness is not always clear, seemingly being different for each case (ibid.). These findings put the policy practice to try to increase region-specific strengths in doubt.

Another publication that discusses the policy initiatives of “*Peaks in the Delta*” is that by Frenken et al. (2007). The authors study the effect of clustering and (un)related variety within a region on the local economy. It was found that for Dutch regions, related variety – the co-location of closely related industries – stimulates employment growth and unrelated variety – the co-location of unrelated industries – dampens unemployment growth. Frenken et al. (2007) did however not find any significant effect of clustering itself on regional economic growth. These results imply that policy is the most useful if it is aimed at increasing the related variety within a region, i.e. stimulating the formation of broad rather than narrow clusters.

Besides these policy-specific reviews there also is a strand of literature that discusses the do’s and don’ts of regional economic policy in general. Two main recommendations often are made. First of all, a ‘picking-the-winner strategy’ as is adopted in “*Peaks in the Delta*” is discouraged for several reasons (Boschma, 2009). It is unpredictable which industries are going to be the drivers of tomorrow’s economy. Another reason is that if every country wants to specialise in the industries that show the greatest potential for economic growth, then it is likely that many of them will focus on the same industries. And there probably only is space for a few such clusters in a globalised knowledge economy, meaning that most initiatives will fail (ibid.). Secondly, a one-size-fits-all policy approach also is criticised. Seeing cases of regions with a very innovative environment and reading studies about how that environment has been constructed over time might cause policymakers to want to copy that structure. But that is unlikely to work because regions tend to have very different economic and socio-institutional backgrounds (Asheim et al., 2006). What is argued to be the best type of

regional innovation policy is the type that stimulates knowledge exchange between related but different industries (Asheim et al., 2006; Frenken et al., 2007; Boschma, 2009). This still means that regional specialisation would occur but not to the same extent as that may be expected to follow from a 'picking-the-winners' policy like the kind that has been applied in the Netherlands during recent years.

3.3 Conclusion

This chapter described and discussed the structure and goal of recent Dutch regional economic policies. The purpose of this closing section is to sum the findings up in a meaningful way so that some expectations for the upcoming analysis and the following discussion can be derived. For the entire time span 1995-2007 which is analysed, the cluster concept took an important place in the development of policy. The existing economic strengths were relished and supported where possible. At the same time, an important goal was to create an innovative environment by the identifying and tackling bottlenecks that stopped entrepreneurs from developing their ideas into growing businesses. Most of the focus was thus on the regions that led the Dutch economy. Less developed regions did get 'convergence' support earlier but by 1995 this only was still the case for the three most northern provinces. The way that the policy has affected the regional economic structures in the Netherlands remains to be seen. Scholars have pointed out that the tools that policymakers have to construct regional advantages have their limits. In particular, the emphasis on making the strong parts stronger has been questioned.

CHAPTER 4

Data and methods

The previous chapters form the framework of background knowledge that is necessary to design the methods for measuring regional specialisation trends in the Netherlands and for interpreting the resulting figures. This chapter forms the start of the second part of this thesis. This part focuses on the empirical analysis. First, the properties of the data that is used to calculate the degrees of specialisation for the Netherlands is presented. It then presents and discusses the methods that are applied. Section 4.1 describes the main characteristics of the database. The choice for COROP regions as scale level is also justified in that part. Section 4.2 presents a measure called the Coefficient of Regional Specialisation. That is the calculation with which specialisation degrees are approximated. Afterwards, section 4.3 discusses the data and the methods. This final section of the chapter examines the implications of the methodological choices that have been made. What are the weaknesses of this approach and how can they be minimized? Earlier in the previous research section it has been noted that the results of measuring specialisation trends are sensitive to the methodological choices that researchers make. For that reason section 4.3 is open about the potential shortcoming of the adopted method but it also explains how those limitations are tried to be kept to a minimum for as far as that is possible.

4.1 Database

The best available data comes from the Dutch national bureau of statistics (CBS). Their database⁴ contains information on thirty-seven⁵ different business and service sectors that together form the entire range of the economy. Several indicators, including number of employees and value added are available on a yearly basis for different regional scale levels between 1995 and 2007. The scale level that is chosen as a level for analysis is a NUTS-3 level, corresponding with the forty Dutch COROP regions. This regional scale level is a standard statistical classification based on a nodal principle. A COROP region generally consists of a regional centre and its surrounding service area. COROP regions are commonly associated with labour markets (Van Aalst et al., 2005, p. 10). Studies by Bongaerts et al. (2004) and by Cörvers et al. (2009) confirm that COROP regions indeed resemble a suitable scale level to observe labour markets. A higher level of spatial aggregation (provinces) was not chosen because that would imply the loss of analytical power due to regions that are dissimilar in economic structure being merged together. A lower level of spatial aggregation

⁴ The database is available on <http://statline.cbs.nl/StatWeb/selection/?DM=SLNL&PA=37590TAK&VW=T>

⁵ See appendix A for an overview of the sectoral classification (A.1), the regional classification (A.2) and a map that shows the location of the regions (A.3).

(municipalities) was not an option because the required data is not available on that scale level.

Unfortunately the statistics bureau does not publish all the figures for all the years and every region. A part of the data is classified as secret⁶. But which cells' values are hidden is constant over time and between different indicators. The number of classified cells adds up to 11.6 percent of the absolute total. Their relative share depends on the indicator and the year that is used but it is 2.9 percent for employment in 2007 and 3.5 percent for value added in 2007. The method that has been used to calculate the degree of regional specialisation and how this data secrecy issue has been handled are described in the following method section.

4.2 Method

Out of the available indicators it was chosen to work with both employment and with value added. The previous studies on regional specialisation usually only use employment as an indicator⁷. Employment is measured as the total number of employed labour years⁸ and value added is a measure that indicates the value difference between the purchased (intermediary) goods and the produced goods. Values are measured for gross value added, meaning that no deduction for the depreciation of capital investments (machinery, real estate etcetera) is included. The reason for using both indicators is that they display different aspects of the economy and that a combination of the results therefore gives a better picture of how the economic structure of the Netherlands is changing. Employment can be argued to be the better general representative of a region. A relatively large share of the workforce of a region being active in a specific industry characterises a region independent from the overall economic importance of that industry (although both are likely to be correlated). A high degree of specialisation as the result of an industry that is employing a large share of the workforce in a region also means that the region is particularly sensitive to any development in that industry. Might that industry for some reason face trouble, then many people will be affected and not have many other industries to fall back on. So it can be said that employment is an indicator that has strong societal and political implications. Value added on the other hand is a narrower economic indicator. It indicates which industries are the biggest moneymakers. A high degree of specialisation based on value added thus implies that a region is characterized by depending on 'unusual' industries to create a large share of the value added. One reason for a region to show a high degree of specialisation based on value added could be the presence of certain natural resources such as a gas field (present in the north of the Netherlands). A highly specialised region in terms of value added could very well be highly specialised regions in terms of employment as well. But this does not necessarily have to be the case. Some industries are more capital-intensive than others. Manufacturing companies for instance, could create a lot of value added with the use of machines and just a few employees.

⁶ See appendix B.3 for an overview of which data is secret per region and per industry.

⁷ A notable exception is the study by Amiti (1999). She uses both employment and production figures.

⁸ A labour year is the equivalent of the number of hours that one full-time employee would work if (s)he was working the entire year. The number of hours worked by part-time employees and full-time employees that did not work in one industry in the same COROP region the entire year have been added up and divided by the number of hours in a labour year.

The method that is used is equal regardless of the indicator (employment or value added) that is used. The specialisation of a region is measured by the Coefficient of Regional Specialisation (CRS):

$$CRS_{AB} = 1/2 \sum_i |(X_{iA}/X_{rA}) - (X_{iB}/X_{rB})|$$

where employment (in the remainder of this section, where it says employment it could also say value added) in industry i in region A is X_{iA} , employment in the same industry in region B is X_{iB} , total employment in all industries in region A is X_{rA} and total employment in all industries in region B is X_{rB} . The calculated value will always lie between zero (exactly the same employment pattern) and one (nothing in common, i.e. completely specialised). The CRS can be considered to be a measure of relative specialisation because it compares employment in one region with another region. The benefit of using the CRS is that the resulting values are easy to interpret. It indicates the proportion of the workforce that should relocate to another sector to even out the differences in specialisation between region A and region B. Or in other words: it indicates the share of the workforce that works in a different (same) sector when comparing two regions⁹.

