The evolution of a cross-border regional innovation system: An institutional perspective

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Introduction

Cross-border regions differ greatly in size, competences, finance and commitment. Cooperation is often confined to a limited number of issues (Klatt & Herrmann, 2011). Complementarities in the economic structure, socio-economic institutions and innovation capabilities between the neighbouring regions, which create room for new combinations, markets and synergies, are often seen as the main driver of cross-border cooperation.

From an innovation perspective, the nation-state border acts as a barrier to cross-border learning, by impeding interaction between actors on both sides of the border. Thereby it frustrates the exploitation of the possible synergies and complementarities that actors perceive. The border is not only a political line dividing states, there are economic, social and mental bordering processes that hinder cross-border interaction and network formation, which are prerequisites for cross-border institution building and the development of a cross-border innovation system (CBRIS). Within the cross-border region 'institutional gaps' can be observed, which resemble the limited amount of innovation related cross-border interaction among actors, due to differences in the institutional architectures on both sides of the border. Furthermore, these institutional gaps can hamper the build-up of regularities and influence the evolution a cross-border innovation system in a negative manner. As cross-border regions have to focus more on their innovation performance to remain or become competitive (Lundquist & Trippl, 2011), the institutional gaps in the evolution of CBRISs become a relevant research object.

The border is an important factor in the evolutionary path of a CBRIS. Due to the fact that the adjacent regions in the cross-border region remain institutionally embedded within their national systems, actors that try to pursue cross-border innovation objectives, find themselves embedded in a multi-level institutional architecture. The border makes it harder to transfer knowledge and competences across the border (Trippl, 2009). In this paper we further investigate this multi-level institutional embeddedness of actors, and the evolution of a CBRIS. Actors are confronted with institutional gaps in their cross-border actions and try to seek solutions accordingly. These problems and solutions can emerge at different levels in a cross-border setting. By finding solutions to overcome the institutional gaps, these actors contribute to the evolution of a CBRIS, albeit passively as a by-product of their goals and actions. Only certain government actors are actively and purposively attempting to build a CBRIS.

To identify institutional gaps, it is necessary to unpack the multi-level institutional architectures that meet at the border. The behaviour of individuals and organizations that are confronted with institutional gaps, provides information concerning agency in the evolution of a CBRIS. Indeed, actors also use and exploit the multi-level institutional architectures to reach their cross-border objectives. Their behaviour is shaped, influenced or constrained, but not wholly determined by the institutions (Gertler, 2010).

The main research question that follows, is: *'How do multi-level institutional architectures influence the evolution of a cross-border innovation system'?*

The remainder of the paper is broadly divided in two parts. Part one consists of a literature review and analytical framework. The second part of the paper is dedicated to a case study that has been undertaken in the region of Venlo (The Netherlands) and Niederrhein (Germany). The first part of the case study sets the scene by addressing the institutions at play and the multilevel aspects within. The second part will discuss how agency takes form by analyzing the behaviour of agents in two separate topics: innovation policy and education. The empirical work in this paper is informed by an in-depth case study conducted for Greenport Venlo, an intermediary body for the agrofood sector in the Venlo region.

Regional innovation systems and Cross-border regional innovation systems

A regional innovation system (RIS) consists a knowledge-producing and a knowledge exploiting system (Cooke, 1992). The knowledge-producing system can include universities, colleges and other research institutions. Actors who transform knowledge into products and services form the knowledge exploiting system. In successful, innovative regions there is a constant interaction between these two (sub)systems. The RIS approach focuses on the institutions and policy that facilitate the technological development and innovative potential of firms in a given territorial unit (Doloreux & Parto, 2005). The knowledge infrastructure, the firms in the region and the institutions and policy facilitating the transfer of knowledge between them, are object of analysis.

Taking this even further Asheim, et.al. (2011; 878) state that:

'At the core of the RIS approach is an emphasis on economic and social interactions between agents, spanning the public and private sectors to engender and diffuse innovation within regions embedded in wider national and global systems'

Institutions or an institutional infrastructure can be supportive for the regional cluster of firms (Asheim & Gertler, 2006). This institutional infrastructure can be strengthened and to a certain extent planned by policy interventions, which results in what Asheim & Gertler (2006) call a regionally networked innovation system. Institutions then influence the 'practices of firms in the region' (ibid, 300). At the same time these institutions are a product of the regional institutional architecture. They are also strongly influenced by national institutions, and embedded in the national innovation system. For example: whether a region is part of a national innovation system in a liberal market economy or a

coordinated market economy will make a difference for the kind of regional institutions to develop and the specific regional innovation system that is present (B. T. Asheim & Gertler, 2006; Christopherson, 2002). Institutions therefore influence the behavior of actors and thereby the evolution of a RIS.

The CBRIS concept can be seen as a specific form of a RIS. Most cross-border regions started cooperating on a small number of issues. On the long term however, their cross-border economic strength is likely to rest upon their capacity to build an integrated innovation system (Lundquist & Trippl, 2011). Lundquist & Trippl (2009, p.2) argue that CBRISs should be seen as the 'last and most advanced form of cross-border integration, building on the success of previous incremental and less innovation-oriented modes of integration'.

