Article

Short Value Chains in Food Production: The Role of Spatial Proximity for Economic and Land Use Dynamics

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Abstract: Agricultural land demand tends to be in weak condition vis-à-vis settlement development, transport infrastructure and industry expansion. At the same time, the awareness and demand of consumers for regional food is constantly rising, in particular in urban regions. The resulting challenge is that high demand for regional food is concentrated at places where land for food production tends to be particularly under pressure. Against this background, our article reflects on the extent to which regional food supply chains support the status of agricultural demand in the competition for land. The main aim of our paper is to understand the role of proximity between the different stages of value creation, including cultivation, production (manual or industrial) and trade (retail, direct marketing). Our empirical study on the example of three products in Bavaria (Germany) shows that short distances within food value chains support the agricultural condition in land use dynamics (beer, sweet cherry, asparagus). The analyses are based on official and internal statistics as well as expert interviewing. This mixed-methods approach results in value-creation mappings and provides spatial differentiation of the economic process. Proximity between at least two stages of value creation plays an important role to explain the economic trends and land use dynamic. These findings are rooted in arguments of efficiency, tacit knowledge, networks, as well as product reputation. However, the role of proximity does not automatically play a role but has to be stabilized by strategic measures such as product innovation and marketing measures.

Keywords: regional value creation; short food supply chains; local food; food geography; economic geography

1. Introduction

Agricultural land use is under pressure in many parts of Europe [1]. Settlement development, transport infrastructure and industry expansion tend to override agricultural land demand. Urban sprawl and accelerated expansion of sub-centers are leading to increasing landscape fragmentation and partial abandonment of traditional agricultural lands [2,3]. This contributes to concentration processes in agriculture and food production throughout recent decades [4]. Economies of scale tend to disadvantage small-scale structures in agricultural land use; instead, large-scale cultivation with a high degree of specialization tends to have a rather high competitiveness in globalized trade, superimposing transport costs even on large scales [5,6].

In parallel to the concentration processes, regional food has seen a tremendous rise in popularity [7–10]. It is considered as an important part of a sustainable lifestyle in ecological, cultural and economic ways [11,12]. Moreover, recent research is increasingly focusing on the role of small farm activities in regional food systems, predominantly in the context of sustainable agricultural landscapes and food security [13–15]. These studies highlight that small farms currently play an important role in food production and regional food availability. In this context, the contribution of small farms to food availability is determined by their market networks. Furthermore, the recent Covid19-pandemic put

the discussion on resilient food systems high on the agenda, stressing the potentials of regional supply and demand relations [16,17]. For instance, several countries experienced an increasing demand for shorter supply chains, and local small-scale suppliers received more attention due to better food quality [18,19]. One might think that the demand for regional food could foster the status of cultivation areas in land use dynamics. However, the situation is complex and results in the problem that a rising demand for regional food rather finds a land dynamic that puts cultivation areas under pressure [20].

Against this background, the interface of regional food production and land use dynamics is at the heart of sustainable development and deserves analytical scrutiny. The focus of our case study is the deepening of economic geographic analyses for exemplary regional food products. The results arise from the ReProLa project (Regional Product-Specific Land Management in City-Land Partnerships in the Nuremberg Metropolitan Region), which is funded since 2018 by the German Federal Ministry of Education and Research. The basic assumption of the project is that regional products contribute to sustainable land use, and this paper presents the results on the examples of Bavarian beer, asparagus and sweet cherry.

Our paper is based on a conceptual framework that links the economic geography perspective with approaches of value chain analyses, in particular with regard to the food sector. In order to empirically reflect on the regional economic functioning of food products, the value creation mapping tool was developed as the key analytical tool. The tool captures and visualizes spatial creation processes of a product, differentiating various spatial levels. This includes, first, the identification of all stages of the value chain, i.e., the cultivation of raw materials, intermediate products, the (further) processing and refinement as well as the trade. Second, the mapping tool distinguishes between different spatial scales, specifically regional, national, European and global. For this article, the results on beer, asparagus and sweet cherry are presented in a comparative manner. The value creation stages of these regional food products differ significantly from each other, which makes a more in-depth analysis particularly interesting. The data base comprises both secondary statistics and information from expert interviews.

Our study explores the role of proximity along the value chain. We want to understand if the proximity of economic activities along the value chain has an impact on the role of cultivation areas in land-use dynamics. We aim to respond to the following two questions: What is the interrelation of short value chains and land use dynamics? What role does spatial proximity play in the value creation process for economic and land-use dynamics? Our objective is to contribute to a more differentiated understanding of the spatial dimension in value creation.

The current debate on short food value chains is intense on the micro- and macro- level but leaves a research gap on the meso-level. On the micro-scale, a series of studies argues with local cases on the firm level and for concrete products (e.g., [21–25]). The empirical and conceptual approaches of these studies vary widely. Most of them have a product-specific focus, such as the analysis by Ibery and Maye (2005) on shorter food supply chains of livestock products in the Scottish-English border regions [24]. Other studies, as for example Roest and Menghi (2000), deal with the question of regionality by analyzing the value chain of Parmigiano Reggiano Cheese [25]. Whereas these studies provide chronological analyses of value creation, Schiereck et al. (2020) develop a bottom-up perspective, analyzing single businesses [22]. They developed an accounting-based concept for quantifying regional value creation. Their approach was tested with a large food retailer from Germany, based on data from a company's accounting. This allows to measure its entire value added and classifies it into regional and supra-regional components. These value chain analyses also permit the consideration of aspects such as learning, innovation and strategic network foundation [26]. However, the general relevance of spatial patterns is not always clear from this perspective. On the macro-scale, a broad range of studies explores flows of value creation on the international and global level. Trade flows and investment patterns in economic sectors show the relations between countries [27–32]. The strong point of this

perspective is to analyze internationalization dynamics and power relations in globalization processes, including competition for land and regulation differences in environmental terms or on the labor market. The weaker point is often the lacking spatial fine-scale differentiation of flows and relations.

We fill this research gap by combining both, (a) a fine intra-regional scale approach and (b) a perspective that captures patterns consisting of different businesses along the complete value chain on different spatial scales. We focus on the meso-level, i.e., 'above' the individual firms and products, and 'below' the (inter-)national scale, which mostly focuses on sectors. Such an approach that captures value creation in a comprehensive sense comes along with a high complexity and challenges of data availability. For this reason, we combine quantitative data with an interactive approach that allows data validation and calibration with sectors experts.