Region A always is one of the COROP regions. Region B is the Netherlands as a whole minus region A. Some studies (e.g. Suedekum, 2006) simply compare a region with the country as whole but because the region is a part of the country, the regional employment structure will partly be compared with itself, normally resulting in a lower degree of specialisation. This could make a difference especially for COROP regions with a relatively large economy.

The decision was made to measure regional specialisation without the effect of government jobs. The reason is that the location of those jobs is much less dependent on economical processes than for other kinds of jobs. Government employment is different because although value added can be assigned, it is not aimed at making profits directly. Rather it facilitates the preconditions leading to economic growth. And because there is no economical competition among governmental organizations, their location is not decisive in their success. Therefore government employment is not suitable as an indicator for the degree to which ongoing economical processes affect regional patterns of specialisation.

The data that is classified as secret obviously poses a problem. A straightforward solution would be to leave either some regions or some industries out of the analysis. But either way would result in a weak analysis due to the large amount of data that would be discarded. Instead a less radical, threshold satisfaction approach is adopted. Because aggregate data for both the entire economy and for parts of the economy (e.g. the manufacturing sector as a whole) are available, it is possible to work out which share of a region's employment is classified as secret. It was decided that in order for a region to be incorporated into the analysis, at least eighty percent of its employment and value added has to be known on the most detailed level of industrial classification. This criterion is satisfied for all COROP regions except for "*IJmond*" (#20), "*Delfzijl en omgeving*" (#2) and

⁹ See appendix B.1 for an example of the calculation of a coefficient of regional specialisation and its interpretation.

“Zeeuwsch-Vlaanderen” (#31)¹⁰. For the remaining regions that do satisfy the threshold criterion but for which not all values are available, some categories are merged and the corresponding value is computed using the aggregated values. The same industrial merges are then made for region B. This approach means that in practice the sectoral classification is slightly different for most regions. In general it can be assumed that the bigger a region’s share of the economic indicator that is merged into broader categories, the lower is the corresponding degree of specialisation. Appendix B.2 contains an example of how CRS-values might be affected by merging industries and of the share of employment and value added that is available at the most detailed industrial level for each region.

4.3 Data and methods discussion

The purpose of this section is to critically discuss the method before the results are presented. It explores the possibilities and especially the limitations of the empirical analysis of the next chapter. Understanding potential shortcomings and how they could influence the results is important in order to be able to interpret the analysis’ outcome correctly. Several remarks can be made about the strengths and weaknesses of this particular study.

First of all, the results of any calculation of coefficients of regional specialisation are dependent on the characteristics of the data. The different conclusions from studies that have measured specialisation in Europe emphasise this. The lack of homogeneity of the data across countries in terms of sectoral disaggregation, the measurement method and the available years posed a problem for scholars focusing on a group of countries. However, these factors are not an issue in this study. The industries are the same for each region and the data stem from the same database for all COROP regions. The only data heterogeneity problem that remains is that the industries for which the values are secret, are different between regions. But by merging some industries and doing the same for the comparison region (the Netherlands minus the observed COROP region) and by installing a threshold level for data satisfaction, this problem can be well managed. The merging of industries can be expected to lead to lower CRS-values, because specialisation might occur within the grouped industries. However, the threshold should keep this effect to a minimum. Moreover, the comparability of specialisation coefficients over time is not compromised because the same industries are merged for each year and region. And because the CRS is a relative measure of specialisation, the trends – changes over time – are more insightful than the actual values anyway. Strictly speaking however, CRS-values are only comparable between COROP regions if the sectoral classification is exactly equal. This is not always the case but again, the error margins are kept to a minimum. Especially given the many requirements that the database has to fulfill – industries, regions, years and indicators – and the absence of a database that satisfies all of these requirements perfectly.

That being said, some other remarks about the use of a specialisation index are equally applicable to studies focusing on a supranational level as well as to studies like this one, focusing on subnational regions within one country. Combes and Overman (2004) outline several criteria for measures of specialisation. Their main critique against a measure like the CRS concerns the fact that arbitrary regional borders possibly bias the resulting pattern of specialisation. Clusters of industries might cross the borders of COROP regions.

¹⁰ Zeeuwsch-Vlaanderen actually satisfies the 80% threshold criterion for most years for employment but it does not for value added. To keep the results as comparable as possible, Zeeuwsch-Vlaanderen’s CRS will not be included in the employment results either.

And when the overall degree of regional specialisation is calculated, then the economic activity in neighbouring regions counts the same as economic activity in regions far away. So in a worst case scenario a cluster is located on the crossing of borders of multiple COROP regions and those regions are all home to a similar amount of companies, employment and value added in that cluster. What could be a relatively strong display of regional specialisation is then lost because individually none of the regions measures a particularly strong degree of specialisation in that industry. Now this is an issue that is more difficult to resolve. The core of the problem is that the spatial scale at which industries are able to benefit from localized network externalities differs between and possibly even within industries (De Bok and Van Oort, 2011). The use of maps in section 5.2 makes it possible to identify clusters of regions that are equally specialised and/or display the same specialisation trend. This could indicate that the industries that are (relatively) dominant in those regions cluster on a lower scale, i.e. in an area that is bigger than one COROP region. But it is just as feasible that neighbouring regions show the same numerical specialisation pattern based on a different industrial structure. This limitation should therefore be kept in mind when analysing the results.

Finally, it needs to be admitted that the time span 1995-2007 that is available for analysis is short. A longer time span would have been better for at least two reasons. First, it would increase the certainty with which the findings could be asserted. Partly because a longer time span is likely to show more changes in the observed specialisation trends but also because theoretically, the twelve years that are analysed do not have to be representative of a longer time span at all. There is no indication that it would not be, but no certainty can be given without a more comprehensive dataset. Second, the availability of suitable data going back much further than 1995 would make it possible to relate the degree of specialisation to technological and economic cycles. Without going much into the details of the relevant literature in this thesis, it suffices to say that economies are characterised by cyclical movements. The cycles can be related to the creation and development of major innovations. And as these technologies diffuse over time, the market nature shifts from the creation of new products to a cost-competitive market. It is in this second phase that economic activities reallocate to peripheral regions because the required knowledge is widely available and the need for low costs is present. See for example the work of Schön (1998) for a more in-depth discussion about this topic. The point is that the availability of a longer time span would be possible to examine how the regional economic structure of a country changes in different phases of these cycles.

CHAPTER 5

Empirical analysis. Specialisation trends and patterns in the Netherlands

This chapter turns to the results of the empirical analysis. Using the data and methods described in chapter 4, an annual degree of specialisation is calculated for each of the thirty-seven COROP regions. To start with, section 5.1 examines the changes of the average CRS-values for COROP regions in the Netherlands between 1995 and 2007. The trend for employment based CRS-values is compared with the trend based on value added. Because they move in different directions and because the literature review has pointed out that the average degree of specialisation hides region- and sector-specific trends, the remainder of the chapter applies a less generalised view. First, section 5.2 looks into the spatial distribution of the regional degrees of specialisation. This gives insight not only into the kind of regions that tend to be more specialised, but it also hints at the changes in the economic structure. What kind of regions are getting more specialised and which regions are getting less specialised? This question is discussed in the light of regions' initial degrees of specialisation and in light of their proximity to other each other as well as to core economic areas. Finally, differences in the sectoral contribution to the aggregated CRS-values are analysed. In other words, do all economic sectors follow the same pattern? Evidence from a previous study suggests that they do not. Dixon and Freebairn (2009) found that almost all of the decrease in regional specialisation in Australia can be explained by changes in the manufacturing sector. To what extent this observation also applies to the Netherlands is discussed in section 5.3.