Lundquist and Trippl (2011) identify three stylized stages in the evolution of a cross-border innovation system: weakly integrated systems, semi-integrated systems and strongly integrated systems. Collaborative innovation in a cross-border setting represents the last and most advanced stage of cross-border cooperation (ibid, 2011).

In this paper we build on the CBRIS concept of Lundquist & Trippl, by focusing on the institutional dynamics and the room for agency in the process of construction of cross-border innovation systems. Hence, we are interested the evolution of a CBRIS and the institutional dynamics at work. Translated into the concept of Lundquist & Trippl, we add the continuous interaction among the stages. This is indicated by the multiple feedback loops between the three stages of a CBRIS (see figure 1).

Most cross-border regions can find themselves in all three stages at the same time, depending on the cooperation subject at hand. When trying to understand the evolution of CBRIS, it is necessary to take into account these two aspects of feedback loops and different cooperation subjects.

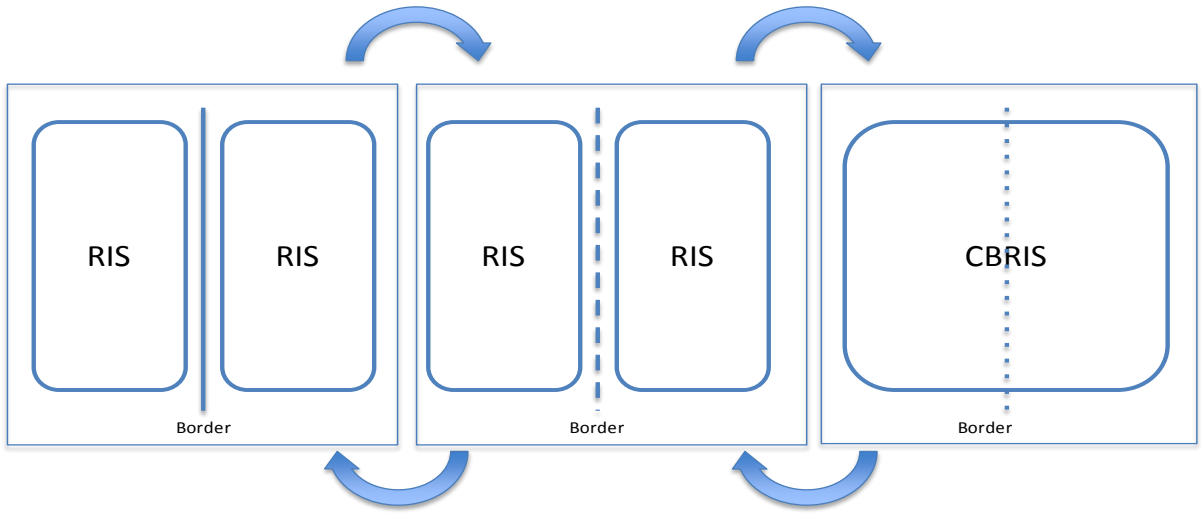

Figure 1: Feedback loops in the construction of CBRIS (adapted from Lundquist & Trippl, 2011. Adjustment by authors)

Institutions, scales and agency

Institutions govern and condition social life by reducing uncertainty in everyday practice and by doing so provide (temporary) stability (Gertler, 2004; Moodysson & Zukauskaite, 2012; North, 1990; Scott, 2001). Institutions might consist of rules, routines, habits, conventions, customs or practices that are internalized by the majority of actors in a population (Moodysson & Zukauskaite, 2012; Gertler, 2004). In the evolution of a CBRIS, institutions may facilitate processes of collective learning and the build-up of economic relations by providing (temporary) stability. The border impedes this build-up of regularities and structure. The institutional architecture of a CBRIS is a complex composition of institutions that are already present on various levels and interact in a cross-border setting, and new (cross-border) institutions that originate in the evolution process.

Here, we discuss the nature of institutions, and the institutional architecture that influences the development path of a CBRIS. Furthermore, the way actors behave in this institutional architecture is addressed in order to reach their objectives in a cross-border setting.

Nature of institutions

A prime distinction can be made between formal and informal institutions (North, 1990). Formal institutions refer to laws, rules and other judicial elements in a regional or national innovation system. Differences in juridical systems and laws can act as an important impediment to cross-border cooperation (Haselsberger & Benneworth, 2011). On the other hand laws and regulations that are formulated on a supranational level can be supportive to cross-border cooperation as part of the uncertainty related to collaborative cross-border innovation is reduced. For example, patented intellectual property rights in the EU, are protected by the European Patent Convention (epo.org). This reduces uncertainty between actors collaborating on patentable inventions in different EU countries.

