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RESEARCH FOR AGRI COMMITTEE - THE EU CATTLE SECTOR: CHALLENGES AND OPPORTUNITIES - MILK AND MEAT

STUDY

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AGRICULTURE AND RURAL DEVELOPMENT

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Abstract

The cattle sector is of great economic importance within the EU agricultural sector. Productivity of the sector is very heterogeneous. In the near future, a further increase in milk and bovine meat supply can be expected. To avoid a decline in farm gate prices, further product differentiation at the EU level, an increase in export opportunities as well as compensation for environmental services to support extensification will be needed.

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LIST OF ABBREVIATIONS

AWU	Annual work unit, see Table A.1 for definition
bln	Billion(s)
BPS	Basic Payment Scheme (European Commission, 2015c)
CAP	Common Agricultural Policy of the EU
DPs	Direct payments (European Commission, 2015c)
EU-S	Southern MS of the EU, see Table A.1 for definition
Extra-EU trade	Trade between a MS and a country which is not member of the EU
FADN	Farm Accountancy Data Network of the European Commission
FSS	Farm Structure Survey of Eurostat
GP	Greening Payment (European Commission, 2015c)
ha	Hectare
Intra-EU trade	Trade which takes place only between EU MS
LFA	Less favoured area, see Table A.1 for definition
LSU	Livestock unit, see glossary (Table A.1) for definition
m	Million
MENA	Middle East and North Africa
MS	Member State(s) of the EU
mt	Million tonnes
PPS	Purchasing power standard
RDP	Rural development programme
SFS	Small Farmers Scheme (European Commission, 2015c)

SO Standard Output as defined in European Commission (2008a)

SSA Sub-Saharan Africa

TF14 Type of Farm classification as defined in European Commission (2008a), see Table A.1 in the Appendix

TP Transitional Payment (European Commission, 2015c)

TSO Total Standard Output as defined in European Commission (2008a)

UAA Utilized agricultural area

UTPs Unfair trading practices

VCS Voluntary coupled support

YFS Young Farmers Scheme (European Commission, 2015c)

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EXECUTIVE SUMMARY

The EU cattle sector consists of the EU bovine meat sub-sector, which produces and processes beef and veal, and the EU dairy sector, which produces and processes cow milk. **The cattle sector is of considerable importance to the European Union (EU)**: the EU is one of the world's leading producers, consumers, and traders of bovine meat and dairy products; the sector provides employment and contributes to territorial vitality especially in marginal or vulnerable regions; it provides environmental goods such as biodiversity preservation; and many EU beef meat and dairy products are regarded as high quality products that are protected by EU schemes. Nevertheless, the EU cattle sector is **faced with severe challenges in recent years**. These challenges relate to: public policies – both at national and EU level – such as environmental restrictions and the abolition of the milk quota system in April 2015; price developments at world, EU and national levels; problems of profitability in the sector; changing demand both in terms of quantity and quality; increased competition in the EU due to the progressive opening of the market through international trade agreements; a changing geopolitical context; the international economic situation; and the consequences of climate change.

The Common Agricultural Policy (CAP) includes provisions for the support of the EU cattle sector such as direct payments and market measures under the first pillar and rural development measures under the second pillar. However, challenges in the sector are of such a nature that **specific support measures – especially for the dairy sector –** were introduced. These included the 2012 milk package to improve bargaining of dairy farmers in the milk supply chain and the 2015 aid package targeting the beef meat and dairy sectors through, among others, aid for private storage and promotion.

In light of these considerations, **the aims of the current study** are to:

1) **Analyse the current situation** of the EU cattle sector focusing on its characteristics, the interlinkages between the meat and dairy sectors, the challenges and opportunities it is facing and the reasons behind the current crises.
2) **Propose specific policy options** for CAP measures for supporting the EU cattle sector by focusing on an assessment of the role of current CAP measures for farmers' incomes and by discussing potential alternative measures of support for the sector.

While all farms of the EU cattle sector share commonalities, they also differ considerably in important aspects across EU regions. Moreover, farms in the cattle sector that are specialized in certain products or production systems are clustered regionally. As a result, the effects of changing market conditions or policies do not affect farm income in the EU regions in a uniform way. Therefore, **this study takes a regionally disaggregated perspective** to account for these differences. Specifically, the methodological approach is based on two dimensions: (1) Macro-level analysis treating the sector as an entity from an aggregated point of view and; (2) Regionally disaggregated micro-level analysis ensuring the cohesion perspective of the analysis. Based on this pronounced cohesion perspective, the study assesses the diverse structures of the EU cattle sector, its regional disparities and the effects of potential future policy choices on these two aspects.

The methodological approach provides a **comprehensive quantitative analysis which in part is descriptive and in part uses statistical methods for generating insights into the EU cattle sector**. The quantitative analysis uses a number of suitable indicators and metrics, and a range of statistical tools and models to quantify and summarize multi-dimensional relationships between indicators. This approach allows to discover patterns in

the data which are not detectable by descriptive analysis. Throughout the study, the analysis will follow seven perspectives along the macro-micro divide (Table 1). The analysis is complemented by results of interviews with experts in the EU cattle sector from various MS[1].

Table 1: Perspectives of the analysis

Analysis dimensions	Macro-level vs. micro-level
Supply chain level	Primary production: commercial vs. non-commercial farms Processing chain: structure vs. conduct vs. performance
Member States	EU15 vs. EU13, EU-North vs. EU-South
Production intensity	Intensively vs. extensively operated commercial farms
Farm income	Income quintiles
Farm type	Specialist dairying Specialist cattle — rearing and fattening Cattle — dairying, rearing and fattening combined Mixed livestock, mainly grazing livestock Field crops — grazing livestock combined

Source: Authors

The study is written in a comprehensible and illustrative non-specialist style. It presents the information in an accessible visual way using informative infographics such as graphs or maps. Table A.1 contains a glossary in which key terms are explicitly defined and connected with their legal source documents where applicable.

The study is structured according to the conceptual model shown in Figure 1. **The conceptual model includes the main factors that influence the current state of primary production and supply chains in the cattle sector**, namely societal (demand, trends), political (policy) and economic (local and global markets) factors. The conceptual basis for the sections on the dairy and bovine meat supply chain is the Structure-Conduct-Performance paradigm. Each supply chain section includes three sub-sections: *market structure* includes indicators such as size distribution of processing firms, concentration ratios and regional distribution of the main EU processors; *conduct* provides information about the degree of vertical coordination along the supply chain; *market performance* is discussed based on the development of price margins and competition in the sector, and the level of innovativeness.

The **heterogeneity of the EU cattle sector** at regional level is substantial. Pronounced differences exist between regions in western and eastern Member States (MS) as well as between regions in northern and southern MS. Farms in the western MS often operate on several dozens of hectares specializing either in milk or in bovine meat production. Farms in the eastern MS often continue to be small in size (often smaller around 10 ha or less) and have a mixed production portfolio, i.e. keeping several kinds of livestock or having a mixed crops-livestock focus. The EU cattle herd is concentrated in and around the Benelux, in and around the Alps, eastern Poland, north-western France and Ireland. The sector has special **importance in naturally disadvantaged areas**, such as mountain ranges or other regions of low production potential. Alternative farm specializations are barely feasible in these regions due to poor soil quality, topographical conditions or climate. Therefore, farms will rather opt to follow an extensive production system.

[1] Details on the methodology can be found in the Annex to chapter 4, p. 242.

Germany, France, The Netherlands, the UK, and Ireland are the five most important EU MS in the EU dairy sector measured by standard output. Moreover, **the EU15 has a share of 83% in total EU milk production**. The variance in prices for dairy products has increased substantially since 2007. From 2000 to 2006 the monthly prices ranged between 5% and 10% and they increased to price ranges between 15% and 30%. Per capita consumption of cheese in the EU has increased by more than 15% since the year 2000 while per capita consumption of fresh dairy products declined by 4% in the EU. The **structure of the dairy processing sector differs substantially between MS and between regions**. The dairy sector in MS in the north and north-west of the EU is based primarily on large-scale dairy companies that process in excess of 100 thousand tons of milk per year. In the south and the east of the EU, a larger share of milk is processed by medium- or small-scale dairy companies. Mergers and acquisitions and joint ventures are key avenues for the major dairy companies to uphold growth rates and profitability. The concentration ratio of the four largest EU dairy companies increased in the period between 2008 and 2013 from 32% to 36% of the total turnover in the dairy sector. However, concentration ratios in individual MS can be much higher than those of the EU level. Main changes in the conduct of dairy sector supply chains include: increased vertical coordination through long-term contractual arrangements and partnerships between dairy companies and dairy farmers (farmer supply groups) and increased sustainability standards driven by downstream actors in the supply chain.

More than 50% of the standard output of specialized cattle fattening farms is generated in France, Germany, Spain and the United Kingdom. Moreover, the EU15 produces 89% of the total bovine meat in the EU. **Input cost productivity of bovine meat production is decreasing from south-western EU regions to north-eastern regions**. Highest input cost productivity clusters on the Iberian Peninsula as well as in parts of Italy. Highest average cattle densities are clustered in and around the Benelux, in north-western France, northern Italy, Croatia, and southern Finland. **Bovine meat production in the EU has declined since 2000 and this decline has been larger (in percentage points) in the EU13 than in the EU15.** In comparison to dairy prices, cattle slaughter prices have shown a much smoother development and lower price variability. While the concentration ratio in the beef and veal processing sector is low for the EU as a whole, concentration levels within some individual MS are much higher; the top-5 beef and veal companies exceed a 50% market share in Germany, France and the United Kingdom.

A close **interconnection exists between the bovine meat and milk sectors** of the EU. A substantial share of the bovine meat production results from the dairy herd. Apart from pure milk breeds and meat breeds, farms may also have dual-purpose cattle breeds. Moreover, while most commercial cattle farms in the EU have milk as their main output (78%), switching between meat and milk production is possible through cross-breeding., The interconnection between the milk and bovine meat sector provides some additional flexibility to farmers, especially given the recent challenges in the dairy sector.

The **major challenge for farms in the EU dairy sector is the structural change in milk price formation in the EU since 2007, resulting in increased price volatility**. Moreover, **cattle farms in the EU13 may face higher survival risks** than their EU15 counterparts in both the dairy and the bovine meat sector due to their smaller average scale and already smaller share in total EU production. **Opportunities for the EU dairy sector derive from future growth in demand in major third country markets**. However, these opportunities will depend on possibilities for further diversification of processed dairy commodities into high-quality and high-value products as well as macro-economic and political developments in importing countries. A challenge faced by the bovine meat sector is

the response to the societal debate about high stocking densities in the sector, particularly in regions of the Benelux, north and south of the Alps and north-western France.

The analysis of the Direct Payment Scheme and farm incomes shows that on average **EU dairy farmers are reliant on CAP payments for about 70 percent of their income**, while for **beef farms** this share is even **more than 100 percent**. Income simulations under the new CAP conditions show that in the majority of cases, **farm incomes are higher under the new CAP compared to the old CAP**. This effect may be partly explained by changes in farm structure (e.g. farm scale increase) or by distributional changes within MS. The latter can be particularly more pronounced in those MS that switched from the Single Farm System to a flat rate per hectare. **Three policy options** are suggested: (1) Grazing premium for beef and suckler cows; (2) Market transparency and market information initiatives; (3) Product differentiation and institutional export promotion.

GENERAL INFORMATION

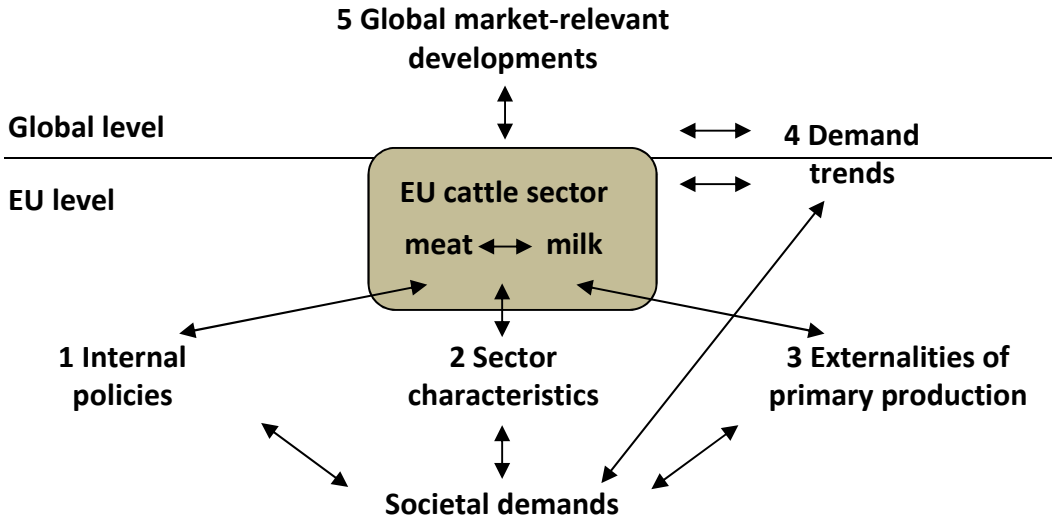
KEY FINDINGS

- The **main drivers** of the EU cattle sector include: internal policies, specific sector characteristics, externalities of primary production, EU and global demand trends and global market developments.
- Policy measures of the CAP in previous decades allowed EU policy-makers to **exercise substantial control** to the extent that global market changes were transmitted to domestic markets.
- Due to the **trade liberalization** in the past decades, the role of policy in shaping the sector is progressively diminishing.
- Farming in the EU, including the EU cattle sector, is for statistical and economic analysis purposes differentiated into **non-commercial and commercial farms**.
- The minimum economic sizes farms need to have in order to be considered as being operated due to commercial purposes is **defined individually by each MS**.
- The minimum economic sizes farms need to have in order to be considered as being operated due to commercial purposes varies among the MS and **ranges between 2,000 € and 25,000 €** in standard output per year.
- As a result, the number of commercial farms per FADN region differs substantially, with the lowest number observed mainly in the **northern parts of Finland and Sweden** (between 600 and 7320 farms per FADN region) and the largest number observed in the **eastern parts of Poland and Romania** (between 95,370 and 330,160 farms per FADN region).
- **Commercial cattle-keeping farms** are the main unit of analysis in this study.

The EU cattle sector can be thought of as being subject to five categories of **influencing factors** (Figure 1). Most of them are **indirectly influenced by societal demands** in the EU for raising sanitary, ethical, animal welfare and environmental standards in food production, processing and marketing. The majority of these categories originate entirely within the EU (categories 1 to 3). Categories 4 and 5 are partly or entirely **global drivers** that either affect the international **competitiveness** of the EU cattle sector or are increasingly transmitted to the internal EU market due to the progressive trade liberalization in recent decades.

Only a **small part of these drivers** (mainly the ones belonging to category 1) may be **influenced directly by** decisions of **EU policy-**makers. To some extent, policy may also impact some drivers of category 2, in terms of competition law or production requirements. Policy measures of the CAP in previous decades allowed EU policy-makers to exercise substantial control to the extent that global market changes were transmitted to domestic markets. Due to the **trade liberalization** in the past decades, the role of policy for shaping the sector is progressively diminishing. Category 3 can only be influenced through policy by, e.g. creating incentives that favour certain **externalities** and punish others. The fourth and fifth categories are largely out of the direct control of policy-makers.

Figure 1: Key drivers of the EU cattle sector



Source: Authors

Farming in the EU in general as well as in the EU cattle sector is for statistical and economic analysis purposes divided into non-commercial and commercial farms. Eurostat is conducting the Farm Structure Survey (FSS, European Commission, 2008b), which includes overview data of all farms in the EU published as averages per NUTS2 region. The FSS is conducted every three years; the most recent one is being conducted in 2016. To be included in the FSS, farms must meet certain minimum criteria defined in the European Commission (2008b, Article 3), which involve the size of the land used or other minimum production thresholds. This condition means that farms of a very small size (less than 1 hectare) or that are operated mainly for subsistence, leisure, lifestyle, traditional or other non-commercial reasons do not appear in the official statistics.

Nevertheless, many of these farms which meet these minimum thresholds for being included in the FSS are small in land size and production potential. The households living on these farms and operating them often cannot base their livelihoods on the income they earn from the share of their production that is marketed if they at all market any of their own production. Therefore, the farm households usually depend on earning income outside agriculture (European Parliament, 2015a). Furthermore, many of these small farms do not qualify for support in the framework of the CAP because they fall below the minimum eligibility thresholds. As they play a negligible role for food production in the EU, for the incomes of the households operating them as well as for policy-making, they are not in the focus of this analysis.

However, a number of the farms covered by the FSS produce significant quantities of food and have a significant marketing potential. They generate significant income for the farm household/the farm owner, employ hired labour and are eligible for CAP regulations. Table A1.4 shows the minimum economic sizes that MS farms need to have in order to be considered as being operated for commercial purposes. A representative sample (European Commission, 2016k) of these farms are annually monitored by the Farm Accountancy Data Network (FADN, European Commission, 2016a). The sample is representative in terms of the economic size classes and the production types of EU farms in each EU region. These regions of the FADN data (see Map A.1, p. 174) coincide with NUTS2 regions in some MS; in others they do not coincide, as illustrated in Map A.2 in Appendix A.

This subset is considered the commercial farms of the EU[2]. As this subset contains the farms of most economic and food production potential, it is often regarded as the benchmark for monitoring the development of the agricultural sector of the EU and evaluating the effects of the CAP measures. Most of the following analyses will therefore focus on these commercial farms. Thereby we distinguish between commercial farms in general and commercial cattle-keeping farms. The latter category is the main target of the remainder of this study. Table A1.5 and Table A1.6 give some indications, comparing commercial and non-commercial farms and the entire agricultural sector of the EU as well as the EU cattle sector.

Demand can be separated into demand at the EU and at the global level. A further differentiation within the context of this study is made between dairy and meat products. The demand, with respect to the quantity and quality of products demanded, depends on changes in the size of the global population and the demographic trends. These trends result in changes in household purchasing power and consumer tastes, which are also often linked to changes in purchasing power. The food industry, including food processors and food retailers, act as intermediaries between final consumer demand and demand at the farm level as well as translators of the former into the latter, but they can also influence final consumer demand directly.

For the analysis of the demand, the trends in global markets and the trends observed in the EU are derived from data on export demand and aggregate demand in the EU. Such demand analysis allows to identify future sales opportunities at the macro level. Where relevant, the structure of the EU cattle sector and its impact on farm gate prices will be considered, using information from secondary sources in combination with interviews conducted among key stakeholders. This information provides insights on how expectations at the societal level are translated into demand for specific products and product qualities, such as beef produced according to different kinds of animal welfare standards or milk produced by cows fed on hay (haymilk).

[2] Table A.1 shows the official definition of commercial farms that is also applied in this study.

1. ROLE OF THE EU CATTLE SECTOR

KEY FINDINGS

- About **3.6 million farms belong to the EU cattle sector**. 57% of them are operated for commercial purposes. They account for 42% of all EU commercial farms.
- **Seventeen per cent of all EU farms** belong to the EU cattle sector. They keep **half of EU livestock units**, contribute **one third to the total EU agricultural gross production value**, utilize **one third of EU agricultural land** and employ **one quarter of EU agricultural labour force**.
- The **heterogeneity of the EU cattle sector** at the regional level is substantial. Pronounced differences exist between regions in western and eastern MS as well as between regions in northern and southern MS.
- **Germany, France, the UK and Italy** account for half of the gross production value of the EU cattle sector.
- In **western MS, large highly specialized farms dominate**. In **eastern MS, small farms with a mixed production portfolio dominate**.
- The EU **cattle herd** is concentrated in and around the **Benelux, in and around the Alps, eastern Poland, north-western France and Ireland**.
- **The income per worker** in the EU cattle sector ranges between 2,300 and 65,000 € per year and worker unit.
- **Income support via the CAP** provides a large share (57%) of the total annual farm net income in the cattle sector: 49% in the dairy sector and 100% in the bovine meat sector, respectively.
- MENA countries, East Asian countries, the US and Switzerland are the **main trading partners for exports**.
- South America, Oceania, the US and Switzerland are the **main trading partners for imports**.
- The main **net-importing regions** are Asia and Africa with China and the Russian Federation being by far the most important ones.

This chapter provides a bird eye's view on the role of the EU cattle sector in EU agriculture and EU regions.

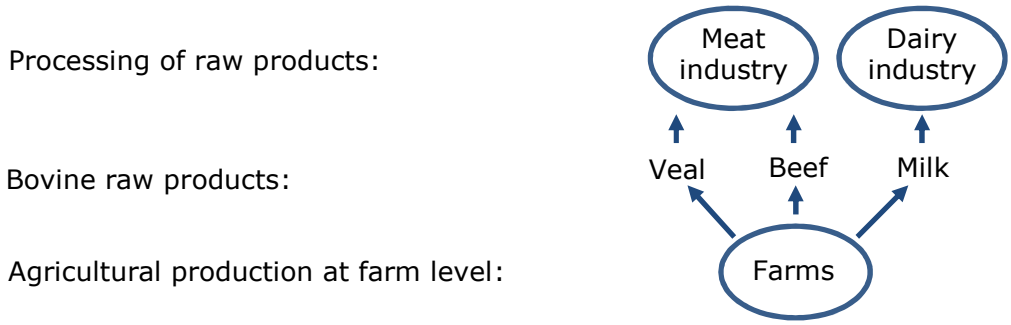
1.1. Farm Types

This section outlines the structure of the EU cattle sector as understood for the purposes of this study. It elaborates on the categories of disaggregation used in the analysis and highlights important issues to be considered for understanding the EU cattle sector. Figure 2 illustrates the **EU cattle sector** consisting of the **EU dairy sector**[3] and the **EU bovine meat sector**. The EU cattle sector is based at the level of **primary production** on farms which produce milk and/or bovine meat. Many farms are **specialized in the production** of a single commodity or in one stage of the supply chain. This analysis considers the five major types

[3] Milk in the EU is also produced by sheep, goats and buffalos; however, they account for 3% of total EU milk production and are therefore neglected in this analysis (Eurostat, 2016c).

of farms belonging to the EU cattle sector as outlined below. The farms belonging to the five farm types produce either **milk** (and milk products), **meat** (beef or veal) or a combination of both **bovine raw products**. The **processing** of the raw products milk, beef and veal by the dairy and the meat processing industries creates a high number of food products, which are – either domestically or internationally – marketed by food retail and food services. Examples are traditional types of sausages or **dairy products**, such as fresh milk, butter, cheese or milk powder. In this study, the most important products will be considered.

Figure 2: The EU cattle sector



Source: Authors

The agricultural sector is heterogeneous across the EU because of varying climatic conditions and traditional farming systems. As a result, various specializations of farming exist across the EU. Regulation 1242/2008 of the European Commission (European Commission, 2008a) establishes the legal basis for the categorization of agricultural holdings[4] of the EU. The categorization is based on the **Total Standard Output** (TSO) of a farm. This output is calculated as the sum of Standard Output (SO) of each of the farm's activities multiplied by the quantity of the activity's output. The TSO is therefore a monetary value in euros which quantifies the economic size of a farm. It is also very suitable for classifying the specializations of farms because the SOs of the various activities of the farm can be compared to each other as well as to the TSO. In this way, this methodology allows for the **classification of farms** according to the pattern shown in Table A1.2. For the purpose of this study, the following five principal farming types will be considered:

- Specialist dairying,
- Specialist cattle — rearing and fattening ("specialist fattening"),
- Cattle — dairying, rearing and fattening combined ("dairying and meat"),
- Mixed livestock, mainly grazing livestock ("mixed livestock") and
- Field crops — grazing livestock combined ("crops and cattle").

1.2. Product Differentiation

Based on Eurostat classification in the triannual dairies structure database (apro_mk_str), dairy companies can be distinguished based on horizontal end-product differentiation according to the following categories:

- Fresh products,
- Drinking milk,
- Powdered dairy products,

[4] See the glossary in Table A.1 in the appendix for an exact definition of the term. For simplicity, the term *farm* is used instead of *agricultural holding* in this study.

- Butter and
- Cheese.

An alternative horizontal product categorization is to distinguish between dairy commodities (milk powders), dairy ingredients (milkfat, casein and whey protein) and consumer dairy products (cheese, butter, dairy drinks, desserts and yoghurts).

Product differentiation in the bovine meat sector can be related to the age of the slaughtered cattle, distinguishing between calves, young cattle and adult cattle (Eurostat, 2016n). It can also refer to the end-products: meat cuts, offal, edible fats, and by-products, such as hides for leather, glands for pharmaceutical applications and bones for use in fertilizer production.

Apart from horizontal product differentiation, a distinction can also be made between companies and supply chains in the dairy and bovine meat sector that are vertically differentiated. Such supply chains are effectively differentiated through the use, for example, of specific certification schemes and labelling to signal quality. For the purpose of this report and due to data availability, we will mainly consider product differentiation as included in the Eurostat statistics.

1.3. Role in EU Agriculture

Based on legal grounds, EU farms are distinguished into **non-commercial** and **commercial farms** (see Table A.1 for the definition and Table A1.4 for the minimum threshold economic size per MS commercial farm). As the commercial farms represent the backbone of EU agriculture in terms of production capacity but also income and general economic potential, in the analysis we focus mainly on this subset of farms, if not otherwise stated.

Commercial farms of all production types account **for 40% of all farms** in the EU (Table A1.5) and yet 85% of the total SO (Table A1.6). A share of **40% of all commercial farms are specialized in livestock production**, 46% on crop production and 14% have a mixed cropping and livestock portfolio. Specialized livestock production types as well as the mixed farm types belong to the EU cattle sector. Broadly defined[5], the EU cattle sector accounts for 42% of all commercial farms, but 22% of the non-commercial farms. Thus **57% of all cattle-keeping farms** in the EU **are commercial farms**. For **specialized milk farms** that represent one of the four production types belonging to the EU cattle sector, the share of farms of this production type being operated on a commercial basis is highest among all farm types (**87%**). In contrast, **more than half of the mixed livestock farms and mixed cropping and livestock farms** of the EU are **non-commercial** farms. The farm types belonging to the **EU cattle sector** have the **highest** shares of **commercialized operations** among all farm types (57% on average). Table A1.6 shows that **91% of the total SO of the EU cattle sector** is generated by these **commercial cattle-keeping farms**—a share which is also lower for most other farm types. The EU cattle sector generates 34% of the total SO of EU farming and 37% of the total SO of all commercial farms in the EU. This contribution stresses the importance of the sector as the main income source of the operators of the cattle-farms as well as the importance of the EU cattle sector for the total agricultural production of the EU.

[5] Data on EU farming is available at two aggregation levels, namely at the general farm type level (TF categorization) and at the principal farm type level. The general farm type level is broad, while the principal farm type level is more narrow and specific. For details see Table A1.2, p. 142.