5.1 Specialisation trends compared

The degree of specialisation as well as the direction in which that degree is moving depends on the indicator that is used (figure 1). Measuring specialisation in terms of employment points to an overall decrease in specialisation. The weighted average CRS starts at 0.154 in 1995 and steadily declines to a low of 0.145 in 2007¹¹. This indicates a net employment shift of 0.9 percent of the total employment over twelve years. Measuring specialisation by value added shares results in a less clear trend. The weighted average CRS starts at 0.257 in 1995 and generally follows the same development as the decreasing employment trend until about 2002. But after reaching 0.245 in 2002, the value added trend moves towards increased specialisation, ending with a value of 0.262 in 1997. In other words, the industrial

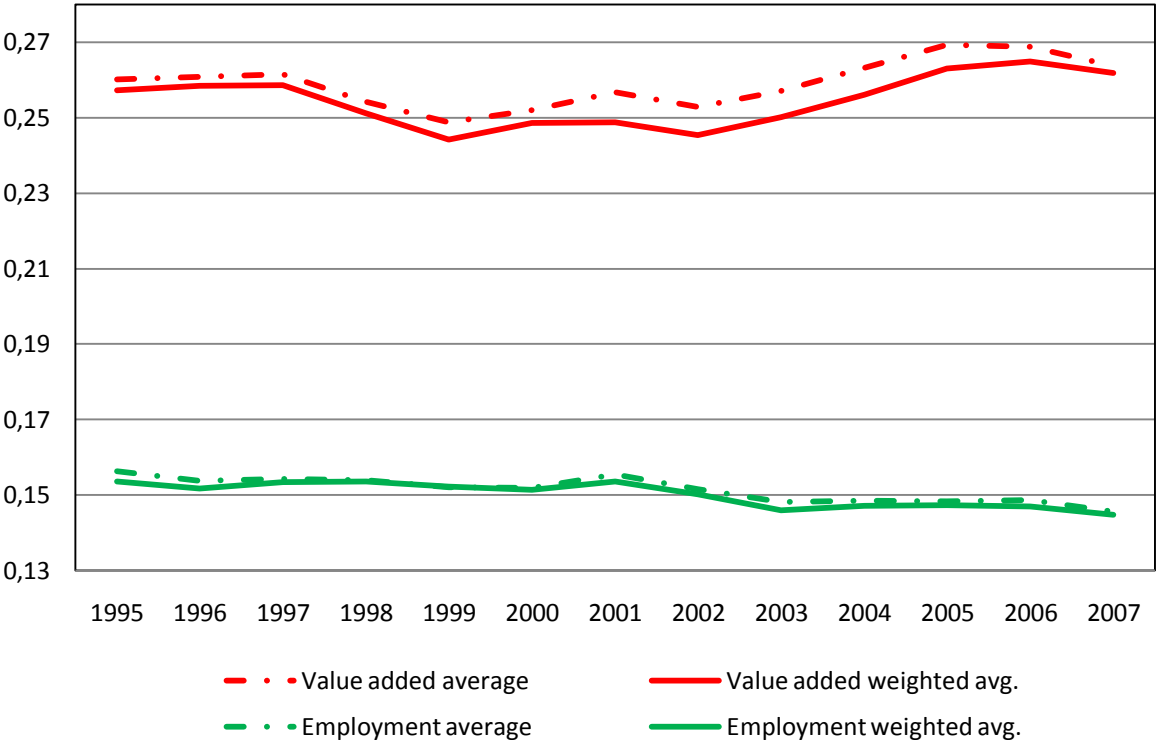
¹¹ The difference between the average and the weighted average is that for the weighted average the CRS-values of each COROP region are multiplied with a factor that represents their absolute size in any given year in terms of employment or value added in comparison with the COROP37-average for that indicator and year.

composition of employment in Dutch COROP regions has been becoming more alike over time. At the same time, the industrial composition of value added has been becoming less alike over time.

A couple of additional observations can be made when examining figure 1. First of all, the average degree of specialisation per region is much higher when measured for value added than for employment. This indicates that the industries with a relatively high level of labour productivity are more densely concentrated than other industries. Labour productivity is defined here as the amount of annual value added generated, divided by the number of employment years worked by employees.

Second, both trend lines move in different directions. This is especially true for the second part of the time span. It means that during those years, the structure of jobs per industry became more alike between regions while at the same time, the regions grew further apart in terms of which industries created the largest shares of value added. In order to gain a deeper understanding of why the trend lines move in different directions, it is necessary to look at which regions are (de)specializing and at industry-specific specialisation trends. Both of these analyses follow in the next sections.

FIGURE 1: Average CRS values for employment and value added.



A third observation that can be made from figure 1 is that the average CRS-value of employment is much more stable than that of value added. The higher degree of fluctuation in value added can partly be attributed to it simply having a higher value than employment. An equal relative increase (decrease) in values will therefore have a bigger absolute impact. But there is more to it than that. The value added created in an industry is dependent on the market for its products or services. A recession could curb the demand unexpectedly. A manufacturing industry faced with suddenly decreasing sales can respond in several ways. It

could somehow expand its market but that is difficult in a tough economic time. More likely is that the production will be down adjusted to match the new demand or that the product price is lowered to stimulate sales. Both of those measures result in a decrease of value added. The opposite process, triggered by favourable market conditions could also cause the value added to increase quickly. And theoretically, within the manufacturing sector, a lot of value added in one year could negatively affect the next year's value added if the customer market became temporarily saturated. All of these factors make the value added based specialisation trend subject to some fluctuation. Employment figures on the other hand are much less prone to fluctuate due to short-term processes. Labour is only a flexible resource to a certain degree. Laws protecting employees keep employers from sacking employees from one day to the next without having to concede extra costs.

In summary it can be stated that the observed changes in regional specialisation are quite marginal. Their direction depends on the indicator that is used. The evidence from the Netherlands does not provide much support for the increased specialisation hypothesis that was predicted by Krugman's New Economic Geography model (see Krugman, 1991). The only clear specialisation trend for the Netherlands between 1995 and 2007 is a decrease in the specialisation of regional employment structures. This finding matches the results of the studies by Suedekum (2006) and by Dixon and Freebairn (2009) that found that the employment structures of regions in Germany and Australia respectively have been getting more alike over time. But neither of those studies also measures specialisation for a narrower economic indicator such as value added. And it is the combination with the value added trend line that highlights that a restructuring of the economy as a whole is ongoing. The diverging trends indicate that not every region and each industry develops in the same way. A better understanding of these ongoing processes can be gained from studying the differences more. The next section therefore looks for differences in specialisation trends between different parts of the country.

5.2 Specialisation compared between regions

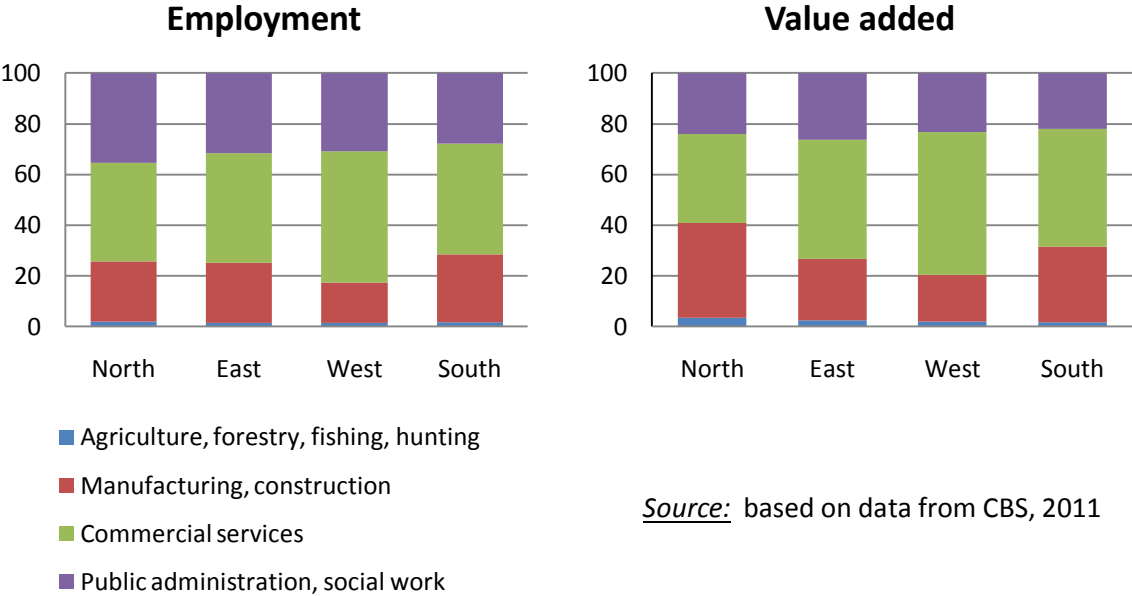
This section uses the aid of maps to show which COROP regions are the most specialised and how this pattern is developing over time. Again, a comparison between employment and value added as indicators is made. Figure 2 on page 29 shows which regions were the most specialised in 2007. Figure 3 on page 30 shows the development of CRS values between 1995 and 2007. Together both figures give insight into the changing economic structure of the Netherlands.

