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Multiple Paths of Development: Knowledge Bases and Institutional Characteristics of the Swedish Food Sector

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ABSTRACT

The aim of this paper is to explain the complex development of the food sector in Southern Sweden in the past decades, focusing on the relation between institutions and innovation practices and taking into account the diversity of actors composing the sector. The paper develops a theoretical framework combining concepts of path dependency and knowledge bases, and applies it empirically. The three paths identified in the paper resemble path development via radical change, incremental change and diversification.

JEL Code: B52; O31; R11

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Introduction

Much attention has been dedicated in recent years towards trying to better understand and explain the evolutionary paths among firms in different industries, not least in research fields like economic geography and regional studies (Asheim and Coenen, 2005; Boschma and Iammarino, 2009; Boschma and Wenting, 2007). Empirical observations show distinct differences with regard to the paths of development between different types of economic activities, and between regions and countries with different characteristics. Among the most common models for explaining such differences are those that take their main point of departure in either sectoral aspects (Breschi and Malerba, 1997) or in aspects related to the national or regional context in which the sectors are located (Cooke, 2002; Whitley, 2002; Zysman, 1994). While not dismissing sectoral and contextual characteristics as potentially important sources for explaining differences between firm and industry transformations, this paper acknowledges recent research indicating that such factors can only explain variety to a limited extent. Following Srholec and Verspagen (2012), far more of the variance is due to heterogeneity among firms within both countries and sectors. Even in the most narrowly defined industries, firms do not follow the same pattern of innovation behavior (Leiponen and Drejer, 2007). These findings call for alternative explanations, and this paper presents one attempt at finding such alternatives. As opposed to many studies which focus on input (e.g. investments in R&D) or output factors (e.g. types of products or processes), mainly dealing with how much resources firms invest and how much they get out of their investments, this study instead aims at capturing how firms actually go about innovating, and why their modes of innovation differ. The paper compares different paths of development of the food sector in Southern Sweden. All the firms are embedded into the same national, regional, and sectoral institutional framework, which changes over time, such as when Sweden was accepted into the EU and/or when new funding support programs are initiated.

An initial empirical observation serving as a point of departure is that there are at least two contrasting narratives describing the development of the food sector in Southern Sweden during the past couple of decades. One of these describes the sector as largely transforming into an emerging field of functional food in which value added products are developed by exploiting new knowledge and modern technologies, often in cooperation with universities located in the region (Asheim and Coenen, 2005). The other, which describes a sector in crisis with diminishing R&D departments and low survival rates of innovations, mainly focusing on incremental improvements in existing products (Beckeman, Forthcoming; Lagnevik et al., 2003). The existence of these alternative stories is without doubt influenced by the fact that the food sector is diverse when it comes to perception of innovation, absorptive capacity and openness to policy support programs (Gellynck and Vermeire, 2009; Trippl, 2011). Policy makers should take this diversity into account when designing support programs for the industry. They should not only make the programs attuned to and embedded in the sector and region they aim to influence, but also adapted and open to variations in the knowledge base of various branches of the sector (Coenen and Moodysson, 2009). Diversity is thus specified not on the level of the sector or industry, but on the knowledge base of firms in the same industry. While focusing on the crucial knowledge base of firms representing different development paths, the research design also allows us to pay attention to changing market conditions in which the firms operate, which has been highlighted as a potentially important explanatory factor in previous studies (Laursen, 2012; Leiponen and Drejer, 2007).

Conceptual framework

Institutions, path dependence and regional innovation systems

The innovation systems approach defines innovation as an outcome of the systemic interaction of actors (firms, research organizations and governmental authorities) embedded in

an institutional framework (Edquist, 1997). The institutional framework of a regional innovation system provides formal and informal rules for interactions between organizations and individuals. It influences learning, knowledge exchange, cooperation patterns and innovation diffusion (Lundvall, 2010, Storper, 1997, Asheim and Gertler, 2005). Some authors reject the importance of territorial institutions, limiting those to basic regulative requirements such as the rule of law. They argue that a single firm has its distinct routines that can be applied in any territorial context, while each territory is characterized by a variety of routines. Therefore, institutional renewal is possible only through technological renewal when firms develop new routines in relation to new technology (see e.g. Boschma and Frenken, 2009, 2011). On the other hand, Gertler (2004) convincingly reveals how territorial institutions influence varying development paths within the same industry. This implies that industry-specific institutions alone cannot explain variation in the development processes and innovation activities.

Due to geographical and industrial variation, some institutional constellations might be more favorable for innovation than others. Therefore, institutions can be both hinderers and enablers of innovation processes (Hodgson, 2003). The duality of institutions as obstacles and triggers for innovation is a central aspect in the analysis of this paper. In the discussion on the dual relation between institutions and innovations, path dependency is one of the central concepts (Strambach, 2010). It highlights the historical nature of change emphasizing that present choices are influenced by past experiences (North, 2010). The basic rationale is that historical accidents lead to the establishment of certain institutional infrastructures. Since different kinds of institutions are closely interrelated, the change is slow and accumulative, leading to a certain path of development. Institutions are furthermore embedded in geographical space. Therefore, path dependency is place specific (Martin and Sunley, 2010).