In innovation systems, informal institutions imply the use of values, norms and routines (Boschma, 2005; Mattes, 2012; Torre, 2008). When crossing the border, not only laws and rules change, but also the manner in which actors interact and the relevant norms and beliefs that apply when doing business. These soft institutions can thereby impede knowledge transfer across borders. They are also hard to change over time and may lead to situations of lock-in. In a cross-border region, actors on both sides of the border are embedded in different national and regional institutional architectures; thereby institutional gaps arise, hampering the structural build-up of cross-border networks and transfer of knowledge, and finally the evolution of CBRIS.

Scott (2001) has refined the distinction between formal and informal institutions by distinguishing between three pillars of institutions: regulative, normative and cultural-cognitive. Regulative institutions show strong overlap with North's notion of formal institutions. They are of a coercive nature and consist of rules, laws and accompanying sanctioning (Scott, 2001). Normative institutions on the other hand are morally governed, binding expectations to which people adhere such as values, norms and codes of conduct. The cultural-cognitive dimension of institutions refers to shared logics and common

beliefs that are taken for granted, supported by culture and everyday practices (Scott, 2001; Moodysson & Zukauskaite, 2012).

Moodysson & Zukauskaite (2012) add to these three pillars the distinction between industry specific institutions, and territorial institutions. The industry specific institutions mainly refer to the culture and ways of organizing innovation activities within industries. The territorial institutions facilitate the transfer of knowledge in a region, and are seen as durable structures that facilitate inter-firm networking (Boschma & Frenken, 2009). However, inter-organizational innovation relations are not only of a regional nature, but also national and global (Asheim & Gertler, 2005; Moodysson and Zukauskaite, 2012). The importance of this distinction between industry-specific institutions and territory-specific institutions in a cross-border region is that differences in institutional architectures could also be related to differences in industry-specific institutions, and should not be conflated with territory-specific institutions.

Multi-level institutional architectures in the evolution of a CBRIS

Actors in a CBRIS are embedded in multi-level institutional architectures. Institutions on a supranational, (sub)national and regional level influence the behaviour of individuals and organizations that are trying to pursue economic opportunities in this cross-border setting. Various institutions are relevant on different levels (Hansen & Serin, 2010). The figure depicts institutional levels, not necessarily territories. Specifically at the nation-state border, institutions from all these levels interact.. For actors developing innovation activities in a cross-border setting, this means that they encounter institutional gaps along the way, to which they try to find solutions accordingly. In other words, actors that try to engage in cross-border innovation initiatives, are embedded in multi-level institutional architectures, which influences their room for agency, and therefore they also influence the evolutionary path of a CBRIS. Analogous to the RIS literature, cross-border regional innovation systems are strongly embedded within the institutional structure of the national innovation system (Boschma & Frenken, 2006). Here, the hierarchy of competences between the regional and national level clash. Therefore it is necessary to identify the relevant institutional levels and to analyze how the hierarchies unfold and influence the behaviour of actors that are engaging in cross-border activities. Figure 2 visualizes these different levels in a European setting, as this is a particular supranational institutional level (dotted lines) of importance in European cross-border regions.

Agency

Besides influencing, constraining and shaping cross-border interaction, institutions at different levels also provide room for agency. As Gertler (2004; 7-8) argues:

'Although these institutionally shaped attitudes, values, and conventions influence choices and constrain decisions regarding practices, they do not wholly determine them. There is still a major role here for individual agency to produce a variety of responses within the same sector, region, and nation-state.'

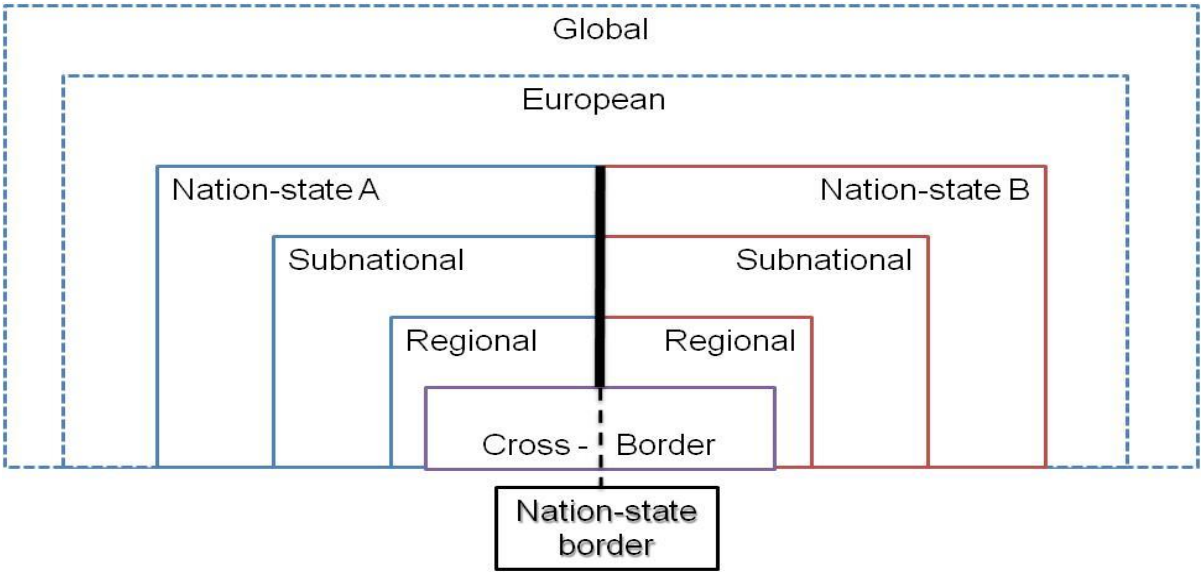

Figure 2: Multi-level institutional embeddedness of actors.