Our findings have high practical relevance. Whereas policy measures in food policy and land use regulation are rather separate spheres, our paper shows the relevance of proximity in food value chains for the land use dynamic. Thus, political support of production networks, knowledge creation and cultivation patterns can have an impact on spatial development.

2. Conceptual Framework

2.1. Value Creation in Food Production

2.1.1. The Spatial Perspective

On the regional level, the debate on 'short food supply chains' (SFSC) is the most prominent strand in food geography [33–38]. From this perspective, spatial proximity within regional product chains potentially leads to low transportation costs, increased value added, preservation of the cultural landscape, strengthening of regional identity and job creation [39,40]. These debates on food regionality refers to 'values of proximity'. This includes positive associations, symbolic or qualitative meanings of regional foods, such as the freshness and quality of produce, environmental sustainability, social justice, organic production, support of local and regional farmers and seasonal eating [41–44].

Marsden et al. [45] and Renting et al. [46] identify three main types of SFSC. First, in a SFSC, the consumer may purchase a product directly from the producer or processor on a face-to-face basis (including farm stores, farmers' markets and street vendors). Second, SFSC products are made and sold in a specific production region, while consumers prioritize the 'local/regional' identity of the product at the point of sale. Different from the first category, products are also offered in restaurants, hotels and grocery stores.

The third category comprises products that are specific for a region but sold also outside the traditional production region itself. The most prominent examples are products with PDO (Protection of Designated Origin) and PGI (Protected Geographical Indications) [47–49]. They are sold as 'specialty' foods also in distance to the place of origin. More generally speaking, the shortness of a value chain is not always a clearly defined category. Instead, it can also be a characteristic that implies clearer spatial references, transparency for the consumer and shorter distances at least in some parts of the value chain. In our study, the attention is in particular on the proximity between the different stages of cultivation and production.

Processes of value creation are organized over different steps, linking numerous actors and businesses in a spatially complex manner. Here, the concept of geographic proximity comes into play. This proximity can be expressed with so-called 'food miles', i.e., the distance the product travels from farm to market [50,51]. Morris and Buller [52] focus on foods that are distinctive by originating from a particular geographic area.

Proximity does not only mean the metric dimension of production but also captures other forms. Relational proximity with regard to regional food is understood as economic relation between actors. This refers to the direct exchange between producer and consumer as a personal contact in a common space, coming along with social aspects such as trust

and power [53]. This includes, for example, farmers' markets, community supported agriculture and producer-consumer communities [54,55].

From a methodological point of view, the classical approaches of value chain analysis allow spatial quantification at the product and business level. However, a more comprehensive reflection at the meso-level, capturing entire sectors, is still lacking.

2.1.2. Regional Value Creation

Value creation is a complex research field that can be analyzed on multiple levels of analysis and theoretical disciplines [56–60].

Generally speaking, value creation is the key economic performance indicator of national accounts and implies the increase in value created by production, processing, finishing processes or by other economic activities of economic units [61–63]. From the macro-economic perspective, value added is the output contribution of a national economy; from the microeconomic perspective, it is the output contribution of an individual economic unit (e.g., enterprise, household) or sector (e.g., industry, business sector) to the national economy. The concept of value chains therefore permits small-scale analyses of value-adding activities of a company, an industry or a region [64]. Concretely speaking, value added is the total output generated by an economic unit after subtracting the intermediate inputs purchased from other economic units.

From an economic geography perspective, the spatial organization of value chains is particularly interesting. The analyses of global production networks have been most prominent [65–67]. Here, the focus lies on economic network formation and the organization of spatial structures across the global production system [68–72]. Generally speaking, the role of spatial positioning and economic activities is a key concern. Value creation can involve numerous businesses located at different locations. The processes of value creation are not organized in an economically and spatially even way, but come along with concentration patterns [73]. Several studies have found that SFSCs can be sources of value creation, contributing to rural development and economic regeneration [74]. Nevertheless, the economic impact remains an empirical challenge. In particular, the fine-scale dynamic and small quantities of regional food chains hamper data availability and methodological robustness. This is in particular true for complex products that undergo different steps of treatment and several steps of value creation.

2.2. Spatial Proximity and Land-Use
2.2.1. Neoclassical Arguments

Value creation analyses can provide a good level of spatial information, including localized networks, logistical flows and investment patterns. From the neoclassical perspective, all economic activity aims at generating the highest value in given circumstances. This is also true for land as an important production factor, covered by the concept of land rent [75–77]. In this context, the rent gap concept comes into play, which has been discussed most broadly in urban studies. Particularly in gentrification processes, the gap between potential and de-facto rents can be a trigger for land and real estate conflicts [78–80]. The same dynamic applies to agricultural contexts in times of changing rents [81]. As soon as the lucrativeness of a certain activity on a given places is higher, the existing land use form might be altered [82,83]. Small-scale cultivation areas in particular in urbanizing areas are a typical case in this context [84]. From this perspective, land conversion is the result of profit maximization [85–88].

Additionally, in cultivation, the location choice of actors plays a key role, which is composed of different factors, including the availability of raw materials, the fertility of the soil, distance to markets etc. [89,90]. Traditionally, the focus lies on the rent generated by land as a factor of production, and on location specific transport costs as a function of the perishability and bulkiness of agricultural goods. This leads to spatial patterns in which sensitive goods with a high value and high transport costs tend to be produced close to the market. However, and along with technological, logistical and organizational development,

the relevance of transport costs has dramatically decreased. In parallel, economies of scale have seen a tremendous rise in importance. These economies of scale are due to cost advantages resulting from the production of large quantities [91]. Companies benefit from geographical proximity to others in the same industry. The agglomeration effects comprise short distances to suppliers and labor pooling of specifically qualified employees within a region, which is particular true for production [92]. In densely populated areas, companies benefit from a high quality of the infrastructure, which in turn attracts other companies in the same or at least related industries. This creates a dynamic, reinforcing agglomeration effect [93]. Concentration processes in cultivation, however, are predominantly linked to rural areas.

2.2.2. Relational Arguments

Differently from the neo-classical perspective, relational approaches see economic actors as socially embedded and contingent individuals. In this setting, networks contribute to savings in transaction costs on the basis of long-term agreements and trust building with suppliers and customers [94,95]. Spatial proximity generates regional knowledge spillovers and location advantages through tacit knowledge and shared learning routines [96–98]. Certain knowledge components have local characteristics and are, thus, regionally bound [99]. The localization of knowledge leads to geographical proximity between firms, which ultimately benefit from reputation effects [100,101]. Furthermore, geographically anchored tacit knowledge can come along with joint learning processes and spatial agglomeration effects [102,103]. Proximity can also lead to path dependencies and 'lock-in' effects, as cognitive, organizational and intra-institutional proximity can have both positive and negative effects [104].