Table 2 characterizes the role of the EU cattle sector (narrowly defined at the principal farm type level) in EU farming. The columns have the following content: Column (A) contains the TF14 classification; Column (B) displays the total of the EU farming sector in 2013 of each of the seven characteristics; Column (C) displays the total of the EU cattle sector; the last column (C)/(B) contains the share the EU cattle sector accounts for in the EU farming sector regarding each of the characteristics. The EU cattle sector accounts for 47% of the total livestock units kept. The cattle-keeping farms in the EU use about 30% of the area used for farming. They produce 29% of the total standard output of the EU farming sector and employ about one quarter of the total agricultural labour force. **One in six farms throughout the EU belong to the EU cattle sector.** The relations of the shares of the farm number to the shares of the economic and geographic variables stress the economic importance of this production type in EU farming. The farms belonging to **the EU cattle sector**

- **Keep half of** the **EU livestock units**,
- **Produce** about **one third of the total standard output** of EU farming,
- **Utilize** about **one third of the agricultural land** of the EU and
- **Employ a quarter** of the entire EU **agricultural labour force**.

It is a fact that one out of seven farms operated **mainly for subsistence** belong to the EU cattle sector. While 44% of all farms are operated mainly for subsistence, this share amounts only to **35%** of the cattle-keeping farms of the EU. This illustrates that subsistence farming is relatively less important regarding the EU cattle.

Table 2: The role of the EU cattle sector in EU farming

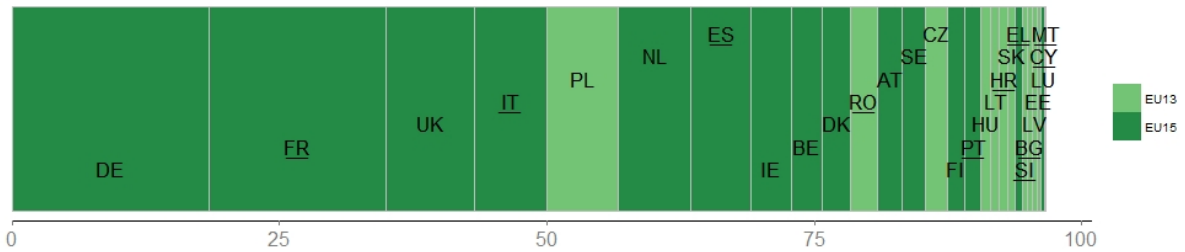
(A) Characteristic	(B) EU total	(C) All cattle-keeping farms	(C)/(B)
Farm number	10,841,010	1,825,370	17%
Utilized agricultural area (UAA, ha)	174,613,630	54,717,470	31%
Livestock units (LSU)	130,172,030	60,694,260	47%
Labour force (AWU)	9,508,470	2,501,220	26%
Standard output (SO, Euro)	331,101,770,640	96,592,485,310	29%
Total area (ha)	213,813,200	63,515,240	30%
Subsistence farms (number)	4,765,980	643,720	14%

Source: Authors based on Eurostat dataset ef_kvftreg
Note: The reference are the totals for all (commercial and non-commercial) farms in the EU as collected by Eurostat at the principal farming type level. At the principal farming type level, the EU cattle sector is defined as the sum of the farm categories 45, 46, 47, 73 and 83. "All cattle-keeping farms" denotes the commercial and non-commercial farms belonging to the EU cattle sector. Data for 2013.

Figure 3 splits the total SO of the EU cattle sector into the contributions each MS makes. **Half of the total SO** (52%) is generated by the **cattle-keeping farms in Germany, France, United Kingdom and Italy**. The **remaining 24 MS** together account for **the other half**. The contribution the national cattle sector of an MS belonging to the EU15 makes to the EU total is on average 4 bln € larger than the average contribution of a MS of the EU13 (Table A1.7). This **difference in the size of the national cattle sectors** measured by SO between the EU15 and EU13 **is structural** (Table A1.7). This is visible in Figure 3, since the EU13 MS

cluster on the right-hand side. The **EU13 contribute 17%** while the **EU-S contribute 37%** to the total SO of the EU cattle sector (Table A1.8). The economic power of the **EU cattle sector is concentrated in the North-Western MS** of the EU (Figure 3).

Figure 3: Contributions of MS to the Total Standard Output of the EU cattle sector



Source: Authors based on Eurostat dataset ef_kvftreg
Note: The bar plots the SO of the cattle sector of each MS in descending magnitude. The MS belonging to the EU13 are marked in light green. The MS belonging to the EU-S are underlined. Data for 2013 in bln Euros.

Table 3 shows the relative role of the EU cattle sector in EU commercial farming. It also provides evidence on the role and the distribution of bovine raw products in the total production value across the 14 major farm types (see Annex 1 for more details). The columns have the following content: Column (A) contains the TF14 classification; Column (B) shows the total production value of each type in the entire EU in 2013 in billion Euros; Columns (C) and (D) contain the production value of each farm type of milk/milk products and beef/veal, respectively; Column (E) contains the sum of (C) and (D); Column (F) shows the share of the production value of bovine products (E) in the total (B) of the farm type; Column (G) shows the shares the values in (E) account for in the total production value of the entire EU in 2013, which was 351 bln Euros.

In 2013, the commercial farms in the EU produced goods in the amount of 351 bln Euros. Column (B) indicates that specialized **milk farms** account for the **largest part** of this amount (68 bln € corresponding to 19%), followed by specialist granivores (14%) and farms specialized on cereals, oilseeds and protein crops (12%). Mixed crops-livestock farms account for 10%. Specialist cattle and mixed livestock farms account for 6% and 3%, respectively. The **EU cattle sector** consisting of general farm types 45, 49, 70 and 80 accounts for almost **40% of the total output value**.

Column (F) shows that **no farm type is completely dependent on the production of bovine raw products**[6]. However, these products account on average for 81% and 67% of the total EU production value of specialized milk and meat farms, respectively. For **mixed livestock and mixed crops and livestock farms**, bovine products account on average for 36% and 25% of their total production value, respectively, which is still **substantial**.

[6] For the correct interpretation of these numbers, one needs to keep in mind that the numbers in the table are aggregated values for each farm type at the EU level. For the individual farms belonging to each type or for the average of each farm type of an individual MS, these shares are likely to differ from the values shown. That means, the corresponding production value shares of individual farms or the corresponding averages per NUTS2 region or MS cluster around these shares—they might be higher or lower—as the values given in the table are average characteristics at the EU level. Table A1.5 in the Appendix gives an indication for the magnitudes of the deviations of the MS averages from these EU average shares for the four categories of the EU beef sector. The EU average shares displayed in columns (F) and (G) are weighted by the number of farms of each type per MS.

Bovine raw products account for about **one quarter** (column (G)) **of the total production value** of all commercial farms in the EU (87 bln € in column (E)). More than **2/3** of this total production value are **generated by milk and dairy products** (60 bln €) and 1/3 by bovine meat production (27 bln €). **Raw products are not exclusively produced by the EU cattle sector** (column (E)). The sector accounts for 96% of the output value of all bovine raw products generated in the EU. 9% of the total value of bovine meat and 2% of the milk production value are created outside the sector. **Specialized** milk and cattle **farms** (categories (45) and (49)) **dominate** the production. Mixed farms belonging to the EU cattle sector (categories (70) and (80) together) only account for 8.2 bln € of the milk (14%) and 5.1 bln € of the bovine meat value (21%) created by all farms of the EU cattle sector.

The value of **55.5 bln € of milk and meat** produced **by** the **specialized milk farms** alone is still **larger than** the total production value **of any other commercial farm type** in the EU in column (B). This value accounted for almost **one sixth of the entire agricultural production** in the EU in 2013. This amount is also almost four times as large as the value of bovine raw products generated by specialized cattle farms. Specialized cattle farms are the second most important farm type in terms of production value among the farms of the EU cattle sector.

Figure A1.2 illustrates that the **share** of the bovine raw products value in the total EU agricultural production value has been **fairly stable since 2004**, varying between 22% and 26%. It has shown, however, a **slightly declining tendency** since 2005. The production value of the specialist milk farms appears to be most stable until 2012, at the same time the production values of the remaining general farm types showed a slightly decreasing trend.

Table 3: Production values of bovine raw products in the EU

(A) General farm type	(B) Total	(C) Milk & milk pro-ducts	(D) Beef & veal	(E) Bovine pro-ducts	(F) Share bovine prod.	(G) Bovine prod. in 2013 total
(15) Specialist COP	41.2	0.1	0.5	0.5	1%	0.2%
(16) Specialist other field crops	31.8	0.2	0.4	0.6	2%	0.2%
(20) Specialist horticulture	29.6	0.0	0.0	0.0	0%	0.0%
(35) Specialist wine	19.6	0.0	0.0	0.0	0%	0.0%
(36) Specialist orchards fruits	13.2	0.0	0.0	0.0	0%	0.0%
(37) Specialist olives	4.2	0.0	0.0	0.0	0%	0.0%
(38) Permanent crops combined	3.4	0.0	0.0	0.0	0%	0.0%
(45) Specialist milk	68.1	48.2	7.4	55.5	81%	15.8%
(48) Specialist sheep and goats	15.4	0.3	1.2	1.5	10%	0.4%
(49) Specialist cattle	22.1	2.9	11.9	14.7	67%	4.2%
(50) Specialist granivores	47.4	0.4	0.3	0.7	1%	0.2%
(60) Mixed crops	8.1	0.1	0.1	0.2	2%	0.0%
(70) Mixed livestock	12.2	3.0	1.4	4.4	36%	1.3%
(80) Mixed crops and livestock	34.7	5.2	3.7	8.8	25%	2.5%
EU cattle sector	**137**	**59**	**24**	**84**	**61%**	**24%**
All commercial farms	**351**	**60**	**27**	**87**	**25%**	**25%**
EU cattle sector in all comm. farms	**39%**	**98%**	**91%**	**96%**		

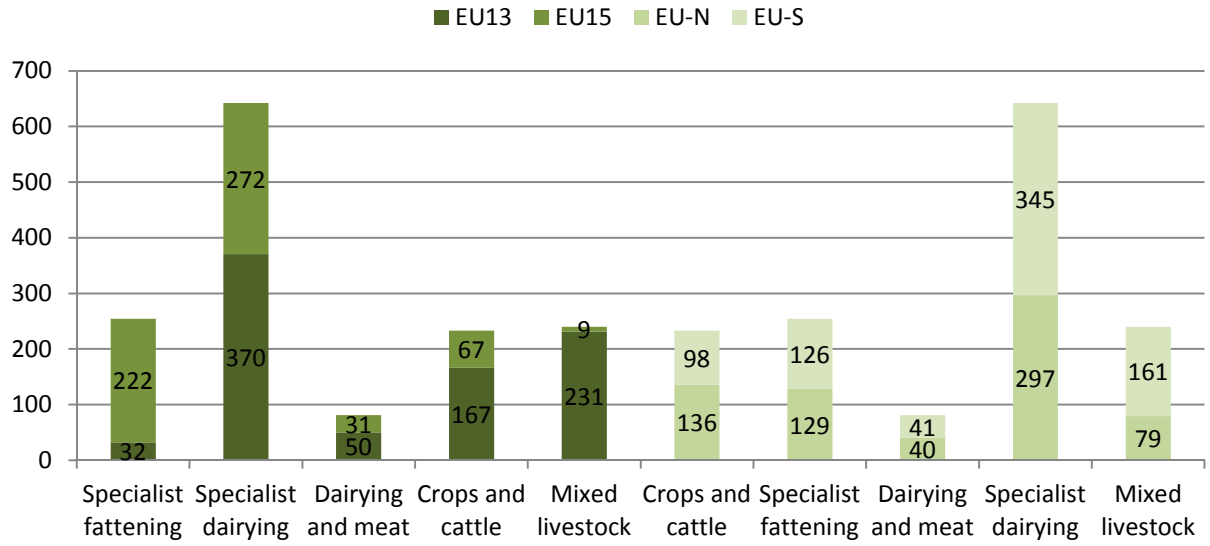
Source: Authors based on European Commission (2016c)
Note: The data is only for commercial farms grouped by general farm types. At the general farm type level, the EU cattle sector is defined as the sum of the farm types 45, 49, 70 and 80. Data for 2013 in bln €.

Based on the relation of the production values of dairy products and bovine meat products, the main production focus of each of the farm types belonging to the EU cattle sector can be determined. This classification based on the main production focus is used for **determining which of the farm types belongs to the EU dairy sector and the EU bovine meat sector**, respectively, **for the purpose of this analysis**. As general farm types (45), (70) and (80) have a higher output value of milk than of bovine meat, they form part of the EU dairy sector. The general farm type (49) is the only one belonging to the EU cattle sector

which has a higher output value of bovine meat than of milk and, thus, will be analysed below in the chapter on the EU bovine meat sector[7].

Figure 4 summarizes the locations of the numbers of the five farm types of the EU cattle sector. In 2010, there were **1.2m commercial farms in the EU dairy sector and 255 thousand farms in the EU bovine meat sector**. Most of the dairy farms (**54%**) were **specialized dairy farms**, of which 58% (46%) were located in the EU13 (EU-N)**. Dairying and meat farms account for 7%** of the total number of dairy farms, of which 62% (49%) were located in the EU13 (EU-N). **Crops and cattle farms account for 19%** of all dairy farms, of which 71% (58%) were located in the EU13 (EU-N). **Mixed livestock farms account for 20%** of all dairy farms, **of which 96%** (33%) **were located in the EU13** (EU-N)**. Specialist cattle fattening farms have almost the same number as crops and cattle farms and mixed livestock farms**. **Most of these farms** are, however, **located in the EU15 (87%)** where they are **almost equally spread between EU-N and EU-S**.

Figure 4: Farm numbers of the EU cattle sector by production type and region



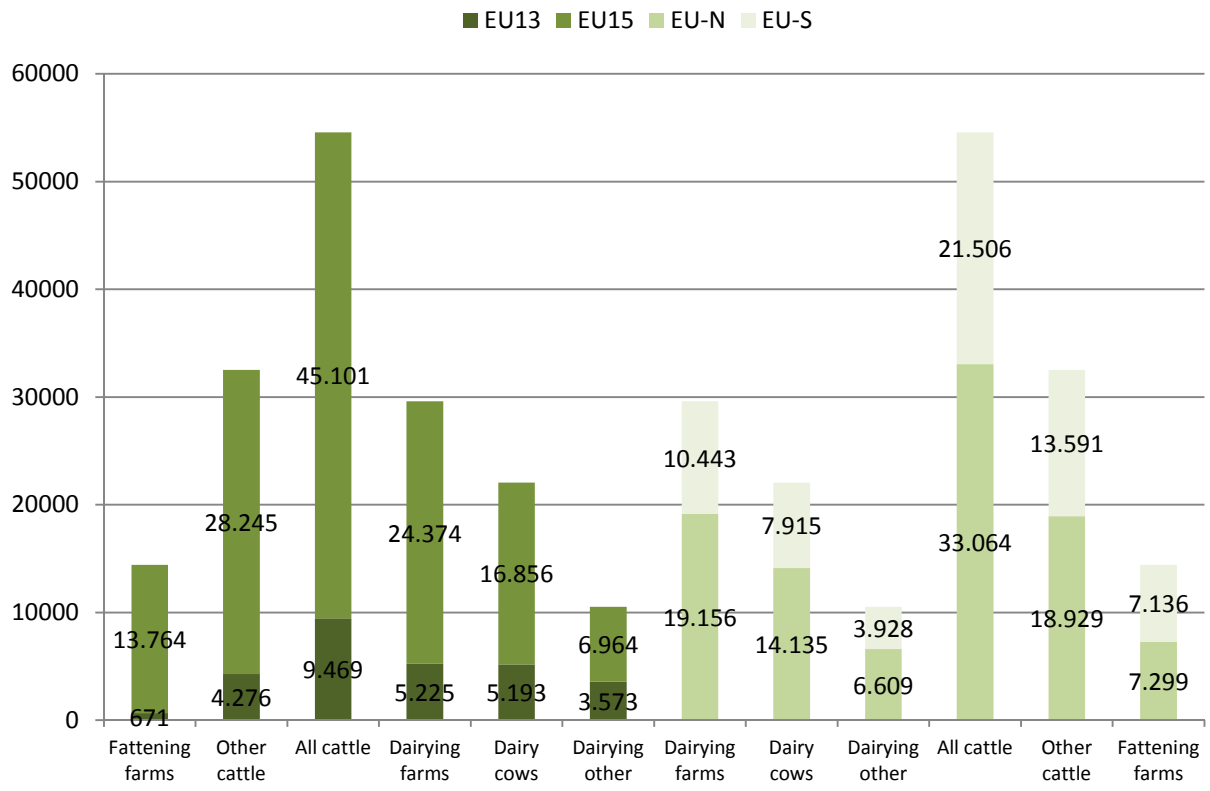
Source: Authors based on European Commission (2016j)
Note: The numbers given in the diagram measure farm numbers in thousand farms per type. The bars are ordered according to decreasing shares of the farm numbers of each type in the EU15 and EU-N, respectively. Data for 2010. For the exact definition of farm types, see Table A1.2, p. 178.

Figure 5 presents a similar aggregation for cattle numbers of commercial farms. It shows which shares of the total cattle herd are kept by which production type in which region of the EU and also shows which types of bovine animals are kept in which region. In 2013, the **commercial farms of the EU cattle sector kept 55m animals**. **40% of them were dairy cows**. **Most of the cattle of the EU were kept in the EU15 (83%) and the EU-N (61%)**. The disequilibrium is particularly pronounced for **cattle fattening farms: 95% of the cattle** kept by farms of this type **are located in the EU15**. The share of cattle located in the EU13 is highest for the cattle kept by other/non-specialized dairying farms (34%).

[7] Since the definition at the more precise principal farming type level is more exact, the general farm type category (49) is split up into categories (46) and (47). (46) is assigned to the EU bovine meat sector, while (47) is also part of the EU dairy sector because the share of milk production of these farms in their total output value is about 50% higher than their share of bovine meat production as elaborated in Table A1.3, p. 117. Thus, the general farm type (49) partly belongs to the EU dairy sector and partly to the EU beef sector. This definition of the EU dairy sector at the principal farming type level is in line with the common analyses of parts of the EU cattle sector, for example, European Commission (2013b).

65% of cattle kept by specialist dairying farms is located in the EU-N, compared to 51% of the cattle kept by specialist fattening farms. Dairying farms keep most of the cattle in the EU (54%). Specialist fattening farms and other/non-specialized dairy farms keep 26% and 19% of all cattle, respectively.

Figure 5: Cattle numbers of the EU cattle sector by production type and region



Source: Authors based on European Commission (2016j)
Note: The numbers are in thousand animals. The bars are ordered according to decreasing shares of the farm numbers of each type in the EU15 and EU-N, respectively. Data for 2013. The bars "Dairying farms", "Dairying other" and "Fattening farms" denote the total cattle numbers kept by specialist dairying farms, other dairy farms (that is, the sum of categories (47), (73) and (83)) and specialist cattle fattening farms, respectively. "Dairy cows" and "Other cattle" denote the total number of dairy cows and other cattle kept by any farms of the EU cattle sector, respectively. "All cattle" is the sum of these latter two variables.

Based on stakeholders' views, a number of key determinants of the current structure of the EU cattle sector were identified (see Stakeholders' View 1). In the dairy sector in the EU-N, an important driver has been the cost structure, environmental restrictions and price developments which necessitate a move towards consolidation, and an increased dependence on technological progress and entrepreneurship. Structural changes in the EU13 have been driven mainly by the EU accession process and the further integration into world markets. Determinants of the structure in the EU bovine meat sector are mainly related to the consumer side in the meat supply chain. On the one hand, retailers are translating shifting consumer demands into reward systems for specific breeds and production practices; on the other hand, regulatory support and existing quality grading systems are stimulating quantity rather than quality production in the sector. The abolishment of the milk quota and the milk price crisis have affected both the dairy and the bovine meat sector through an initial increase in the dairy herd, followed by an increase in the number of dairy cows in the meat supply chain.

Stakeholders' View 1: Key determinants of the current structure of the EU cattle sector

Respondent (MS)	Answer
Cattle sector:	
R1 (IT)	EU price and structural policies
Dairy sector:	
R2 (NL)	Dutch dairy sector mainly shaped by the production environment in NL • intensive production because of high costs of production factors labour, capital and land but also knowledge and entrepreneurship • main factor is technical development (how many cows can an entrepreneur manage) driven by knowledge and entrepreneurship • regulatory framework (super levies, the nitrate policy, phosphate regulations) of secondary importance

R3 (PL)	• EU enlargement & following substantial EU market growth
	  ○ Fast integration of national EU13 markets with the EU15
	• End of quota system & supply increase, milk package was not sufficient
	• Market globalization and its tangible influences on EU domestic market
	  ○ 2004: PL mainly dependent on DE but barely linked to world
	  ○ 2016: global effects noticeable in PL

R4 (UK)	• Mainly profitability: price and ability to make a decent margin • Geographic location of farms within the country: favourable natural conditions and distance to large consumption agglomerations • Consolidation of milk processing in recent years due to profitability challenges, farm expansion constraints as well as distances to dairies (which also experienced a consolidation in recent years)
Bovine meat sector:	

R5 (UK)	• Retail sector (fixed price retail packs and downward push on carcass weights so that animals need to be finished quicker and younger)
	  ○ Native cattle schemes (bonuses for Aberdeen Angus and Hereford sired animals)
	  ○ Penalties for dairy sired beef, more than 4 movements and inferior EUROP grid qualities
	  ○ Producer groups established by retailers

R6 (DE)	• Increase in dairy cows/farm due to abolishment of the milk quota • Shifts in consumer behaviour, governmental support too much quantity-based and too little quality-based
R7 (DE)	• Consumer behaviour • Breeding progress • Technical progress

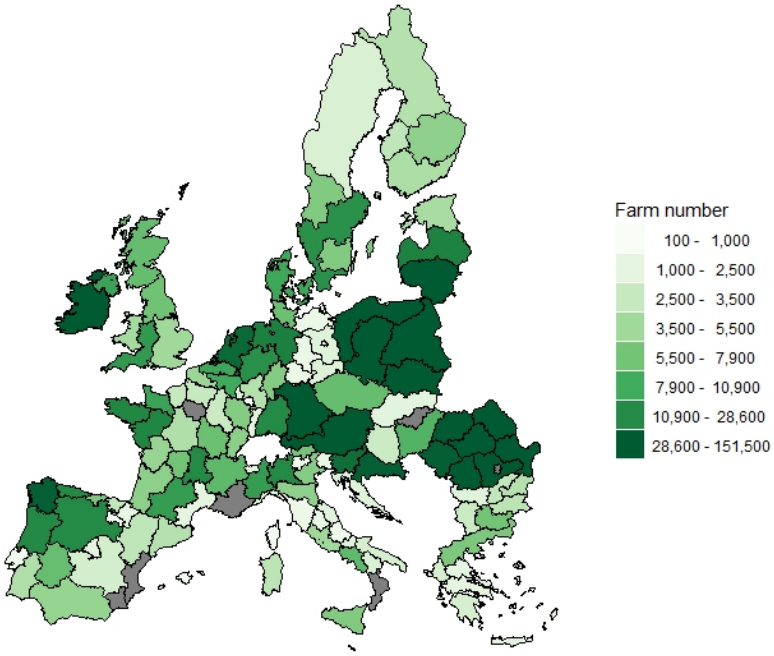
Source: Authors based on stakeholder interviews
Note: This is the summary of stakeholders' statements responding to question I.1 as outlined in Table A4.4.

1.4. Role in Member States and Regional Rural Economies

The **heterogeneity of the EU cattle sector at the regional level is substantial**, as shown by the distribution of farm numbers in Map 1 and Map A1.1. Depending on which farm characteristic is considered, the **patterns of the EU cattle sector at the farm level across the regions of the EU differ markedly**. Map 1 shows the regional density of cattle-keeping farms across the EU. Map A1.1highlights the relative role these farms have in the agricultural sectors of the regions by measuring the share of cattle-keeping farms in all commercial farms in a region. In some **Spanish and French regions and in Luxembourg, the cattle sector**

accounts for more than 75% of all farms. That is, cattle keeping is the dominating agricultural activity in these regions (Table A1.12). **The typical region** as measured by the median **has 32% of its farms belonging to the EU cattle sector**. **In 28 of the 136 FADN regions, more than half of all commercial farms belong to the EU cattle sector** (Map A1.1). These regions are mostly located in **France, Germany, northern Spain and the Scandinavian MS. Furthermore, in Lithuania, Latvia, Belgium, Austria, Slovenia and Ireland** bovine meat and/or milk is produced by more than half of the farms. **Along the Mediterranean Sea, the EU cattle sector is of negligible importance** in the regional agricultural sectors, accounting often for less than 10% of all farms (Map A1.1 in the Annex to chapter 1).

Map 1: Regional distribution of EU cattle-keeping farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the number of cattle-keeping farms per FADN region. That is, it displays the commercial farms belonging to the EU cattle sector, which is defined at the principal type of farming level (for details see Table A1.2, p. 178). Dark grey regions indicate that either the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. For an overview of all FADN regions, see Map A.1 and Map A.2, p. 174 et seq. Data for 2010. The colour categories are based on the categorization of the data into eight quantiles. In other words, each colour category contains the same number of regions. Hence, the same numbers of regions fall into each interval given in the legend.

The comparison of the numbers of farms belonging to the EU cattle sector between EU regions indicates that **most commercial cattle-keeping farms are located along the eastern EU border and at the north-eastern side of the Alps** (Map 1). Ireland, as the region with the fifth-largest number of cattle-keeping farms, is a geographical exception. The **five regions**[8] **with the highest numbers of cattle-keeping farms** account for **one third of all commercial farms** of the EU cattle sector (Table 4). Four of them are located in Poland and Romania in **regions which have one third or up to half of the EU average of the purchasing power standard** (PPS) **per inhabitant** (Eurostat, 2016l).

[8] Five regions correspond to less than 4% of all 136 FADN regions.

Table 4: Regions with the most and least commercial cattle-keeping farms in 2010

Region (MS)	Cattle-keeping farms	Region (MS)	Cattle-keeping farms
Mazowsze and Podlasie (PL)	151,500	Corse (FR)	300
Nord-Est (RO)	110,000	Saarland (DE)	200
Nord-Vest (RO)	85,500	La Rioja (ES)	200
Sud-Vest-Oltenia (RO)	64,900	Baleares (ES)	200
Ireland (IE)	61,100	Malta (MT)	100
Sum (share in total)	473,000 (33%)	Sum (share in total)	1000 (<0.1%)

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions with the most farms belonging to the EU cattle sector defined at the principal type of farming level. The two right-most columns show the five FADN regions with the least numbers of cattle-keeping farm. The last row displays the sum of the farm numbers of the five regions mentioned in each column as well as the share this sum accounts for in the total number of commercial cattle-keeping farms in the EU. Hence, this last row is a measure of the regional concentration of the EU cattle sector.