The evolutionary trajectory of a CBRIS is characterized by multiple feedback loops and the actors within the system are embedded within multilevel institutional architectures. Institutional gaps can arise due to the existence of the nation-state border, which obstructs the evolution of the CBRIS. Hansen en Serin (2010) put forward the suggestion of 'patching up' and 'transposition' as ways of dealing with institutional gaps in cross-border regions. They question whether new structures and institutions need to be created (patching-up between existing institutions) or if the existing structures can be used in innovative ways to reach the objective of cross-border innovative cooperation (transposing the existing institutions) (Genschel, 1997; Hansen & Serin, 2010).

Actors influence the evolutionary path of a CBRIS, as they operate in between the institutional levels. These actors are what (Lofgren, 2008) calls regionauts.

'Regionauts are people who develop skills of using the world on both sides of the border.'

(Lofgren, 2008; 196)

These agents can drive the evolutionary path of a CBRIS, as regionauts use the world on both sides of the border and beyond to reach their objectives. However, there is a notable difference between firms, knowledge institutes and government actors. The first category of actors is mainly pursuing its own economic interest and thereby indirectly influences the evolution of a CBRIS. They are not actively pursuing the development of a CBRIS. Rather, the collective actions of all actors lead to a structuration process from which institutions evolve. On the contrary, some government actors might be actively trying to construct a CBRIS, as this could be a policy goal. Blatter (2004) observes that policy might be as important as a driver of cross-border institution building as complementarities in economic structures.

This leads us to distinguish between passive and active engagement in the evolution process of a CBRIS. Both kinds of actors are frontrunners in developing skills to use the world on both sides of the

border and thereby create linkages, but with a difference in intentionality. This has implications for the way they use and exploit, and are conditioned by the multi-level institutional architectures in which they are embedded. Whereas the business and knowledge institutes might be more engaged in patching-up institutional gaps when they encounter one, the government actors might be more actively engaged in trying to transposition existing institutions to fill the institutional gaps.

Analytical framework

Following from the literature review an analytical framework can be constructed. Three analytical parameters are taken into account.

First, institutional gaps are present due to the nation-state border, which acts as an impediment to cross-border cooperation. The nation-state border has led both regions and countries to develop different institutional architectures. Institutional gaps can be territory specific or industry specific.

Second, the analytical framework includes the embeddedness of actors in multi-level institutional hierarchies. Actors that try to construct a cross-border innovation system, encounter problems in the cooperation process, which are related to differences in the multi-level institutional hierarchy.

Third, the solutions that actors try to find for the obstacles they encounter when developing cross-border innovation relations are discussed. The actors are embedded in the multi-level institutional architectures and use and exploit opportunities that arise on these levels when necessary and profitable.

The analytical table is therefore constructed as follows:

	Cross-border cooperation theme
Institutions	Description of institutional gaps (regulative, normative, cultural-cognitive).
Multilevel institutional hierarchy	The problems in the evolution of a CBRIS due to the multilevel institutional hierarchies.
Agency	How do regional actors try to overcome these problems and how do they use these kinds of institutions to reach their cooperation objectives.

Table 1: Analytical framework (authors' own composition)

In the following section the case study is presented. The analytical framework will be used to analyse three examples in the evolution process of a cross-border innovation system in the region of Venlo-Niederrhein, where barriers to cooperation emerge. The examples are related to innovation policy, education and greenhouse innovation.

Case Study: Horticultural ambitions in the region of Venlo-Niederrhein

General context

The Venlo-Niederrhein region is situated in the southern part of the Dutch-German border. It consists of the Northern part of the Dutch province of Limburg and the German region of Niederrhein. The cross-border region is part of the Euroregion Rhine-Meuse North (RMN) and has no formal status as an administrative cross-border region. However, several cross-border initiatives can be observed in

this specific region, which is situated directly at the border. The majority of initiatives is centred around the most prominent commonality of both regions, which is the dominance of horticulture in their economic structure.

At the Dutch side of the border the city of Venlo is cooperating with neighboring towns in a regional cooperation structure called 'Greenport Venlo'. Greenport Venlo is one of six Dutch regions with the 'Greenport' status, which comes with political and financial leverage. This enables the intermediary body of Greenport Venlo, to adhere budgets and spend them on innovative projects in the horticultural and food sector.