Proximity in the relational sense matters for manifold sectors, including cultivation and food production [105]. Spatial agglomerations can emerge at different spatial levels, from local to transnational patterns [106]. Regional networks are mostly characterized by regional proximity between small and medium-sized enterprises, which join forces to realize synergetic economies of scale, to develop common values and share tacit knowledge [107,108]. From an economic perspective, networks are known as (regional) clusters, e.g., [109,110], industrial districts [111] or creative milieus [112].

In this context, core competencies are an important concept, corresponding to resource-oriented management theory [113,114]. Company-specific resources and competencies are seen as competitive advantages, comprising tangible and intangible resources [115]. Core competencies have a high durability and relevance for maintaining regional competitiveness. The network's ability to pool different resources is essential for the formation of cooperative core competencies. Corporate relationships are seen as a source of competitive advantage, as profitable complementation takes place through combination with the resources of network partners [116,117]. These processes are supported by the proximity of the interaction partners, both spatially, cognitively, organizationally, socially or institutionally [118].

The competencies approach is applied to resources and capabilities of a region and considered beyond the boundaries of the individual firm (e.g., [119–121]). Here, regional structures and processes are framework conditions for companies for developing a particular competitiveness. The focus is on both the agglomeration effects and social interaction patterns in the regional network, reflected in the regional value chain through the exchange of information and mutual trust [122].

To summarize, both the neoclassical and the relational perspective consider proximity to be of economic relevance. This leads back to our research question, as we address this relation in an empirical manner.

3. Material and Methods

3.1. Operationalisation and Value Creation Mapping

Our paper aims at understanding the role of proximity in land use dynamics, in particular with regard to agricultural use. Our empirical arguments are based on three agricultural products in Bavaria, namely beer (with hops and barley), asparagus and sweet cherry. These products clearly differ with regard to economic volumes and performance. At the same time, they have in common that at least two steps of the respective value chains are organized in spatial proximity, as pointed out in more detail later.

The key method is a so-called value creation mapping that captures the value added over the different steps and scales in a visual manner (see Figure 1). The value chain mapping starts with the identification of all relevant steps of value-creation. It covers all steps including the cultivation and production of intermediate products, (further) processing and refining, as well as different forms of trade. The input arrows comprise the transaction efforts (in particular logistics, shipping) which cannot be further differentiated in a quantitative manner, due to data availability. The value chain takes a multi-scale perspective, thus considers the regional scale of Bavaria as well as the national, European and global scale. This approach goes beyond classical value chain analyses as it does not focus on single businesses but on the spatial differentiation on the meso-level. We complement the value creation mapping with a small-scale localization which cannot be represented in the tool itself, but in cartographical form.
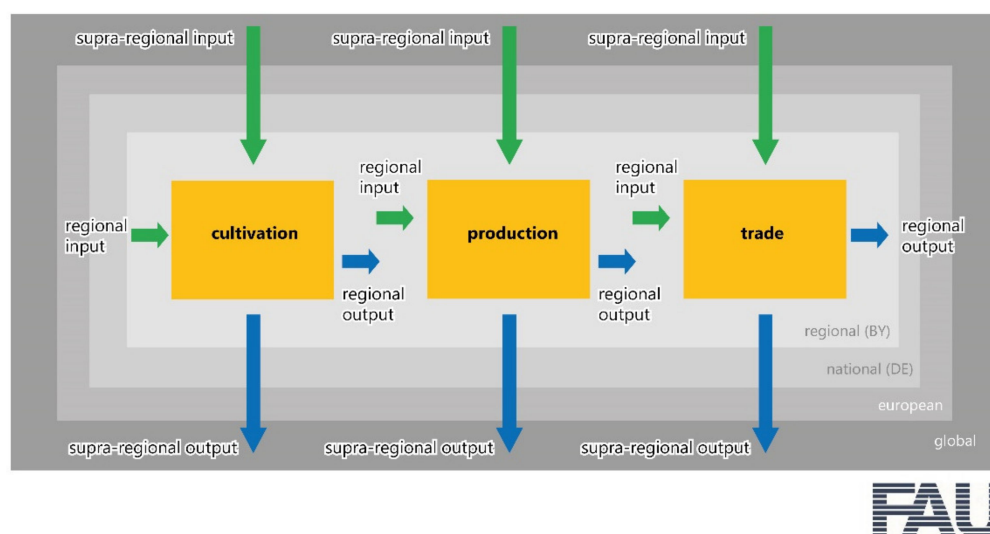

Figure 1. The value creation mapping tool.

3.2. Data Base and Quality

We apply a mixed methods approach that combines two data sources. Firstly, the statistical database comprises official statistics as well as associations' and consultancy information. The second information source is expert interviews, helping to complement, differentiate and calibrate the value creation mappings.

With regard to the statistical data availability, two challenges arise. On the one hand, official sector-specific statistics show monetary values for a given sector (including gross value added, total sales) only on a higher spatial scale, such as NUTS-1 (level of Federal states, e.g., German 'Bundesländer') or NUTS-2 level (level of Government districts, e.g., German 'Regierungsbezirke'; NUTS for European Nomenclature of Territorial Units for Statistics). On the other hand, local and regional statistics often do not provide the necessary degree of differentiation of the economic branch. For example, value-added data is available for the main group of beverages, but not for the sub-group of beer production. Regional statistics of the beer industry (e.g., employment, companies, cultivation areas) are often available on a small scale (NUTS-3, level of counties and independent cities, e.g., German

'Landkreise und kreisfreie Städte' and LAU, municipality-level, e.g., German 'Gemeinden'; LAU for Local Administrative Units). However, data protection limits full access to small-scale, industry-specific values. This is why we complemented the official statistics data with industry reports and further statistical information, in particular employment statistics from the Federal Employment Agency, tax statistics on the brewing industry from the Federal Statistical Office and sales tax statistics from the Bavarian State Office for Statistics (see Table 1). For the analysis of the value chain of beer, a variety of land use data (1, 3) and agricultural data (5, 7, 8) was supplemented by data on employment (9–11), the processing stage (12–14) and trade statistics (15) as well as field research. Regarding asparagus, we complemented land use and agricultural data (1, 4, 5, 6, 7) with trade-specific information from sector reports and field research. Finally, our findings on the sweet cherry rest on land use and agricultural data from the orchard sector (2, 6), returns (7), on the distillery process (12, 13) and its trade (15). For better readability, we do not refer to the product-specific data sources in the results chapter.