The picture changes substantially by looking at the relative regional importance of cattle-keeping farms in all commercial farms in each region (Map A1.1). Farms keeping cattle for milk or meat production in the **North of Spain** as well as in the **centre and west of France** (Table A1.12) especially, but also in the southern part of the **Benelux**, in **Ireland, north-east of the Alps** and the **Scandinavian MS** account for a high share. In regions close to the **Mediterranean Sea**, the cattle farming has the **least importance** throughout the EU. But also in many countries of the EU13, the relative importance is much lower than the absolute numbers suggested in Map 1.

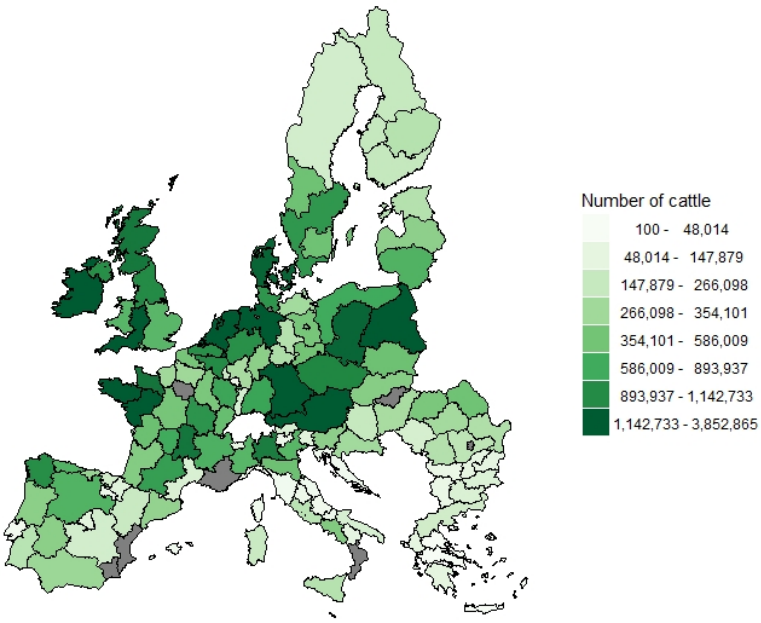
As one farm is often operated by one household and the farm is the relevant unit for policy intervention, this result suggests that the **economic challenges** or crises the EU cattle sector faces as well as the **changes of policies** relevant for the sector **affect** many rural households in **these regions** and thus also strongly affect the agricultural sector as well as the rural economies as a whole in these same regions.

This regional distribution of farm numbers does not imply that the EU cattle sector is concentrated because it only provides a partial view by considering of farm numbers without regarding herd sizes or economic sizes of farms. But it highlights one aspect of the regional structure of the EU cattle sector throughout the EU. The regional distribution of productivity of the EU cattle sector, of its production specialization or of its farm and labour income diverge from this pattern of farm numbers. This insight emphasises the **need for a differentiated analysis that considers various aspects of the EU cattle sector**. Map 2 and Table 5 illustrate, for example, that the **regional pattern of the number of cattle** of any type kept by the farms shown in Map 1 **differs substantially from the regional pattern of farm numbers**, both in terms of **concentration across all EU regions** as well as **the location of the regions being most important**.

The five regions with the highest cattle numbers account for 24% of the total cattle number of commercial farms of the EU cattle sector. Thus, **cattle numbers are more evenly spread across the EU than** numbers of **cattle-keeping farms**, for which the five regions with the largest farm numbers account for one third of all commercial cattle-keeping farms in the EU. Furthermore, Map 2 indicates that four of these five regions with the largest cattle numbers are located in the EU15, namely in **central Europe** (NL and DE) **as well as in Ireland**. Also, cattle-keeping farms in the UK, northern and central France, northern Spain, northern Italy, Austria, Denmark and southern Sweden have more than half a million

bovine animals per region. The region of Mazowsze and Podlasie (**eastern Poland**) **appears to be an exception** to this pattern, as it is the only region in the EU13.

Map 2: Regional distribution of cattle throughout the EU



Source: Authors based on European Commission (2016j)
Note: The plot shows the total number of cattle kept by commercial farms of the EU cattle sector per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation missing due to some other reason. Data for 2013.

Ireland and Malta are the only regions which appear in Table 4 and Table 5. This emphasizes the role of the cattle sector in those regions: while **cattle farming appears to be a backbone of Irish agriculture** it is **virtually absent in Malta**. Such differences suggest, as also indicated by Map 1 and Map 2, that the **EU cattle sector at the farm level is characterized by a pronounced north-south divide**. However, there exist **major structural differences in the national cattle sectors of the** MS belonging to the **EU-N** as indicated by the divergence of regional patterns of Map 1 vs. Map 2.

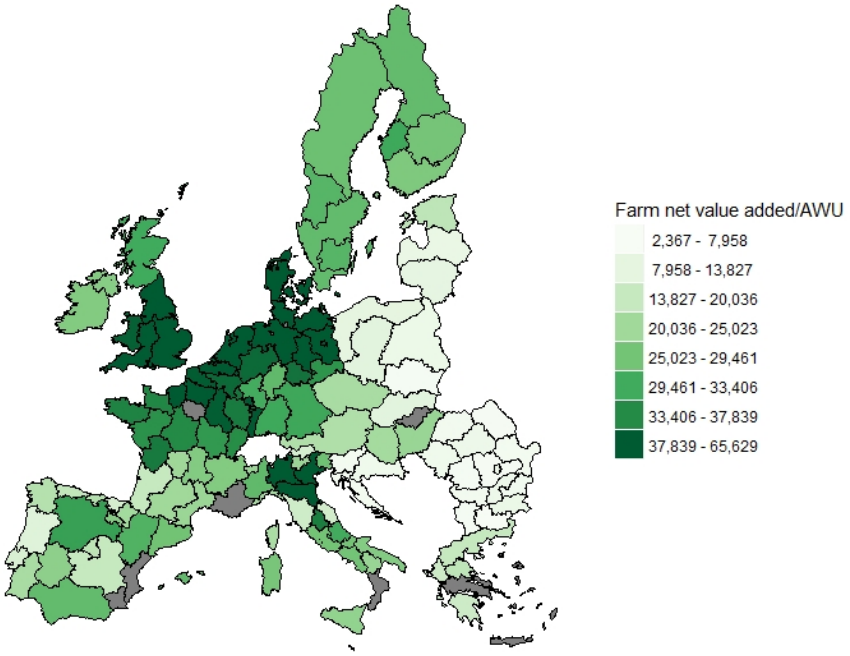
Table 5: Regions with the highest and lowest cattle numbers

Region (MS)	Cattle number	Region (MS)	Cattle number
Ireland (IE)	3,852,865	Liguria (IT)	11,886
The Netherlands (NL)	2,692,060	Ribatejo e Oeste (PT)	9,747
Bayern (DE)	2,426,680	Malta (MT)	9,597
Mazowsze and Podlasie (PL)	2,162,557	Sterea Ellas-Nissi Egaeou-Kriti (EL)	1,425
Niedersachsen (DE)	1,692,811	Thessalia (EL)	100
Sum (share in total)	12.8m (24%)	Sum (share in total)	32,755 (<0.1%)

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions with the highest numbers of cattle of any kind kept by commercial farms of the EU cattle sector (as defined at the principal type of farming level). The two right-most columns show the five FADN regions with the lowest numbers of cattle of any kind kept by commercial farms of the EU cattle sector. The last row displays the sum of the cattle numbers of the five regions mentioned in each column as well as the share this sum accounts for in the total number of cattle kept by commercial cattle-keeping farms in the EU. Hence, this last row is a measure of the regional concentration of the EU cattle sector.

Map 3 and Table 6 display the regional distribution of labour income across the FADN regions, which again somewhat differently spread across the EU. **Highest labour incomes** of about 60,000 € per year and AWU are clustered in the **central EU** and **northern Italy**, while the **lowest incomes** are concentrated along the **eastern border of the EU and in the west and south of the Iberian peninsula**. This suggests a **pronounced income gradient from the central EU to its peripheral regions**. The **gradient**, that is, the change in the average regional income per annual work unit (AWU) of a cattle-keeping farm, is **strongest towards the east and south**.

Map 3: Regional distribution of labour income in the EU cattle sector



Source: Authors based on European Commission (2016j)
Note: The plot shows the average farm net value added per AWU of cattle-keeping farms in € (defined at the principal type of farming level). Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. The data are the averages of years 2011 to 2013, in order to smooth out potential exceptional annual effects.

The map also suggests that in many cases **labour income shows a pronounced MS-specificity**, that is, for many MS the average income of cattle-keeping farms of its regions appears to be very similar, which holds especially for the **EU13 and the Scandinavian MS**. Several EU15 MS, such as Germany and Italy and to a lesser extent France and Spain, show considerable variation in average incomes between their regions. Map 3 also suggests a smooth gradient of the magnitude of labour income across the northern and eastern EU, that is, neighbouring regions tend to have similar income levels, while incomes in neighbouring regions are more heterogeneous in southern France, Italy and Spain. For the labour income per family working unit (FWU), the distribution across the EU looks somewhat more homogeneous, as shown by Map A1.2, p. 192.

Table 6 highlights the **substantial differences in the levels of labour income across** the EU. The average income of cattle-keeping farms in **Denmark** is the **28-fold** of the average labour income in the **Bulgarian region** of Yuzhen tsentralen or more than the 20-fold than in several **Romanian regions**. Differences in **income per FWU** per region **even vary by a factor of 40** (Table A1.13, p. 192).

Map A1.3 and Map A1.4 plot which FADN regions belong to which quintile of the regional incomes in cattle-keeping. Map A1.3 proves that the **25 regions of highest income** (quintile 1) and the **26 regions of lowest income** (quintile 5) **strongly cluster regionally**. Regions of **highest income of cattle-keeping farms** are almost exclusively located in a band **along the southern and western shores of the Baltic Sea and the North Sea**. They stretch from Eastern Germany across Denmark, the Benelux and north-eastern France until the English regions. The exceptions are three regions in northern Italy, which also belong to this class of regions. **Regions of lowest average income** show a similar **geographic continuity along the eastern EU border**. They stretch from Latvia across Lithuania, Poland and Slovakia until Romania and Bulgaria. The exceptions are two regions in central Portugal. The remaining three quintiles are scattered in a less uniform pattern across the EU.

Table 6: Regions with the highest and lowest labour income in the EU cattle sector

Region (MS)	Farm income	Region (MS)	Farm income
Denmark (DK)	65,629	Malopolska and Pogorze (PL)	3,202
The Netherlands (NL)	60,998	Sud-Vest-Oltenia (RO)	3,195
Lombardia (IT)	60,923	Sud-Muntenia (RO)	3,094
Picardie (FR)	52,809	Nord-Est (RO)	2,925
Veneto (IT)	52,725	Yuzhen tsentralen (BG)	2,367

Source: Authors based on European Commission (2016j)
Note: Labour income is measured by the farm net value added per AWU in Euros. The two left-most columns show the five FADN regions in which the average farm net value added per AWU of cattle-keeping farms (defined at the principal type of farming level) in € is highest among all 136 FADN regions of the EU. The two right-most columns show the five FADN regions in which the average farm net value added per AWU of cattle-keeping farms in € is lowest. The data are the averages of years 2011 to 2013, in order to smooth out potential exceptional annual effects.

Income per FWU shows a somewhat less concentrated pattern than income per AWU, as shown in Map A1.4. However, still most regions of the first quintile are located along the Baltic Sea and North Sea, and regions of least average income of cattle-keeping farms cluster along the eastern border of the EU.

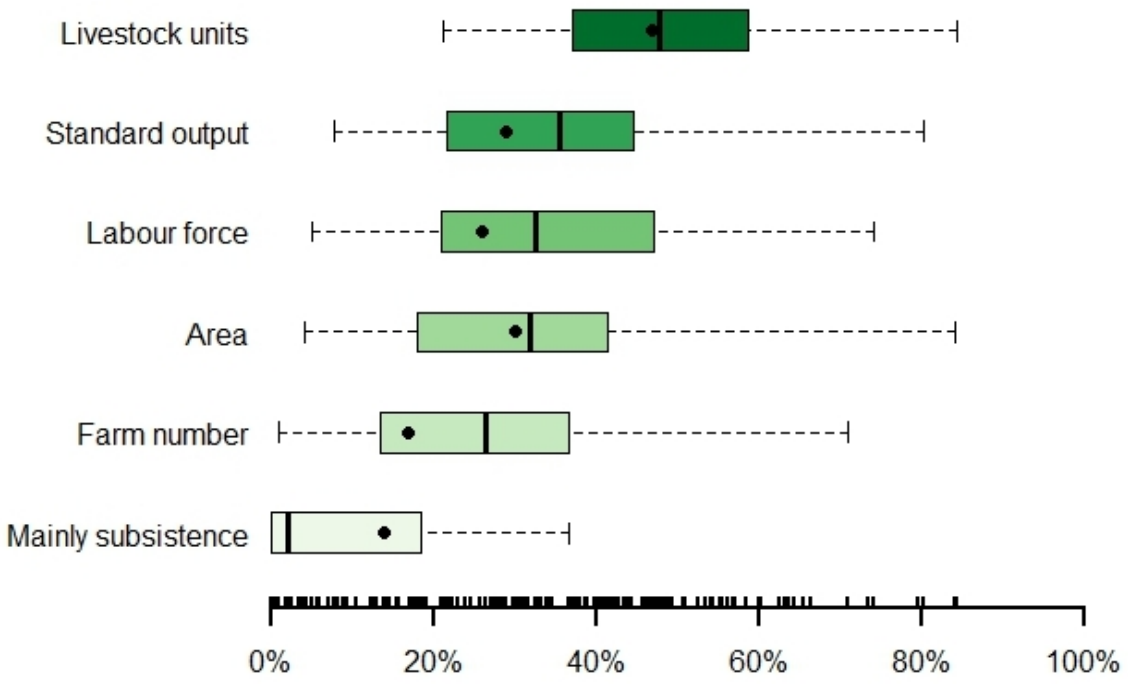
Figure 6 indicates that **differences in the importance of the national cattle sectors among the MS are huge** (see also Table A1.9, p. 187). The national cattle sectors of a MS account for **between 21%** (Greece) **and 84%** (Luxembourg) **of the total national livestock units**. The median per MS is 48%. The **share of the cattle sector in the total standard output of a MS** is again smallest in Greece (**8%**) and largest in Luxembourg (**80%**). The median of this share among the MS is 36%. The **cattle sector** gives **employment** to **5%** (Cyprus) **and 74%** (Ireland) **of the total national AWU**. The median amounts to 33%. The **share of the area farmed by farms belonging to the EU cattle sector in the total national agricultural area** varies between very low shares, such as **4%** in Greece or 6% in Malta and Bulgaria, and very high shares, such as 84% in Luxemburg or **66%** in Ireland. The median at the national level is 32%. The **share of the cattle sector in the total national farm numbers** of a MS shows similar variation. In Cyprus, only **1%** of the farms keep cattle, compared to **71%** in Ireland. The median of the cattle keeping farms in the total national farm numbers of a MS amounts to 26%. This picture also holds for the **share of the cattle sector in the number of farms which mainly serve subsistence**. The cattle sectors of many EU13 states show very high shares (Slovakia **37%**, Lithuania 34%), while such farms **do not exist in 10 of the EU15 states** (almost all MS north of the Alps), such that the median at the MS level only amounts to 2%.

Table A1.9 indicates which MS can be considered "typical" with respect to the importance of its cattle sector in its national agriculture for each of the six characteristics shown in Figure 6. Figure A1.3 in the appendix complements Figure 6 by illustrating how the ranks of the MS

relate to each other, according to these six characteristics. The **ranking** concerning the first five characteristics could be considered **remarkably stable**.

Table A1.10 proves this impression: the **correlation**s between the shares of the national cattle sectors in the total national agricultural sectors is for the first five characteristics larger than 0.7, i.e. **high**. Therefore, if the national cattle sector of a MS accounts for one of the largest shares among all MS of the total animals kept in the country, then it is likely to also account for a large share of its total farms, livestock units, labour force and standard output, and vice versa. However, the ranking changes strongly for **subsistence**, since this characteristic is **barely or even slightly negatively correlated** with all other five. The MS with a small area, mostly in the south-east of the EU, rank lowest in regards to the first five characteristics, which indicates that the cattle sector plays a negligible role in their national agricultural sectors.

Figure 6: Distribution of shares of the EU cattle sector in the agricultural sectors of MS

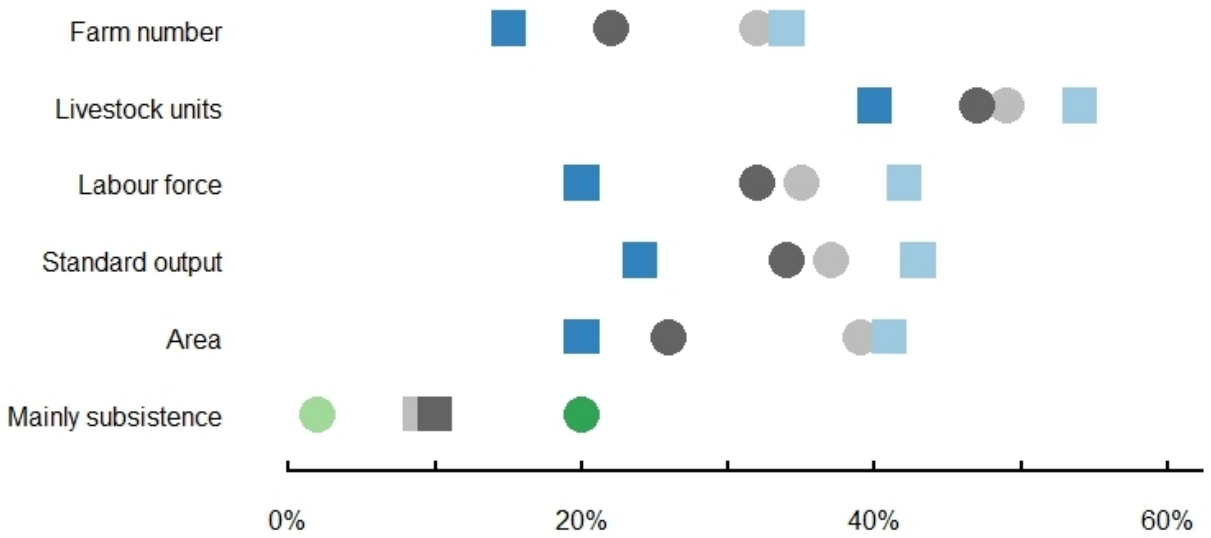


Source: Authors based on Eurostat dataset ef_kvftreg
Note: Data for all farms (commercial and non-commercial) covered by the FSS of Eurostat and principal farming types. At the principal farming type level, the EU cattle sector is defined by farm categories 45, 46, 47, 73 and 83. Each boxplot shows the distribution of the shares of the EU cattle sector in the agricultural sector of each MS regarding each of the variables shown. For example, *Livestock units* denotes the shares of the EU cattle sector (defined at the principal farming type level) has in the total livestock units of each of the 28 MS. *Standard output* measures the share of the EU cattle sector in the total standard output of the agricultural sector of each MS. *Labour force* measures the share in the total directly employed labour force in AWU by the agricultural sector of each MS. *Area* measures the share in the total land in ha used by the agricultural sector of each MS. *Farm number* measures the share in the total farm number of each MS (commercial and non-commercial farms if covered by the FSS). *Mainly subsistence* measures the share of farms belonging to the EU cattle sector in all farms per MS in which more than 50% of the production of a farm is self-consumed by the farm holder. The dot denotes the EU average, that is, the farm-number-weighted average share of each characteristic in the total size of the characteristic at the EU level. The left/right-most part of each sub-figure shows the minimum/maximum share the EU cattle sector has for the respective variable among all 28 MS. The left-most end of the coloured box shows the first quartile, the bold vertical line the median and the right-most end of the box the third quartile. The dot denotes the mean. Data for 2013.

Figure 6 illustrates that the **EU cattle sector plays very heterogeneous roles** for various aspects of the entire agricultural sectors of the MS. Each of the six sub-figures demonstrates the **heterogeneity of the role the EU cattle sectors plays** across the MS. While the sector accounts for **47% of the total EU livestock units**, it only accounts for 14% of the EU farms, which are mainly operated for subsistence, and **17% of the total EU farm number**. Furthermore, it accounts **for 29% of the total EU standard output**, **26% of the total agricultural labour force** and **30% of the total agricultural area**. The figure also indicates the variability of the importance of the EU cattle sector across the MS for each of the variables, which will be more elaborated upon in the next section.

Figure 7 splits Figure 6 into two pairs of sub-groups of MS: EU13 vs. EU15, depicted as circles and the southern MS (EU-S) vs. the northern MS (EU-N) depicted as squares. The squares lie much farer apart from each other than the circles for all characteristics and are coloured instead of grey-shaded. For the last characteristic, the relationship is reversed. For the share of the national cattle sector in the national total of all farms which mainly operate for subsistence, the circles lie far apart and are coloured, in contrast to the squares.

Figure 7: Regional patterns in the importance of the cattle sectors at MS level



Source: Authors based on Eurostat dataset ef_kvftreg
Note: The symbols depict the averages of the importance of the national cattle sectors across sub-groups of the MS. Circles compare the average of each variable of the EU13 (dark-coloured) to the average of the EU15 (light-coloured). Squares compare the average for each variable of the EU-S (dark-coloured) to the average of the EU-N (light-coloured). Grey circles and squares signal that there is not a statistical difference to the other circle or square, respectively. Green circles and blue squares signal that there is a systematic statistical difference between the two sub-groups for the respective variable. The underlying statistical results are given in Table A1.11, page 190.

This plot leads to important conclusions regarding the heterogeneity of the importance of the national cattle sectors for these sub-groups of MS. The importance of the national cattle sectors in the **EU15 and in the EU13 does not structurally differ** from each other, in regards to the first five sector characteristics. However, the **difference** in importance **is huge and structural between the EU-N and EU-S**, for these characteristics. Note that the role of the national cattle sectors in these two sub-groups of MS not only structurally differs, but the **magnitude of the differences** is also **substantial**. The **share of the national cattle sector in the total** national farm number[9], labour force, standard output and area **in the EU-S is only about half the share in the EU-N**.

[9] Map A.3 shows the distribution of all commercial farms across the EU.

The difference in the importance of the national cattle sector in total national livestock units is smaller in magnitude: while it accounts for 54% in the EU-N, it accounts for 40% in the EU-S. The **EU15 does not structurally differ from the EU13** with regard to these characteristics. However, the only structural difference between these two groups of MS exists in the role of cattle farms for **subsistence**. While **cattle farms in the EU15** only account on average for **2%** of the national total of these farms, they account for **20% in the EU13**. Between the EU-N and the EU-S, there is no structural difference.

1.5. Role in the EU Common Agricultural Policy

Agricultural policy plays an important role in EU agriculture. **The Common Agricultural policy (CAP) of the EU has been the first truly European policy area**, in the sense that MS have agreed very early in the development of the EU that this policy field should be developed and administrated by the EU. For details on the historical development of the CAP, see, for example, Oskam et al. (2011). Throughout its existence, **the CAP has experienced several major reforms**. These subsequent reforms changed the initial focus of the CAP consisting of support for agricultural products by interfering with markets as well as support for agricultural producers by granting them support mostly independent of the quantities produced. In 2014, the last major reform was implemented. It called for redesigning the direct payments in a more targeted fashion and giving MS more freedom in terms of national policy choices (for details, see European Parliament, 2015b and 2015c). The aspects of the current CAP relevant for the EU cattle sector are discussed in detail in chapter 5. Options for future policy choices relevant for the EU cattle sector are discussed in chapter 0 based on the opportunities and challenges the EU cattle sector faces identified in chapter 0.

The role of the EU cattle sector in the CAP is substantial, as it accounts for such large shares of EU agriculture as discussed in section 0. **The role of the CAP for the EU cattle sector is equally important** as there are almost 2 million commercial farms producing the raw products of milk and bovine meat. Most of these farms are specialized in milk production (Table 3), so that the income of the farm household and the hired workers strongly depend on the conditions of the raw milk market. A regional perspective of the EU cattle sector is of particular importance, as it is present in almost all regions of the EU, including those of unfavourable natural conditions (mountainous areas, etc.). Hence cattle farming is an income option for rural regions throughout the EU except for regions located close to the Mediterranean Sea, as discussed in section 1.4. Table 7 shows the role of the EU cattle sector in EU agricultural policy[10]. **Commercial cattle-keeping farms receive about 22 bln € of financial support annually** from the CAP. **Almost two thirds of this amount are direct payments**. 5.5% coupled support for non-dairying cattle (1.2 bln Euros), 2% coupled support for dairy cows (480m Euros) and the remaining 30% are other subsidies. **Almost three quarters of this total subsidy amount are directed towards the farms of the EU dairy sector** (Table 7). While farms of the bovine meat sector virtually receive no subsidies for dairy cows, farms of the EU dairy sector receive 26% of the total subsidies dedicated towards non-dairying cattle.

[10] As the most recent numbers are only available for 2013, this analysis holds only for the old CAP, valid until 2013. However, our estimations in chapter 5 indicate that the numbers for the new CAP are of comparable magnitude.

Table 7: CAP Subsidies in the EU cattle sector

(A) Region or subsector	(B) Milk cows	(C) Other cattle	(D) DPs	(E) Other	(F) Total
EU cattle sector (m €)	480	1,201	13,867	6,698	22,246
Share of EU dairy sector	99%	26%	75%	72%	72%
Share of EU bovine meat sector	1%	74%	25%	28%	28%
Share of EU15	64%	95%	81%	70%	78%
Share of EU13	36%	5%	19%	30%	22%
Share of EU-N	67%	31%	64%	75%	65%
Share of EU-S	33%	69%	36%	25%	35%

Source: Authors based on European Commission (2016j)
Note: The amounts and shares are averages of the annual amounts received by all commercial farms belonging to the EU cattle sector of the years 2011 until 2013. Columns (B) and (C) display the MS-specific support (VCS) coupled to milk production or other cattle types, respectively. Column (D) displays decoupled payments. Column (E) displays any other subsidies obtained by the commercial farms. Column (F) displays the sum of all subsidies, that is, the sum of columns (B) until (E). The percentages give the share of each subsector or regional subgroups of the MS of the amounts in the second row. The values in each column of rows 3 and 4, rows 5 and 6 and rows 7 and 8 add up to 100%, respectively. For example, all commercial farms of the EU cattle sector located in the EU15 obtain 64% of the total VCS paid per year for milk production in the entire EU (480 m Euros) on average throughout the years 2011, 2012 and 2013. All commercial farms of the EU cattle sector located in the EU13 account for 36% of this value.