What stands out in figure 2 is that the northern part of the Netherlands generally is more specialised than the south. This pattern already shows for employment as indicator and even more so for value added. Especially the COROP regions in the northeast show high CRS-values when measured for either employment or value added. Now, as already mentioned in section 3.1, the northern provinces¹² also were the ones to receive financial support to stimulate the development of underperforming regions the longest. A recent report by Boneschansker and Hospers (2009) about innovation and entrepreneurship in the north of Netherlands contains some clues that help to explain the relatively high degree of specialisation that is observed there. The traditional economic core area is located in the west of the Netherlands. It is dubbed the Randstad and roughly consists of the area between

¹² The north consists of COROP regions 1-9, together forming the provinces Groningen, Friesland and Drenthe. See appendix A.3 for their exact location.

Amsterdam, The Hague, Rotterdam and Utrecht. This still is the economic core today, but it is expanding because of the high congestion costs in the area (Boneschansker and Hospers, 2009). The entire area surrounding the Randstad is profiting from this expansion, but the northern provinces have not (yet?) been reached (ibid.). Another factor that is mentioned is the northern production structure that is different from the other Dutch country parts. There are two aspects to this element. First, the main aim of the support program was to deal with the high unemployment rate. This unemployment has mainly been tackled by creating jobs in the public sector (ibid.). The second element is that most of the region’s innovativeness and competitiveness takes place within ‘traditional’ industries like agriculture, water management, food processing, ship building and energy producing (ibid.). Together, these aspects lead to a relatively small commercial service sector. Figure 4 confirms these findings. It shows that the north has the smallest service sector for employment and for value added and also that the public sector is an important employer but that most of the value added is produced within the manufacturing and construction industries. It actually is the only region in the Netherlands for which the commercial services sector is not the biggest in terms of value added. What especially stands out in comparison to the other regions is the ratio between value added in the manufacturing and construction sector compared with the value added from the commercial services sector. These characteristics of the northern provinces’ economic structure clarify why the COROP regions located in those provinces show to have relatively high CRS-values in figure 2. One remark has to be made about this explanation though. As mentioned in the previous chapter, the data on which figure 2 is based does not comprise the entire economy. A part of the public administration industries are excluded and so is the data from COROP region “*Delfzijl en omgeving*”. The clues stemming from the report by Boneschansker and Hospers (2009) nevertheless seem to offer plausible reasons for the observed specialisation pattern.

FIGURE 4: The regional economic structure of the Netherlands, 2007.



Employment

Legend

No suitable data

CRS values per COROP region

2007

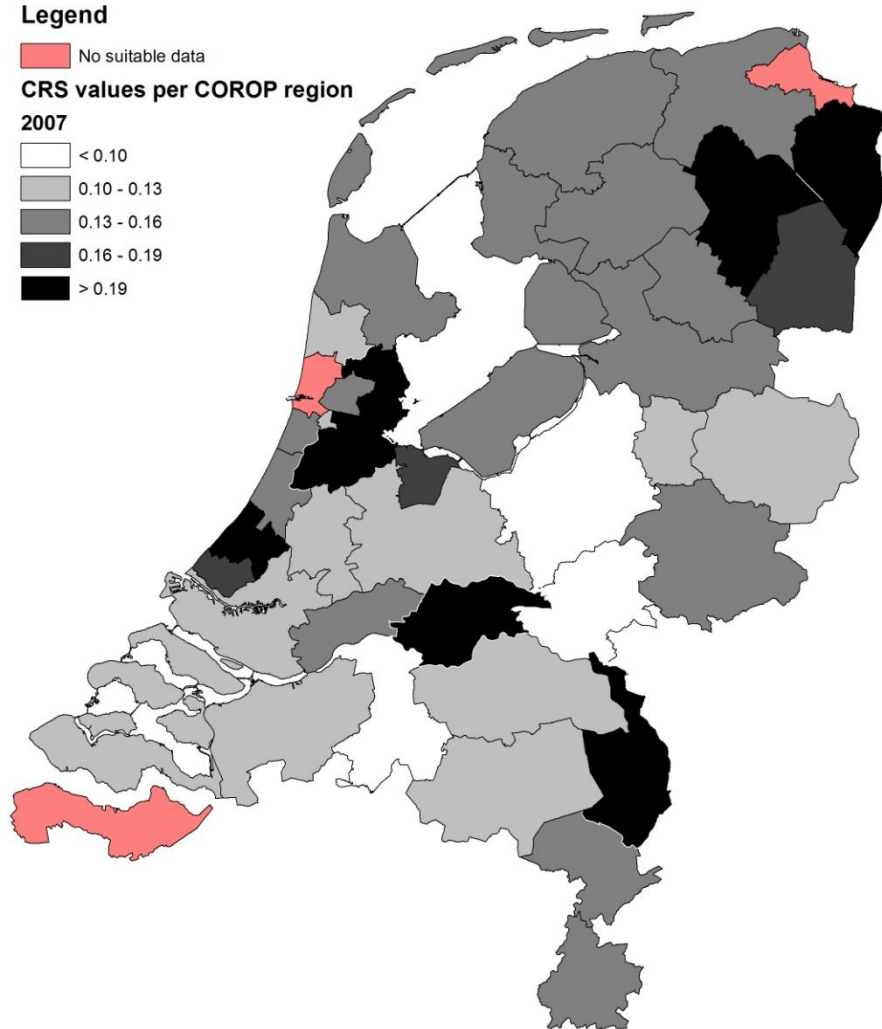
< 0.10

0.10 - 0.13

0.13 - 0.16

0.16 - 0.19

> 0.19



Value added

Legend

No suitable data

CRS values per COROP region

2007

< 0.23

0.23 - 0.25

0.25 - 0.27

0.27 - 0.29

> 0.29

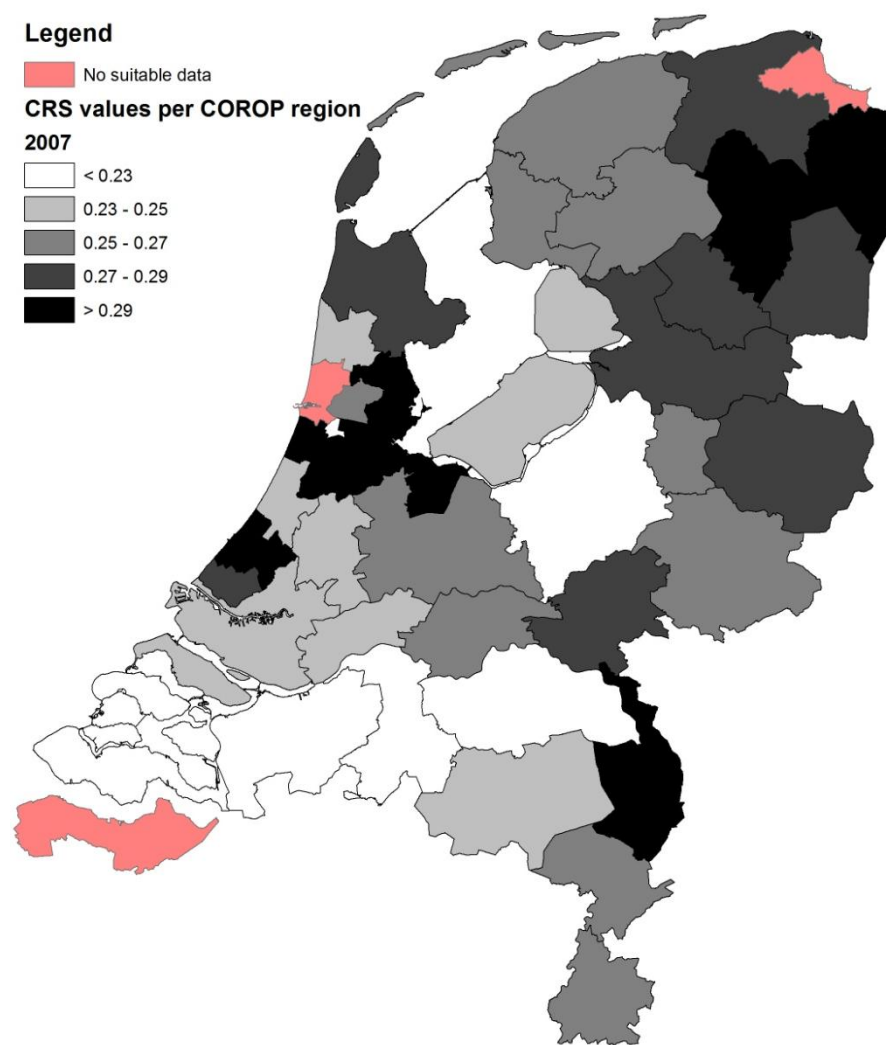


FIGURE 2: Degrees of specialisation (CRS) per COROP region in 2007.