Table 1. Statistical data basis for value creation mapping.

Topic	Sources
Agricultural area und land use	1. Bavarian Research Centre for Agriculture (2018): Invekos. Integrierte Verwaltungs- und Kontrollsystem (Special query. Code numbers: 132, 856, 860). 2. Bavarian Office for Statistics (2013, 2019): Tree-fruit grower surveys 2012 (C1800C 201251), 2017 (C1800C 201751) 3. Bavarian Office for Statistics (2012): Agricultural land use statistics 2011. 4. Bavarian Research Centre for Agriculture (2012): Report on the agricultural market, 2011.
Input Costs (cultivation stage)	5. Bavarian Research Centre for Agriculture (2021): Contributions and costing data of the Bavarian State Research Centre for Agriculture (Special queries. Spring barley, Spalter Hopfen, Asparagus (all years), 2016-2020). 6. Kuratorium für Technik und Bauwesen in der Landwirtschaft e.V. (2010): Orcharding. Manual. KTBL. Darmstadt.
Agricultural returns	7. Destatis (2019): Harvest statistics: Harvest quantity (vegetables and strawberries): Federal states, years, types of vegetables in the open field (41215-0001). 8. Federal Ministry of Food and Agriculture (2019): Economic Accounts for Agriculture: Value added of agriculture (in mill. € at current prices) (3130500).
Employment and business	9. Federal Employment Agency (2019): Employment statistics: Employees subject to social insurance at the place of work according to selected economic sectors of the Classification of Economic Activities 2008 (Special query. 26.03.2019) 10. Destatis (2019): Quarterly production survey: production value, quantity, weight and enterprises of the Quarterly production survey: Germany, years, goods register (42131-0003). 11. Bavarian Office for Statistics (2019): Agricultural structure survey: Total agricultural enterprises 2016 by respective areas and crops (41141-001).
Processing	12. Destatis (2019): Cost structure survey in manufacturing: persons employed, turnover, production value and value added of enterprises in manufacturing: Germany, years, economic activities (42251-0003). 13. Bavarian Office for Statistics (2017, 2019): Manufacturing production: in Bavaria 2016, 2018 (plus mining and quarrying) (E1500C 201600, E1500C 201800). 14. Bavarian Office for Statistics (2020): Turnover tax statistics: Districts, taxable turnover, turnover tax, recoverable input tax, turnover tax advance payments, economic sectors (WZ 2008), year (from 2009). (73321).
Sales and trades	15. Bavarian Office for Statistics (2020): Trade statistics: Annual survey Bavaria (51000-007s).

A regionalization procedure allows small-scale analyses. For this purpose, suitable indicators were defined. Examples of regionalization indicators are at the 'production' level the cultivated area (ha) per county for the respective primary products and at the 'processing' level industry-specific employees subject to social security contributions per county.

The regionalization is carried out in a top-down procedure, starting the federal level, via the state level (Bavaria) to the districts and cities. Enterprise mapping based on company data (Hoppenstedt, Amadeus, Fraunhofer databases) allowed to calculate approximate data on employment relevance and calculate value-added stages of production and processing. A wide range of data is thus included in the statistical basis, which was object to validation and differentiation in the next step, the expert interviews.

Based on agricultural census data (1–4), land use changes were calculated for the period of 2011–2018 (beer and asparagus), and 2012–2017 (sweet cherry), respectively.

3.3. Expert Interviews

The main objective of the expert interviews was the calibration of the existing data with regard to the spatial dimension. Concretely speaking, draft versions of the graphic value creation mappings were prepared based on the available statistics (see the product specific results in Figure 2). The interviews discussed the validity of these drafts, filled data gaps existing due to data limitations in secondary data as mentioned before and reflected on further differentiations as well as possible interpretations. The interviews covered seven categories, which were addressed flexibly in each interview, depending on the stage of the value chain:

- **Inputs and sales:** differentiation of spatial scales (regional, national and international inputs and sales), shares and origin as well as destination of the purchased inputs and sales
- **Value creation variables:** share of intermediate inputs and gross value creation in total sales; components with highest share within intermediate consumption and gross value creation
- **Market trend:** assessment of the variability and trends of sales prices in Bavaria/Germany, current average sales price per product, reasons for dynamics
- **Employment:** proportion of employees subject to social security contributions, part time employees and seasonal employees
- **Spatial relations:** role of proximity to a previous or subsequent stage of the value chain