Path dependency can lead to both positive and negative institutional lock-in. Positive lock-in refers to the accumulation of institutions that encourage cooperation, learning, knowledge exchange and other aspects beneficial for innovation (Asheim and Gertler, 2005). In the case of negative lock-in, previously successful institutions become outdated and turn into obstacles to innovation. However, since there have been lots of investment and time devoted to the development of procedures and interaction patterns, there might be resistance or inability to change. This might take place at organizational, sectoral or regional levels. Economic geography addresses the issue of negative lock-in mainly as the decline of previously successful regions due to loss of learning capabilities caused by long standing personal ties, the search for external ideas, conservative culture and common world views excluding alternative perceptions (Asheim, 2000; Boschma and Lambooy, 1999; Grabher, 1993; Hassink, 2010). What is often omitted or implicit in the analysis of declining regions is that lock-in exists not only on the producer side, but also on the consumer side (Barnes et al., 2004). Consumers are guided by their shopping habits, preferences and capabilities. Therefore, for a new type of product to be developed and established in the market, there is a need for innovative activities on both the producer and consumer sides.

Evolutionary economic geography highlights the fact that path dependency and lock-in are geographically bounded processes. However, while some regions get trapped in path dependency and decline, others create new paths and phases of development (Martin and Sunley, 2006, 2010). The same national institutional framework might stimulate varying paths of regional development (Strambach, 2010). The literature on regional development and regional innovation systems addresses this question, highlighting the importance of regional institutions in innovation processes (Asheim, 2012; Asheim and Gertler, 2005; Cooke et al., 1997; Storper, 1997). However, this paper analyzes differences not between different regions, but between different paths in the same region and even within the same industry. More

concretely, we observe that some firms in the same region and sector follow new or renewed paths, while others remain in established paths with very little variation. This relates to Strambach's (2010) argument that actors can interpret and combine regional, sectoral and organizational institutions in many different ways, enabling several developments within the same region or country.

It is not only combination and interpretation of institutions that might lead to several developments within the same region. One of the functions of institutions is to provide incentives, to 'specify and implement the sticks and carrots of economic life' (Edquist and Johnson, 1997:53). Examples of institutions providing incentives for innovations are income tax, labor regulations, educational traditions and entrepreneurial values. Several developments within the same incentive structures are possible, because actors can choose how to respond to them. Consciously or not, humans make choices and in this way create multiple paths (Hodgson, 2003; North, 2010). The institutions of high wages create the incentive to reduce labor-intensive activities. The choices of firms might be either to move to low-wage countries or try to optimize and upgrade their activities through innovation. Since actors within the same location (and industry) are very heterogeneous, they might make different choices leading to varying paths of development (Martin and Sunley, 2006, 2010). Therefore, there is some flexibility even in the interpretation of formal institutions. Actors in the food sector in Scania are embedded in the institutional framework consisting of national and global regulations (e.g. free flow of capital, goods and people within EU), regional norms (e.g. scientific culture of the region, emphasis on innovation), sectoral traditions (e.g. traditionally highly regulated domestic market) and procedures within the organizations (e.g. initiations of innovations by marketing department or through cooperation with university).

Seminal work on path dependency (David, 1985) conceptualizes path creation as an outcome of 'historical accidents', while more recent studies within economic geography tend to

highlight the interrelatedness between former paths and new path creation. New path creation is a historical process influenced by conditions, resources, competences, and assets rooted in the area – stemming from previous rounds of path development (Martin and Simmie, 2008; Martin and Sunley, 2006, 2010; Simmie, 2012; Trippl and Otto, 2009; Tödtling and Trippl, 2012). According to Martin and Sunley (2010), previous paths in a certain location can be enabling (if they allow for openness to new industrial and technological development) or constraining (if there is a built-in legacy of old industrial structures and restrictive business culture) the emergence of new paths (see also Martin and Simmie, 2008). However, from an institutional point of view, treating locational characteristics as necessarily enabling or constraining is too simplistic. Martin and Sunley (2006) themselves emphasize that regional paths are embedded in and influenced by the changes in organizational routines, other regions, and national and global levels. It follows that institutions influencing path dependent processes consist of rules, norms and procedures at different geographical levels, and might trigger or hinder innovation processes. In other words, within the same region some institutional characteristics enable, while others hinder, the creation of new paths. Furthermore, because of institutional complexity (different types of institutions at different geographical levels), and heterogeneity of the actors, the reactions by firms to incentives provided by institutions vary. Some actors actively create new paths, while others remain in an existing paradigm (David, 1992; Simmie, 2012). This leads to multiple paths within the same region and industry. Trippl and Otto (2009) differentiate between the path of incremental change associated with modest modifications in the existing trajectory; diversification associated with renewal via relations to other established industry; and radical change associated with new knowledge intensive industries (i.e. new path creation)[i].

In the analysis part of this paper the main discussion is centered on which institutions have an impact on the food sector in Skåne, what incentives those institutions create and how actors

respond to them – i.e. via incremental, radical change or diversification – resulting in new path creation or remaining in the same paradigm. The motivation and the characteristics of the actors making one or another choice lie partly beyond the scope of this paper and could be an interesting topic for future research. This paper limits this part of the analysis to assessing the impact of differences, with regard to the crucial knowledge base, on actors' perception of and response to institutional change.