Employment

Legend

No suitable data

CRS values per COROP region

Change 95-07 in % points

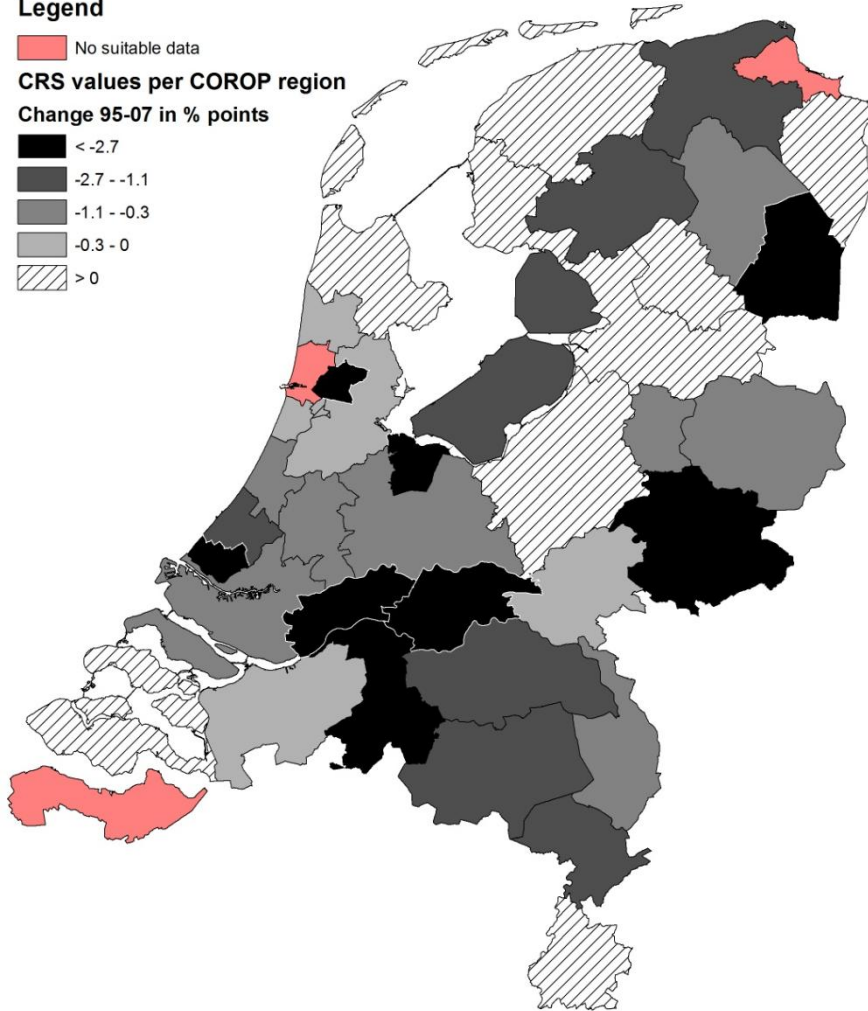
< -2.7

-2.7 - -1.1

-1.1 - -0.3

-0.3 - 0

> 0



Value added

Legend

No suitable data

CRS values per COROP region

Change 95-07 in % points

< -1

-1 - 0

0 - 0.5

0.5 - 2

> 2

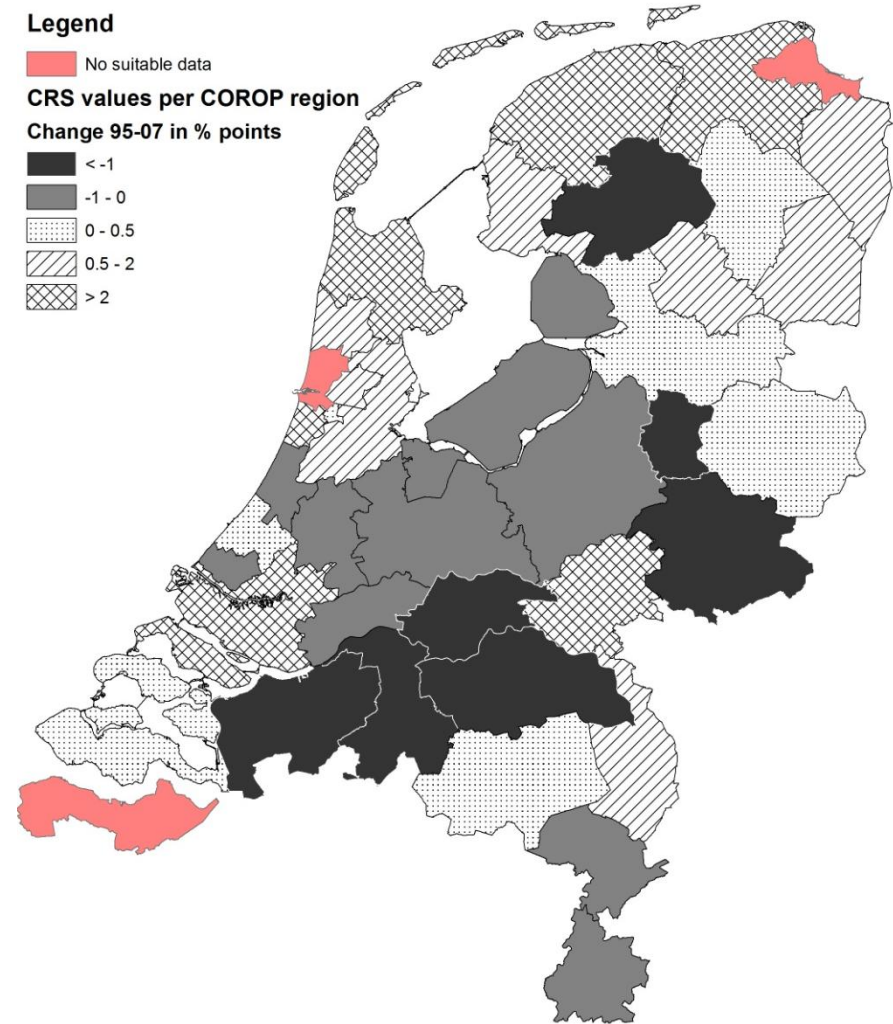


FIGURE 3: Changes in CRS values of COROP regions from 1995 to 2007 in percentage points.

Taken together, the evidence indicates that the main reason for the strong specialisation of the northern COROP regions is their peripheral location. Apparently the local economic structure draws on a different set of characteristics than the rest of the country. The distance from the north to the economic core means that firms are not able to tap into the networks of knowledge spillovers that operate in the west and the south of the country. The northern economic structure has therefore developed local expertise in other industries, leading to relatively high CRS-values when compared to the rest of the Netherlands. But the northern provinces are not the only highly specialised regions in the Netherlands.

The COROP regions containing Amsterdam and The Hague also belong to the highest category of specialisation for both indicators (figure 2). These two cities are the country's largest and third largest in terms population and both are capitals. Amsterdam is the official (constitutional) capital and The Hague is the city in which the national government is located, i.e. the administrative capital. Despite the fact that government related jobs and value added have been excluded from the calculation, these cities still show to be some of the most specialized in the country. A deeper analysis shows that both COROP regions are especially specialised in commercial services. N.B. the narrow description of commercial services as classified as one of thirty-six industries (see appendix A.1) and not the broad commercial services sector as it appears in figure 4 above. The size of the commercial services sector in Amsterdam is not surprising because it has a history as the financial and business center of the Netherlands. It houses the oldest stock exchange in the world and it presents itself as a prime business location (Zuidas Amsterdam, 2009). The Hague's central location and core function in the Dutch economy seemingly also attract a lot of economic activity with an emphasis on the commercial service sector. The COROP regions containing the other big cities (Rotterdam, Utrecht, Eindhoven and Tilburg) on the other hand score relatively low on CRS-values for 2007 (figure 2).