The receiving commercial farms of the EU cattle sector are unequally distributed across the EU**. Almost four fifths and two thirds of all subsidies for the sector end up in the EU15 and in the EU-N, respectively**. Farms located in the EU13 receive 5% of all non-dairying cattle subsidies, while they receive more than one third of all support dedicated towards dairy cows. Farms located in the EU-S receive one quarter of all other subsidies, while their share in non-dairy cattle support accounts for more than two thirds.

This amount of support from the CAP accounts for 80% of the total annual net income of cattle-keeping farms in the EU, which amounts to 27.2 bln € (Table 8). Farms of the EU dairy sector earn 84% of this amount. 77% and 57% are earned by cattle-keeping farms in the EU15 and EU-N, respectively. The EU cattle sector employs labour of the amount 2.4 m AWU, of which 86% is provided by farms of the EU dairy sector. This amount is almost equally split between farms located in the EU-N and EU-S, while **farms in the EU13 account for almost three fifths of the total labour**.

These numbers translate into an **average annual income per worker of all farms of the EU cattle sector of 11,411 euros**. Workers on farms of the EU bovine meat sector earn on average 15% more than on farms belonging to the EU dairy sector. While the average income per worker in the EU dairy sector is about 17% higher than in the EU bovine meat sector, the average income between the EU15 and EU13 differ by a factor of 4.5 (column (D) of Table 8). In other words, the average annual salary per worker in the EU cattle sector in the

EU13 equals less than 3 monthly salaries of an average worker in the EU cattle sector in the EU15[11].

Table 8: Income, labour and the role of subsidies in the EU cattle sector

(A) Region or subsector	(B) Income	(C) Total labour	(D) Income/AWU €	(E) Cattle support as share of farm income
EU cattle sector	27,211 m €	2.4 m AWU	11,411 €	57%
EU dairy sector	84%	86%	11,174	49%
EU bovine meat sector	16%	14%	12,842	100%
EU15	77%	42%	20,831	61%
EU13	23%	58%	4,539	46%
EU-N	57%	53%	12,226	61%
EU-S	43%	47%	10,481	51%

Source: Authors based on European Commission (2016j)
Note: The numbers and shares are the averages of all commercial farms belonging to the EU cattle sector of the years 2011 until 2013. Columns (B) and (C) display the shares of the subsectors and the regional subgroups of MS, respectively, as relation to the numbers given in the second row of the table. Columns (D) and (E) display the farm-number-weighted averages of all farms of the EU cattle sector belonging to each of the categories given in column (A). Column (E) quantifies the amounts of subsidies coupled to dairy or bovine meat production (VCS) and DPs as a share in average farm income (columns (B) to (D) of Table 7. For example, 84% of the total average farm income of years 2011 until 2013, which amounted in total to 27.2 bln €, was earned by professional farms belonging to the EU dairy sector as defined at the principal farming type level. While the average income of all commercial farms of the EU cattle sector amounts to 11,411 € per AWU, the average income of all farms belonging to the EU dairy sector is slightly lower (11,174 €/AWU). The average share of cattle-related VCS and DPs amounts on average to 57% of the farm income of the EU cattle sector. In the MS belonging to the EU-S, this share amounts to 51%.

Financial support originating from the CAP, which is either coupled to milk or bovine meat production or is paid as production independent DPs, amounts to more than half (**57%**) of the **total farm income** of all farms of the EU cattle sector (column (E) of Table 8). While this share, on average, lies below 50% in the EU dairy sector, it amounts to 100% of farm income in the EU bovine meat sector. This share is fairly evenly distributed across EU regions ranging from 46% in the EU13 to 61% in the EU15 and EU-N.

For the new CAP since 2014, **MS have been given flexibility in deciding whether to implement voluntary coupled support (VCS) measures**. They have also had a certain degree of freedom with respect to the way they implement them. Table 9 shows details about the allocation of VCS across farm production specializations, with dairy and bovine meat production being two of them. **More than 60% of the total budget spent on VCS is allocated to the EU cattle sector**. More than 75% of the MS apply these measures, indicating a broad implementation throughout the EU.

[11] For more information on EU farm income see European Parliament (2015a).

Table 9: Allocation of voluntary coupled support to the EU cattle sector

(A) Specialization	(B) VCS in m €	(C) Share in EU budget	(D) Number of MS
Beef and veal	1 706	41%	23
Milk and milk products	829	20%	19
Sheep and goat	503	12%	19
Protein crops	443	11%	15
Other sectors	646	all < 5%	
Total	4 127	100%	27

Source: Authors based on European Commission (2013a)
Note: Column (A) denotes the production specializations VCS that are paid for under the 2014-2020 CAP. Column (B) displays the total amounts of VCS spent by MS in 2015. Column (C) displays the share in the total EU budget allocated to VCS. Column (D) shows the numbers of MS which implemented VCS for each specialization.

1.6. Role in global dairy and bovine meat markets

In this section, we assess the role of the EU cattle sector in international trade and global markets, both from the EU perspective as well as the global perspective. Table A1.16 and Table A1.17 in Annex 1 explain the methodology used in this trade analysis.

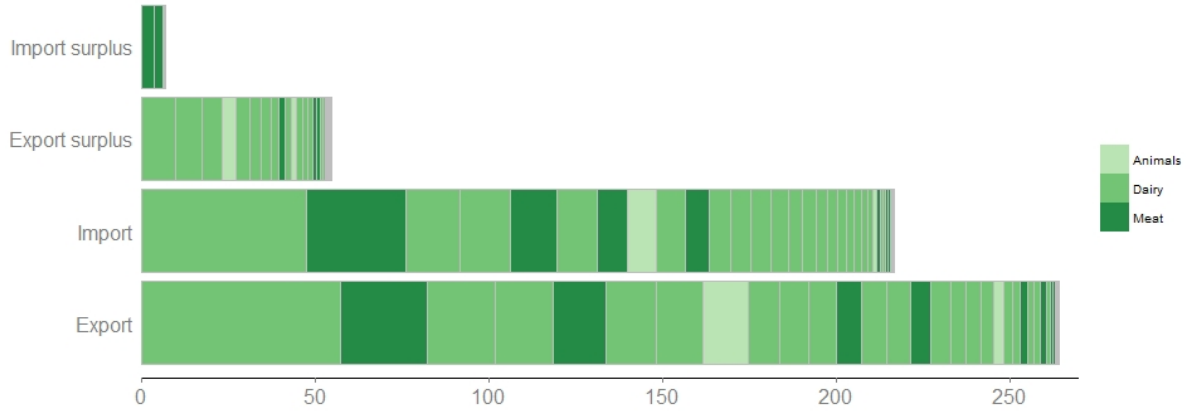
1.6.1. Importance for the EU

1.6.1.1. Current Trade Structure

Figure 8 and Table A1.18 summarize the **current structure of the external trade of the EU in bovine products** by showing the values of the year 2015. They classify the commodities into the three major bovine product categories: dairy, meat and live animals. In 2015, the **EU has a positive trade balance** of about **48 bln €** in these bovine product categories vis-a-vis the rest of the world. **Dairy products account for the largest part** of it. They not only account for a larger share of exports than of imports (**68% of imports and 72% of the exports**), but also for larger absolute values (146 bln vs. 190 bln).

This pattern also holds for live animals, as they account for 5% of imports (10 bln euros) and 6% of exports (16 bln euros). The trade structure of bovine meat differs structurally. **Bovine meat imports exceed the exports by 1 bln euros**; their **share in exports of bovine products** amounted in 2015 to **22%**, while their **share in imports** amounted to **28%**. Most of the trade value as well as most of the commodities which have a significant export surplus are associated with dairy products, whereas bovine meat products dominate the few bovine products for which the EU has an import surplus. Both **exports and imports are highly concentrated**: the 13 commodities among the 35 HS6 codes with the largest export values account for 80% of the total bovine product export value, whereas it is the largest 12 imported commodities which account for 80% of the total bovine products import value. **80% of the export surplus is realized by 8 commodities of which one is non-dairy**.

Figure 8: EU trade in bovine products (in bln Euros)



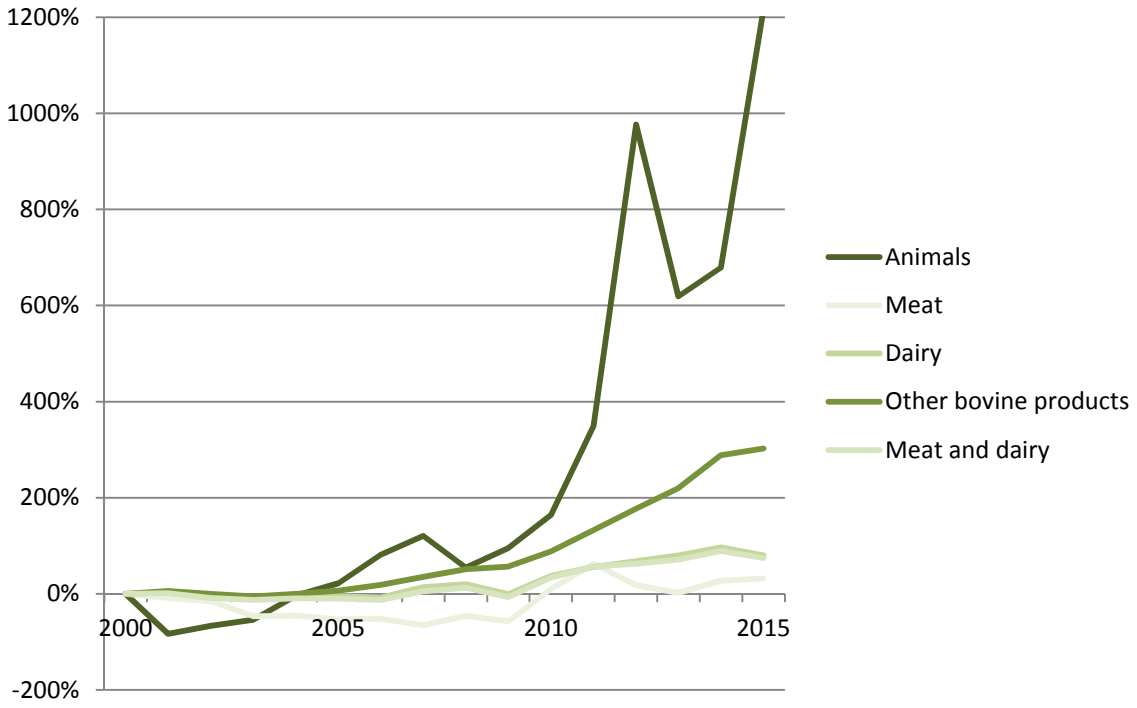
Source: Authors based on Eurostat Comext dataset DS-016893
Note: All relevant HS6 codes are assigned to one of the three categories of bovine products: dairy, meat or live animals. The categories are identified based on the HS6 codes of the commodities in Comext. Of the 35 HS6-codes available and relevant, 22 belong to the dairy category, 11 to the bovine meat category and 2 to the animal category (see Table A1.16 for the complete list, the category "other bovine product" has been disregarded in this graph). In each bar, the commodities at the HS6 level are ordered according to decreasing trade value. The underlying data is displayed in Table A1.18. Data for 2015 in bln Euros.

1.6.1.2. Development of Bovine Products Trade since 2000

Figure 9 shows the relative changes of the exports of the bovine products categories mentioned in Table A1.16in comparison with the benchmark year 2000**. All export values have experienced some growth**[12]. Growth was smallest for bovine meat (+32% in nominal terms corresponding to virtually no increase in real terms). **Milk exports rose by 80%**, exports of **other bovine products by 300% and live animal exports by more than 1200%**. Nevertheless, dairy products continue to be the largest category of bovine products exported. The **export value of bovine meat shrunk until 2010** in nominal terms and has experienced since then a modest growth. **Dairy products continue to be the dominating bovine product category in EU exports, although they have lost importance since 2000**. Live animals, bovine meat as well as other bovine products accounted for 10%, 9% and 69% of the dairy export value of 2015 (9.3 bln Euros), respectively, while they accounted for 1%, 12% and 31% of this value in 2000. The **value of bovine meat exports** relative to dairy exports **has declined** by one quarter since 2000, whereas live animals and especially other bovine products have gained substantially in importance relative to the value of dairy exports.

[12] According to the Eurostat dataset prc_hicp_aind cumulative inflation in the EU since 2000 amounted to 34%.

Figure 9: Development of EU bovine product export values

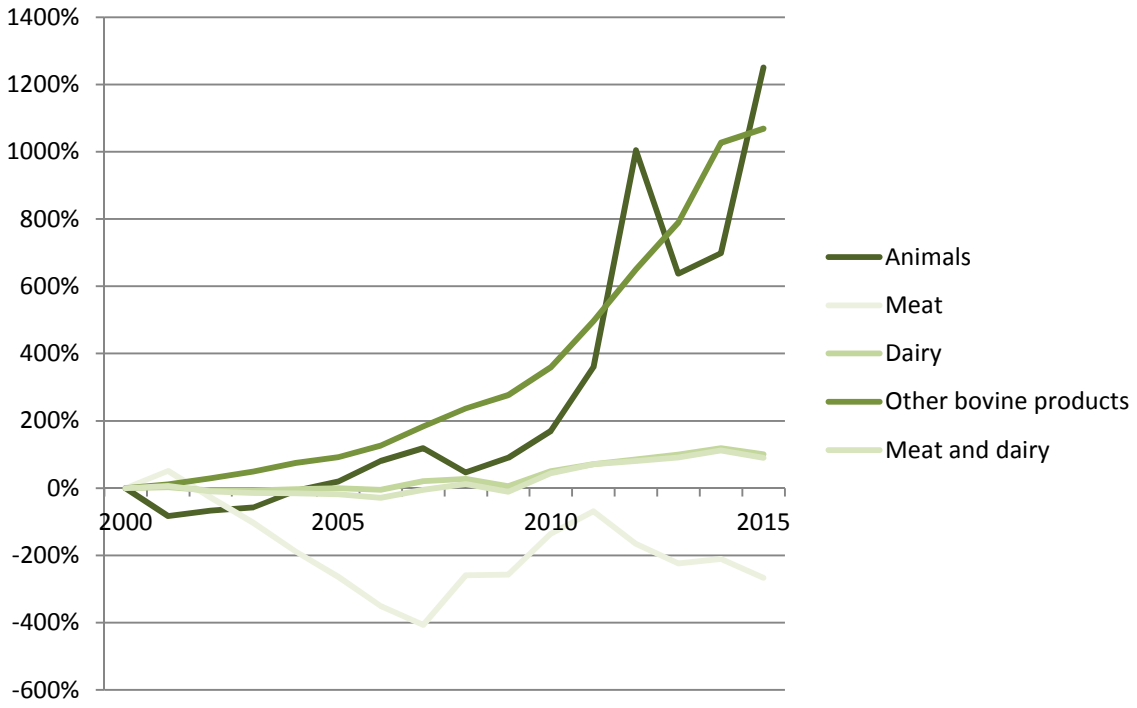


Source: Authors based on Eurostat Comext dataset DS-016893
Note: All variables are indexed, that is, the value in 2000 of each variable is set to equal the starting value 0, the values of the original variables for the following years are each divided by the value in 2000 of the corresponding variable and 1 is subtracted from the quotient. Calculated based on the data in Table A1.19 and Table A1.20.

Figure 10 displays the balance between the export and import values of these product categories. The data is again shown in the form of indices. The **dairy trade balance almost doubled** between 2000 and 2015, that is, it increased by 101%. However, the positive **trade balances of live animals and other bovine products increased by more than 1000%** in the same period. The **trade balance of bovine meat reduced strongly** in the same period. It had in 2000 a negative value of 270 m € and increased to a **deficit of almost 1 bln € in 2015**. The corresponding line in the figure shows that this development was quite **unstable**. While there was a rapid decline until -1.4 bln € in 2007, the trade balance recovered in the following years quickly, almost reaching the level of 2000. But it is again showing a pronounced negative trend, increasing the negative trade balance since 2012.

Also in terms of the trade balance, dairy products continue to be the **dominating bovine product category in EU foreign trade.** But as for exports, they **have lost importance** relative to other categories **since 2000**. The trade balance of live animals and other bovine products accounted for 10% and 63% of the dairy trade balance of 2015 (8.7 bln Euros), while they accounted for 2% and 11% of the dairy balance in 2000, respectively. The **negative trade balance of bovine meat has doubled** relative to the dairy balance. In 2000, the absolute value of this trade deficit amounted to 6% of the dairy balance, whereas it was 11% 15 years later.

Figure 10: Development of EU bovine product trade value balance



Source: Authors based on Eurostat Comext dataset DS-016893
Note: All variables are indexed, that is, the value of the year 2000 is set to equal 0, the values of the original variables for the following years are each divided by the value in 2000 of the corresponding variable and 1 is subtracted from the quotient. Therefore, this graph shows the relative changes of the variables in comparison with 2000. Calculated based on the data in Table A1.19 and Table A1.20.

However, as shown in Figure A1.5, p. 204, and Table A1.21,the **development of the export values of dairy and** especially **bovine meat underperformed** the development of the export value of all **EU agri-food exports**, although their absolute development in nominal terms has been positive since year 2000. **EU agri-food exports rose by 139%** between 2000 and 2015 (Table A1.21). The commodities produced by the **EU cattle sector and the following processing chain account for one seventh of total EU agri-food exports**. The export share of all bovine products decreased from almost 14% in 2000 to 10.4% in 2006 (Figure 11). **Since 2006** they have experienced **a steady growth** larger than the growth of the total EU agri-food export value, reaching again almost 14% in 2015.

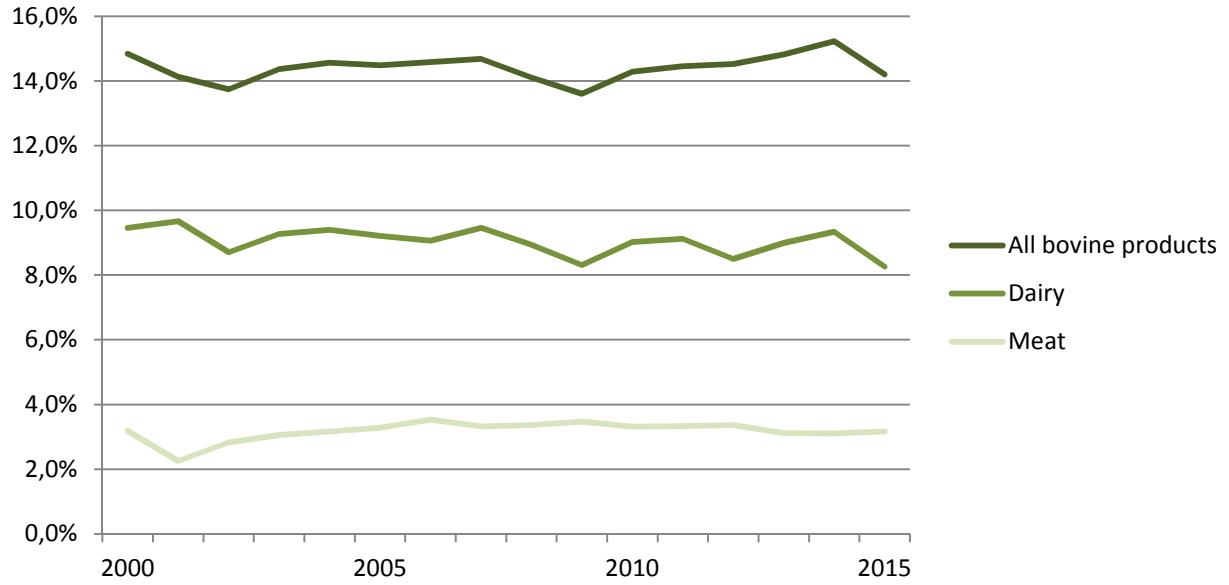
The composition of the bovine products exported is experiencing structural change as shown in Figure 11 and Table A1.21. In year 2000, dairy exports accounted for almost 10% of all EU agri-food exports; 15 years later their share amounted to 7.2%. **Dairy exports continue to account for the largest part of these exports**, i.e. for around half of the bovine products export value in 2015. However, **dairy exports lost one quarter of their share** and **meat exports lost almost half of their share** in comparison with the year 2000. On the other hand, **exports of other bovine products** and especially **live bovine animals rose strongly**. The shares of other bovine products and live animals **exceeded the growth of the total value of EU agri-food exports by 69% and 452%**, respectively.

Figure 11: Milk and bovine meat exports in total EU agri-food exports

Source: Authors based on Eurostat Comext dataset DS-016893
Note: Based on the data in Table A1.21. The graph shows the development of the share of the export value of milk and bovine meat in the total EU agri-food export value.

In contrast to these developments in extra-EU agri-food trade, **the share in intra-EU agri-food trade flows** for both product groups as well as for all bovine products have been remarkably **more stable**. Figure 12 illustrates the development since year 2000. While the **shares of bovine meat and all bovine products** have almost been **constantly** around 3.3% and 14.5%, respectively, the **share of dairy products slightly**, but continuously **diminished** from 9.5% in 2000 to 8.3% in 2015.

Figure 12: Milk and bovine meat in total intra-EU agri-food trade



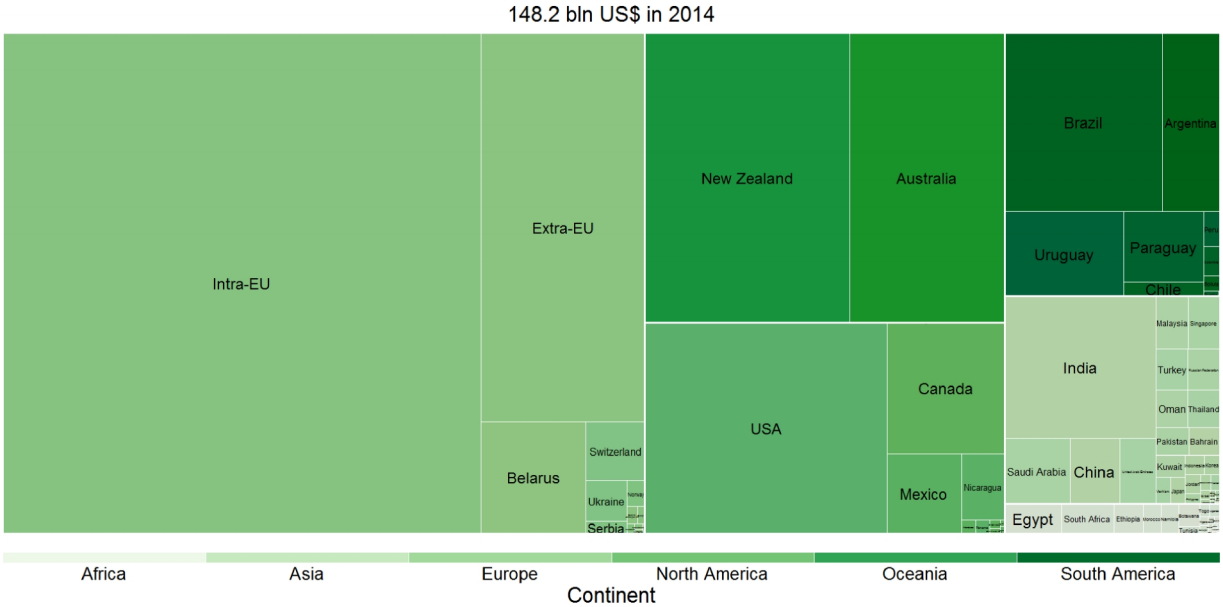
Source: Authors based on Eurostat Comext dataset DS-016893
Note: Based on the data in Table A1.23. The graph shows the development of the share of milk and bovine meat trade in the total intra-EU agri-food trade value.

1.6.2. Role in world markets

1.6.2.1. World Market Shares

The **EU** plays an important role in the global trade of bovine products (dairy, meat and live animals). It **dominates the European market and is the largest bovine product exporter on the world market.** Intra-EU imports account for more than 40% of global bovine product imports. The **EU belongs to the five largest bovine products importers worldwide**. Figure 13 and Figure 14 illustrate its dominating role in Europe and worldwide both in regards to bovine products exports as well as, to a somewhat smaller extent, imports. The **EU accounts for** about **half of global bovine product exports**[13] **and** slightly less than half of bovine products **imports** (Table A1.22, p. 206). However, **most of this trade takes place within the EU**. 20% of the total exports of the MS in bovine products leave the EU, and 5% of their bovine product imports originate outside the EU.

Figure 13: Market shares in global exports of dairy, bovine meat and live animals



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global exports of dairy and bovine meat commodities as well as live bovine animals. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. The values are the sum of the export values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global exports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade, based on the value shares of 2014 in Figure A1.6. Data for 2014. The summary of trade value shares per continent is given in Table A1.22, p. 206.

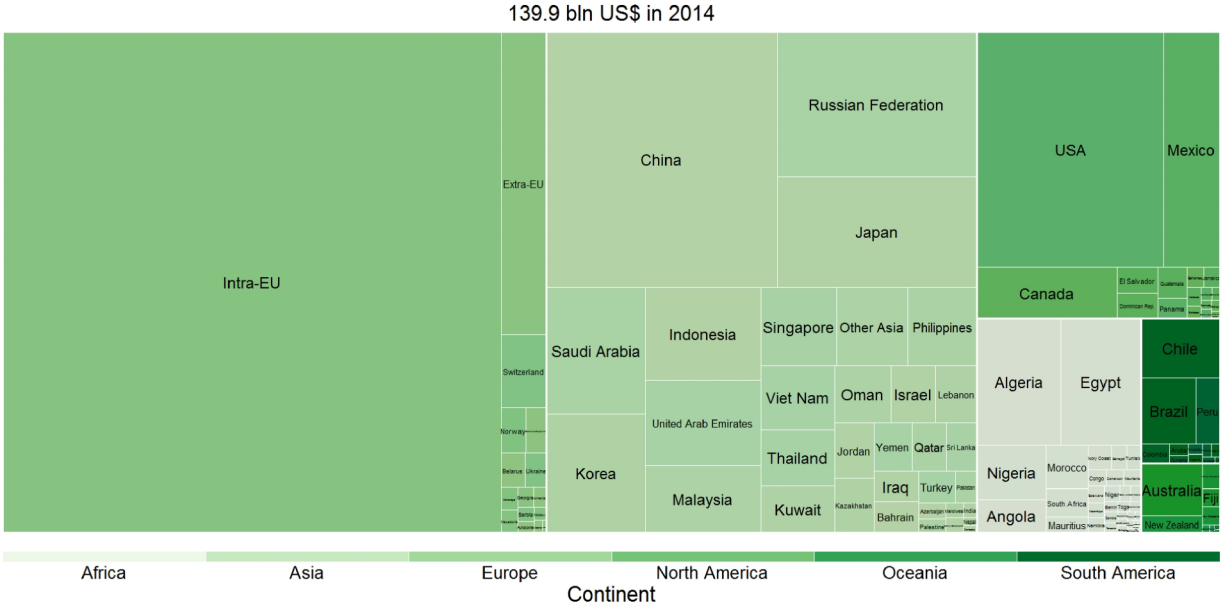
Intra-EU trade of bovine products **accounts for more than 40% of the export values as well as of the import values traded globally**. In 2014, extra-EU exports were larger than bovine product exports of any other single country. Extra-EU imports ranked fifth on a global scale. Except for the role of the EU, the **structure of global exports and imports is determined by the direction of trade**. **Australia, New Zealand, North America, Brazil and India are the main competitors for** EU bovine product **exports**, since they account together for 32% of global exports. Figure 13 shows that the **shares in bovine**

[13] Exports and imports as measured by Comtrade (2016) refer to any trade crossing a border between nations, that is, between two MS of the EU, between one MS and a non-member country or between two non-member countries. From a EU perspective, the distinction between intra-EU vs. extra-EU trade is particularly relevant.

products exports are unevenly distributed across the continents. Also **within continents**, except for South America, **it is typically one to three countries which account for the lion's share** of the continent's exports. Uruguay, Argentina, Paraguay, Canada and Mexico as well as India and Belarus play also a significant role in the current structure of bovine product exports.