Different knowledge bases as sources for innovation

As touched upon above, our assumption is that sub-sectoral differences with regard to the crucial knowledge base of actors can contribute to explaining differences in interpretation, adoption and combination of institutions. Thus, firms abilities to learn, change and innovate depend on the knowledge base underlying their activities (Asheim and Gertler, 2005). This study highlights how reliance on one knowledge base, or specific combinations of different knowledge bases, influences innovation activities which in turn lead to different responses to the incentives created by the institutional framework.

Activities drawing primarily on an analytical knowledge base aim at explaining and understanding processes of the natural world. Scientific knowledge is highly important, often based on deductive processes and formal models. Knowledge inputs and outputs are often codified due to documentation in patents and publications. Therefore, university research and university-industry links are of very high importance in innovation processes (Asheim et al., 2007; Coenen and Moodysson, 2009; Martin and Moodysson, 2012). In contrast, a synthetic knowledge base refers to knowledge required for activities involved in the design of something that works as a solution to a practical problem. Innovation activities take place through application and new combination of existing knowledge, know-how and skills. Firms with an underlying synthetic knowledge base might have some collaboration with

universities, but usually it is limited to concrete problem solving rather than understanding and explaining the basic rationale of the phenomenon (Asheim, 2007; Asheim et al., 2007).

The dominating knowledge base within the food sector as a whole must be classified as synthetic (see e.g. Martin and Moodysson, 2012; Martin et al., 2011). However, several knowledge bases can be identified at different stages of development and in different innovation processes (Manniche, 2012; Manniche and Testa, 2010). A well-known example is the development of functional food, which requires both analytical and synthetic knowledge. The inclusion of an analytical knowledge base in traditional (synthetic) activities is highlighted as crucial for the innovation process (Coenen and Moodysson, 2009; Moodysson et al., 2008a). On the other hand, the synthetic knowledge base is very broad, underlying many different industries and activities (Martin, 2012). Therefore, innovation may emerge while combining expertise from different industries, although all of them are ultimately based on synthetic knowledge – e.g. in the interface of packaging and distribution lines (see e.g. Coenen and Moodysson, 2009). Finally, the continuous trial and error processes (learning by doing), which are characteristic of synthetic knowledge base activities, lead to incremental improvements in the products within the same field of activities; according to some researchers this should not even be referred to as innovation, but rather incremental development (Beckeman, Forthcoming; Lagnevik et al., 2003). These three possible innovation processes are further analysed in the paper, mainly focusing on the role of institutions as triggers and hinderers of the activities.

Summary of the conceptual framework

The basic rationale of the conceptual framework applied in this paper is, thus, that institutions consisting of national and international regulations, consumer norms and habits, and organizational procedures create incentive structures for companies in the region. Due to the

knowledge base, or combination of knowledge bases underlying the firms' innovation activities, their responses to these incentives vary. More concretely, we expect that firms combining analytic and synthetic knowledge bases in innovation processes are more likely than others to start new path creation via radical innovation. They will respond to institutional incentives by collaborating with a university, bringing science into traditional industry and creating value-added products. Firms relying on a synthetic knowledge base from one field of expertise are most likely to remain within the established path and respond to the institutional incentives mainly through incremental innovations. Finally, firms combining synthetic knowledge bases from two fields of expertise are more likely to respond to institutional change via process innovation and product diversification. The relation between innovation activities and the institutional framework is obviously not a one-way relation but a mutual one. Innovation activities and actors' responses might change the institutional framework in the long run. Nevertheless, the main focus of this paper is on the impact of institutions as hindrances and triggers for innovation activities, while the analysis of potential reverse impulses is saved for future studies. Figure 1 summarizes the conceptual framework applied in the analysis of the data.