Overall the similarities between the specialisation patterns for both indicators are large. The only big difference between the indicators is observed in the middle of the country, with COROP regions "*Arnhem/Nijmegen*" (#15) and "*Zuidwest-Gelderland*" (#16). Arnhem/Nijmegen has a low degree of specialisation when measured for employment, but a high degree of specialisation when measured for value added. The situation in its neighbouring region Zuidwest-Gelderland is exactly the opposite.

To sum up, the following observations can be made from studying the CRS-values of COROP regions in 2007. The economic structure in the south of the Netherlands is more representative of the national average than the economic structure in the north. A high degree of specialisation in a region can be explained because the region either is an important core region (Amsterdam, The Hague) or because it has been lagging behind the rest of the country (the northern provinces). Finally, the regional specialisation pattern is fairly consistent across different indicators of the economy. So figure 2 gives some valuable insights into the structure of the Dutch economy, but it also is cross-sectional, only depicting one moment in time. Figure 3 does capture a change over time and is therefore better at explaining how the spatial structure of economic activities develops.

Were the differences between employment and value added as indicators not so distinct in figure 2, they are in figure 3. For employment, nine out of thirty-seven COROP regions are characterised by increased specialisation. But the value added map shows twenty regions that had higher CRS-values in 2007 than in 1995. Most of the changes only consist of a few percentage points but the resulting patterns seem more than just random. Clusters of

neighbouring regions that fall into the same category are apparent for both indicators. The entire economic core, the Randstad, has gotten less specialised in terms of employment per industry. Some of the strongest decreases in specialisation occur in regions that are located just southeast of the Randstad though. The regions that moved closer towards the national average for value added are almost all connected and located in the middle and south of the Netherlands.

What stands out when figure 3 is compared with figure 2 is that there is a strong connection between a high 2007 CRS-value based on value added and an increase in CRS-value between 1995 and 2007 also based on value added. Out of the fifteen most specialised regions in 2007, thirteen got more specialised since 1995. And only one out of the five least specialised regions became more specialised during the same period and for the same indicator. This finding indicates divergence. The differences in regional employment shares per industry are not increasing for the majority of regions. But that is expected after seeing the average employment CRS-value decreasing since 1995 (figure 1). As expected from the literature review, the generalised specialisation trends that were observed in section 5.1 do not justify region-specific developments. It is found that the economic structure of some parts of the Netherlands develops in a way that deviates from the average. The next section makes a different distinction between the data, for it analyses sector-specific developments.

5.3 Specialisation compared between industries

So far in this chapter, the economic structure has mainly been treated as a whole. But this section focuses on industry-specific specialisation trends. Because the CRS measure of specialisation is additive, it can be decomposed into various sectoral components. This section makes use of that property by analysing specialisation trends from different sectors. The main question that is answered is how specialisation in the manufacturing sector compares to specialisation in the rest of the economy. Dixon and Freebairn (2009) found that for Australia, the manufacturing sector explained almost all of the reduction in the Coefficient of Regional Specialisation between 1985 and 2006. The spatial distribution of employment shares in other industries actually stayed very equal over the twenty year period that was observed (Dixon and Freebairn, 2009). It has already been shown that the mean weighted average for employment based CRS-values in the Netherlands also went down between 1995 and 2007 (figure 1). This section shows that the Dutch case is similar, yet it does not follow the same pattern as the Australia exactly.

The weighted means of the CRS-values for employment and value added are plotted in the graphs in figure 5 (see page 34). Just like in Australia, the distribution of employment shares in the manufacturing sector has become more alike between Dutch regions over time. But unlike the Australian case, employment shares in the non-manufacturing industries became more concentrated regionally (figure 5). The trends of the two sectors actually are almost perfectly inversed for both employment and for value added. The only notable exception being that the CRS-values for manufacturing industries based on value added have stagnated after dropping until about the year 2000. The main difference between the two indicators is that the non-manufacturing sector contributes more to the total CRS-values for value added than for employment. In other words, the direction of the average CRS trends as presented in figure 1 is determined chiefly by the decline of the manufacturing sector for employment and by the increase in the non-manufacturing sector for value added. Considering that the manufacturing sector is a lot smaller than the non-manufacturing leads

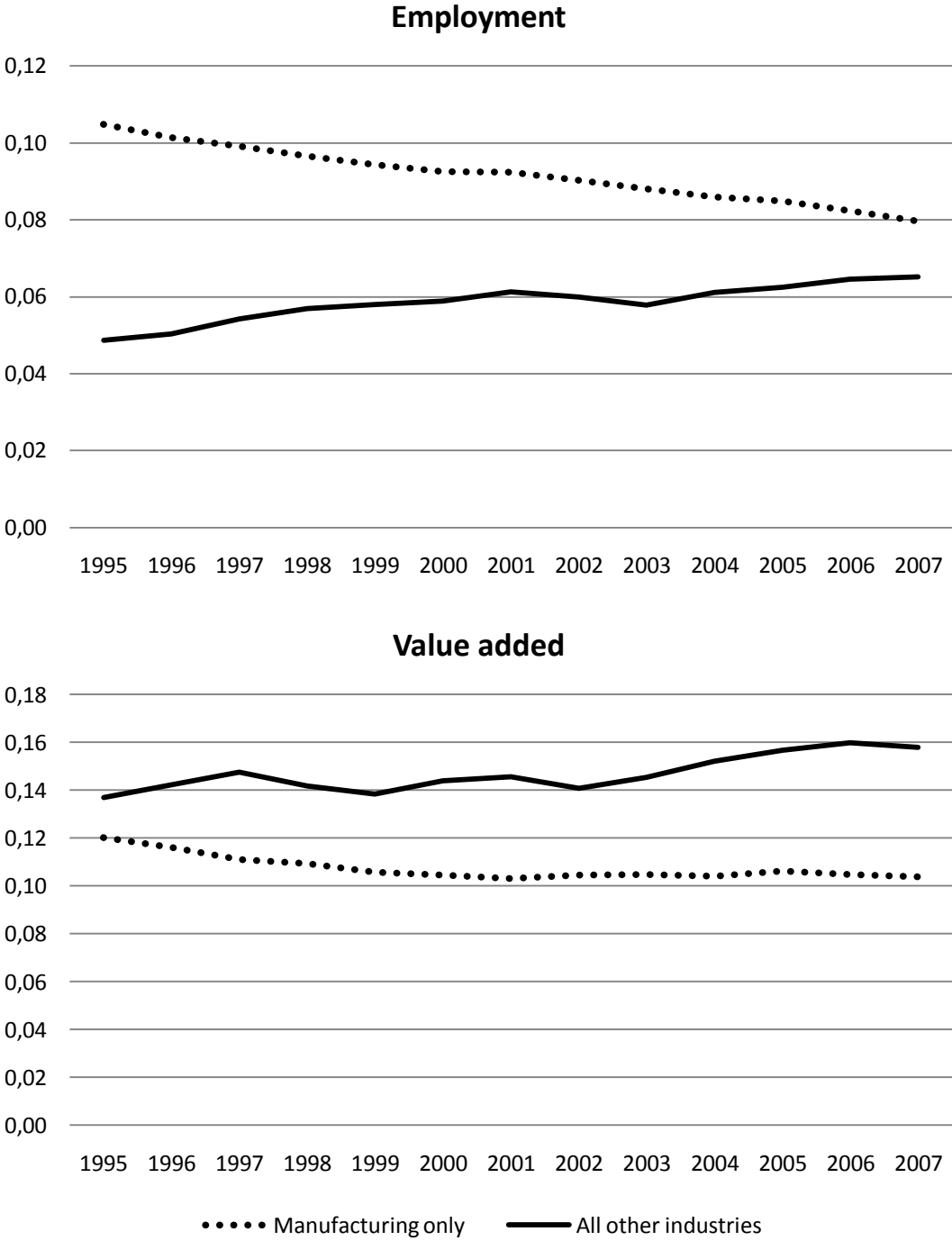
to the conclusion that the ongoing restructuring within the manufacturing sector is more profound than within the other sectors of the economy. So in that sense, the observed pattern is close to the Australian one. Dixon and Freebairn (2009) only measure CRS-values for employment so the value added based trend cannot be compared with Australia.