A similarly uneven pattern appears in the distribution of import shares of bovine products across and within continents. Extra-EU imports account only for a minor share of total EU imports (6%). **Africa plays virtually no role in international bovine products trade—** although a larger role in global imports than exports—, while **Asia accounts for 34% of global imports** (Table A1.22). In other words, it is the second-most important destination for bovine products exports worldwide behind the EU. The shares of Asian countries in total Asian bovine products imports are relatively equally distributed across more than a dozen countries. **China imports more** bovine products **than the US** does. Furthermore, Russia, Japan, Saudi Arabia and Korea belong to the major Asian importers. **In North America, the US and Mexico appear to be the main importers**. The **import shares of South America and Oceania are of negligible magnitude**, although Chile is a somewhat significant importer. **A number of MENA countries account for significant import shares**—Algeria, Egypt and Saudi Arabia being the largest ones.

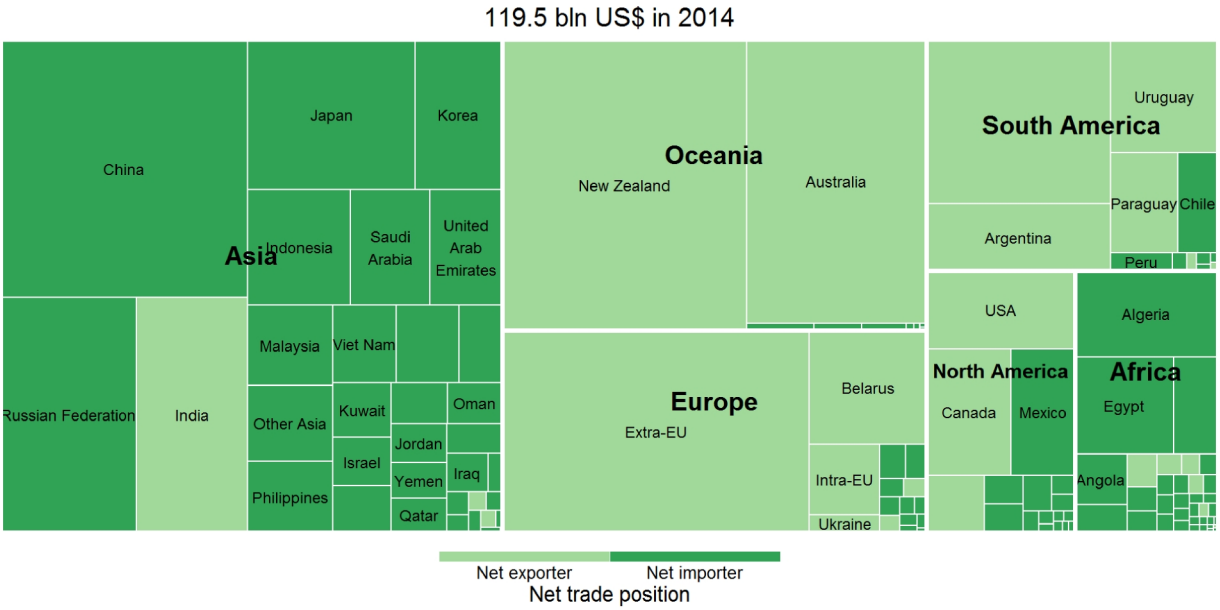
Figure 14: Market shares in global imports of dairy, bovine meat and live animals



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global imports of dairy and bovine meat commodities as well as live bovine animals. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the import values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global imports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade, based on the value shares of 2014 in Figure A1.6. Data for 2014.

Figure 15 shows the magnitudes of the balances of export and import values of bovine products per country and continent. Light and dark green coloured countries are net exporters and importers of these commodities, respectively. **Eleven countries earned the net income of more than 1 bln US$** in 2014: New Zealand, extra-EU trade, Australia, Brazil, India, Belarus, Argentina, Uruguay, US, Canada and Paraguay (in decreasing order).

Figure 15: Net trade positions in global dairy, bovine meat and live animals trade



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the magnitudes of the trade balances of dairy, bovine meat and live bovine animals for single countries and continents at the global level. The trade balance is defined as the value of imports subtracted from the value of exports of a country. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. Countries are coloured according to their net trade position. The size of the rectangles is the value of the net trade position of all dairy and meat commodities as well as live bovine animals as outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in the globally aggregated trade value (the sum of all absolute values of the net trade positions). The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade, based on the value shares of 2014 in Figure A1.6. Data for 2014.

Extra-EU ranks second in the international net trade position in 2014. New Zealand and Australia earned more than 10 bln US$ in 2014, while the trade balance of Paraguay was only of about 1.3 bln US$. On the other hand, **12 countries were net-importers of at least 1 bln US$** in 2014: China, Russia, Japan, Korea, Algeria, Indonesia, Egypt, Saudi Arabia, United Arab Emirates, Mexico, Malaysia and the Philippines (ordered according to decreasing deficit). **China has a net-import value of bovine products of almost 13 bln US$**. The **net imports of Malaysia and the Philippines are close to 1 bln US$**. With the exception of India, the US and Canada, the **economies realizing significant net exports** in bovine products trade are **located in Oceania, Europe as well as the Americas**.

1.6.2.2. Major Trading Partners

The **trading partners of the EU for bovine products depend on the direction of trade as well as on the commodity category**. Table 10 indicates that the **export destinations** of bovine meat, dairy and live animals are **much more diversified** (29 countries accounting for 75% of the total export value) **than the import sources** (5 countries accounting for 75% of the total import value). 28 countries account for 75% of the total trade value of these three product categories. **For exports, the MENA and East and Southeast Asia play the most important role**. In the MENA alone, more trade of the largest export destinations are located than in East and South East Asia together. Two countries from North America (the US and Canada) and SSA (Nigeria and Angola) as well as one country from Oceania (Australia) belong to the major export destinations. **South America is by far the most important source of imports** of these products (mainly bovine meat).

Table 10: Number of trading partners by world region for the EU cattle sector

(A) REGION	(B) TOTAL TRADE VALUE	(C) EXPORTS	(D) IMPORTS
MENA	8	11	
East Asia	5	5	
South East Asia	4	5	
South America	3		3
Europe	3	3	1
Oceania	2	1	
North America	2	2	1
SSA	1	2	
Number of partners	**28**	**29**	**5**

Source: Authors based on Eurostat Comext dataset DS-016893
Note: Data for 2015. Based on a ranking of trading partner countries according to the aggregated value in bln € of total trade, total exports and total imports in dairy products, meat products and live animals, respectively. The table mentions the number of countries per region, with the included countries together accounting for 75% of total EU beef trade. MENA means the Middle East and North Africa. Column (B) denotes the value of the exports added to the value of the imports, that is, the total value of trade in either direction. The last row indicates the sum of the countries above.

The **most important trading partners** measured by the size of the trade balance, that is, the difference between the export and the import values, **depend** strongly **on the commodity** considered. Table 11 contains the main destinations for EU bovine meat trade and EU bovine dairy trade. The **magnitude of the balances** of both product categories **differs markedly**. While the EU realizes **the largest trade surplus of dairy exports with the US accounting for 1 bln Euros**, the **largest trade surplus of bovine meat accounts for only 120 m € with Hong Kong**, which corresponds to one eighth of the largest dairy balance. Most of the **most important destinations for EU bovine meat are located in Europe**. Trade in **dairy products mainly flows to the US, East Asia and the MENA**.

Table 11: Trading partners of the largest EU net exports of bovine meat and dairy trade

(A) PARTNER	(B) BALANCE MEAT (bln €)	(C) REGION	(D) PARTNER	(E) BALANCE DAIRY (bln €)	(F) REGION
Hong Kong	0.12	East Asia	US	1.01	North America
Bosnia and Herzegovina	0.08	Europe	China	0.90	East Asia
Switzerland	0.07	Europe	Saudi Arabia	0.47	MENA
Norway	0.07	Europe	Algeria	0.41	MENA
Turkey	0.03	MENA	Japan	0.34	East Asia

Source: Authors based on Eurostat Comext dataset DS-016893
Note: Data for 2015. Columns (B) and (E) show the difference between the value of exports and the value of imports of bovine meat and dairy. Columns (C) and (F) contain the region the partner country is located in. The table contains the five partner countries with which the balance for the EU is largest. For the ranking, trade partners are only considered when they had a trade volume with the EU of at least 10 m € in 2015. Definition of dairy and meat commodities based on Table A1.18.

As indicated above in Table 10, the **imports are much more concentrated** on a few partners than the exports. Table 12 lists these partners with which the EU has the largest trade deficient or smallest trade surpluses. The **most important sources of bovine meat are located in South America, the US and Australia**. With **Brazil**, the EU has a **trade deficit** for bovine meat **of half a billion Euros**. For **dairy**, the EU realizes trade surpluses with most partners. The only countries with **deficits** were **New Zealand and Switzerland** in 2015.

Table 12: Trading partners of the largest EU net imports of bovine meat and dairy trade

(A) PARTNER	(B) BALANCE MEAT (bln €)	(C) REGION	(D) PARTNER	(E) BALANCE DAIRY (bln €)	(F) REGION
Australia	-0.21	Oceania	Moldova	0.01	Europe
US	-0.23	North America	Montenegro	0.01	Europe
Uruguay	-0.31	South America	Niger	0.01	SSA
Argentina	-0.37	South America	New Zealand	-0.05	Oceania
Brazil	-0.47	South America	Switzerland	-0.07	Europe

Source: Authors based on Eurostat Comext dataset DS-016893
Note: Data for 2015. Columns (B) and (E) show the difference between the value of exports and the value of imports of bovine meat and dairy in bln Euros. Columns (C) and (F) contain the regions the partner country is located in. The table contains the five partner countries with which the balance for the EU is largest. For the ranking, trade partners are only considered when they had a trade volume with the EU of at least 10 m € in 2015. Definition of dairy and meat commodities based on Table A1.18.

Again, the magnitude of the largest deficits differs by a factor of 7. The US and Switzerland are the only countries which appear in both groups of main trading partners. While the US is the main destination for dairy exports, Switzerland is the fourth-largest source of bovine meat and the third-largest net-exporting destination of EU bovine meat products. It is also the country with which the EU runs the largest deficit in dairy trade worldwide.

Table A1.24 emphasizes the **discrepancy in trade partners for exports and imports of bovine meat, dairy and live animals**. **China, the US, two MENA countries and Hong Kong** are the partners with which the EU realizes **the largest aggregate trade surplus**. On the other hand, **Brazil, Argentina, Uruguay, New Zealand and Namibia** are the countries with which the EU has **the largest aggregate trade deficit** for these bovine-based commodity categories. The trade surpluses are about twice as large in absolute magnitude than the trade deficits for the five major partners.

Table 13: Trading partners of largest EU export value growth

(A) PARTNER	(B) CHANGE MEAT	(C) REGION	(D) PARTNER	(E) CHANGE DAIRY	(F) REGION
Hong Kong	+2947%	Asia	Belarus	+1711%	Europe
Bosnia and Herzegovina	+1138%	Europe	China	+977%	Asia
Israel	+970%	MENA	Pakistan	+824%	Asia
Switzerland	+701%	Europe	Serbia	+822%	Europe
Egypt	+649%	MENA	New Zealand	+680%	Oceania

Source: Authors based on Eurostat Comext dataset DS-016893
Note: Changes calculated based on data for 2015 and 2005 in bln € in nominal terms. Trade flows are considered only when they had a value of at least 1m € in 2005. Columns (B) and (E) show the percentage change of the export value to the destination country in 2015 in comparison with the value of 2005, respectively. Columns (C) and (F) contain the regions the destination country is located in. The table contains the five destinations, for which the export value changed the most between 2005 and 2015. Definition of dairy and meat commodities based on Table A1.18. For example, the value +2947% for Hong Kong means that in 2015 the sum of the value of exports of all bovine meat products from the EU to Hong Kong was 2947% larger than in 2005.

Hong Kong was also the trading partner for which **bovine meat exports increased the most** in the last ten years (Table 13). Most of the five countries with which the value of bovine meat product exports increased the most have a population of less than 10m inhabitants. The only exception is **Egypt,** which is with a population of close to 100m; it is the largest country in the MENA. The value of **dairy exports increased the most in Belarus**. Three of the five countries showing the largest export value growth are again small countries of a population of less than 10m inhabitants. In contrast, **China and Pakistan are countries of large populations to which EU dairy exports have almost experienced a tenfold increase** since 2005.

Table 14: Trading partners of largest EU import value growth

(A) PARTNER	(B) CHANGE MEAT	(C) REGION	(D) PARTNER	(E) CHANGE DAIRY	(F) REGION
US	+6737%	North America	Israel	+86%	MENA
New Zealand	+480%	Oceania	Switzerland	+51%	Europe
Australia	+473%	Oceania	Norway	+3%	Europe
Switzerland	+321%	Europe			
Uruguay	+228%	South America			

Source: Authors based on Eurostat Comext dataset DS-016893
Note: Changes calculated based on data for 2015 and 2005 in bln € in nominal terms. Trade flows are considered only when they had a value of at least 1m € in 2005. Columns (B) and (E) show the percentage change of the import value from the source country in 2015 in comparison with the value of 2005, respectively. Columns (C) and (F) contain the regions the source country is located in. The table contains the five partner countries, for which the import value changed the most between 2005 and 2015. Definition of dairy and meat commodities based on Table A1.18. For example, the value +86% for Israel means that in 2015, the sum of the value of imports of all dairy products from Israel to the EU was 86% larger than in 2005.

Total annual import values of dairy products have hardly changed (Table 14), and if they changed, it would be only for small producing countries. However, bovine meat import values have experienced a distinct development. The value of **imports from the US has risen by close to seventy times**. Also, **imports from Australia and Uruguay**—other countries for which the EU has the largest trade deficits for bovine meat (Table 12)—**have quintupled and more than doubled** during the last ten years, respectively. Mainly imports of high quality beef have increased, and in particular imports of high quality beef from the US (in relative terms) with an increase in the quota for duty free imports in 2012.

2. CURRENT SITUATION IN THE EU DAIRY SECTOR

KEY FINDINGS

- Specialised dairy farms in **Germany, France, The Netherlands, the UK, and Ireland** are the five most important EU MS in in this sector measured by standard output.
- The **EU15 have a share of 83% of total milk production**.
- **Cheese** (36%), **butter** (29%), and **cream** for direct consumption (13%) have together a product share of more than 75% of all raw milk delivered and processed.
- The **per capita consumption of cheese has increased** by more than 15% since the year 2000, while per capita consumption of fresh dairy products declined by 4% in the EU.
- The **average milk yield per cow** ranges between 1,972kg/cow in Campania (IT) and 9220 kg/cow in Cataluña (ES).
- The **labour income per labour unit** among specialist dairy farms ranges between 13,676 € per year in Adriatic Croatia and 74,264 € per year in Lombardia (IT).
- The **variance in prices for dairy products has increased substantially since 2007**. From 2000 to 2006 the price range between the highest and lowest monthly prices used to be between 5% and 10%; they increased to price ranges between 15% and 30%.
- The **structure of the milk processing industry** differs substantially: the EU-N is characterised by large-scale dairy companies processing more than 100 thousand tons of milk per year; Bulgaria and Romania are characterised by small scale companies, processing less than 50 thousand tons of milk per year.
- The EU dairy processing industry has invested in **product differentiation** over the past decade using a number of product attributes including location and production method.

This chapter analyses the EU dairy sector in detail. It considers the following four of the five principal farming types which belong to the EU cattle sector as defined in footnote 7, p. 31, and Table A1.3, p. 179:

- (45) Specialist dairying,
- (47) Dairying and meat,
- (73) Mixed livestock and
- (83) Crops and cattle.

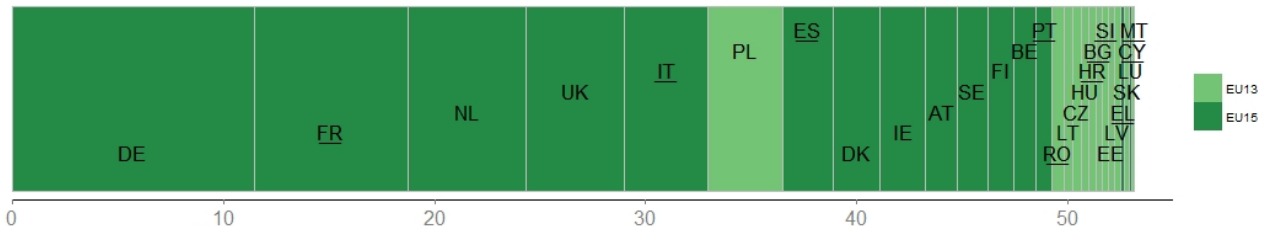
For all these farm types the average revenue earned from dairy products exceeds the average revenue from bovine meat products (Table A1.3). The chapter analyses several aspects of both primary production as well as the structure, conduct and performance of the EU dairy processing industry. It characterizes the structure of the EU dairy market and subsequently elaborates on the domestic demand for dairy products, the global demand, domestic supply, the EU supply chain and related recent developments of prices of dairy products.

2.1. Bird's Eye Perspective on the EU Dairy Market

Milk production is unevenly distributed across the EU. In particular, large differences exist between the EU15 and EU13 on one hand and the EU-N and EU-S on the other. This section provides an overview of the EU dairy market by characterising the current structure of the economic potential, domestic production, domestic demand and foreign trade of selected dairy products.

Figure 16 disaggregates the TSO of the **EU dairy sector** into the contributions of each MS. The SO of the EU dairy sector accounts for **55% of the total SO of the EU cattle sector** and is thus the most important production type within the EU cattle sector (Table A1.8). **55% of the SO** of the EU dairy sector is generated by the **dairy farms in Germany, France, the Netherlands and the United Kingdom**. The **remaining 24 MS** account together for **the remaining 45%**. The contribution of the national dairy sector of an EU15 MS to the EU total is on average 2.5 bln € larger than the average contribution of an EU13 MS (Table A1.7). This **difference in the size of the national dairy sectors** measured by SO between the EU15 and EU13 **is structural** (Table A1.7) and is also visible in Figure 16, as the MS of the EU13 cluster at the right-hand side. The **EU13 contribute 13%** while the **EU-S contribute 30%** to the total SO of the EU dairy sector (Table A1.8). As indicated by Figure 16, the **specialized dairy farms are concentrated in the North-Western MS** of the EU.

Figure 16: Contributions of MS to the total Standard Output (in bln euros) of specialized dairy farms

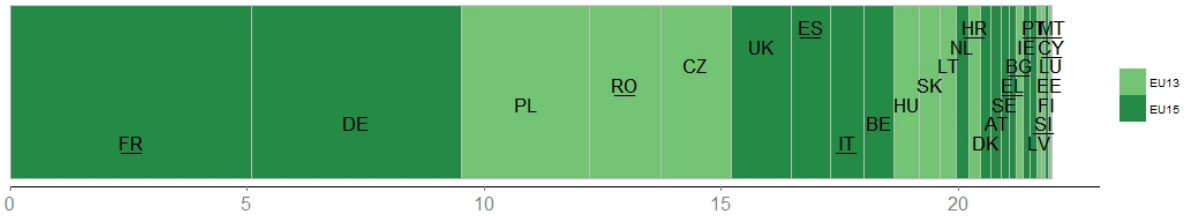


Source: Authors based on Eurostat dataset ef_kvftreg
Note: The bar plots the Standard Outputs of the cattle sector of each MS in descending magnitude. MS belonging to the EU13 are marked in light green. MS belonging to the EU-S are underlined. Data for 2013 in bln euros.

For **mixed farms with cattle, no structural differences exist** between EU15 and EU13 as well as EU-N and EU-S (Figure 17)[14]. **More than half of the total SO** of this production type (56%) is **generated in France, Germany and Poland**. The **EU13 contribute 35%** while the **EU-S contribute 40%** to the total SO of this production type (Table A1.8). As indicated by Figure 17, the **mixed farms with cattle** are the production type within the EU cattle sector that is **most evenly spread between northern, southern, western and eastern MS**.

[14] This finding results from the econometric analysis shown in Table A1.7 which suggests no significant differences between these two parts of the EU.

Figure 17: Contributions (in bln euros) of MS to the TSO of EU mixed farms with cattle



Source: Authors based on Eurostat dataset ef_kvftreg
Note: The bar plots the Standard Outputs of the cattle sector of each MS in descending magnitude. MS belonging to the EU13 are marked in light green. MS belonging to the EU-S are underlined. Data for 2013 in bln Euros.

Table 15 highlights the regional differences among the EU MS in the north and the west in comparison with the MS in the east and around the Mediterranean Sea with respect to the largely differing contributions they make to milk production of the EU cattle sector. The farms of the EU cattle sector kept **23.5 million dairy cows in 2015**. About **22%** of these animals were located **in the EU13** and **36% in the EU-S**. **Average milk yield** per cow amounted to **6859 kg per year**. **Cows in the EU15 and EU-N** were on average substantially **more productive** than animals in the EU13 and EU-S, respectively. They produced on average about 2200 kg and 874 kg more milk per year, respectively. That is, the EU15 and EU-N **exceeded the yields per animal in the EU13 and EU-S by 43% and 14%**, respectively.

Table 15: The structure of milk production in the EU in 2015

(A) REGION	(B) DAIRY COWS		(C) MILK YIELD		(D) MILK PRODUCTION		(E) MILK DELIVERIES		(F) PRODUCED MILK DELIVERED (D)/(E)
	NUMBER (1000)	SHARE	AMOUNT (KG/COW)	RELATION TO EU AVERAGE	AMOUNT (1000t)	SHARE	AMOUNT (1000t)	SHARE	
EU	23,364	100%	6,859	100%	160,258	100%	152,189	100%	95%
EU15	18,146	78%	7,356	107%	133,491	83%	130,777	86%	98%
EU13	5,218	22%	5,130	75%	26,767	17%	21,412	14%	80%
EU-N	14,907	64%	7,175	105%	106,966	67%	103,737	68%	97%
EU-S	8,457	36%	6,302	92%	53,292	33%	48,452	32%	91%

Source: Authors based on European Commission (2016m)
Note: Column (E) quantifies the milk amounts delivered to dairies. Column (F) displays the share of the milk delivered from the amount of milk produced. The share not delivered to dairies is either used as feed or for other on-farm purposes (e.g. for the subsistence use of farm household) or is directly marketed. The underlying data is contained in Table A2.1. The rows of EU15 and EU13 (EU-N and EU-S) add up to the EU total values.

160 m tonnes of milk were produced in the EU in 2015. **83% and 67%** of this quantity **was produced in the EU15 and the EU-N**, respectively. 95% of this production is delivered to dairies; however, the shares which do not enter the milk processing industry differ strongly by region. While in the EU15 98% are delivered to dairies, only 80% in the EU13 are delivered. This difference is much smaller between EU-N and EU-S. Hence, **farmers in the EU15 and EU-N receive from one dairy cow substantially more income** than in the EU13 and EU-S, respectively, as their average yield per cow is higher and almost all of this milk is marketed to dairies.

Table 16 assesses the associations of these national dairy market characteristics with each other and with a number of key macroeconomic variables[15]. **Milk production, milk deliveries and the cow number** of the MS are **very strongly associated with each other**. All of these three characteristics have, however, **no association with the average milk yield per cow**. Milk yield is moderately positively related with GDP/capita and moderately negatively with the accession year. Hence, **the higher the GDP/capita** of a MS, **the higher its average milk yield** tends to be; the association between these two variables is however only moderate.

Table 16: Macroeconomic MS characteristics and their structure of milk production

	Population	GDP	Accession year	Population density	GDP/capita	Milk deliveries	Milk production	Cow number	Milk yield
Area	++	++	-	o	o	++	++	++	o
Population		+++	--	o	o	+++	+++	+++	o
GDP			--	o	o	+++	+++	+++	o
Accession year				o	--	--	--	--	-
Population density					o	o	o	O	o
GDP/capita						o	o	O	+
Milk deliveries							+++	+++	o
Milk production								+++	o
Cow number									o

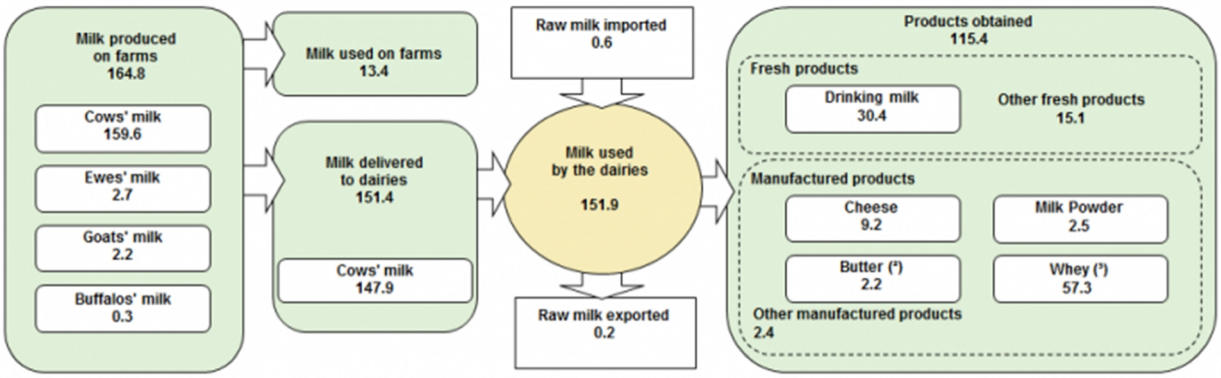
Source: Authors based on European Commission (2016m) and European Union (2016)
Note: The table is based on the bivariate Pearson correlation coefficients of these characteristics for all MS. The underlying data is shown in Table A2.1.The symbols denote the following: +++ means a strongly positive association between the two characteristics (correlation ≥0.8), ++ means a moderately positive association (0.8> correlation ≥0.5), + means a weakly positive association (0.5> correlation ≥0.25), o means no association (0.25> correlation ≥-0.25), - means a weakly negative association (-0.25> correlation ≥-0.5), -- means a moderately negative association (-0.5> correlation ≥-0.8) and --- means a strongly negative association. For example, +++ signals a strongly positive association between two characteristics. Consider the intersection between the row "Population" and the column "GDP" in the table above. Its value is +++, that is, if a MS has one of the largest populations of the EU, then its GDP will also be among the MS with the largest GDPs. -- means that there is a moderately negative association between two variables. Consider the value -- of the intersection between "GDP" and "accession year". The higher the accession year (that is, the later a MS has joined the EU), the lower its GDP was in 2015. A - or a + indicates a weakly negative or positive association. The symbol o is interpreted as no association between two variables, as is the case with, for example, the intersection between "accession year" and "population density". Data for 2015 (except for the accession years).