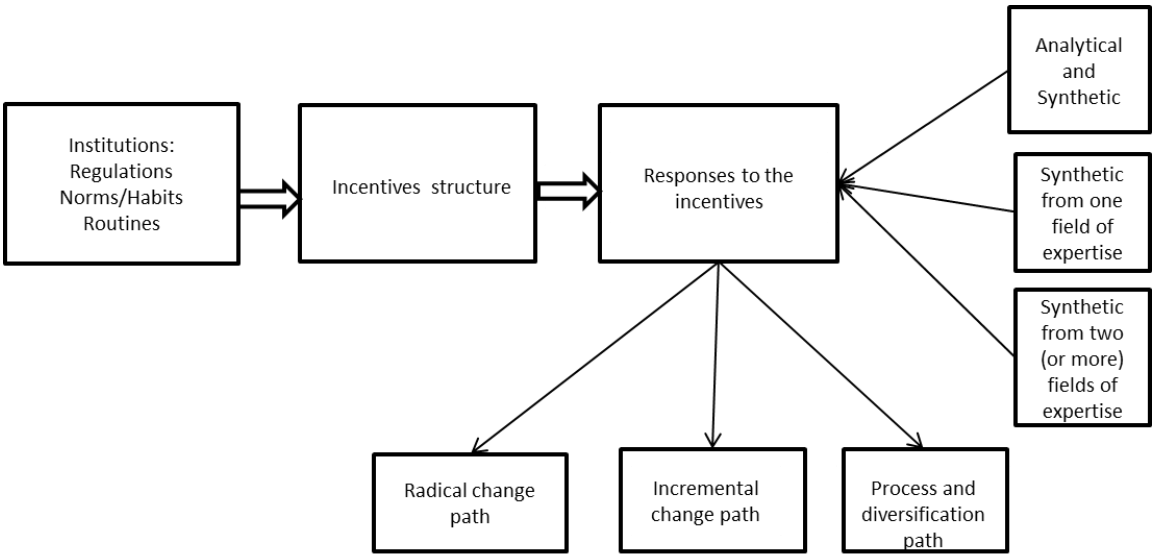

Figure 1: The Summary of the Conceptual Framework

Research design

This paper draws on an analysis of development paths within the food sector in Southern Sweden. The whole value chain of the food sector includes a broad range of actors – from farmers to retailers and consumers. Innovation processes are addressed from the manufacturers' perspective – the introduction of new products and processes. Other actors in the value chain are addressed indirectly, mainly through the influence they have on manufacturers. Furthermore, the manufacturers here belong to two main groups which are primary addressed by the regional policy makers in their support programs – conventional food and special food innovation (i.e. functional food) firms (Cooke et al., 2007).

The main methods for data collection are text analysis and semi-structured interviews. Text analysis was used as a first step in the data collection. It included a review of previous academic studies on innovation processes within the food sector in Sweden and other countries, as well as non-academic texts such as reports regarding the development of the food sector in the region. In addition, websites of food companies and different policy initiatives regarding food were used as data sources. The primary goal of this desktop analysis was to understand how the food sector is described and presented when it comes to innovation processes, what actors are identified and what problems and opportunities are highlighted. In the next step of data collection, 14 semi-structured interviews were conducted with firms' representatives (CEOs, production managers or marketing directors), representatives of regional policy support programs, and other individuals with experience from and insights into the development of the food sector. Each interview lasted for about one hour, was recorded, transcribed and interpreted by both authors. The main thematic focus of the interviews was development of the food industry in general and in the region in particular.

Respondents were asked to describe how the sector had developed over the last few decades, how new products and processes were developed and how that changed over time, what the main triggers and hindrances were for innovation, and what the role of the region was in those processes.

The data was analyzed through the process of retroduction. The theoretical approach suggests that there might be several paths of development, depending on the underlying knowledge base, while the collected data enabled further specification of the concrete paths identified. Since the institutions that matter for each path are not entirely overlapping, the time dimension slightly differs in each path. These are not historical year by year accounts, but rather accounts of which institutions came into the path, when they did so, and how they influenced the activities and development possibilities of the actors.

Analysis

Overview of the food sector in Southern Sweden

Southern Sweden has a strong national position in food production. One quarter of the country's food industry is located in the region, employing about 25,000 people. The majority of companies are clustered in the western part of the region, with activities covering the whole food production value chain from primary production to storage, transport, packaging and processing. Traditionally, it was a highly regulated industry strongly geared towards the domestic market. The profits of the companies depended on negotiation with the national government rather than on market conditions. Global competition accelerated as a consequence of Sweden's entry into the European Union in 1995, which increased the pressure on the food industry to develop towards higher value added niche products involving greater knowledge content. An overview of consumer trends in the region, presented in an unpublished report by Lagnevik (2000) suggests that consumer trends are contradicting. On

the one hand, consumers are getting more and more interested in healthy food, implying growing market possibilities in this area. At the same time, however, consumption habits reveal an opposing trend; fast food and ready-made meals are becoming more and more popular and the intake of sugar is getting higher.

Skåne Food Innovation Network (SFIN) was created in the middle of the 1980s in order to increase the food sector's international competitiveness, mainly through connecting the food industry with other relevant industries such as packaging, machinery and logistics, as well as with academia. SFIN is involved in human capital and competence development in industry through presenting the food sector to students during career days, specially organized tours and internship programs. The initiative also assists in opening new innovative markets, supporting the development of innovations by facilitating connections with academia and to some extent providing financial support for R&D. It is also engaged in the design and development of higher education programs at Lund University, but the main focus of the initiative is networking and communication among the actors. It is running a ten-year development project called Food Innovation at Interfaces, funded by a consortium of state actors (primarily VINNOVA), Region Skåne, Lund University and some food companies in the region. The overall objective is to improve cooperation within the food industry and between food companies and academia, and thereby stimulate innovation and economic growth. Next to SFIN (the largest and most influential initiative in the region) are several smaller initiatives with slightly different focus. *Ideon Agrofood* (IDAF), located in Lund, is a foundation that was established in 1986 with the primarily goal of increasing the interaction between academia and the food industry. *Centrum för livsmedelsutveckling i Karlshamn* (CLUK) is one of the youngest initiatives. It was established in 2011 and can be defined as a resource and information centre funded by the European Regional Development Fund and Region Blekinge. Most of the SFIN and IDAF activities are geared to innovation activities

requiring an analytical knowledge base, while the main focus of CLUK is on activities requiring synthetic knowledge (process development).

To sum up, the food industry in Southern Sweden is an old industry with deep traditions and involves many diverse actors in the region. It competes in the global market and is exposed to changing and contradicting consumer trends.

The path of radical change – food and health convergence

One example of the development of the food industry in Southern Sweden, which we here refer to as the path of radical change, is the emergence of high-value added products with health benefits. The best known examples of this change are such products as Proviva and Oatly[ii]. The development processes within this path take place through the combination of synthetic and analytical knowledge bases. The basic rationale is that a different kind of knowledge is used in the development process. Critical for the radical change in the path is the ability to add analytical knowledge to synthetic knowledge (Martin and Moodysson, 2012; Moodysson et al., 2008a). The analysis of how new products are created and the organization of the activities behind them are well documented in other works (see e.g. Asheim and Coenen, 2005; Lagnevik et al., 2003; Moodysson et al., 2008b). Therefore, it is not repeated here. Instead, focus in this segment is on the institutional triggers and hindrances to innovation and the development in obtaining new forms and introducing new products over time. In other words, focus is on the radical change in the path rather than on the individual innovation processes within the path.