Niederrhein is part of the administrative region of Bundesland North Rhine-Westphalia (NRW). The 'Bundesländer', will be referred to as States from this point onwards. Within this larger region the focus of (innovation) policy is directed towards the high tech and automotive sector, horticulture being only a marginal sector on state level. On the level of the Kreisen and cities in Niederrhein, the horticulture sector is one of the most important sectors of the regional economy. This has led the regions on both sides of the border to investigate whether there is room for more cooperation between the regions to create an integrated horticultural industry. The most prominent towns that are investigating whether it would be fruitful to operate in a cross-border setting are Stadt Straelen and Stadt Nettetal.

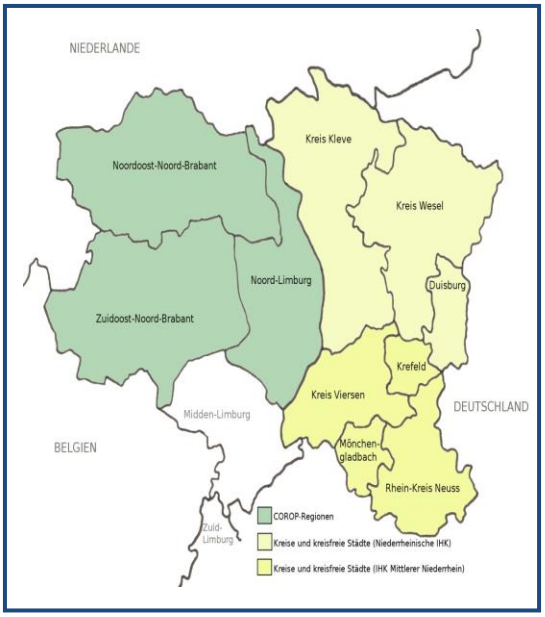

Figure 1: The Venlo-Niederrhein region

Besides their common economic specialization, there is also a partly shared history. The region nowadays called Northern-Limburg and what used to be Kreis Geldern (now part of Kreis Kleve) were one of four quarters of the duchy of Gelre. In 1543 the treaty of Venlo separated this 'Oberquartier' from three other quarters, which are now part of the Dutch province of Gelderland (Betuwe, Achterhoek en Veluwe). Only in 1815 at the Congress of Vienna the Dutch and Prussian part of the 'Oberquartier' are separated. Economic and cultural ties remained strong for a long time, also due to the shared Catholic religion, which was dominant in this region.

In 2012, the author have been engaged in a study, funded by INTERREG IV A Netherlands-Germany, which aimed to investigate the sub-sectoral structure of the horticulture in both regions. The goal was to study whether there are complementarities in the primary and secondary agricultural industry in the two neighboring regions. A secondary goal was to investigate the existence of cross-border relations, cross-border cooperation and the role of the border in this respect. The case-study consisted of 25 interviews with companies, educational institutes, universities and government officials on both sides of the border in the Venlo-Niederrhein region. The interviews were supplemented by official

documents and reports. In cooperation with dr. Hein Vrolijk a statistical analysis was carried out for the whole agrofood sector in the region.

Evolution of the cross-border agrofood and horticulture innovation system

Both Northern Limburg (referred to as Venlo) and Niederrhein are relatively peripheral regions within their respective countries. Niederrhein is not only peripheral within Germany, but also within the state of North Rhine-Westphalia. When comparing Niederrhein and Venlo, and looking at governmental jurisdiction, the state level in Germany is more comparable to the national level in the Netherlands. This does not mean that the German national level is not important. For most regulative institutions, such as law and government jurisdiction it is less important than the state level. For the analysis of the cross-border we look at two interrelated cooperation topics, innovation policy and education as examples of domains within the CBRIS where barriers emerge. The focus is thereby on the innovation system of the agrofood and horticulture sector.

Innovation policy

In the Netherlands the national level dominates innovation policy. The two key governmental actors are the ministry of economic affairs (EZ) and the ministry of education, culture and science (OC&W). EZ is responsible for innovation policy and more industry oriented. OC&W is responsible for the science and education policy. The innovation policy of the Dutch government rests on a selection of nine so-called 'top-sectors'. For each of these sectors a team is composed of four people from the industry, science and government officials who are responsible for implementing the policy in their sector. Agriculture and food (A&F) and horticulture and propagation materials (T&U) are selected as a two top sectors of the Dutch economy (*Naar de top: De hoofdlijnen van het nieuwe bedrijfslevenbeleid*, 2011). This signifies that at the national level the economic specialization of the Venlo region receives much policy attention.

The national level policy attention is also reflected in the spatial-economic policy of selecting a few horticultural hotspots, the so-called Greenports. Regions with the Greenport status receive national level investments with priority. Venlo is one of the six Greenports. However, the importance of the Greenport status within the national policy domain has decreased with the implementation of the top sector policy, as there is only partial attention for the regional level in this policy.