[15] The analysis focuses on the relationship of the dairy structure variables among each other and their relationship to the macro-economic variables and skips the analysis of the relationships among the macroeconomic variables among each other.

Population density of a MS has **no relation with** any of the **dairy sector characteristics**. This points to the fact that less densely populated MS are not less productive, neither are more densely populated MS more productive than others. GDP per capita have mostly no relationship with MS dairy sector characteristics, except for one case. **The later the MS joined the EU, the lower its milk yield per cow** tends to be. The **accession year of the MS** is the only characteristic that shows **substantial negative associations with most other variables**; **milk production, milk deliveries and also cow numbers** are strongly negatively correlated. Hence, **the later a MS joined the EU**, **the lower** will be the values of these characteristics in comparison to other MS. The **total population** of a MS as well as its **total GDP are strongly positively related to the total cow number, milk production and milk deliveries** in the MS. This correlation is partly due to the general economic potential of the MS, which yields also a highly specialized and productive dairy sector. The **total area of a MS** is also **strongly positively associated with** the **total population, total GDP, total milk production and deliveries and MS's cow numbers**, since the cattle sector strongly depends on the availability of land.

Figure 18 outlines the structure of the dairy supply chain in the EU which is directly related to the raw milk produced; thus, it also partially includes foreign trade in dairy. The graph indicates the quantities produced by the varying milk producing animals kept by EU agriculture as well as the quantities of major dairy products obtained from raw milk. **97% of all milk produced in the EU is produced by cattle**. **92% of the milk produced is delivered to dairies**. **Foreign trade in raw milk is of negligible magnitude**. About **20% of the raw milk is processed into fresh drinking milk** and an additional 10% into other fresh milk products. The **remaining 70% are processed into manufactured dairy commodities**. From that, about 9 mt of cheese, 2.5 mt of milk powder and 2.2 mt of butter are obtained as well as 57 mt of whey as a by-product.

Figure 18: The dairy supply chain of the EU

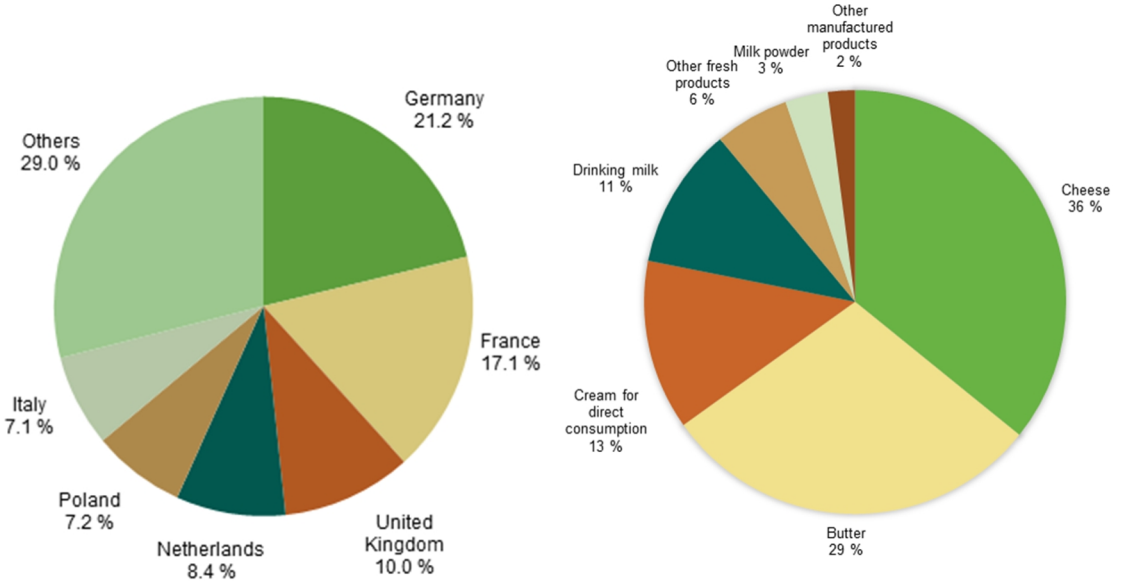


(¹) 2013 for Croatia; only flows of raw milk are displayed; changes in stocks are not recorded.
(²) Includes other yellow fat dairy products; expressed in butter equivalent.
(³) In liquid whey equivalent.

Source: Eurostat (2016c)
Note: Numbers in million tonnes. Data for 2014.

Figure 19 breaks this supply chain down into national shares of production and shares of raw milk quantities processed by the dairy industry. The **three MS which produce the largest milk quantities** in the EU are **Germany, France and the UK**. Together they almost account for **50% of EU milk production**. The Netherlands, Poland and Italy account together for slightly more than one fifth. The remaining 22 MS only contribute in total 29% to the total milk production. Hence, **six of the 28 MS** (21%) **account for almost three quarters** of total EU milk production, while farmers in the **remaining 80% of the MS generate together less than one third of EU milk production**.

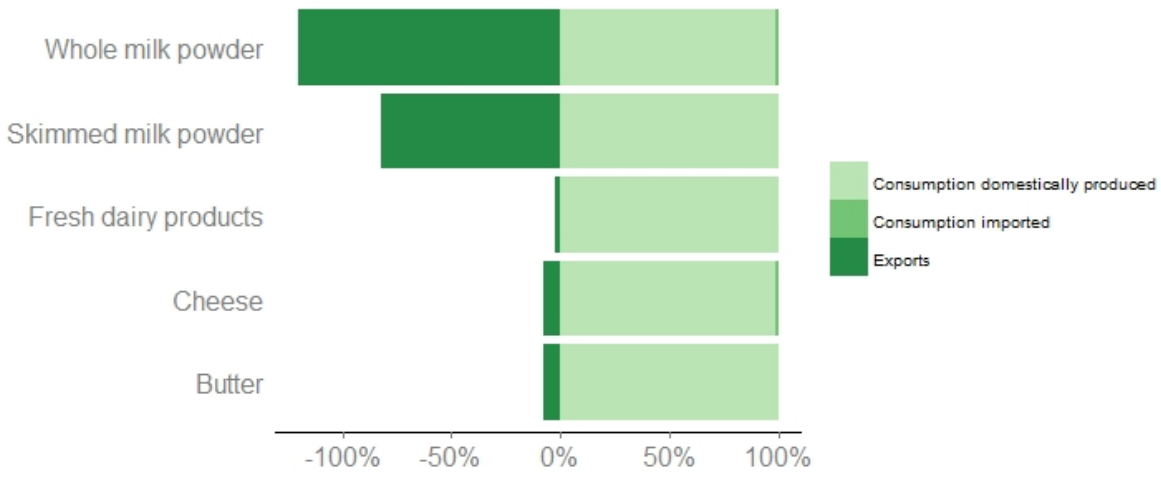
Figure 19: Shares of EU milk production and processing



Source: Eurostat (2016c)
Note: Shares of MS in the total EU quantity of cow milk delivered to dairies, shown in the pie-chart on the left-hand side. The shares of the quantities of raw milk delivered and processed into a number of dairy products are shown in the pie-chart on the right-hand side. Data for 2014.

Figure 20 summarizes the structure of foreign trade of the most important dairy products. It splits the domestic production into the portion domestically consumed and exported and adds the imports used for domestic consumption. The exports of the dairy products produced domestically are measured relative to the total domestic consumption (including the negligible import quantities). The figure stresses that the **EU is more than self-sufficient for dairy commodities**. **For some storable manufactured dairy products**, such as milk powders, the **EU exports about the same quantities as consumed domestically**.

Figure 20: EU domestic consumption, exports and imports of dairy commodities

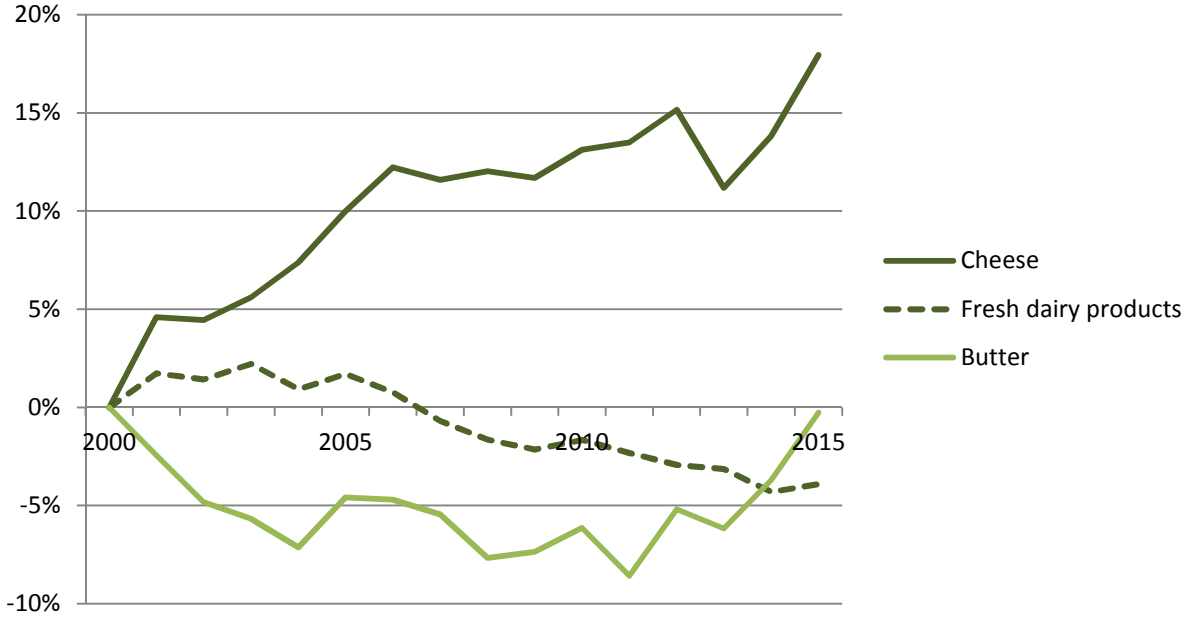


Source: Authors based on Eurostat Comext dataset DS-016893
Note: The shares are based on quantities produced and traded. The data has been normalized to the amount of domestic consumption because the EU consumption quantities of these commodities differ from each other by almost 14,000%. For example, while 46 mt of fresh dairy products were consumed, only 340,000 t of whole milk powder were consumed. Data for 2015.

2.2. Domestic Demand

Consumption of dairy products has experienced profound change during the last 15 years. Figure 21 compares the consumption trends of selected dairy products.

Figure 21: Evolution of per capita consumption of selected dairy products in the EU



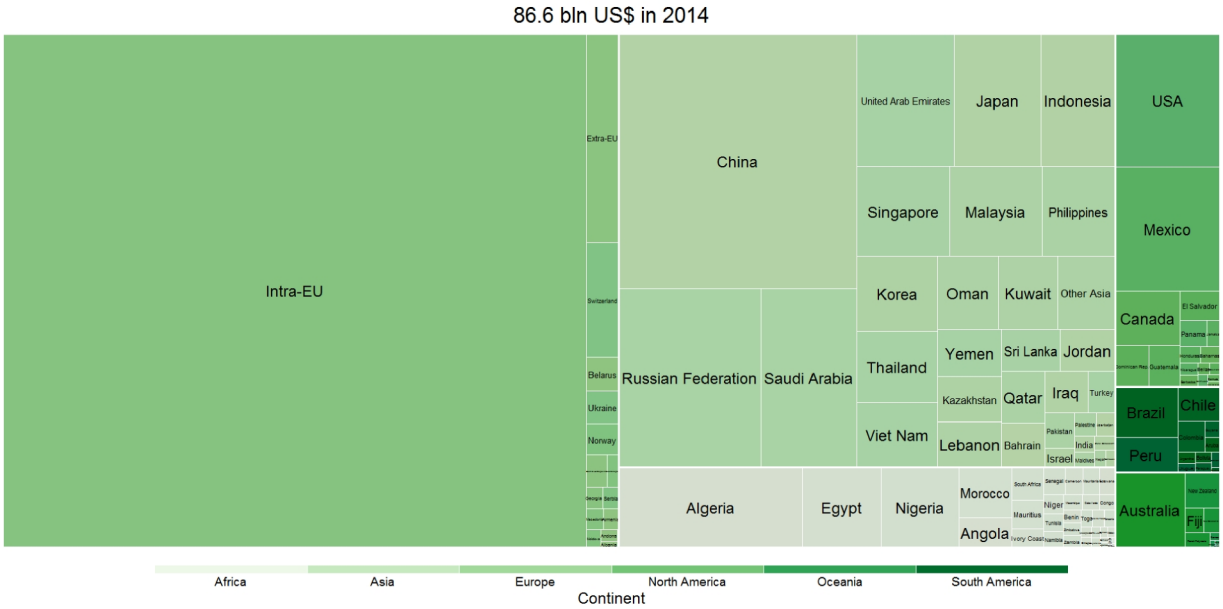
Source: Authors based on European Commission (2016m)
Note: All variables are indexed, that is, the value in 2000 is set to equal 0, the values of the original variables for the following years are each divided by the value in 2000 of the corresponding variable in and 1 is subtracted from the quotient. Therefore, this graph shows the relative changes of the variables in compared with year 2000. The original data is measured in kg/capita.

Consumption of butter and fresh dairy products has been showing a **slightly negative trend**, although butter consumption has rebounded since 2011 such that it reached in 2015 again the same level as in 2000. Fresh dairy products have however been showing a persistently declining trend of per capita consumption of about 0.6 percentage points per year since 2005. In contrast, **cheese shows a persistently increasing trend** of 1.2 percentage points per year so that average per **capita cheese consumption in 2015 was 18% higher than in 2000**.

2.3. Global Import Demand

Global demand for dairy products is dominated by imports within the EU. **China, Russia, Saudi Arabia and Algeria** belong to the five largest importers (Figure 22). All of these countries imported dairy products amounting to more than 2 bln US$ in 2014. Intra-EU dairy imports account for about half of global dairy imports and **Chinese imports** for **about one tenth**. **Imports to the EU from outside** are below 1 bln US$, that is, they **account for only about 2% of total EU dairy total imports**. **Apart from the EU, Asian countries account for the lion's share** of the rest of global dairy imports (34% in 2014, see Table A1.22). North America and Africa follow with 13% and 12%, respectively. **14 Asian countries import dairy products of the significant size of more than 0.5 bln US$** per year, with China and Russia being the largest ones. Also, a number of **MENA countries** appear to be major dairy importers. Canadian dairy imports also have a magnitude of about 0.5 bln US$. **Quickly growing emerging economies**, such as Mexico, Korea, Malaysia, Philippines, Chile or Peru, **import substantial amounts** of dairy products worth several hundred million US$.

Figure 22: Market shares in global imports of dairy commodities



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global imports of dairy commodities. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the import values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global imports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade, based on the value shares of 2014 in Figure A1.6. Data for 2014. The summary of trade value shares per continent is given in Table A1.22, p. 206.

Table 17 outlines the major global dairy import developments in the last decade. **Asia and Africa experienced the highest growth: about 300%**. While the **Asian share** in global dairy imports has thus **grown to be about one third of total global imports**, the **share of all African countries only accounts for 6%.** That is, Asia has absorbed most of the quantities resulting from the increase in global imports. Europe and North America, two of the continents realizing the largest net earnings from bovine products trade (Figure 15), have experienced the lowest increases in dairy imports.

Table 17: Development of dairy product imports by continent 2004-2014

Continent	Imports 2014	Share 2014	Change 2014 vs. 2004
Africa	5.5	6%	+246%
Asia	29.8	34%	+310%
Europe	43.8	51%	+90%
North America	5.1	6%	+63%
Oceania	1.1	1%	+215%
South America	1.2	1%	+179%
Sum	86.6	100%	

Source: Authors based on Comtrade (2016)
Note: These values are the sum of the import of all the relevant HS6 commodity categories as outlined in Table A1.18. Import values in bln US$. Growth in nominal terms.

Table 18 shows the eight countries with the largest growth in dairy imports during the last decade. **Import quantities for most of these countries** are nevertheless **on a very low level** corresponding to shares in global imports of less than 1**%. In total, they only account for one eighth of total dairy imports**. Among these countries, there are three

countries with a Muslim population majority and three Asian countries. **China is the exception: dairy imports have increased ten-fold since 2004, and the country currently accounts for about 10% of global dairy imports**.

Table 18: Largest increases in dairy product imports 2004-2014

Country	Imports 2014	Share 2014	Change 2014 vs. 2004
Colombia	0.12	0.1%	+2160%
Egypt	0.88	1.0%	+1122%
China	8.41	9.7%	+1028%
Pakistan	0.15	0.2%	+841%
Belarus	0.15	0.2%	+582%
New Zealand	0.17	0.2%	+530%
Ukraine	0.15	0.2%	+498%
Kuwait	0.60	0.7%	+430%
Sum	10.62	12.3%	

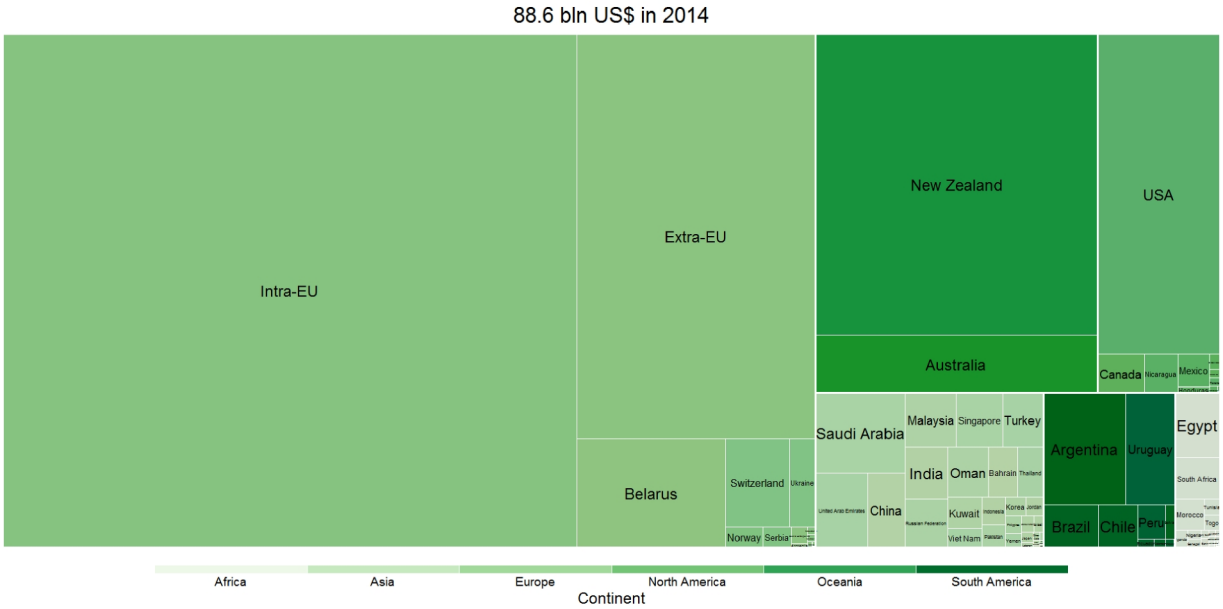
Source: Authors based on Comtrade (2016)
Note: These values are the sum of the import of all the relevant HS6 commodity categories as outlined in Table A1.18. Import values in bln US$. The column "Shares 2014" denotes the share of the country's dairy product imports in the total global dairy product imports in 2014. Growth in nominal terms. As there are many countries which had very low import values in 2014 despite huge growth rates of several ten thousand percentage points, in the table only the countries that had in 2014 an import value of 0.1 bln US$ (corresponding to a world market share of dairy imports of 0.12%) are considered.

2.4. Domestic Supply

At the global level, the **EU accounts for more than 60% of all dairy exports** (Table A1.22). Of that, intra-EU dairy exports is almost half of all global dairy exports, indicating a **pronounced specialization across MS**. About **one quarter of the domestic supply of dairy products of the EU is exported**. This share has been **rising since 2006** (Figure A1.6).

Figure **23** suggests that there are **only a few countries that export dairy products in substantial amounts**. The **EU and New Zealand dominate global dairy exports.** Dairy trade exports of the EU ('extra-EU') and New Zealand each account for about 15% of the total value of exports (Figure **23**). Other **large players in dairy exports are the US, Belarus, Australia, Argentina and Saudi Arabia,** all of which exported dairy products of a value of more than 1 bln US$ in 2014. These five countries together have a share of about the same magnitude as extra-EU or New Zealand exports.

Figure 23: Market shares in global exports of dairy commodities



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global dairy exports. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the export values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global exports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade, based on the value shares of 2014 in Figure A1.6. Data for 2014.

In the remainder of this chapter, the regional structure of the farms belonging to the EU dairy sector and the development of domestic supply are analysed in detail.

2.4.1. Farm numbers

The **regional distribution of specialist dairying farms** in Map 4 **shows a similar pattern as the distribution of all cattle-keeping farms** in Map 1. The regions with the **highest numbers** of this farm type **are mostly located along the north-eastern and central-eastern border of the EU**. Instead of Ireland, a disproportionate number of farms of this type is located **in and around the Alps**, i.e. together Bayern and Austria having 60,000 of these farms.

The **typical region of the EU** as measured by the median of these farm numbers **has 2,250 specialist dairy farms**. The **regions with the five highest farm numbers account for 36%** of all specialist dairying farms in the EU (Table 19). This finding and the fact that some of them have 30 times as many specialist dairy farms as the typical region indicate a **very high degree of an uneven regional distribution**[16].

[16] This statement only holds for farm numbers; it has no implications for farm sizes or the income situation.

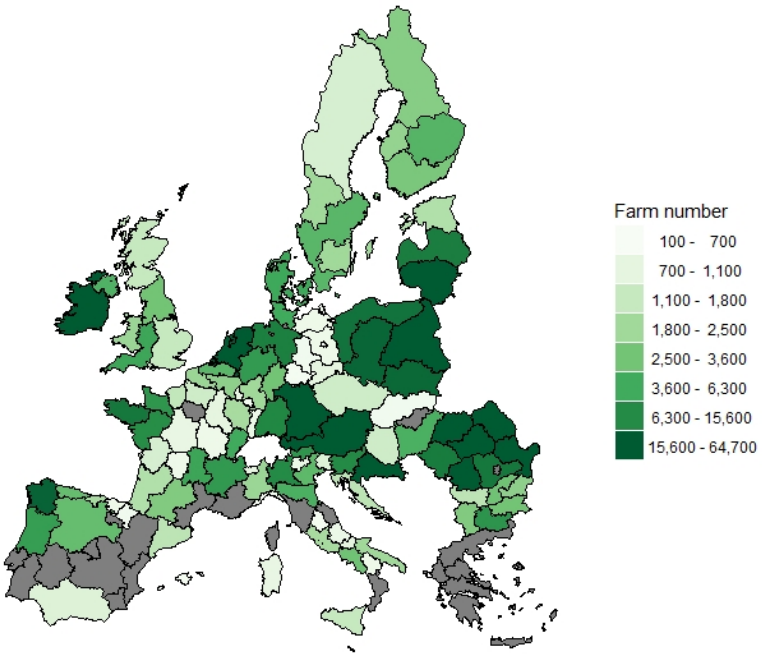
Table 19: Regions with the most and least specialist dairying farms

Region (MS)	Specialist dairying farms	Region (MS)	Specialist dairying farms
Nord-Est (RO)	64,700	Thüringen (DE)	200
Mazowsze and Podlasie (PL)	64,300	Liguria (IT)	200
Nord-Vest (RO)	42,600	Umbria (IT)	200
Bayern (DE)	32,300	Baleares (ES)	200
Sud-Est (RO)	27,100	Malta (MT)	100
Sum (share in total)	231,000 (36%)	Sum (share in total)	900 (0.1%)

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions with the most specialist dairying farms. The two right-most columns show the five FADN regions with the least cattle-keeping farm numbers. For 15 FADN regions, no data was available. Data for 2010.

In 2010, **16 FADN regions had at least 10,000 farms** of this type. Of these regions, **five were located in Romania and four in Poland**. In the EU15, only the regions of Bayern (32,300 farms), Austria (27,000), the Netherlands (17,400), Ireland (15,600) and Galicia (ES, 13,600) belonged to this group.

Map 4: Regional distribution of specialist dairying farms



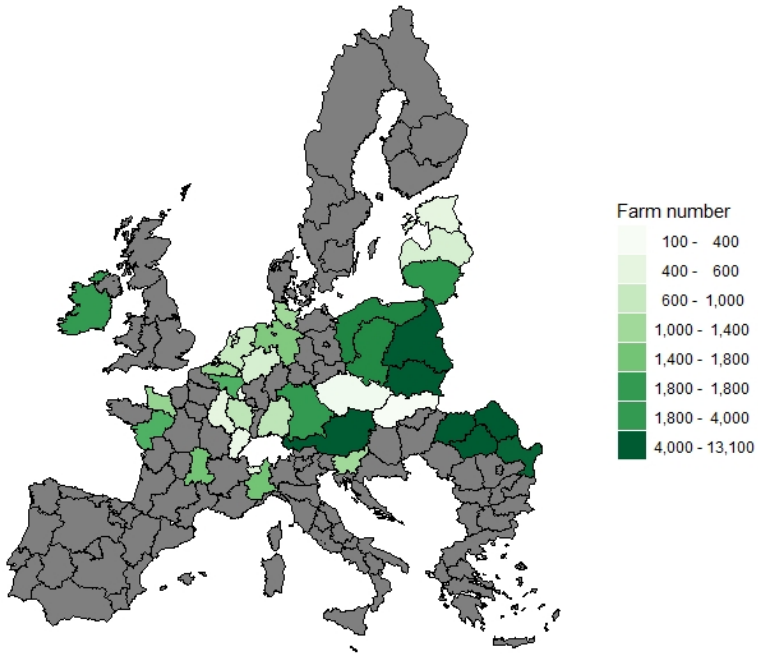
Source: Authors based on European Commission (2016j)
Note: The plot shows the number of specialist dairying farms per FADN region (principal farming type (45)). Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2010.