Sweden's membership in the European Union had an impact on the overall Swedish economy and not least on the food sector. Among other aspects, it changed the regulations regarding the import and export of food products and opened up the previously highly regulated domestic market for international competition. The ability to develop high value added products

providing health benefits was perceived by regional support programs as one of the ways to stay competitive in a globalized market. This was to be achieved through combining different competences through collaboration, and most importantly bringing university research into the food industry, i.e. bridging the gap between industry and academia. Regional support programs (mainly SFIN) could gain influence through policy initiated at the national level – VINNVÄXT funded by VINNOVA (The Swedish Agency for Innovation Systems). The rationale behind VINNVÄXT is to stimulate regional development based on the strengths already existing in the region, while drawing on the collaboration activities between industry, university and the public sector (Triple Helix collaboration). One of the winning strategies of the first call (2001), which was developed by SFIN, highlighted the renewal of the food sector in Southern Sweden by exploring innovation at interfaces with other sectors and knowledge domains (Coenen and Moodysson, 2009).

In the formal institutional structure, this trend of bridging food and health-care sectors, as well as university research and industry, can be identified not only in the national, but also regional and global levels. Food security, health and wellbeing are among the challenges identified by Horizon 2020. The platform for Food Drink Europe indicates nutrition and health, as well as food safety and science, as their priorities for the development of the sector. The regional support program creates a platform for networking between university and industry, and provides meeting arenas for interdisciplinary collaboration where the relation between health-care and food is highlighted as an important example. Next to institutional triggers, technological breakthrough in biotechnology in the 1980s is identified as an important factor creating possibilities for innovations in the food industry. According to one of the interviewees, the 1990s was a time of possibilities with high expectations in terms of new technological advancements. Proviva and Oatly are examples of that development. However,

these are two success stories among many failed projects in attempts to develop functional food.

There are two main types of products developed in this area of functional food. The first type can be described as 'traditional' foods with health benefits. They are marketed as tasty and healthy products that can be used by any consumer who wants to be healthy, and are sold in ordinary supermarkets. The optimal goal for producers of these products is to reach large scale volumes in production. Therefore, it is important that the products are not perceived as only relevant to a small group of consumers who have milk allergies, are lactose intolerant or live according to vegetarian ethics. The representatives of the companies think of their products as a mass-niche product – positioned in a large health niche. The other type of product, which may be, for example, wild honey based products to prevent a hangover or reduce cold symptoms, has a stronger resemblance to medicine. These kinds of products are sold in pharmacies, health stores and through companies' own websites. Regardless of the final goal, the initial practices for product development are very similar. These innovations start with researchers at university who want to work on practical issues and identify problems in society and/or in the food industry. The processes emerge from analytical knowledge base activities – raising questions about the functioning of the natural world (e.g. why wild honey is a healthy product). The initial aim of the company is to develop a new product at the intersection of science and industry. Synthetic knowledge becomes important in searching for the right consistency and taste for a healthy scientific invention.

This kind of development is an ongoing activity in the region and still a very important part of the innovation processes within the food sector. However, it cannot be identified as the main characteristic of the food industry in Southern Sweden. Only a few new companies working in this field were either identified by the interviewees or found in other publicly available channels, in addition to the known examples mentioned above. According to one of the

interviewees, there are fewer biotechnology based innovations (or innovation attempts) within the food sector now than in the 1990s. Now, companies are more aware of the risks related to such projects and less willing to try out new ideas. From an institutional perspective, it follows that organizational procedures (risk avoidance) become hindrances to innovation activities in the path combining synthetic and analytical knowledge bases, since those are high risks projects. Other organizational practices, such as employment strategies, were also identified as hindering this path of development. Companies are often unwilling to employ high-skilled university employees and therefore lack the absorptive capacity for collaboration with a university. Regardless of the fact that there are few actors working on these types of innovations, this path is by far the most supported and encouraged by regional policy initiatives (Coenen and Moodysson, 2009).

Although, in general, development at the intersection of food and health is perceived as positive at regional, national and EU levels, The European Food Safety Authority (EFSA) regulations (reviewed in 2006) made it very difficult for food companies to claim that their products had health benefits. Some of the younger and smaller companies do not have the resources needed for the process, and the more established firms that can afford the process find the allowed claims very complicated in their formulations and therefore of hardly any use for marketing. Informal institutions such as consumer norms and habits have a dual role in these processes. On the one hand, a majority of the informants perceive growing consumer concerns about health as an important trigger for innovation. However, several companies pointed out that there was a big difference between what consumers claim they want and what they actually buy. The health trend is still quite small and people are not ready to pay a lot for good quality value-added food. Obesity, diabetes II and other food-related diseases are increasing. It follows that there is a discrepancy between the widely expressed health concerns and actual shopping habits of consumers. For radically new products to succeed,

new shopping habits have to be created. However, the creation of new markets is a very slow process. Furthermore, existing markets for functional food are considered to be fragile (Cooke et al., 2007). This has led to two responses by the industry. First, there are few companies operating in this field because slow growth in consumption means slow growth in volumes and returns on investment. Those that are already in the field, instead of constantly introducing radically new products, tend to start offering small improvements of existing products (new taste of a drink etc). It means that the analytical knowledge used in these innovation activities is gradually reduced or disappears.