The main finding that can be derived from figure 5 is that the seemingly low changes in the average degree of specialisation that were witnessed in figure 1 hide a lot of the restructuring within the spatial division of economic activities that actually has been going on. Because the manufacturing sector and the non-manufacturing sector move in different directions, they dampen the total change when combined as in section 5.1. The shift to a knowledge-based economy is accompanied by an increase in the concentration of commercial services and other non-manufacturing industries. However, a relatively stronger specialisation effect is the decreased concentration of manufacturing industries. A possible explanation for this is that those manufacturing industries that do not rely on a business model constructed around resources that are unique to (a region in) the Netherlands or the rest of the western world, might increasingly relocate their activities to low-cost parts of the world.

5.4 Conclusion

The focus of this chapter was measuring the extent to which Dutch COROP regions have specialised economic structures and to see in which direction the specialisation trends move. When the results of all regions are combined into a weighted mean value, and when no distinction between sectors is made, then the results indicate that the employment structure of regions is getting more alike over time, while the industries that generate the largest share of the value added increasingly show more dissimilarity. But the picture gets more refined when separate country parts or sectors are taken into account. Two types of regions turn out to be the most specialised. One type consists of regions with a prime function in the economic structure of the country, housing industries that are chiefly located in the biggest agglomerations. Another type consists of regions that are the furthest away from the core economic area. These peripheral regions are specialised because their economies are characterised by a relatively small share of commercial services. Regional economic policy measures that have been introduced in the past to tackle persistent unemployment rates also seem to play a role. Finally, it is found that concentration trends in the manufacturing sector move in an opposite direction as concentration trends in the rest of the economy. The regional distribution of employment and value added shares in the manufacturing sector has become more alike over time. But employment and value added shares in the non-manufacturing industries have become less alike. How these findings can be explained and how they relate to a broader context is the topic of the next chapter.

FIGURE 5: Weighted means of the Coefficient of Regional Specialisation 1995-2007.



Source: based on data from CBS, 2011

CHAPTER 6

Discussing the results

One of the reasons for studying regional specialisation trends in the Netherlands is that previous studies found different results when measuring changes in the spatial structure of economic activities. Developing expectations for other regions based on that available evidence, for example for policymaking, is difficult. I argued that the methodological differences between those studies explain a part of the ambiguity in their results. Therefore this study adopted an open approach by measuring CRS-values for two indicators and examining both regional and sectoral differences. It has thereby been confirmed that the interplay between opposing economic forces and external conditions set by path dependency and policy measures intertwine in a complex model; one that is not the same for each case. A meta-analysis of the results of empirical studies can therefore only yield generic statements. However, one observation that can be made is that specialisation trends seemingly move in different directions depending on the analysis of either supranational or subnational economic structures. Most studies measuring between-country specialisation confirm the hypothesis that regions (i.e. countries in that case) are expected to get an increasingly specialised production structure. This hypothesis is often attributed to Paul Krugman's work on the development of the New Economic Geography. However, results for Germany and Australia, based on the comparison of subnational regions' economic structure indicates that those countries are moving towards a spatial division of industries that gets more alike between regions over time. Evidence from the empirical analysis of the Netherlands reveals a similar pattern when measuring changes in local employment structures.

A fundamental question in all of this is: what does it mean that one region is more specialised than another? It means that it has an economic structure in which one or a few industries are either bigger or smaller than in the comparison region. But this answer still does not say much about the meaning for regions themselves. The question might have to be reformulated to: how is a region affected by having a particular economic structure? Answering this question is much more difficult. Of course it depends on the specific case. Regions like Silicon Valley and Wall Street are specialised but so are peripheral regions that used to be manufacturing hotspots but now are characterised by high unemployment rates. Specialisation means totally different things to these regions. Or does it? After all, those regions with old-fashioned economic structure once used to be like the Silicon Valleys and Wall Streets of their time. High degrees of specialisation mean high dependencies on a certain type of activity. That can cause regions to flourish or deteriorate. The study by Frenken et al. (2007) has shown that it is related variety that is positively correlated to economic growth. This variety, not equality, is important. These questions and their answers are considerations that have to be taken into account with the formulation of regional innovation or economic policy.

CHAPTER 7

Conclusion and scope for further research

This thesis has investigated regional specialisation trends in the Netherlands during a period that has been the décor of an increased integration of markets. Firms are faced with foreign competition under the ongoing shift towards a knowledge-based economy. How the economic structure of Dutch COROP regions has changed in the light of these developments has been assessed by measuring Coefficients of Regional Specialisation. During the recent period from 1995 to 2007 there was no clear process of regional specialisation in the Netherlands. Overall, the employment structures of Dutch regions have become slightly more similar, while the regional industrial structures behind the creation of value added have become less alike. However, these general trends do not do justice to the specifics of separate country parts and groups of industries. Decomposing the overall trends reveals that:

1. The parts of the Netherlands that are the most specialised are either located in the most peripheral areas or they are the very core areas;
2. The area with the biggest regional economy – i.e. the “Randstad” – and its surrounding area had a less specialised employment structure in 2007 than in 1995;
3. When measured for value added, the most specialised regions in 2007 also tend to be typified by the largest specialisation increases (percentage points) since 1995;
4. The manufacturing sector causes the overall specialisation trends to fall, while the non-manufacturing sector causes the overall specialisation trends to rise.

Relating these observations to the theory about the localisation of industries does not lead to the identification of ‘better’ or ‘worse’ views. When Paul Krugman asked himself the question which forces – centripetal and/or centrifugal – actually explain the spatial economic structure of economic activities, he replied: “*The answer is of course, all of them*” (Krugman, 1996, p. 8). That is the same answer that I would give someone that would ask me which forces have shaped the regional economic structure of the Netherlands.

The assumptions that the environment in which firms compete constantly changes and that the location of firms partly determines their competitiveness are confirmed by the findings of the empirical analysis. The speed at which these changes occur is open for discussion, but that regions and industries develop differently over time is clear. Quantitative methods like the measurement of Coefficients of Regional Specialisation can provide insight to the direction and scope of these processes. However, they should be seen as a tool rather than as a conclusion itself. Just like a ‘one-size-fits-all’ innovation policy is unlikely to maximise region-specific opportunities, a ‘one-size-fits-all’ description of regional economics is not likely to cover a specific region in a way that its development can be understood by a set

of numbers. One way to develop a better understanding is to differentiate between aspects like regional scale levels, groups of industries and the indicators of an economic structure. But non-numeric explanations should also have an important role in explaining the observed trends. For the background and the socio-economic history of a region, as well as external factors like policy influence a region's economic structure. This study shows that such an approach reveals much more than just an overall specialisation trend.

Scope for further research

The limited availability of suitable data put some constraints on this study. Access to a more comprehensive database could arguably have helped to increase its descriptive power. Looking at a longer time span would make it possible to place the observed trends into a better historical understanding. And a more detailed sectoral classification could help to pick up even more details in specialisation trends. But there also is a scope for further research in absence of such a detailed dataset. This study could be the starting point to a deeper investigation into some of the findings of the empirical analysis. Why is it that some regions are highly specialised in terms of employment, but not at all in terms of value added? This is an example of a question that could be studied. Finally, this study also opens ideas that justify a wider geographic scope. For example, if it is true that countries are getting more specialised but that within-country specialisation falls, then how does this relate to policy initiatives to construct cross-border regional advantages? Such studies would contribute to the understanding about the commonalities between firms that are required or perhaps detrimental to the positive externalities flowing from the exchange of knowledge.

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Appendix A

A.1 Sectoral classification (Manufacturing in *italics*)

01	Agriculture, forestry, and fishing;	19	Other construction;
02	Mining and quarrying;	20	Wholesale trade;
03	<i>Food, beverages and tobacco;</i>	21	Retail trade, cars, repair;
04	<i>Textile and leather products;</i>	22	Hotels and restaurants;
05	<i>Paper and paper products;</i>	23	Land transport;
06	<i>Publishing and printing;</i>	24	Air transport, water transport;
07	<i>Coke, refined petroleum, nuclear fuel;</i>	25	Auxiliary transport activities;
08	<i>Chemical products;</i>	26	Post and telecommunications;
09	<i>Rubber and plastic products;</i>	27	Banking;
10	<i>Manufacture of basic metals;</i>	28	Insurance, pension funding;
11	<i>Manufacture of metal products;</i>	29	Auxiliary financial activities;
12	<i>Machinery and equipment;</i>	30	Real estate activities;
13	<i>Electrical and optical equipment;</i>	31	Commercial services;
14	<i>Manufacture of transport equipment;</i>	32	Education;
15	<i>Manufacturing n.e.c.;</i>	33	Health and social work;
16	Electricity, gas and water supply;	34	Environmental services;
17	Civil commercial industrial building;	35	Culture, sports and recreation;
18	Civil engineering;	36	Other service activities.