The **regions with the lowest numbers of these farms tend to be located in the EU-S** (Italy, France, Spain). Map A1.1, p. 191, shows that the cattle sector is of minor importance for their regional agricultural structure. The **share of cattle-keeping commercial farms**

in this part of the EU amounts to very low levels, **often below 10%** of the total number of commercial farms. However, in the **centrally located EU regions, such as the Czech Republic, Slovakia and Eastern Germany** (e.g. Thüringen), the number of specialist dairying farms is low. The reason is that in these regions **large post-socialist farming structures dominate** the cattle sector, as proven by Map 6.

Most farms which are specialized in cattle production but **produce milk as well as bovine meat are located** in Austria and Romania **in the mountainous areas of the Alps and the Carpathians** (Map 5). In most **Austrian** NUTS2 **regions**, these farms **rank among the 50 richest farms of the 276 NUTS2 regions**, having a PPS per inhabitant of about 130% of the EU average. However, the NUTS2 regions corresponding to the **Romanian FADN regions** (see also Map A.2) in which this farm type is of similar importance in terms of farm numbers **rank among the 20 poorest NUTS2 regions**, having a PPS per inhabitant of 30-50% of the EU average (Eurostat, 2016l). **58% of these farms are located in the EU13**.

Map 5: Regional distribution of dairying and meat farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the number of farms of principal farming type (47) per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2010. Map A2.1 and Map A2.2 on pages 216 et seq. display the regional farm distribution of the other two principal farming types belonging to the EU dairy sector.

This production type of the EU dairy sector is much **less frequent than the specialist dairy farms**. While the latter amounted to 642 thousand commercially operated holdings in 2010, the former only amount to **81 thousand holdings, i.e. 13%**. However, this farm type is even **more regionally concentrated** than specialist dairy farms: **the five regions with the most farms of this type account for 56%** of the total number of these farms throughout the EU (Table 20). Among the 34 FADN regions in which this farm type is recorded, the typical region has 1,200 farms of this type. **62% of these farms are located in the EU13**.

Table 20: Regions with the most and least dairying and meat farms

Region (MS)	Number of com. farms	Region (MS)	Number of com. farms
Nord-Est (RO)	13,100	Franche-Comte (FR)	300
Austria (AT)	12,800	Acores e Madeira (PT)	300
Nord-Vest (RO)	10,100	Luxembourg (LU)	200
Centru (RO)	5,500	Czech Republic (CZ)	200
Malopolska and Pogorze (PL)	4,100	Slovakia (SK)	100
Sum (share in total)	45,600 (56%)	Sum (share in total)	1,100 (1%)

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions in which the largest numbers of commercial dairying and meat farms (principal farming type (47)) are located. The two right-most columns show the five FADN regions in which the lowest numbers of principal farming type (47) are located. 89 FADN regions were recorded not to have any commercial farms of this type. Data for 2010.

Mixed livestock farms and crops and cattle farms, that is, the other two farm types belonging to the EU dairy sector, are mainly located in regions of the EU13. **96% and 71% of these two farm types, respectively, are located in the EU13** (Figure 4 and Table 21). **Concentration among regions is 62% and 46%, respectively**, and of a similarly high degree as for the other two farm types. While crops and cattle farms also exist in the EU15 to some extent (Map A2.2), **mixed livestock farms barely operate in the EU15** (Map A2.1). Mixed livestock farms are only reported for 25 regions, mainly found in Poland and Romania. Smaller numbers are also existing in Croatia, Austria and the western part of Germany. Crops and cattle farms are much more spread, being reported in 76 FADN regions.

Table 21: Regions with the highest numbers of mixed livestock farms (73) and the highest number of crops & cattle farms (83)

(73) - Region (MS)	Number of com. farms	(83) - Region (MS)	Number of com. farms
Sud-Muntenia (RO)	41,100	Mazowsze and Podlasie (PL)	41,100
Mazowsze and Podlasie (PL)	32,900	Malopolska and Pogorze (PL)	26,100
Nord-Est (RO)	27,100	Wielkopolska and Slask (PL)	15,800
Sud-Vest-Oltenia (RO)	26,000	Sud-Vest-Oltenia (RO)	14,600
Nord-Vest (RO)	22,700	Nord-Vest (RO)	10,100
Sum (share in total)	149,800 (62%)	Sum (share in total)	107,700 (46%)

Source: Authors based on European Commission (2016j)
Note: The two left-most columns contain the regions where the most commercial mixed livestock farms (principal farming type (73)) are located. The two right-most columns contain the regions in which the highest number of commercial crops and cattle farms (principal farming type (83)) are located. Data for 2010. For 98 regions, no data was available. See also Map A2.1 and Map A2.2.

2.4.2. Farm sizes

The **distribution of the economic size of farms** (measured in standard output) of the EU dairy sector **shows a very distinct pattern**. The largest farms of all four types are located in the centre of the EU, that is, in **East Germany, Slovakia and Denmark** (Table 22 and Map 6). Large specialist dairying farms are also found in **the UK and the Czech Republic**. The largest dairying and meat farms as well as mixed livestock farms are also found in the

Benelux. Most notably, **both the largest and smallest farm sizes are found in former Warsaw Pact countries**. The **farm size structure has largely survived the economic transformation** experienced by these countries **following 1990**. Table 22 illustrates **the magnitude of the regional differences** in average economic size of farms of the EU dairy sector. In the case of specialist dairying, farm size differs between East Germany and Romania for some regions **up to a factor of 200** or more.

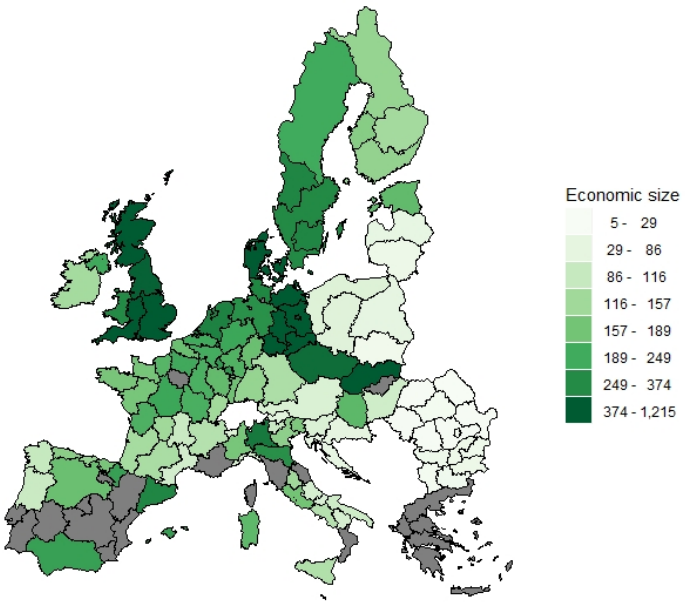
Table 22: Regions with the highest and lowest economic size of specialist dairying farms (in 1,000 euros standard output per FADN region)

Region (MS)	Economic size	Region (MS)	Economic size
Brandenburg (DE)	1,215	Sud-Muntenia (RO)	8
Sachsen-Anhalt (DE)	1,033	Sud-Est (RO)	6
Thüringen (DE)	977	Nord-Vest (RO)	6
Mecklenburg-Vorpommern (DE)	964	Sud-Vest-Oltenia (RO)	6
Sachsen (DE)	861	Nord-Est (RO)	5

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions that have the largest average economic size of specialist dairying farms (principal farming type (45)). The two right-most columns show the five FADN regions that have the smallest economic size of specialist dairying farms (principal farming type (45)). Data for 2013. For 14 regions, no data was available.

Map A2.12, Map A2.13 and Map A2.14 show similar patterns as Map 6: the largest EU dairy farms are located in central EU and partly in the UK, and the **smallest farms are found in Romania and other EU13 countries as well as in Greece**.

Map 6: Regional distribution of economic size of specialist dairying farms (measured in 1,000 euros standard output per FADN region)



Source: Authors based on European Commission (2016j)
Note: The plot shows the average economic size of specialist dairying farms (principal farming type (45)) measured in SO in terms of 1000 € per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason.

2.4.3. Production output

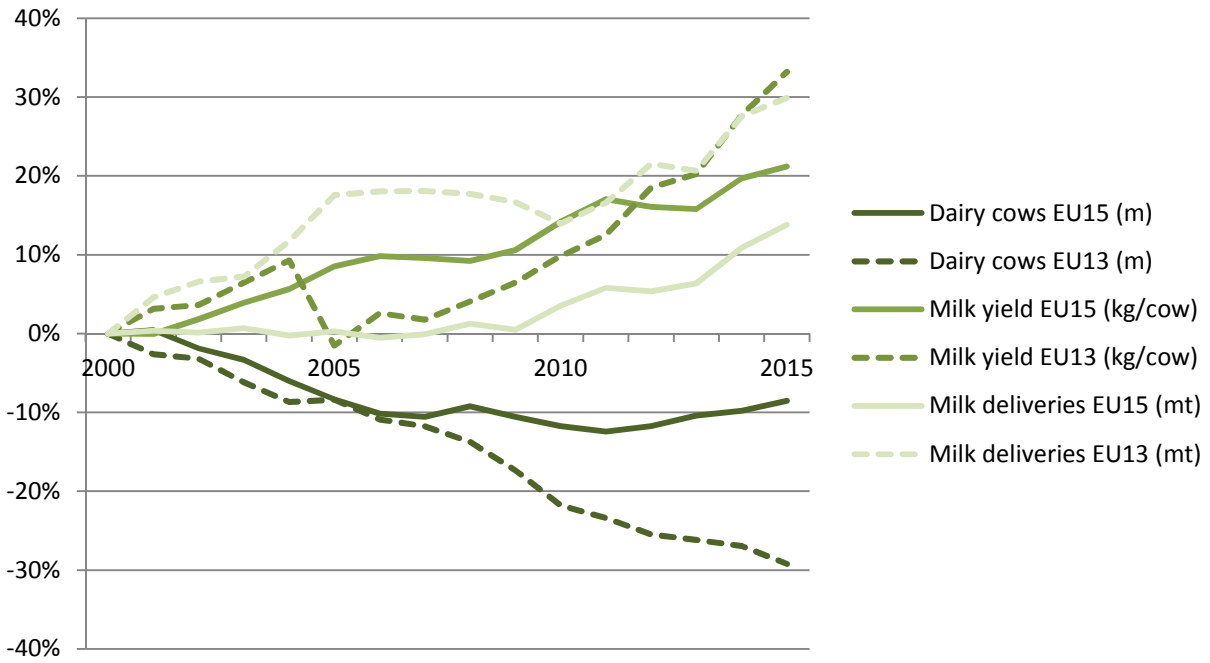
Production structure of the farms belonging to the EU dairy sector has markedly changed during the past 15 years. Figure 24 summarizes the development of key variables of EU milk production since 2015: the number of dairy cows (measured in million heads), the milk yield (measured in kg per dairy cow) as well as the total amount of milk delivered per year by farmers to dairies. **Not all milk produced by farmers is delivered to dairies for processing**: the share sold to dairies varies around 90% of the total milk production and shows a stable increasing trend since 2000 (European Commission, 2016i). The graph distinguishes between the development of dairy production in the EU15 and the EU13.

The **amount of milk produced per cow**, which is a measure of productivity, **has risen** substantially **by 20% in the EU15 and 33% in the EU13** since 2000. This **convergence of productivity** is not unexpected, since the **average productivity of the EU13 was in 2000 only 64% of the average productivity in the EU15** (see Table A2.2, p. 214, for the absolute values). The path of **productivity development differed substantially between both groups of MS**. The **productivity gap** between the EU15 and EU13 **widened until 2007**, since milk yields in the EU15 rose by 10% as they stayed stable in the EU13. **After 2007, the productivity levels converged** towards each other, since milk yields in the EU13 have been steeply rising since then and on average rising more strongly than in the EU15.

As the quota system limited the milk quantities delivered to dairies until April 1st 2015, the productivity increase induced a shrinking herd size. **Until 2007, the number of dairy cows reduced by 10%** in both groups of MS. Afterwards, a very distinctive development took place. **Cow numbers in the EU15 reached a minimum in 2011 and increased since then**. Contrastingly in the **EU13**, the **decline in cow numbers accelerated after 2007**: until 2010 10% less cows were kept. In the following 5 years, the number declined again by 10%, such that the number of cattle kept for milk production had strongly **declined by more than 30% in the EU13, while it only reduced by 10% in the EU15**.

Milk deliveries have risen during the past 15 years by more than 30% in the EU13 and 16% in the EU15. Especially **since 2013, they have grown considerably** in both parts of the EU. The path of the growth was again remarkably **different between the EU13 and EU15**. While they **quickly rose by 20% until 2005 and remained stable until 2010 in the EU13**, EU15 deliveries did not change until 2009 and only started to rise moderately after 2010. However, as illustrated by Figure A2.2, the **share of the EU13 in total EU milk deliveries remained virtually stable at about 14%**. This trend indicates that the convergence in productivity visible in the milk yield per cow rising to 75% and the reduction in herd size from 27% to 21% set off each other to a large extent.

Figure 24: Development of EU milk production since 2000



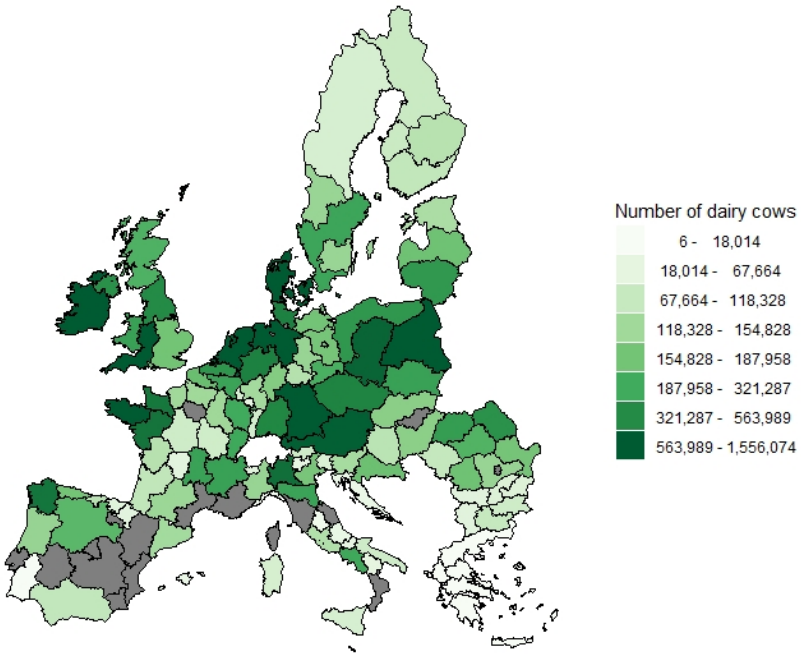
Source: Authors based on European Commission (2016i)
Note: All variables are indexed, that is, the value in year 2000 is set to equal 0 and the values of the variables for the following years are each divided by the value in 2000 of the corresponding variable and one is subtracted from the resulting quotient. Therefore, this graph shows the relative changes of the variables in comparison with 2000.

Table A2.3 shows that **these developments diverged substantially at the level of a single MS**. Farmers in the three MS which contribute more than 40% of the total standard output of the EU cattle sector (**DE, FR and UK**) **reduced their dairy herd by 18%, 22 % and 26%**, respectively, while their **milk deliveries increased by 19%, 8% and 8%**, respectively. In particular, **smaller MS of the EU13 experienced substantial structural change** in these 15 years. While **milk deliveries more than doubled in Latvia and Croatia, the herd size almost halved** over the same period. In **Slovakia, Estonia, Lithuania and the Czech Republic, milk cow numbers decreased** even **more strongly**. The change in deliveries was heterogeneous among the EU13 MS. In several of them, **deliveries barely rose or even shrunk. This development took place in the Czech Republic, Slovakia and Hungary**. **In only three of the 28 MS, the herd size did** virtually **not shrink** or even grow slightly (**NL, IE and LU**).

2.4.4. Production intensity

The **intensity of milk production appears to be highest in a strip stretching from Ireland to eastern Poland** (Map 7). The **Netherlands, Mazowsze and Podlasie (PL), Bayern (DE) and Ireland have the highest dairy cow numbers of more than 1m each** (Table 23). The five regions with the highest cow numbers keep about one quarter of all dairy cows of the EU. In each of the regions of Bretagne (FR), England-West (UK), Denmark, Austria as well as Wielkopolska and Slask (PL), farmers keep more than half a million dairy cows. Hence, **dairy cows are considerably less concentrated than dairy farms**. The **lowest cattle numbers** are found **in the Mediterranean regions** of the EU, as indicated by Map 7. Herd sizes per farm are largest in East Germany as well as in Slovakia, the Czech Republic, Denmark and around the Benelux and its surrounding regions **(Map A2.3).**

Map 7: Distribution of dairy cows



Source: Authors based on European Commission (2016j)
Note: The plot shows the distribution of dairy cow numbers per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2013.

The pattern of total cattle kept by specialist dairying farms in Map A2.4resembles this pattern closely, while the **regional pattern of total cattle numbers kept by** the three **other dairying farm types** (Map A2.5) **diverges markedly** from it. Most cattle by these farm types are kept in **Poland, the Czech Republic, Pays de la Loire (FR) and Wallonie (BE)** (Table A2.8).

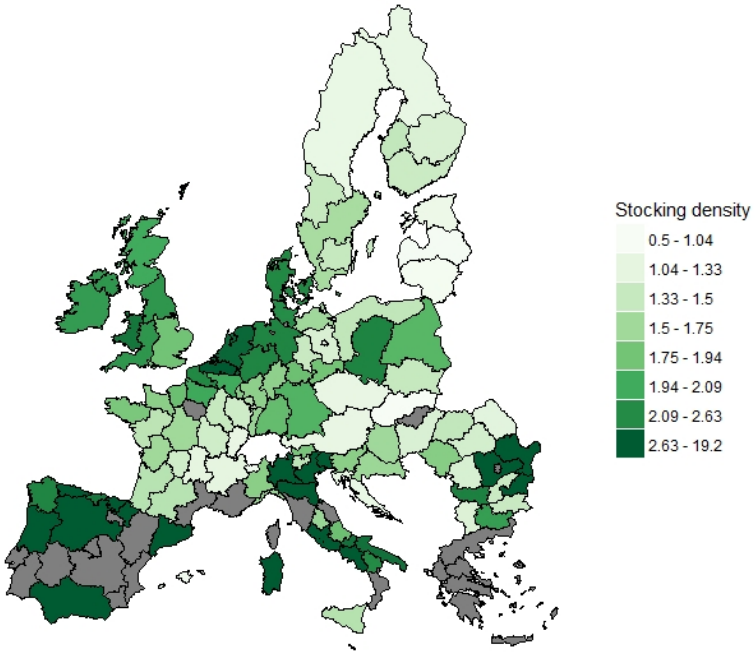
Table 23: Regions with the highest and lowest numbers of dairy cows

Region (MS)	Number of dairy cows	Region (MS)	Number of dairy cows
The Netherlands (NL)	1,556,074	Makedonia-Thraki (EL)	501
Mazowsze and Podlasie (PL)	1,206,766	Ipiros-Peloponissos-Nissi Ioniou (EL)	298
Bayern (DE)	1,199,155	Thessalia (EL)	31
Ireland (IE)	1,055,760	Sterea Ellas-Nissi Egaeou-Kriti (EL)	21
Niedersachsen (DE)	761,958	Alentejo e do Algarve (PT)	6
Sum (share in total)	5.8m (26%)	Sum (share in total)	857 (<0.1%)

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions with the highest numbers of dairy cows. The two right-most columns show the five FADN regions with the smallest numbers of dairy cows. 10 regions did not report any dairy cows. Data for 2013.

The **average dairy herd per farm** shown in Map A2.3differs markedly from the pattern of cow numbers in Map 7, **resembling rather the distribution of the economic size** of dairy farms in Map 6. **Dairy farms of an average size of more than 100 cows are located in East Germany as well as in Slovakia**. **A farm in a typical EU region** as measured by the median keeps **an average 23 dairy cows**. In most **Romanian regions**, dairy farms fall short of this average, having the smallest sizes throughout the EU of on average only **2 to 3 cows per holding**.

Map 8: Stocking density (in LSU per ha UAA) of specialist dairying farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the stocking density of specialist dairying farms (principal farming type (45)) per FADN region measured in LSU per ha UAA. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2013.

Production intensity of specialist dairy farms as measured by **stocking density is highest in EU-S countries**, such as Malta, Italy or Spain, with about 4 LSU per hectare UAA or more (Table 24). In **Scandinavia, the Czech Republic, along the eastern EU border, but also in Austria and central France, average stocking density is lowest** throughout the EU (Map 8), amounting to 1 LSU/ha UAA or less. **Stocking density of dairying and meat farms** (Map A2.6) and mixed livestock farms (Map A2.7) is **highest in and around the Netherlands** as well as East Romania and again lowest in Austria and the Baltic states. **Stocking density of crops and cattle farms is highest in some Spanish and Greek regions**, while it is of the lowest levels in other Mediterranean regions (Map A2.8).

Table 24: Regions with the highest and lowest stocking density (in LSU/ha UAA) of specialist dairying farms

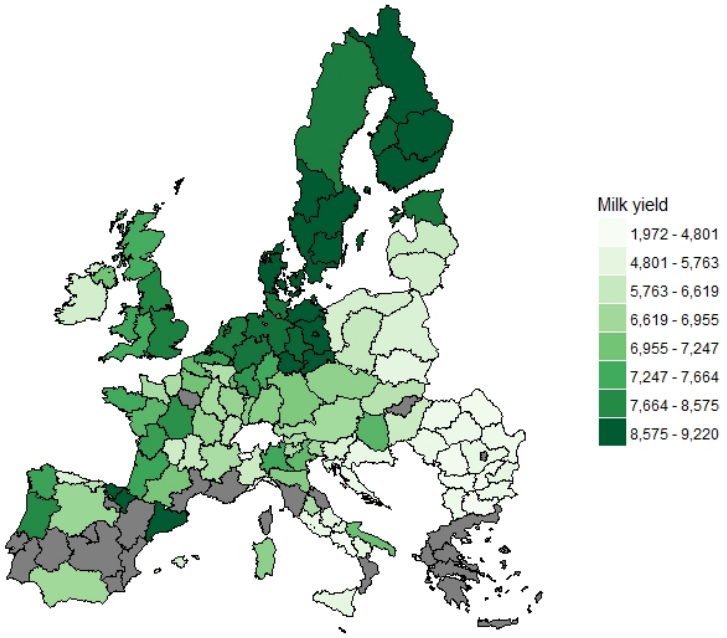
Region (MS)	Stocking density	Region (MS)	Stocking density
Malta (MT)	19.2	Baleares (ES)	0.7
Campania (IT)	5.9	Aosta (IT)	0.7
Lombardia (IT)	4.5	Lithuania (LT)	0.6
Lazio (IT)	4.2	Latvia (LV)	0.6
Veneto (IT)	3.9	Slovakia (SK)	0.5

Source: Authors based on European Commission (2016j)
Note: Stocking density measured in LSU per ha UAA, see Table A.1, p. 170, for an exact definition. The two left-most columns show the five FADN regions with the highest stocking density of specialist dairying farms. The two right-most columns show the five FADN regions with the smallest stocking density of specialist dairying farms. Data for 2013. For 15 regions, no data was available.

2.4.5. Farm productivity

Dairy farm productivity is very heterogeneous throughout the EU, although it **tends to cluster by country** (Map 9). EU regions differ in the productivity of milk production measured by the average milk yield by a factor of 4, that is, the **average regional milk yields range between** more than **9,000 kg per cow and year in Cataluña (ES) and less than 2,000 kg in Italian regions** (Table 25).

Map 9: Regional distribution of the milk yield (in kg/cow) of specialist dairying farms



Source: Authors based on European Commission (2016j)
Note: The map shows the average milk yield in kg/cow of specialist dairying farms (type (45) as defined at the principal type of farming level) per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Map A2.9 and Map A2.11 on page 216 et seqq. display the milk yields for the other four principal farming types belonging to the EU cattle sector. Data for 2013.

The highest milk yields of more than 8,000 kg per cow and year **are clustered in the northern half of Germany, in the two Scandinavian MS and north-eastern Spain** (Map 9). The **lowest milk yields** by specialist milk farms **are obtained in Bulgaria and Romania**. Average regional milk yields of dairying and meat farms and mixed livestock farms are around the same level as the ones of specialist dairying farms in the same region. The highest yields of almost 8000 kg are **clustered in and around the Netherlands** (Map A2.9 and Map A2.10). Average regional yields of **crops and cattle farms show the largest productivity range** of these four production types. They range between 9500 in the FADN region 'England-East' and northwest Italy and 1300 kg in the Greek region of Sterea Ellas-Nissi Egaeou-Kriti (Table A2.14). The highest yields are clustered in East Germany and southern Sweden (Map A2.11).

Table 25: Regions with the highest and lowest milk yield (in kg/cow) of specialist dairying farms

Region (MS)	Average milk yield	Region (MS)	Average milk yield
Cataluna (ES)	9,220	Sud-Vest-Oltenia (RO)	2,774
Thüringen (DE)	8,882	Severozapaden (BG)	2,643
Denmark (DK)	8,879	Yuzhen tsentralen (BG)	2,246
Etela-Suomi (FI)	8,840	Aosta (IT)	1,985
Sachsen (DE)	8,815	Campania (IT)	1,972

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions that have the largest average milk yield in kg/ cow of specialist dairying farms (principal farming type (45)). The two right-most columns show the five FADN regions that have the smallest average milk yield in kg/cow of specialist dairying farms (principal farming type (45)). Data is for 2013. For 15 regions, no data was available.

2.4.6. Farm income

Several MS, such as the UK, Poland, Bulgaria, Romania as well as the Baltic states, **exhibit a largely uniform income level of specialist dairying farms** (Map 10). Other MS, such as Germany, France, Spain and Italy, show very heterogeneous average farm income levels across their regions. The **average annual income of specialist dairying farms is largest in Northern Italy and smallest in Romania and Bulgaria** (Table 26). The largest average regional farm income is almost **sixty times** larger than the lowest average regional income. Regions with the highest average annual income of specialist dairying farms cluster in northern Italy, the UK and East Germany (Map 10). Regions with the lowest farm incomes of this production type cluster in Romania and Bulgaria as well as southern France.