At the regional level the province of Limburg and seven municipalities (Venlo, Beesel, Bergen, Gennep, Horst aan de Maas, Peel en Maas and Venray) cooperate within the Greenport Venlo foundation. The main formal role of the province of Limburg is related to spatial planning; in the spatial-economic domain they play a supporting, but very active, role. The Greenport Venlo foundation is founded in 2009 to 'economically strengthen the Greenport Venlo region and act as linking pin between the agrofood, horticulture and logistics sector within and outside the region' (Greenportvenlo.nl). Within the larger region the focus of innovation policy is on high tech systems and materials and chemicals (Brainport, 2011). Although there exist complementarities with other parts of the region, especially on agrofood, the horticultural strengths of the Venlo region differ strongly from

the rest of region. On this part there exist far more complementarities with the neighbouring region of Niederrhein.

The Niederrhein region consists of the municipalities Kreis Kleve, Kreis Wesel, Kreis Viersen, Rhein-Kreis Neuss and the cities of Monchengladbach, Duisburg and Krefeld. Niederrhein is a subregion located in the state of NRW. The formal jurisdiction lies on the level of NRW and the level of the Kreisen and cities. On the level of Niederrhein several informal collaborations exist on different themes and sectors, for example on Agribusiness.

Innovation policy in Germany is a shared domain at the federal level and the level of the sixteen states. This is expressed through the constitutional rule that financing of public science and research activities is a joint responsibility of the ministries and authorities on federal and state level (Stehnken, 2010).

On the national level Germany has implemented the so-called 'high tech strategy 2020' which is designed to create a coherent innovation policy framework at this level. It focuses innovation policy on matters of major societal challenges and key technological fields. However, the vast majority of funding of science and technology, is in the hands of governing bodies at the state level (Stehnken, 2010). The federal government spends the majority of funds on science and technology through the Ministry of Education and Research (BMBF) and the Ministry of Economics and Technology (BMWi). The states have a say in the allocation of federal budgets and also have influence through their position in intermediary committees that are engaged in innovation policy and funding thereof (Koschatzky & Kroll, 2009). There are some risks to this mainly state funding of science and technology. First, states can act solitary, thereby running the risk of insufficiently specializing the German entire innovation system. Second, the relatively high budget demands for funding science and technology in a state, could lead some states to not exploit their full potential when these states are encountered with budget deficits at the same time (ibid, 2009).

The states are responsible for financing research and teaching at public universities. As Niederrhein is situated in the state of North-Rhein Westphalia, this state will be singled out here. The innovation policy of the state of NRW covers 16 sectors, 7 more than the topsector policy in the Netherlands entails. The Cluster Agency NRW (Exzellenz NRW) acts on behalf of the state NRW in order to operationalize the innovation policy of the state. The Cluster Agency sets out the main areas of work in the specific clusters. In the case of Agrifood Business, a cluster management network (Nutrition.NRW) has been started in 2008. Among others, the tasks of this network varies from improving the quality of food, logistics, personnel development and product design. It also tries to link more than 15 existing subregional and thematic networks in the food business to eachother, thereby developing projects ranging from joint workshops, R&D collaboration and export promotion (http://www.exzellenz.nrw.de). Moreover, it also collaborates with other generic network initiatives that deal with innovation issues in NRW, such as the Innovation Alliance 'Innovationsallianz' of NRW Universities.

The way innovation policy is organized on both sides of the border differs. This leads to several institutional gaps occurring in the cross-border region.

The first gap is that Niederrhein does not have its own policy making capabilities. All policy initiatives can be traced back to the responsibility for the state NRW. Venlo is located in the Province of Limburg, thereby having an intermediairy level between local and national policy levels. The province has been an important partner in matters of financing new projects and lobbying in national settings to embed the Greenport Venlo in topsector policy and the incorporation in the national hotspot of Brainport. This intermediairy level is not present for Niederrhein, thereby limiting the room for project funding in Niederrhein and lobby at the level of NRW. This has to be done by town, Kreise and city officials.

The second gap in innovation policy is the representation of horticulture in the various policy domains. Horticulture is a topsector in the Netherlands, and Greenport Venlo has acquired a good position in this perspective, thereby opening up chances for additional funding from the national level. Even more important, Greenport Venlo is also embedded in the Dutch Brainport region, one of three top priority regions in the economic policy of the Netherlands. Horticulture in Niederrhein has a very marginal role in the NRW innovation policy domain and most attention is given to food processing, because it fits better with the high tech focus of the NRW innovation strategy.

Actors, primarily government officials, in the cross-border Venlo-Niederrhein region try to use European policies to drive more policy attention towards the joint horticultural ambitions. Several cross-border projects have been organized around the Floriade in Venlo, the world's largest horticultural expo that is organized once every ten years and has generated more than two million visitors in 2012. Many events were organized on the NRW pavilion at the Floriade venue, such as information gatherings around the Niederrhein-Venlo horticultural ambitions, which were subsidized with ERDF from the Euroregion Rhine-Meuse-North. The project 'Region without borders' also became part of the Floriade agenda. The goal of this INTERREG IVA project was to market the cross-border region and build cross-border networks in tourism. This also included marketing local food products from both sides of the border.