The path of incremental change – mainstream product development

The path of incremental change represents the mainstream development in the food industry in Sweden and in the region. It refers to minor advancements in existing products such as changes in taste, ingredients, and packages. The main challenge for being competitive in this development is finding the right ingredients to guarantee a long shelf life when a new taste is added to an existing product. Therefore, innovation processes are based on trial and error (synthetic knowledge) mainly from one field of competence (as opposed to the combinatory "bridging" of knowledge bases identified in the radical change path).

Naturally, products within this path have to be developed in line with the formal regulations regarding quality, safety and information for consumers. To constantly offer some improvements of the products is a part of the routines and culture in the food industry. In contrast to the first path, there are no specialized formal institutions affecting this path of development, yet Swedish membership in the European Union in the mid-1990s had an impact on these kinds of developments as well. It became increasingly difficult to introduce new products on the market after Sweden entered the EU. Due to the open market, retailers now have access to a much larger variety of products and do not necessarily prioritize national

or regional brands. Although the companies continue to slightly change their products in order to remain interesting for retailers, the main strategy is price reduction. Next to new taste, packaging or ingredients, price margins are being continuously reduced.

The main trigger for innovation in this path is what marketing and/or communication departments perceive as consumer trends in the society identified through different ways of market scanning. New trends are signaled by products introduced in other markets, media coverage, and retailers' and consumers' feedback. ICT technologies (such as access to social media platforms) play a major role here since they become ways to listen to customers. They also provide consumers with the possibility of providing immediate feedback on products and services.

In recent decades, several new consumer trends have been identified by company representatives and other interviewees. The health trend mentioned in the first path of development also plays a role here. It leads to the introduction of products which in companies' own words are 'healthy in a natural way' rather than through some added qualities. Examples of such innovations are sugar-free (or reduced sugar) versions of juice, cereals, ketchup and other products. Part of the same trend is an innovation in ingredients when sugar is replaced with some other kind of sweetener with a low calorie intake. Closely related to the health trend (or a sub-trend within the health trend) is a clean label movement expressing consumer concerns about additives in food products – the so called "E numbers". Environmental and social sustainability trends also lead to changes in raw materials, packaging, and organization of production. The most prominent example is the inclusion of ecological types (e.g. milk) of traditional products. The main innovation in this case is a new source of supply (e.g. ecological farms). However, it might also lead to adjustment in the process or ingredients in order to able to label the product as ecological. This development is also influenced by formal institutions at national and EU levels, such as regulations regarding

CO2 emissions, or financial support via national or EU funds for the projects that improve environmental and social sustainability.

Diversification path – new processing technologies

The third path that we could identify in our study is the introduction of innovations due to new types of production technologies, enabling producers to process food in a new way. According to our interviewees, these kinds of innovations are very rare in the food sector, coming up once in 10-15 years. Some researchers even argue that this area is solely characterized by frozen and chilled food technologies introduced to Sweden in the 1940s and 1980s respectively (see e.g. Beckeman and Skjöldebrand, 2007)

According to the interviewees, the main reason for these innovations being very rare is a lack of financial resources. Although the companies would be interested in new process technologies, the food sector is described as a low margin sector. Therefore, there are little resources left to invest into such development. Nevertheless, the most prominent examples within this path are the technologies enabling the production of frozen and chilled food. The accounts of the introduction of frozen food in Scania, provided by our interviewees and previous studies, point out the importance of combining the expertise stemming from different fields (see e.g. Beckeman, 2008; Beckeman and Skjöldebrand, 2007). The idea of frozen food originated in the USA. In Sweden the adoption and further development of this technology (starting in Southern Sweden) was a result of the joint efforts of different types of actors with different types of capacities. It included expertise in actual food characteristics – selection of the varieties of food suitable for freezing, as well as engineering knowledge needed for the development of freezing equipment, storage, distribution and packaging. Both fields of expertise are primarily dominated by a synthetic knowledge base. They are both based mainly

on trial and error development in aiming to understand how a certain phenomenon functions rather than what mechanisms govern it.

Although technology largely enables innovation in this path, technology alone is not enough for the products to succeed in the market. There is also a need to change retailers' routines and consumers' habits. In the case of frozen and chilled food, this includes aspects such as making the retailers keep electricity on overnight to prevent defreezing of the products, which was not common practice in the past. The introduction of frozen/chilled products to the market is a radical innovation not comparable to other available products. Therefore, initially, actors have to educate consumers and create new consumption habits in order to stay competitive. This is closely related to other developments in society. Changing norms about women's role in the family has facilitated the creation of new consumption habits – frozen food. Up till now the sales of frozen food have been affected by changing family situations – the increase of single person households, fluctuating sizes of families from week to week (affected by divorce rate). In addition, there is a constant effort to persuade consumers that frozen food can be healthy, or in some cases even healthier than fresh products. Therefore, some of the marketing efforts are influenced by the same health trend as for the other two paths.