A.2 Regional classification (for locations see map in A.3)

01	Oost-Groningen;	21	Agglomeratie Haarlem;
02	<i>Delfzijl en omgeving;</i>	22	Zaanstreek;
03	Overig Groningen;	23	Groot-Amsterdam;
04	Noord-Friesland;	24	Het Gooi en Vechtstreek;
05	Zuidwest-Friesland;	25	Agglomeratie Leiden en Bollenstreek;
06	Zuidoost-Friesland;	26	Agglomeratie 's-Gravenhage;
07	Noord-Drenthe;	27	Delft en Westland;
08	Zuidoost-Drenthe;	28	Oost-Zuid-Holland;
09	Zuidwest-Drenthe;	29	Groot-Rijnmond;
10	Noord-Overijssel;	30	Zuidoost-Zuid-Holland;
11	Zuidwest-Overijssel;	31	<i>Zeeuwsch-Vlaanderen;</i>
12	Twente;	32	Overig Zeeland;
13	Veluwe;	33	West-Noord-Brabant;
14	Achterhoek;	34	Midden-Noord-Brabant;
15	Arnhem/Nijmegen;	35	Noordoost-Noord-Brabant;
16	Zuidwest-Gelderland;	36	Zuidoost-Noord-Brabant;
17	Utrecht;	37	Noord-Limburg;
18	Kop van Noord-Holland;	38	Midden-Limburg;
19	Alkmaar en omgeving;	39	Zuid-Limburg;
20	<i>IJmond;</i>	40	Flevoland.

A.3 Map displaying an overview of the regional features of the Netherlands



COROP regions and their corresponding provinces:

<ul style="list-style-type: none"> 1-3: Groningen 4-6: Friesland 7-9: Drenthe 10-12: Overijssel 13-16: Gelderland 17: Utrecht 	<ul style="list-style-type: none"> 18-24: Noord-Holland 25-30: Zuid-Holland 31-32: Zeeland 33-36: Noord-Brabant 37-39: Limburg 40: Flevoland
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Appendix B

B.1: An example of the calculation of a coefficient of regional specialisation

The easiest way to show the meaning of CRS-values is through an example. Consider a case with two regions and an economy that is divided into just three industries. The table below shows the absolute number of hours worked in each of the industries.

	Industry 1	Industry 2	Industry 3	Total emp.
Region A	250	250	500	1000
Region B	500	250	250	1000

When applying the formula:

$$CRS_{AB} = \frac{1}{2} \sum_i |(X_{iA}/X_{TA}) - (X_{iB}/X_{TB})|$$

where employment in industry i in region A is X_{iA} , employment in the same industry in region B is X_{iB} , total employment in all industries in region A is X_{TA} and total employment in all industries in region B is X_{TB} .

$$CRS_{AB} = \frac{1}{2} * (|(250/1000 - 500/1000)| + |(250/1000 - 250/1000)| + |(500/1000 - 250/1000)|) = \frac{1}{2} * (0,25 + 0 + 0,25) = \mathbf{0,25}$$

This value indicates that 25% of the total employment in region A should be relocated to another industry in order to get the exact same economic structure as region B or vice versa. And indeed, if region A would spend 250 less hours of work in industry 3 and put those hours in industry 1, then both regions would have the same division of labour.

B.2: Merging industries and CRS: an example

The problem that some sectoral values are classified for certain sectors is handled by merging industries. The downside is that it potentially lowers the corresponding region's CRS-value, as is demonstrated by the following, hypothetical, example. Consider a situation with two regions and ten industries, five of which together form the manufacturing sector. The table below shows the percentages of an economic indicator per region and industry. The degree of specialisation between the regions (CRS-value) is

$$\frac{1}{2} * (0.01 + 0.02 + 0.04 + 0.04 + 0.01 + 0.03 + 0.04 + 0.03 + 0.01 + 0.01) = 0.12$$

	Agric.	Manufacturing sector					Service sector			
Economic activity	I	II	III	IV	V	VI	VII	VIII	IX	X
Region A	4	2	6	7	12	4	23	15	20	7
Region B	5	4	2	11	11	7	19	12	21	8

Now let's consider that the values for region B in industry III and IV are classified. It is however, known that the total manufacturing sector in region B constitutes 35 percent of the economy. What then would be done to calculate the CRS is to merge industry III and IV.

Together, industry III and IV must stand for $35 - 4 - 11 - 7 = 13$ percent.

	Agric.	Manufacturing sector				Service sector			
Economic activity	I	II	III + IV	V	VI	VII	VIII	IX	X
Region A	4	2	13	12	4	23	15	20	7
Region B	5	4	13	11	7	19	12	21	8

Now, when the degree of specialisation is calculated, it turns out only to be 0.08. By merging industry III and IV, a part of the detail is lost, leading to a lower CRS-value. This loss can at the maximum be as high as the employment (or value added) percentage of a region represented by the merged industries. An 80% threshold level of values known at the most detailed level of sectoral classification is implemented to minimize the loss of specialisation. But in reality, the majority of regions would even pass a 95% threshold, as table B.2 below shows. The values indicate the percentage of a certain indicator that is known at the most detailed level of the sectoral classification.

Table B.2: Data availability levels (%)

NR	COROP	Value added		Employment	
		1995	2007	1995	2007
1	Oost-Groningen	87	89	80	84
2	Delfzijl en omgeving	43	49	63	68
3	Overig Groningen	99	99	98	98
4	Noord-Friesland	97	98	96	97
5	Zuidwest-Friesland	87	87	85	86
6	Zuidoost-Friesland	90	89	89	88
7	Noord-Drenthe	96	95	97	97
8	Zuidoost-Drenthe	96	96	95	96
9	Zuidwest-Drenthe	95	95	95	94
10	Noord-Overijssel	98	98	97	98
11	Zuidwest-Overijssel	88	91	90	93
12	Twente	95	96	97	98
13	Veluwe	98	98	97	98
14	Achterhoek	95	95	93	94
15	Arnhem/Nijmegen	100	100	100	100
16	Zuidwest-Gelderland	100	100	100	100
17	Utrecht	100	100	100	100
18	Kop van Noord-Holland	99	99	98	98
19	Alkmaar en omgeving	99	99	99	99
20	IJmond	62	68	72	79

Table B.2 continued

NR	COROP	Value added		Employment	
		1995	2007	1995	2007
21	Agglomeratie Haarlem	88	93	92	94
22	Zaanstreek	98	99	98	98
23	Groot-Amsterdam	100	100	100	100
24	Het Gooi en Vechtstreek	94	95	94	95
25	Agglomeratie Leiden en B.	98	98	97	98
26	Agglomeratie 's-Gravenhage	99	99	100	99
27	Delft en Westland	98	99	98	98
28	Oost-Zuid-Holland	92	93	94	94
29	Groot-Rijnmond	100	100	100	100
30	Zuidoost-Zuid-Holland	91	94	91	95
31	Zeeuwsch-Vlaanderen	56	57	79	80
32	Overig Zeeland	85	83	89	90
33	West-Noord-Brabant	90	91	93	94
34	Midden-Noord-Brabant	95	91	98	95
35	Noordoost-Noord-Brabant	100	100	100	100
36	Zuidoost-Noord-Brabant	90	93	88	91
37	Noord-Limburg	99	99	99	99
38	Midden-Limburg	95	97	95	97
39	Zuid-Limburg	92	93	93	95
40	Flevoland	100	100	100	100

B.3: Data secrecy overview (red background indicating secret value)

	1	5	10	15	20	25	30	35
1		■			■			
2		■	■	■	■		■	
3			■	■				
4		■		■				
5		■			■		■	■
6					■		■	■
7				■			■	
8		■		■				
9		■		■				
10			■	■				
11		■		■				
12		■	■					
13					■			
14					■			
15								
16								
17								
18				■				
19			■					
20		■	■	■	■		■	
21		■	■	■			■	
22			■					
23								
24			■	■	■			
25					■			
26			■	■				
27		■					■	
28		■	■	■			■	
29								
30			■		■			
31		■	■	■		■		
32		■	■	■				
33			■		■		■	
34			■				■	
35								
36			■		■			
37							■	
38					■		■	
39					■		■	
40								

The columns represent industries; numbered as in appendix A.1.

The rows represent COROP regions; numbered as in appendix A.2.