The interviews helped with regard to data validation, i.e., to ensure the appropriateness of the existing data in the value creation mappings and to interpret the revealed patterns. Per product, at least eight experts were involved. The selection criteria include the representatives of industries, companies, associations and governmental institutions as well as a comprehensive knowledge of the sectors' structure and functioning. These actors were from the food retail sector, representatives of chambers and associations, and decision-makers from the food production sector. Due to reasons of confidentiality, the experts' affiliations are not presented in detail. For beer, 18 experts were interviewed (e.g., directors from breweries, hop and malt producers, associations, institutions and retailers), 6 for the production stage, 7 for the processing stage and 4 for the trade stage. For asparagus, 9 experts were interviewed (e.g., asparagus producer associations, institutes and retailers), 7 for the production stage, 1 for the trade stage and one meta-expert. For sweet cherry, 13 experts were interviewed (managers from fruit cooperatives, distilleries, associations, institutes and retailers), 7 for the production stage, 3 for the processing stage and 2 for the trade stage. One expert is a meta-expert for all three products on a ministerial level. These semi-structured personal or telephonic interviews took between 30–60 min, and they were documented in a written, condensed way.
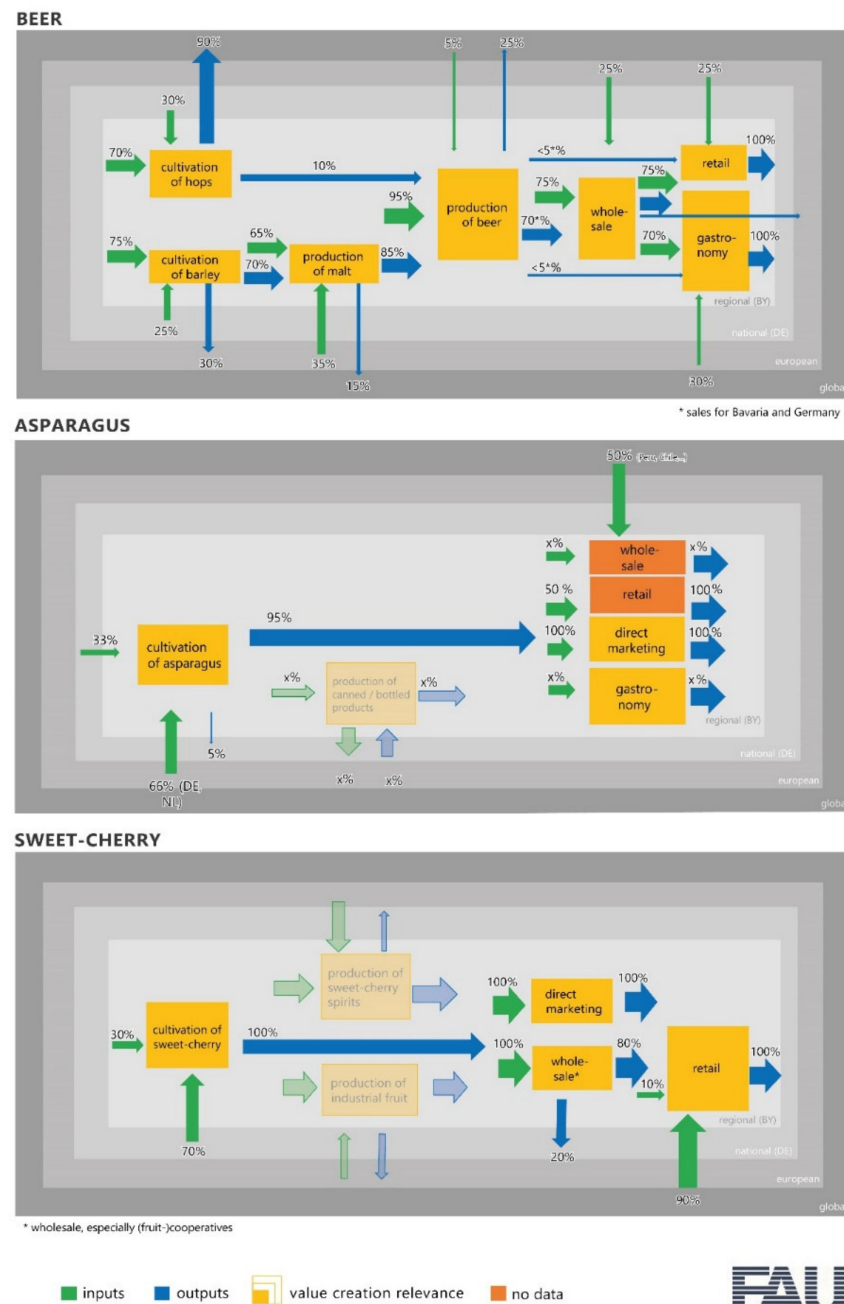
Figure 2. Value creation mappings for beer, asparagus and sweet cherry (NB the size of the yellow value creation signatures differs between the products).

4. Results

4.1. The Spatial Dimension of Value Creation

4.1.1. Overview

Figure 2 visualizes the spatial dimension of the value creation process for the three products beer, asparagus and sweet cherry in Bavaria. As mentioned above, the economic quantifications are the result of combining the statistical information from diverse sources and the refinement in expert interviews.

The graphic shows the value creation stages of cultivation, production/processing and trade. The higher the yellow rectangles, the stronger the value creation relevance for this stage (gross value added in thousands of euros). The green and blue arrows show the

origin (input) as well as the output direction and their spatial dimension. We discuss the product-specific patterns below.

4.1.2. Beer

Beer has a high economic relevance in Bavaria. The Bavarian breweries alone made sales of 3.3 billion euros in 2017. One in every 500 employees in Bavaria works in beer production. The value chain of beer comprises the production of hops and barley, the processing of malt, the brewing of beer and trading paths. The inputs also cover logistics, machines, seeds etc. The mapping indicates a high importance of regional value creation. Most intermediate inputs for nearly all stages of the value chain are located in regional proximity, indicating a high degree of regional self-sufficiency.

To start with the first step of the value creation: Bavarian hops and barley producers purchase more than two-thirds of their inputs (including seeds and seedlings, fertilizers and pesticides, and construction equipment) from regional suppliers. The situation on the output side is different: Whereas the export share of Bavarian hops is approx. 90%, by far most of the barley output remains within the region. More than two-thirds of the spring barley growers sell their product to regional malt houses; just under one-third is sold outside the Bavarian region.

On the next stage, processing comprises malting and brewing production. The market relevance is reflected in a turnover of malt of about approx. 200 million euros. The mapping indicates that the malting enterprises obtain most of their intermediate inputs on the regional level (approx. 65%, including raw materials, contract work, rents and leases). In parallel, the regional malting businesses sell about 85% of their produced malt to regional breweries.

Bavarian breweries source 95% of their inputs—i.e., the malting barley, hops, water, machinery and equipment—on the regional level. Only 5% of the inputs are sourced from other German regions and the USA. Special hop varieties are often procured from the USA. The high regional shares of inputs and sales for the value-added stage of processing show that the Bavarian breweries can rely to a large extent on regional supply. The mapping reflects the high relevance of export of Bavarian beer on a global scale. The output share of 25% is a result of a continuously rising export-orientation in recent years.

The production of beer and the gastronomy trade generate the highest absolute gross value added within the value chain. A large proportion of Bavarian beer (around 75%) is sold through regional retailers and restaurants, with smaller and medium-sized breweries selling their beer within a radius of around 50 km or in their own brewery pubs. In the Bavarian retail trade, beer accounts for 4% of net sales, of which three percentage points are Bavarian beer and one percentage point non-Bavarian beer. Local retailers have a significantly higher share of regional beer in their total beer assortment than discounters. Within the food service sector, restaurants are important sales markets for Bavarian breweries. More than two-thirds of the beer in the restaurant trade is sourced regionally. Brewery contracts between restaurateurs and breweries thus secure the sales markets. In contrast, system catering (e.g., Vapiano) predominantly obtains beer from supra-regional, non-Bavarian breweries.

Summarizing these arguments, we see a two-sided picture: The beer sector combines a strong regional anchorage on the input side with a selective global dimension, namely in terms of hops and beer sales.

4.1.3. Asparagus

Asparagus is the most important vegetable crop in Bavaria in terms of harvest volume, cultivation area and sales volume. The mapping of the regional value creation of asparagus shows that the value chain is largely localized in Bavaria. With a revenue of about 7.80 euros per kilogram, the turnover of Bavarian asparagus cultivation is estimated at about 130 million euros, while the overall net turnover can be estimated at 270 million

euros. The value-added mapping indicates that production and particularly gastronomy generate the highest absolute gross value added within the value chain.