The technologies allowing chilled products instead of frozen were developed at the same time in different places around the world, and one of them was Scania. They are also associated with the health trend described above. According to the producers, consumers perceive chilled products as healthier compared to frozen products. In addition, chilled products are often additive-free, in this way including an additional aspect of the health trend. In one of the cases described by the interviewees, the driver for innovation was to create a process technology enabling a long shelf life of the product without additives, while at the same time preserving

the qualities of the fresh product. The need to chill the product was a ‘side effect’ while searching for the ways to preserve natural qualities.

The establishment of common standards in such processes as pumping of the material, recycling etc. is closely interrelated with this path of development, and creates an incentive for companies to collaborate in the development and help to overcome the hindrance of limited resources. The establishment of world-wide or nation-wide standards cannot take place at the regional level. However, regional support programs could create space for a more problem-oriented networking (establishment of informal common standards among firms within the region/several regions) rather than the creation of arenas for social interactions of the actors.

Summary of the three paths of development

From an institutional perspective there are thus two main reasons for multiple paths of development within the sector. First, depending on the knowledge base underlying the activities, the responses to the same incentive structures differ. Sweden’s membership in the European Union changed shopping habits and emerging health trends have an impact on actors representing all three paths. However, their responses vary from reduced prices and less sugar/less salt products to radical innovations in the creation of high value added products. Second, depending on the knowledge base underlying their activities, the actors respond to, or are influenced by, different incentives. Changes in EFSA regulations primarily influence the group combining synthetic and analytical knowledge (radical change path), since their marketing efforts are closely related to the right to make clearly communicated health claims. An environmental sustainability trend makes the largest impact on traditional food producers (incremental change path), since it leads to the ecological alternative of established products

(minor variation). Changing norms of family structures in the society have facilitated the emergence of convenience food (diversification path).

Since all actors in the food sector in Southern Sweden are embedded in the same territorial context, all of them are to some extent influenced by the same territorial institutions. The signs of environmental sustainability trends or changing family norms can be found in all groups. However, although they are critical for one path, they play minor roles in the other paths. An overview of the three paths and their main institutional determinants is provided in appendix 1.

The findings of this paper are in line with our theoretical expectations regarding knowledge bases and path dependence processes. The companies combining analytic and synthetic knowledge bases resemble the process of path creation via radical innovation as suggested by Trippl and Otto (2009). Companies relying on analytic and synthetic knowledge bases respond to the incentive of increased competition via value-added products. Some of the institutional conditions are favorable for the emergence of this path, e.g. support by regional authorities, and the tradition of medical and biotechnology research. However, other institutional incentives such as shopping habits and EFSA regulations are hindering the development. This finding supports the idea that location and path-specific conditions are not necessarily either enabling or hindering new path. Enabling and contradicting influences might be in place simultaneously. Companies drawing on a synthetic knowledge base from one field of expertise mainly follow the path of incremental change. Some of the institutions (i.e. shopping habits, industry culture) reinforce this behavior, while firms respond to contradicting institutions (i.e. increased competition) via reduced prices. Finally, companies combining synthetic knowledge bases from two fields of expertise innovate via changes in process and product diversification via process technologies. Similarly to the companies in the

second path, they are exposed to increased competition and often seek to reduce prices. However, this is often achieved by optimizing the process.

Discussions and conclusions

As discussed in the previous sections of this paper, food companies in Southern Sweden are embedded in a complex institutional framework consisting of formal regulations, norms and organizational routines. The development of formal institutions can be divided into two periods. The first period, before entrance into the EU, is characterized by a highly regulated domestic market. The second period starts with EU membership and the following increased global competition. Membership in the EU has led, on the one hand, not only to increased competition, but also to support for health trends in food production, and, on the other hand, to compliance with EFSA requirements, which make the marketing of such products very complicated. Normative institutions in this paper refer mainly to consumers' values and expectations regarding food. Those include increasing interest in health and environmental, changing family relations, shopping and consumption habits. Organizational routines refer to practices developed by food producers and range from procedures for initiating new products to avoidance of risk.

Such a complex and interrelated institutional framework provides harmonious and contradicting incentive structures. The health trend creates an incentive to develop healthy products. On the other hand, consumption habits often prevent companies from introducing or maintaining radically new products on the market. Therefore, incentives for minor improvements in existing products are created. Changing family relations (single households and varying number of family members) create incentives for developing convenience food, which might range from healthy alternatives (e.g. frozen vegetables) to fast food options (pizzas and lasagnas), highly valued by young consumers (Lagnevik, 2000). Depending on the

knowledge base underlying innovation activities, companies choose (consciously or not) which incentives to follow and which to disregard. The combination of analytical and synthetic knowledge allows the development of functional food and therefore requires compliance with EFSA regulations in order to make health claims. Synthetic knowledge in one field is more compatible with environmental sustainability trends, since it implies a variation within the existing product group.

Furthermore, the critical knowledge base(s) underlying different innovation activities may lead to a variety of responses to the same incentive. As revealed by our findings, EU membership, health trends, and shopping and consumption habits influence all three groups of innovation activities (in this paper referred to as different paths of development). For example, increasing consumer interest in health creates an incentive to develop healthy food alternatives. Companies innovating through a combination of analytical and synthetic knowledge respond to it by developing high value-added products in the interface with university research. Companies innovating through incremental improvements in one field of synthetic knowledge develop what could be classified as 'not unhealthy food' (Lagnevik et al., 2003) – e.g. adding less sugar, salt or fat. Finally, companies innovating through a synthetic knowledge base by combining different fields of expertise offer a product processed in a healthier way than before – e.g. through process technologies enabling the exclusion of additives, but still preserving quality[iii].