Government actors that are trying to construct a cross-border innovation system do so, mainly by developing specific projects assisted by EU funding. Using the European level thereby in an instrumental through funding. This mode of constructing a cross-border innovation system can be categorized as a patching up of differences in institutional set-up between the two regions by developing projects that are directed towards very specific ends. The existing structures fund the development of collaborative projects, without developing common policy. On the other hand the actors engaging in the collaborative projects, mainly the German actors, use these projects and their results to influence innovation policy in their own region. By showing cross-border synergies they try to get increased policy attention at the level of NRW.

Education

A second example of a domain where barriers to cooperation emerge in the innovation system is the organisation of the educational system. The labour market plays an important role in a regional innovation system as a generator of knowledge flows. For a CBRIS the development of a common labour market is an important goal, because it can facilitate cross-border knowledge flows and

employees or students from one side of the border could solve labour market shortages on the other side. However, there are notable differences between the Netherlands and Germany that impede student exchange, certification, and acknowledgement of competences across the border. To show and analyse the institutional gaps occurring from differences between the two systems we first briefly discuss both systems. Then the institutional differences are analysed.

Dutch education system

The Dutch education system is governed centrally by the ministry of education, culture and science (OC&W). Children are in primary school from 5 to 12 years, after which three types of secondary education are possible. Secondary education has three types of schools [1]: preparatory vocational education (VMBO), school of higher general secondary education (HAVO) and preparatory scientific education (VWO). Tertiary education consists of schools for vocational education, universities of applied science and general and technical universities. Certification at all levels is supervised by the ministry of OC&W, and executed by the educational institutes.

German education system

In Germany the states are responsible for education, with a few exceptions such as military universities (Busse, Berkhof, & Meijer, 2006). Primary education in Germany lasts for only four years. After these four years there is a choice between Hauptschule, Realschule or Gymnasium. Hauptschule can be more or less compared to the Dutch VMBO, mainly preparing children for the dual system, which is seen as an important factor of the high quality of German workforce. In the dual system children go to the *Berufsschule,* but also work several days a week. At the regional level Chambers of Commerce (Industrie und Handelskammern) are responsible for certification and accreditation of the Berufsschulen (Busse, 2010). Next to the Berufsschule there are Fachhochschulen (universities of applied science) and universities.

Institutional gaps in the education system

On all levels of education there are institutional gaps between Germany and the Netherlands. But on the European level a lot of effort has been put in the harmonization of higher education through the introduction of the bachelor-master system and the European Credit Transfer and Accumulation System (ECTS). At the level of vocational education and training this harmonization is also taken up, but is not yet common practice. In the Venlo-Niederrhein region this can be observed when it comes to certification of diplomas of vocational education. At the German side the Chambers of Commerce are responsible for the certification, in the Netherlands the central Ministry of OC&W has this responsibility. They use different examination and qualification requirements. However, when attempting to harmonize these standards the Dutch provinces and cities, which are the main actors promoting cross-border cooperation, have no legal authority and have to influence and demand action from the central government. Whereby for the central government cross-border harmonization of

[1] These are the three main categories. Among others, there are also schools for 'special' education.

certification means that it has to deal with every single Chambre of Commerce on the German side of the border one-on-one. This fragmentation has prohibited harmonization to take place. Both regional actors, from government and education and central government actors are cooperating at the European level for solutions. At this level different initiatives are being developed to address this problem, from a European Credit System for Vocational Education and Training (ECVET) to a European Qualifications Framework (EQF). This is an example of how institutional differences between two neighbouring countries are being resolved by cooperating on a different institutional governance level, in this case the European level. The problem with this is the fact that harmonization on a European level with 27 member states takes a long time, and in the mean time the countries are not capable of harmonizing two systems.

Another example of problems arising from institutional differences between member states is related to cross-border mobility of students. German students can study at a Dutch vocational training institute. However, when one wants to take an exam they need to have comparable knowledge of the Dutch language as Dutch students. It is not allowed to take an exam in German or English at the Dutch vocational training institutes. This discourages German (and other nationalities) students from pursuing parts of their education in Dutch vocational training institutes, thereby forming a barrier to cross-border student mobility.

Internationalisation and exchange between educational institutes has grown throughout the last decennia, supported by the existence of funding by the European Commission for the exchange of students and personnel. For cross-border regions this has as a drawback that most students are more attracted by locations further away than the neighbouring region.

For the specific cross-border case of the Venlo-Niederhein region, the above-mentioned differences can have a negative impact on the ability to develop a well functioning labour market in the horticulture. Actors look for possible synergetic effects in the cross-border vocational training system in order to keep the influx of new students up to par. So to be able to maintain sufficient amount of well-trained employees, schools specialized in horticultural training look across the border for new supplies of students. The institutional differences mentioned above together with language problems form a barrier to cooperation on this important domain, despite of Interreg IVA projects that are developed in order to increase the attractiveness of studying in the neighbouring region across the border.