One third of the intermediate inputs for the production stage are sourced within the region. In particular, structural equipment as well as maintenance services are predominantly procured from the region. In contrast, 90% of the seed planting material and special machinery comes from outside the region (other German states and Netherlands). The films used in asparagus cultivation are produced exclusively on beyond Bavaria.

The second step of value creation is a rather weak one. The production of canned asparagus is shown in a transparent color, as the value added is too low to be quantified. The processing does not have an economic relevance in Bavaria, since the regional asparagus is only marketed as a fresh product. Thus, even if fresh asparagus is a lucrative product, asparagus has a very low value-creation depth. The canned and bottled products are imported from global sources.

Asparagus sales are predominantly established on the regional level (95%), with direct marketing being the most relevant channel. The price fluctuations in direct marketing tend to be smaller than in retail, and the general price level is higher. Gastronomy is an important buyer of Bavarian asparagus, although only the top quality category plays a role here. Half of the retail asparagus comes from the region, partly purchased via wholesale and also via local farmers. The asparagus from outside the region is mainly from Peru, Chile, Spain or Egypt, extending the asparagus season. Recent years have shown a clear increase in production with a stable price development in Bavaria.

4.1.4. Sweet Cherry

In Bavaria, the harvest volume of sweet cherries is at 2400 tons (fresh fruit) and a sales volume of 6–10 mio. euros. The distillation of sweet cherries generates sales of only around 0.5 million euros with a production volume of around 215 hectoliters. The overall volume, thus, is very low (cp. malting for beer of 200 million euros). Similar to asparagus, the value chain of sweet cherries is mainly localized in Bavaria. The mapping shows that the cultivation and retail stages generate the highest absolute gross value added.

The production of spirits as well as the production of industrial fruit are displayed in a transparent signature, since the value added relevance is too low to be quantified. Production of industrial fruit in Bavaria does not have an economic relevance, so we can state a low depth of value creation.

One third of the planting material for the production of sweet cherry is from regional nurseries and 70% from more distant nurseries (including Italy/South Tyrol, the Netherlands, Rhineland). In particular, structural equipment such as canopy systems (South Tyrol, Lake Constance) and machinery (Italy) are mainly purchased on the larger scale. The cherry retail and direct marketing is mainly addressing the regional level. Still, food retailers buy about 90% of their cherries from outside the region, thus, having a low degree of self-sufficiency.

4.2. Localised Activities and Land Use Patterns

4.2.1. Overview

In a next step, we have a closer look at the spatial organization of value creation for the three products. Figure 3 shows the differentiation of the value creation stages in form of spatial concentration maps. Different from the value creation maps, these graphics show the locations of economic activities. These activities indicate land use demand, most obviously in cultivation (the maps on the left-hand side), but also for processing steps (right hand side). Moreover, the data indicate spatial relations and in particular distances and proximity.
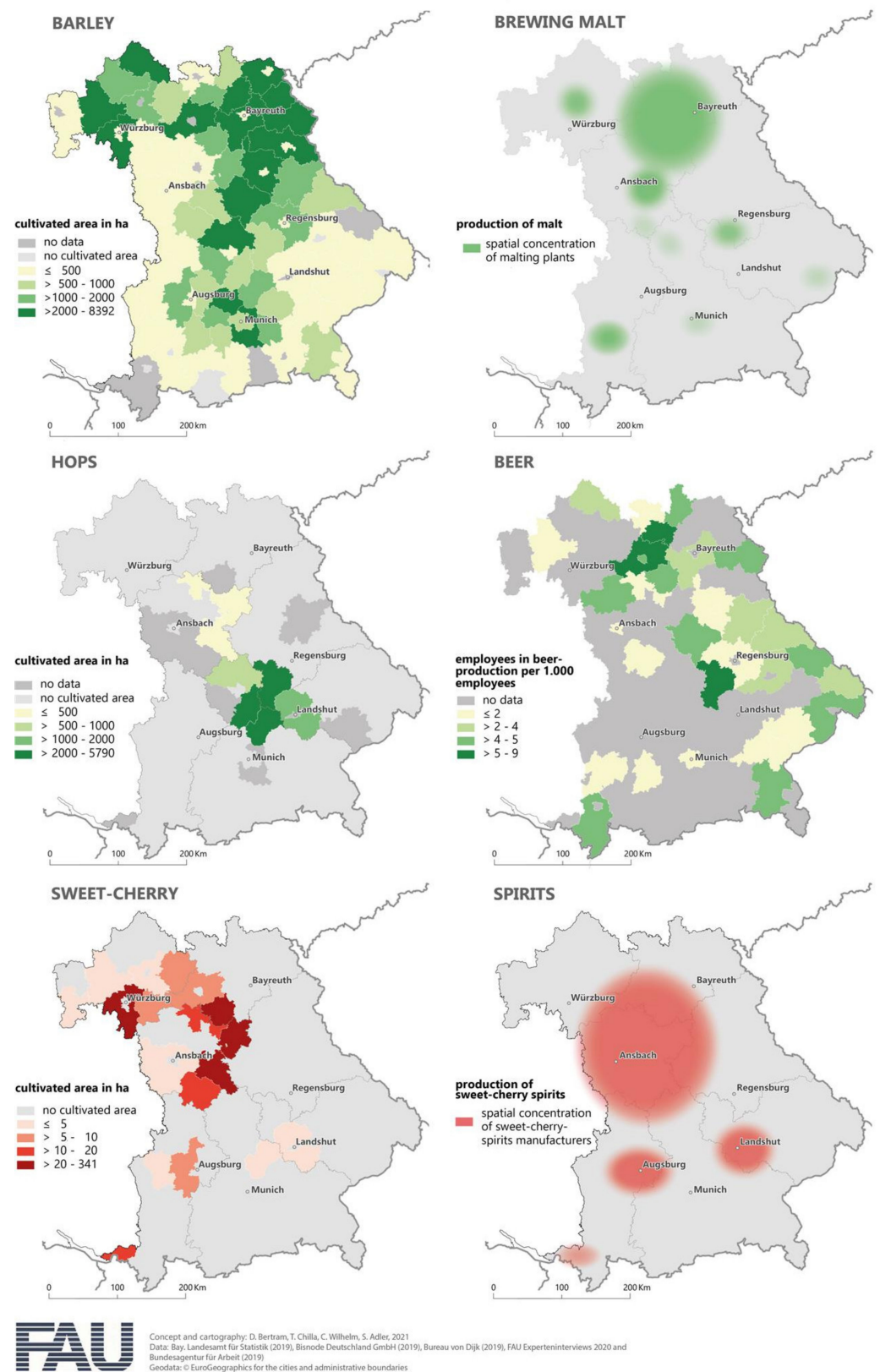
Figure 3. Localized activities and land use patterns.