Institutions can obviously also serve as barriers for innovation. EFSA regulations (formal institutions) make the marketing process of value-added health products very complicated. The shopping habits of consumers often prevent companies from introducing or establishing new products in the market. Finally, organizational routines also hinder innovation processes because of a lack of absorptive capacity, unwillingness to employ high-skilled university graduates, and avoidance of risk.

Negative institutional lock-in might thus have an impact on both companies' behavior and consumers' habits. Companies tend to prefer to do things according to established practices. Consumers also have habits which change slowly, preventing the launch of new products. Regional policy support programs put lots of effort into changing routines and norms within companies – e.g. by spreading ideas of the importance of high value added products, highly skilled employees, collaboration and information sharing, and not least through promoting industry-university interaction. However, very little attention is paid to the change in consumers' habits in this respect. The growing number of people suffering obesity, diabetes II and other food-related diseases reveals that there is a discrepancy between claimed concerns and the actions of mass consumers. Therefore, for the high-value added innovations to succeed, there is a need not only to promote risk taking and a collaboration culture among companies, but also to support change in consumer behavior. Innovative products have to survive under market conditions in order to be successful, which means they have to be accepted and bought by the consumers. Otherwise, innovations will be limited to the second path of incremental changes within established products, while attempts to break with established routines through the first path of innovation will have little chance of success.

Three paths identified in this paper resemble path development via radical change (i.e. new path creation), incremental change and diversification via a relation to other established industries as suggested by previous studies in evolutionary economic geography (Trippl and Otto, 2009; Tödtling and Trippl, 2012). This paper also reveals the complexity of the path dependency process. Since variation can take place within one industry in the same region, it is not only regions and industries that vary in their development paths. The idea that place and path-specific characteristics matter for innovation activities (Martin and Sunley, 2006, 2010) is not rejected in this paper. However, it highlights that the way those characteristics are used depends on the firms and their dominant knowledge bases. Therefore, actors matter not only

when a new path is created, as suggested by Simmie (2012), but also when the existing one is preserved.

With regard to innovation policy, the path in which analytical and synthetic knowledge bases are combined (radical change path) attracts most attention and funding. However, the majority of innovation activities actually take place drawing on a synthetic knowledge base and often within one field of expertise (paths of incremental change and diversification). There is, thus, a need for more fine-tuned policy support programs taking this diversity into account. The dominating policy measures aiming for increased interaction between industry and academia will most likely have a limited impact on the innovative capacity of food companies in Sweden, while a broader approach aiming at innovation processes across all knowledge base combinations would contribute much more to the development of the sector. This is not to say that university-industry relations would have little effect in general, or that policy makers should support practices that are not sustainable in the long run (i.e. price based competition), but just that there is currently a mismatch between existing policy measures and actual needs and demands among the firms composing the target population of these policy measures. More concretely, support for process upgrading and optimization, facilitation of the establishment of joint standards, and help in bridging different fields of expertise with the same dominant knowledge base might be viable policy measures next to promotion of analytical knowledge base activities.

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Appendix 1: Summary of the three paths of development

Institution	Incentive	Responses (S+A)	Responses (S)	Responses (S+S)
EU membership	Competition	High value-added product	Reduced prices	Increased effciency
Health trend	Development of healthy products	Functional food	Not unhealthy products	'Healthy' process
Shopping and consumption habits	Minor variation	Create new habit/slow diminishing of AKB	Slightly improved products	Create new habit/ Improvements only in one field expertise (introduction of related products)
VINNVÄXT	Industry-university-public sector cooperation	Public-private cooperation in the establishment of regional support programs (SFIN)	-	-
Increased risk avoidance	Decrease the development of highly innovative products	Slow diminishing of analytical knowledge base/ few companies	-	-
Changing norms: woman and family	Convenience food	-	-	Initial trigger
Environmental sustainability	Ecological products	-	Adding new raw materials and/or packaging solutions	-

Source: own data

[i] We would like to note that the Trippl and Otto (2008) conceptualization was applied in regional path development. In their paper incremental change is defined as a minor variation within the region, diversification is achieved via attracting traditional industry which is new to the region and radical change is an outcome of an emergence of a new industry which is based on new knowledge and technologies. However, we believe that this typology can be useful for describing the paths within one industry in the region. It can develop incrementally, radically (via relation with new knowledge-intensive technologies) and diversify (via relation with new process technologies).

[ii]Proviva is the first probiotic functional food in Sweden. This product line consists of dairy and fruit drinks to which the bacterial strain Lactobacillus plantarum is added to improve the bacterial flora in the human bowel system. It has been developed through collaborative efforts of researchers at LU and Probi AB.
Oatly is a dairy-like product line based on oats. All oats contain water-soluble dietary fibre, called beta-glucans. According to clinical studies, this fibre can contribute to lowering raised cholesterol levels. Thanks to a patented process, the beta-glucans in Oatly's products are retained intact and therefore those products can lower cholesterol value. This product has been developed through the collaboration of researchers at LU and industrial partners.

[iii] Some of the respondents doubted that additive-free products are always healthier, but they all agreed that such products are considered healthier by a majority of the consumers.