In the next table the findings are presented for the two examples discussed in the case study of Venlo-Niederrhein.

	Innovation policy	Education
Institutional gaps	• Sectoral innovation policy is concentrated at 4 Ministries in NRW, and 1 in the Netherlands (regulative) • Horticulture is not part of innovation policy initiatives in NRW, while it has a prominent role in the Netherlands. (normative) • Venlo region has a Greenport status. Niederrhein is not a prioritized agricultural cluster. (regulative) • The Venlo region can rely on the intermediary level of the Province of Limburg to get funding for their projects. In Germany, only the nation and state negotiate innovation policy (regulative/normative)	• Accredition takes place by the Chambers of Commerce in Germany. In the Netherlands this is governed by the Ministry of Education (regulative) • German vocational training is more oriented towards working and studying at the same time (dual system), while the Dutch vocational training is more theory oriented (normative / cultural-cognitive)
What causes these gaps?	• Niederrhein does not have its own administrative and political body for innovation policy making. • At the NRW level in Germany, horticulture is not seen as a leading industry. In the Netherlands, there is consequent political and financial support for the regional horticulture on all levels.	• Cross-border cooperation in vocational training and the related labour market is impeded by the fact that education is a nationally organized theme in the Netherlands, and State oriented in NRW. • Furthermore, vocational training certificates are the responsibility of the regional (agricultural) Chambers of Commerce in NRW. Harmonization requires cooperation by the Dutch central government, the state of NRW and these Chambers of Commerce.
Role of agency	• The State of NRW was actively involved in the Floriade in Venlo, the world's largest horticultural expo, and they had the chance to develop their own pavilion. This made it possible to focus NRW's policy makers attention to the joint horticultural ambitions. • An Interreg IVA project was developed parallel to the Floriade to research the complementary economic structure of the horticulture industry. Results were also presented at the NRW pavilion and an intensive lobbying strategy is undertaken by German actors, supported by Dutch actors.	• Vocational training initiatives are being developed such as the ECVET and EQF whereby actors try to find solutions to institutional differences on a EU level. • Student exchange projects are being undertaken, but problems with the acceptance of training certificates remains an impediment in the cross-border region and development of the joint horticultural ambitions.

Table 2: Institutional gaps, causes and local agency (Source: authors' own composition).

Conclusions

The main concept in this paper is the evolution of CBRISs from an institutional perspective. Institutions are suggested to provide (temporary) stability, from which structure and coherence can originate with respect to cross-border interaction and learning. Due to the existence of the nation-state border, actors in the CBRIS are embedded in a multi-level institutional architecture. This means that regional, (sub)national and supranational institutions meet at the border and constrain the behaviour of actors that are pursuing economic gain of their cross-border innovation endeavours. Therefore, actors have to deal with the institutional gaps in CBRISs.

The concept follows up on the CBRIS concept of Lundquist & Trippl (2011), who identify three stylized stages of development of a CBRIS. We elaborate on this concept, by introducing feedback loops. The reason for this is that CBRISs, do not 'flip' from one stage to another, but can evolve positively or negatively, depending on the function within the system. There is a relation here between the institutional gaps and their multi-level character on the one hand, and the room for agency on the other hand.

The role of agency is of importance, as the collective cross-border actions of all actors in the CBRIS, positively or negatively influence the evolution of the system. Although actors do not purposively construct a system, except perhaps some government actors, their actions do. So when confronted with institutional gaps, they seek solutions accordingly and thereby circumvent the institutional gaps, by using the multi-level institutional hierarchies to their advantage.

The Venlo-Niederrhein region was used to provide two topics that are useful to demonstrate the presence of institutional gaps, the multi-level institutional embeddedness of actors and the room for agency in the evolution of the CBRIS.

With respect to innovation policy, we observe that actors in the Niederrhein region use the strength of the Dutch national prioritized Greenport status of Venlo, to get more policy attention on the level of North-Rhein Westphalia. This could positively affect the evolutionary path of the CBRIS. Even though the Venlo horticultural sector is seen as a nearby competitor at the same time, which could be a setback for the evolution of the CBRIS. This tension is present and the effects on the evolution of a CBRIS is partly dependent on the behaviour of actors in this matter, thereby reflecting again the importance of feedback loops in the CBRIS evolution.

The education system illustrates how actors use the European level to overcome institutional gaps that arise due to divergent national and regional centres of authority concerning the certification of students in vocational training. Actors in the system try to harmonize this part of the system, as it is perceived a crucial element in developing a well trained cross-border labour market in the horticultural sector of the cross-border region.

The examples indicate that polity and policy still play an important role and that actors engaging in cross-border cooperation often make use of the European level to overcome the problems related to

its respective institutional gaps. The reason for this type of agency could be that the European level seems more independent from influence from the respective national systems (Hansen & Serin, 2010)

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