For most maps, we can rely on statistical data on district level (NUTS3), and for the cases of malt and spirits, the colored signature indicates the zones of significant economic activities, based on the address database of relevant firms. As there is no systematic data available on inter-firm linkages, we cannot conduct a cluster analysis. Considering the

proximity in these maps and knowing about the high share of regional linkages, less than 100 or even 50 food miles [51] are plausible, at least before exporting.

The spatial patterns of cultivation and production differ significantly between the products. While products such as spring barley are spatially dispersed, other products such as hops are spatially more concentrated. The maps do not include the asparagus case because processing do not play an economic role, as mentioned earlier.

The similarity between the maps of the beer and the cherry related activities indicates a spatial proximity between the involved value creation steps. In these cases, spatial proximity across value creation steps obviously plays a strong role. It is true that the local situation, spatial planning regimes, real estate markets and demographic dynamics are also important factors. However, proximity due to economic factors is more than plausible, as we discuss in the following sections.

4.2.2. Beer

About 1% of Bavaria's territory serves the production of beer. The production of spring barley with a cultivation area of about 90,000 hectares represents the highest quantities. Spring barley, 70% of which is used as malting barley, shows rather dispersed spatial production patterns. A good predictability of the work input, the low density of the work as well as the possibility of using service providers for the harvest make the cultivation of spring barley interesting also for part-time farmers. Over recent years, the cultivation area of spring barley in Bavaria is stable despite a strong variability and dependence on weather conditions.

In contrast, the cultivation of hops shows clear spatial concentration. Bavaria accounts for about one quarter of the worldwide hop cultivation (approx. 16,000 hectares). It is concentrated in the world's largest contiguous hop-growing region (Hallertau) with a cultivation area of about 15,500 hectares. A decline in the number of hop farms and a slight increase in hop acreage can be observed. This indicates moderate concentration processes in hop cultivation. According to the expert interviews, the regional know-how developed in many years of cultivation has significantly favored the concentration of hop cultivation in the Hallertau. This prominence has recently been fostered by global trends such as craft beer.

The production of brewing malt takes place in spatial proximity to the production of spring barley. A high concentration of malting plants can be observed in northern Bavaria. Generally speaking, processing of malting barley takes place in around 20 malting plants of varying sizes.

Ongoing concentration processes can also be seen in the production of beer which currently involve 640 breweries. Market power is increasingly concentrated in a few larger companies in southern Bavaria, most of which are (parts of) transnational and global enterprises. They contribute strongly to the rising export share mentioned earlier.

In summary, we see a spatial proximity between the production of beer, the production of malt and the growing of barley producers. The presence of hops is in less direct proximity.

4.2.3. Asparagus

In recent years, the asparagus cultivation area in Bavaria increased significantly, accounting to 4400 hectares under cultivation. The increase in production came along with a stable price development.

Asparagus shows concentration patterns in cultivation as it depends on good climatic and soil conditions. The southern districts tend to host increasingly large farms selling their products on a predominantly through food retailers. A small share of 5% is sold by the large farms in southern Bavaria to the neighboring Austrian and Swiss costumers. The northern farms tend to be smaller (about 50% of the farms cultivate an area of less than one hectare). These family and side-line businesses largely focus on direct marketing. In this case, 95% of the Asparagus is sold as fresh product, and here we see a strong spatial correlation between production and sales.

4.2.4. Sweet Cherry

The cherry plantations in Bavaria comprise an area of about 560 hectares and show clearly concentrated cultivation pattern. The growing areas in the norther parts are particularly well suited for the cultivation of cherries due to favorable climatic and soil conditions. The sales of sweet cherry fresh fruit are mainly concentrated within Bavaria (approx. 80% of the quantity produced), with direct marketing and marketing by cooperatives representing the most important distribution channels. Approx. 20% are sold to other (neighboring) German regions. Sales to other EU countries play a minor role, as the sweet cherry tends to have a limited suitability to storage and, thus, is unsuitable for longer transports.

The production of sweet cherry spirits is located in very close proximity to cultivation, hosting more than 2000 distillers. Trade in sweet cherry spirits is also largely linked to Bavaria (approx. 70% of the volume produced), with direct marketing representing the most important distribution channel alongside regional food retailers. A smaller share (approx. 30%) is sold beyond the region, often via (online) retailers, primarily to other German regions.

5. Discussion

5.1. The Role of Proximity

Table 2 summarizes the results and links them back to the conceptual framework and the research question. All three value chains are characterized by a relevant role of spatial proximity, but the kind of proximity differs significantly between the products.

Table 2. Development trends and the role of proximity for the analyzed products.

	Proximity . . .	Market Trend	Land Use Trend
Beer	. . . of hop, barley, malting plants, breweries, "Proximity for export"	Stable to positive (due to strategy internationalization of regional specificity and export growth)	Stable
Asparagus	. . . of cultivation and sales "Field to plate proximity"	Positive (due to technological development)	Positive
Sweet cherry	. . . of cultivation, distillery and sales "tree-to-plate-and-glass-proximity"	Negative (decreasing competitiveness due to lacking innovation/adaptation)	Stable to negative

In the case of beer, all parts of the production steps are localized in spatial proximity, with the exception of the increasing export share of the final product. The wording "proximity for export" captures this setting in brief manner.

The situation for the asparagus case can be summarized as "field-to-plate-proximity". We see a rather classical setting with a high importance of direct sales of fresh products. The case of the sweet cherry is similar, even if the processing in distilleries complements the regionalized setting. This situation might be captured as "tree-to-plate-and-glass-proximity".

These proximity patterns come along with rather different trends in economic and land use terms. The beer related land use demand is stable. In parallel, the positive economic development is endured by increasing export activities.

Asparagus develops in a positive manner, both economically speaking and with regard to land use trends. The market trend is positive mainly due to technological innovations that led to intensifications (longer season, higher quantities).

The situation for sweet cherry is different, as the economic situation has developed negatively. The decreasing competitiveness due to lacking innovation has led to reduced rentability and, thus, to a modest decrease in land use.

These patterns indicate that proximity between the different steps of the value chain can come along with positive economic and land use trends, but there is no automatism. Against this background, it is worth going deeper into the role of proximity and reflect on its explanatory role.

5.2. Explanations

5.2.1. Beer

In the case of beer, the current trends can be explained by neo-classical and relational arguments. The proximity of barley to malting plants is based on the high relevance of transaction costs as high quantities of the rather heavy material are processed. With regard to the internationalization trends, economies of scale come into play. It is worth mentioning that the natural conditions for the cultivation of all ingredients is positive, so the classical locational factors 'fit'.

From a relational point of view, several important arguments play a role. Incremental innovation in the development of hops and in the breweries are based on tacit knowledge that is strongly place-bound. Centuries of beer production have led to a high density of networks and institutions that are characterized by a certain level of information exchange and mutual trust. Several associations of market actors, specialized education facilities etc. ensure a high level of competence and capacity for innovation. Cognitive, organizational and social proximity of the network partners are a regional core competence. This regional core competence results in the high level of value creation and regional self-sufficiency. This comes along with a worldwide reputation of Bavarian beer, which turns out to be a precondition for export success.

5.2.2. Asparagus

From the neo-classical perspective, the situation for asparagus can be explained as follows: Cultivation finds optimal natural locational factors and the efficiency in cultivation increases continuously due to technological innovation. In parallel, proximity plays a major role in asparagus sales. The limited storage life of fresh products strongly favors spatial proximity between cultivation and consumer demand.

From the relational perspective, two arguments are important. Firstly, the high share of direct sales is based on personal relations between many vendors and clients. Secondly, the particular reputation of local kinds of asparagus is relevant, in some cases supported by European protection of origin (*Schrobenhausener Spargel, Frankenspargel*).

5.2.3. Sweet Cherry

The case of the sweet cherry is rather problematic. The stagnant and low economic relevance is accompanied with a lack of innovation. From the neo-classical perspective, technological innovation with increasing economies of scale would be an option. Specialization and economic niches (in particular orchard products) are alternative options. As these innovations have not (successfully) been implemented in the analyzed region, competitiveness has decreased, in particular compared to other regions with comparable natural settings (e.g., South-East Europe).

From the relational point of view, the development path might be interpreted as lock-in. The traditional way of cultivation and marketing has been maintained until today without strong efforts of innovation and adaption (development of cultivars, alternative cultivation and harvest methods). For the case of the distilleries, the state subsidiaries in recent decades ('Branntweinmonopol') were not linked to market dynamics and might be seen as stabilizing elements but also as obstacle for innovation processes. It remains to be seen if the decreased financial support leads to innovation or rather to economic down turns in this sector.

5.3. Positioning of the Findings: Lessons Learned and Limitations

Our study provides a better understanding of the proximity along the value chain in food production. We show that spatial proximity in value creation process influences land-use dynamics. Our study reveals relevant insights concerning the empirical cases, and beyond. The novelty of our approach lies in particular in the meso-level perspective, going beyond existing studies on the micro level (e.g., [24,25]).

First, the value creation mapping enriches the methodological options of value creation analyses. The perspective allows capturing the whole value chain in a high spatial differentiation without relying on the information of single enterprises (different from, e.g., [22]). Recent years have brought numerous studies with a high degree of detailing but the concentration on selected steps of value creation (e.g., the focus on trade in fishery [123]) or without spatial differentiation (e.g., for the example of beer [124]).

Second, and from the perspective of short food supply chains, we contribute by providing evidence on different stages of value creation that proximity matters. In doing so, we detail existing approaches in an empirical manner and with a higher degree of spatial differentiation.

Our approach, based on the value creation mappings, allows both, but comes along with limitations, too. Due to the heterogeneity of data and the expert-based calibration, the quantifications can only provide approximate values. This data basis is not appropriate for multivariate statistical analyses and similar aspects. One might also criticize that the meso-level perspective does not reflect on the development paths of particularly successful enterprises. Applying the value creation mapping on the meso-level is a new and helpful perspective of value chain analyses. However, this meso-level approach has to be complemented by reflections on other scales.

6. Conclusions and Outlook

Our paper shows that proximity between value chain steps matters. Despite the overarching influence of economic concentration processes on the international level and the predominant role of economies of scale, the question of spatial distance does play a role—both for economic dynamics and for the competing land use demand. In particular, proximity between two steps along the value chain has the potential of supporting land use demand for the cultivation of agricultural products. This is due to two kinds of arguments:

Firstly, the classical argument of minimized transaction costs still applies. Transport costs tend to be lower and contractual relationships tend to be facilitated by spatial proximity. This tends to foster the status of agricultural land in situations of competing land demand.

Secondly, established spatial patterns can come along with localized tacit knowledge that result from often longstanding path dependencies. The innovativeness in hops cultivation and beer brewery is an illustrative example here. This often comes along with a certain reputation and, thus, marketing arguments. The latter can apply on the international as well as on the regional level. This, too, increases the profitability and, thus, the positioning of land use competition.

However, proximity does not automatically matter. Instead, proximity in value creation can only play a positive, stabilizing role if particular preconditions are given. Our case study has revealed the relevance of particular developments, including technological innovation (given in the case of asparagus, not given in the case of the sweet cherry), the export orientation in the case of beer and niche market stabilization, e.g., with Geographical indication for beer and asparagus. This leads to a somehow paradoxical conclusion: Proximity does matter for fostering the role of agricultural areas and land use dynamics. At the same time, the role of proximity has to be based on strategic market development, including innovation, niche strategy and marketing.

From the comparative perspective, it is obvious that there are no simple success factors. Each product relies on a complex setting that has developed over a long time. Both the neo-classical and the relational perspective contribute important arguments for the explanation of success and failure. Proximity can play a positive role but does not guarantee success. The same is true for a high degree of historicity. The combination of rather classical arguments with positive relational dynamics seems to be the perfect fit.

Our findings have practical and policy implications. As proximity between two steps of the value creation process strengthens the importance of cultivation in land use competition, supporting this proximity is of high relevance. In practice, this means to

support local networks and local tacit knowledge. Networking initiatives, brokering chambers, farmers' training programs, etc. all have their share to contribute here. These interventions are promising as they can build on successful paths of knowledge creation, or if a considerable reduction of transaction costs is to be expected. It is important to say that measures on the economic side cannot replace appropriate spatial planning procedures in order to safeguard sustainable land use.

This case study analysis certainly leaves scope for further research, systemizing the findings at hand. A comprehensive quantitative perspective can scrutinize the links between land use dynamics and market development in a statistical way, validating the current findings. We expect that the patterns will be in principle similar for those products where transaction costs (in particular weight) on the one hand or tacit knowledge on the other hand plays an important role. For other products, the role of proximity might be much lower. If this finding is true, a stronger specialization of production patterns and differentiated patterns of land use dynamics would be probable in the future.

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