The regional patterns of the **other production types belonging to the EU dairy sector show, in part, similar patterns**. Regions with the largest average income of dairying and meat farms are spread around the central EU. They are scattered across the EU in northern Italy, the Benelux and its surrounding areas and the Czech Republic (Map A2.15). Regions with the lowest average income levels are located in eastern Poland and Romania. The spread between the highest and the lowest regional income is substantially smaller than in the case of dairy farms, as it only amounts to a factor of 22.

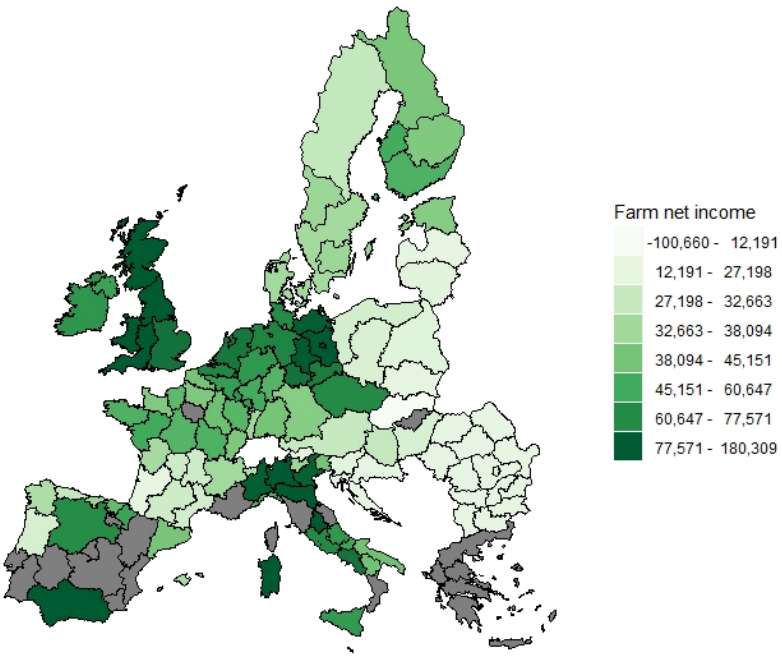
Table 26: Regions with the highest and lowest farm income (in euros/year) of specialist dairying farms

Region (MS)	Net farm income	Region (MS)	Net farm income
Lombardia (IT)	180,309	Sud-Vest-Oltenia (RO)	4,215
Emilia-Romagna (IT)	132,353	Adriatic Croatia (HR)	3,932
Umbria (IT)	111,602	Sud-Est (RO)	3,791
Sardegna (IT)	106,969	Nord-Est (RO)	3,089
Brandenburg (DE)	100,812	Yuzhen tsentralen (BG)	3,039

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions that have the largest average farm net income in Euros/year of specialist dairying farms (principal farming type (45)). The two right-most columns show the five FADN regions that have the smallest farm net income of specialist dairying farms. Data is the average of years 2011, 2012 and 2013. For 14 regions, no data was available. Slovakia is not regarded, since average farm income was negative.

A similar pattern holds for mixed livestock farms (Map A2.16), for which regions with the smallest average income levels are not limited to Poland and Romania, but also located in Lithuania and Slovenia. However, **regional heterogeneity is much larger** than for the previous two farm types, **as the ratio between the largest and lowest average regional farm incomes amounts to 123**. For crops and cattle farms, the pattern differs somewhat (Map A2.17). Regions with the highest average incomes are clustered in East Germany, the Benelux and its surrounding regions as well as southern England. The heterogeneity between the regions is of about the same magnitude as for specialist dairy farms as the ratio between the largest and smallest income is 46. Regions of low average income are partly located in the EU15.

Map 10: Regional distribution of farm income (in euros/year) of specialist dairying farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the average farm net income of specialist dairying farms (principal farming type (45)) measured in € per year for FADN regions. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data is the average of years 2011, 2012 and 2013.

The average regional farm income depends, among other factors, on the farm size. Labour income, therefore, depends on the labour amount used on the EU dairy farms and labour productivity. Map 11 shows the regional distributions of farm net income per AWU of specialist dairying farms. It differs from the pattern shown in Map 10, since **regions with a high labour income are found in northern Italy** (Table 27), **southern Spain, the Benelux and its surrounding areas and parts of the UK**. While East German regions appear to have very low labour income, labour employed by Irish specialist dairy farms is very well paid. Again, regions in the south-eastern EU and along its eastern border have the lowest labour income levels. **Average regional labour income in specialist dairying farming differs substantially and is very unevenly distributed across the EU**; the ratio between the highest and lowest regional remuneration of labour is larger than 5000%.

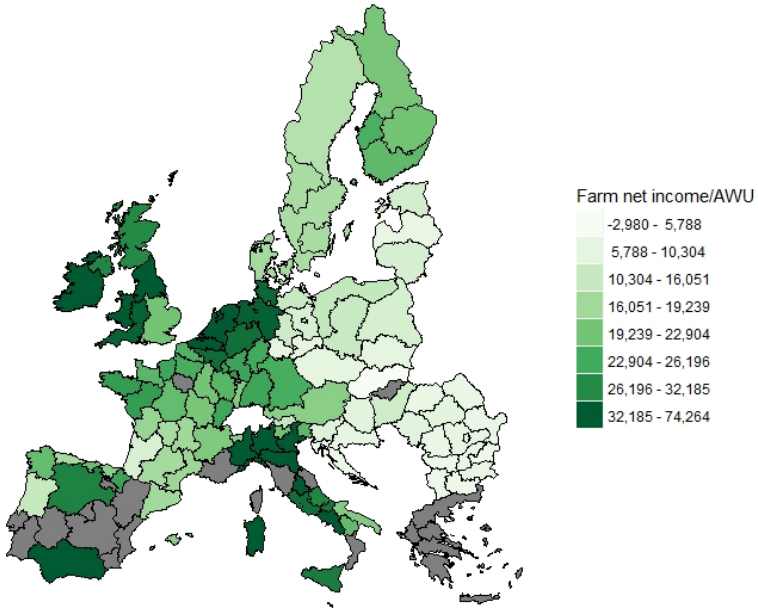
Table 27: Regions with the highest and lowest labour income (in euros/year) of specialist dairying farms

Region (MS)	Labour income	Region (MS)	Labour income
Lombardia (IT)	74,264	Yugozapaden (BG)	2,390
Umbria (IT)	57,525	Severozapaden (BG)	2,281
Sardegna (IT)	47,591	Severoiztochen (BG)	1,948
Emilia-Romagna (IT)	45,709	Yuzhen tsentralen (BG)	1,633
Andalucia (ES)	42,327	Adriatic Croatia (HR)	1,376

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions that have the largest average labour income (farm net income/ AWU) in euros/year of specialist dairying farms (principal farming type (45)). The two right-most columns show the five FADN regions that have the smallest labour income of specialist dairying farms. Data is the average of years 2011, 2012 and 2013. For 14 regions, no data was available. Slovakia is not regarded, since the average farm income was negative.

Ireland and regions in and around the Benelux have the highest average labour income for dairying and meat farms (Map A2.18) **and mixed livestock farms** (Map A2.19). Labour employed by crops and cattle farms is best paid in Belgium, north-eastern France, south-eastern UK, north-western Germany as well as northern Spain (Map A2.20). The **lowest labour income clusters along the eastern EU border for all four farm types belonging to the EU dairy sector.**

Map 11: Regional distribution of labour income (in euros/year) of specialist dairying farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the average farm net income/AWU of specialist dairying farms (principal farming type (45)) measured in € per year for FADN regions. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data is the average of years 2011, 2012 and 2013.

2.4.7. Role in regional economies

The **economic role of specialist dairy farming in the total regional farming sectors is irregularly scattered** across the EU (Map 12). The **typical FADN region** as measured by the median **has a share of 14% of specialist dairying farms** in its total farm number.

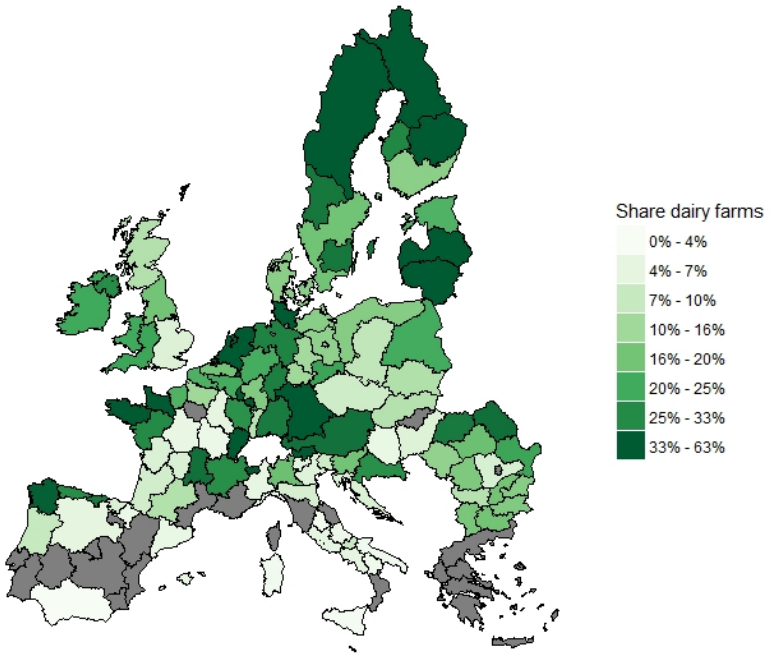
Table 28: Regions with the highest and lowest shares of specialist dairying farms

Region (MS)	Share in com. farms	Region (MS)	Share in com. farms
Franche-Comte (FR)	63%	Puglia (IT)	2%
Bayern (DE)	51%	Sardegna (IT)	2%
Pohjois-Suomi (FI)	48%	Umbria (IT)	1%
Basse-Normandie (FR)	45%	Sicilia (IT)	1%
Lan i norra (SE)	41%	Andalucia (ES)	<1%

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions in which the share of the number of specialist dairying (defined at the principal type of farming level) is highest among all commercial farms in the FADN region. The two right-most columns show the five FADN regions in which the share of the number of specialist dairying among all commercial farms in the FADN region is lowest. Data for 2010.

Specialized dairy farming accounts for the highest shares in regional farm numbers in parts of France, south-east Germany and parts of Scandinavia (Table 28). In these regions about **half of all farms** are specialized in milk production. The only regularity of the pattern in Map 12 is that **specialist dairying farms are of negligible regional importance in most regions bordering the Mediterranean Sea**.

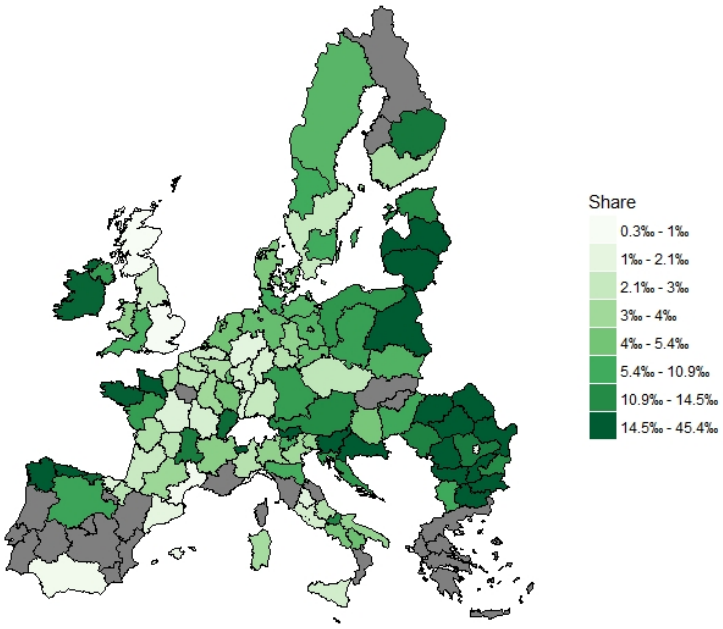
Map 12: Regional distribution of the share of specialist dairying farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the share of specialist dairying farms in all farms per FADN region, defined at the principal type of farming level. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation missing due to some other reason. Data for 2010.

Labour employed by specialist dairy farms accounts for up to 4.5% of the total labour force in several regions along the eastern EU border, but also in two north Italian regions (Map 13). In several Romanian regions, this farm type employs more than 3% of total employment (Table 29). This share amounts to **less than 1‰ in French, Spanish and UK regions**. **High shares of regional labour employed by this farming type cluster along the eastern EU border, but also are scattered across north-western Spain and France as well as Ireland.** In the **typical EU region,** as measured by the median, **0.43% of the regional labour force are employed by specialist dairying farms**. In the Romanian region of Nord-Vest, this share is more than that tenfold, while it is less than a tenth in Scotland and England-East (Table 29). Heterogeneity with respect toof this share is substantial across EU regions: the ratio between the largest and the smallest share equals 134.

Map 13: Share of labour (measured in AWU/year) in total regional labour employed by specialist dairying farms



Source: Authors based on European Commission (2016j) and European Commission (2015b, table C.05 – Employment rate)
Note: The plot shows the share of the total labour in AWU per year employed by specialist dairying farms (principal farming type (45)) in the total labour force employed in the FADN region. Total regional labour is defined as the number of total employed persons aged 20-64 in the FADN region, based on suitable aggregation of the NUTS2-level data in the European Commission (2015b, table C.05 – Employment rate). Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Agricultural labour for 2013, total regional labour for 2014.

The share of **regional labour employed by dairying and meat farms does not exceed 1.5%** (Map A2.21). The largest shares are again found in **northern Romania, but also in regions located in the Alps**. The lowest shares are found in Greece. The ratio between the largest and the smallest shares equals 130. The share of regional labour employed by mixed livestock farms exhibits the largest spread, equalling almost 360 between the largest and smallest regional shares (Map A2.22). **All Romanian regions have a share of at least 1.5%**. In the **EU15 regions, this share is smaller than 1‰.** The share of regional labour employed by crops and cattle farms does not exceed 2.7% (Map A2.23). The ratio between the largest and smallest share is 115, which is the smallest spread among the four farming types of the EU dairy sector. Regions with the largest shares in total employment are clustered in and around Poland, eastern Hungary and selected Mediterranean regions in Greece and the south-western part of the Iberian Peninsula. The smallest shares are found in the Alps, Germany, the UK and Scandinavia.

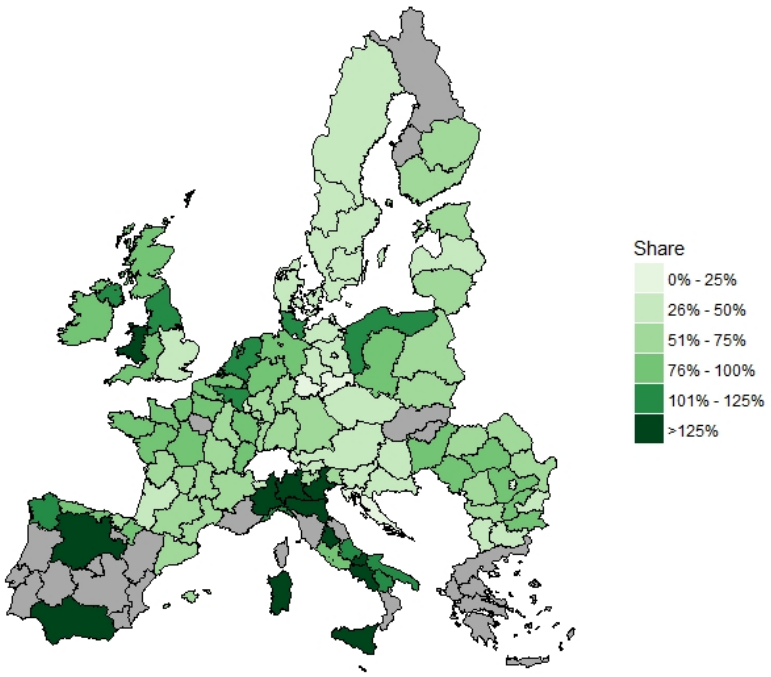
Table 29: Regions with the highest and lowest shares of labour (in AWU/year) employed by specialist dairying farms in regional labour (GDP/capita)

Region (MS)	Share in regional labour	Region (MS)	Share in regional labour
Nord-Vest (RO)	4.5%	Andalucia (ES)	0.06%
Nord-Est (RO)	3.2%	Languedoc-Roussillon (FR)	0.06%
Sud-Est (RO)	3.2%	Liguria (IT)	0.04%
Continental Croatia (HR)	3.0%	England-East (UK)	0.04%
Sud-Vest-Oltenia (RO)	2.7%	Scotland (UK)	0.03%

Source: Authors based on European Commission (2016j) and and European Commission (2015b, table C.05)
Note: The two left-most columns show the five FADN regions in which specialist dairying farms (principal farming type (45)) employ the highest share of regional labour. The two right-most columns show the five FADN regions in which this share is lowest among all FADN regions. Agricultural labour for 2013, total regional labour for 2014.

For the EU-N, the regional pattern of the share of labour income from specialist dairy farming in the regional average income shown in Map 14 differs markedly from the regional pattern of the levels of labour income shown in Map 11.

Map 14: Labour income (in AWU/year) of specialist dairying farms in comparison to regional average income (GDP/capita)



Source: Authors based on European Commission (2016j) and European Commission (2015b, tables CCI 1 - Population and C.08 - GDP per capita)
Note: The plot shows the average income per AWU of specialist dairying farms (principal farming type (45)) as a share in the average income per FADN region. Average income per FADN region is defined as GDP/capita calculated from the European Commission data (2015b, tables CCI 1 - Population and C.08 - GDP per capita). Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Agricultural income is the average of years 2011, 2012 and 2013 and the regional income for 2014.

The high absolute **labour income levels in specialist dairy farming** in comparison with other regions are found **in the EU-S**, mainly in Italy and Spain (Map 11). They **exceed the average income** in these regions (Table 30 and Map 14). Average labour income levels in specialist dairy farming in and around the **Benelux and in the UK and Ireland** are at a comparable level to those in the EU-S; that is, they are also the highest among all regions (Map 11). In contrast to these regions in the EU-S, these income levels in specialist dairy farming lie **below the average income** in these EU-N regions.

The **shares of labour income from specialist dairy farming are lowest in East Germany and various EU13 regions** (Table 30). This share appears to be also very low in Sweden, the Czech Republic, Austria, Hungary as well as south-western France. In south-eastern UK, the share is lower, since the general average income in this region is dominated by the high levels in London. Although the levels of labour income **in most EU13** regions are the lowest among all EU regions (Map 11), they have in many of these regions **a comparable magnitude to the general average regional income**. In the Polish region of Pomorze and Mazury, the average labour income from specialist dairy farming even exceeds the regional average income. **In many Polish and Romanian regions, the average labour income from specialist dairy farming is not smaller than 70% of the general regional income**. However, for other EU13 regions this relation amounts only to 50% or less, especially for Bulgarian regions.

Table 30: Regions with the highest and lowest shares of labour income (in AWU/year) of specialist dairying farms in regional average income (GDP/capita)

Region (MS)	Share in av. income	Region (MS)	Share in av. income
Andalucia (ES)	255%	Yugozapaden (BG)	25%
Eszak-Alfold (HU)	255%	Bucuresti-Ilfov (RO)	24%
Umbria (IT)	239%	Thueringen (DE)	23%
Sardegna (IT)	238%	Sachsen (DE)	21%
Lombardia (IT)	212%	Adriatic Croatia (HR)	14%

Source: Authors based on European Commission (2016j) and European Commission (2015b, tables CCI 1 and C.08)
Note: The two left-most columns show the five FADN regions in which the share of income per AWU of specialist dairying (principal farming type (45)) is highest in the average income of the FADN region, which is defined as GDP per capita. The two right-most columns show the five FADN regions in which this share is lowest among all FADN regions. Agricultural income is the average of years 2011, 2012 and 2013 and the regional income for 2014.

The lowest shares of labour income from crops and cattle farming in general regional income levels are found **in Scandinavian regions, Slovenia and Luxembourg as well as East Germany**. The highest shares are found in northern France, Belgium and Hungary (Table A2.29). The **small spread between agricultural labour income and general regional income levels in many EU13 regions also exists, to a similar extent, for crops and cattle farms** Map A2.26). However, this is not the case for dairying and meat farms (Map A2.24) and mixed livestock farms (Map A2.25), for which the lowest shares are found along the eastern EU border. For these two farm types, the relationship to the general regional income tends to be the lowest among the four farming types of the EU dairy sector (.

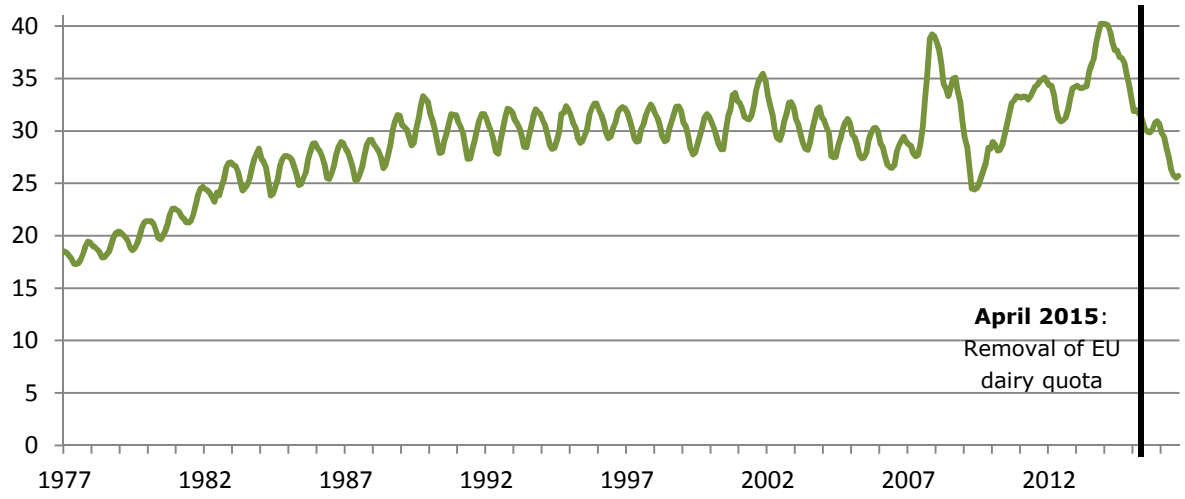
2.5. Dairy Prices

2.5.1. Price levels

The **EU dairy price has shown a pronounced seasonal pattern until the summer of 2007**. The seasonal price pattern used to be remarkably regular, with yearly **price maxima between October and March** (Figure 25). Apart from the regular annual pattern, the price

was remarkably stable throughout the 1990s. The price started a **downward sloping tendency since November 2001,** while still maintaining its seasonal pattern. However, **since June 2007, the development of the EU milk price has profoundly changed** its structure. EU producer prices for milk **reached unpreceded levels of almost 0.4 Euro/kg in late 2007**. These prices collapsed in the following **one and a half years to a level of 0.25 Euro/kg in May 2009**. Such a low producer price had not existed in the EU since the beginning of the 1980s when the milk quota had been introduced.

Figure 25: Development of the monthly EU milk price (euro/100kg) at farm-gate



Source: Authors based on MMO (2016)
Note: The EU price is the weighted nominal average price at EU level in Euro/ 100 kg.

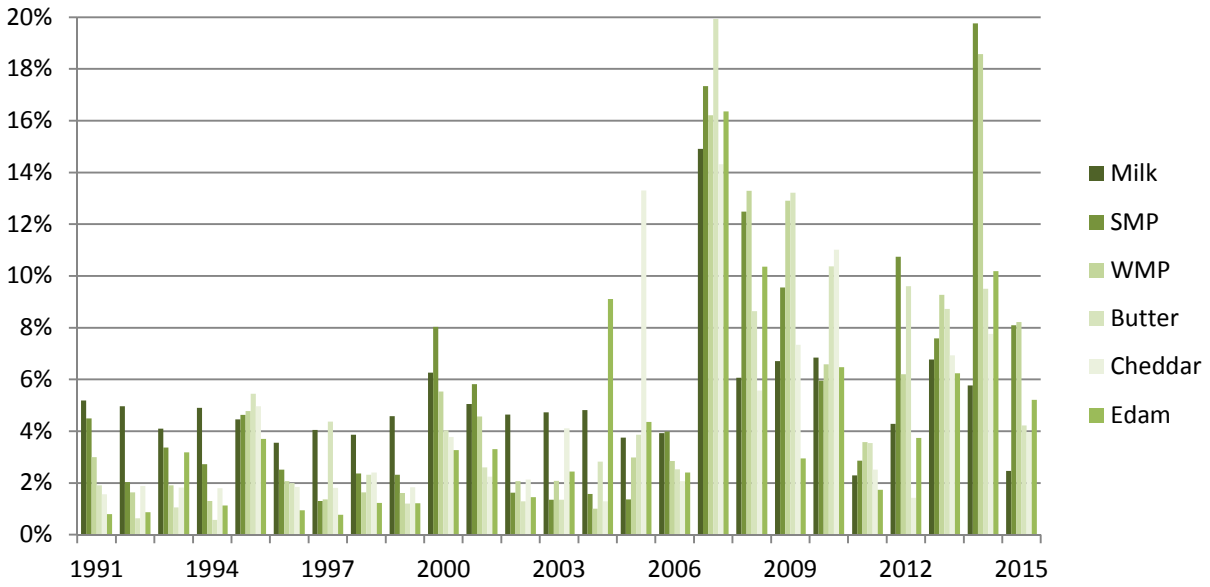
Also, **the regular seasonal pattern was broken**: instead of having regular annual minima in the summer, the low prices in summer 2007 were succeeded by even lower levels only two years later. In the following **four and a half years, the milk price experienced a steady upward trend until reaching again 0.4 Euro/kg in winter 2013**, exactly six years after the first price boom in winter 2007. **Since then, the milk price has been steeply decreasing to 60% of the boom level**, reaching again 0.25 euros/kg exactly seven years after the first price crisis.

2.5.2. Price stability

The **stability of raw milk and dairy prices has substantially reduced during the last decade** (Figure 26). **Since 2007, the price variation** as measured by the coefficient of variation of monthly prices within a year has **reached unprecedented magnitudes in EU dairy markets since 1991**. Until 2006, price variation of dairy products was small, mostly barely exceeding 4% of the price level. **Milk prices used to show** in most years about **double the variation than that of the prices of cheese, butter and milk powder**. Only in 1995, 2001, 2002, 2004 and 2005 did prices of processed dairy products vary substantially more than milk prices.

However, since 2007 the **magnitude of the price variation and the relationships of the price variation between milk and processed dairy products has structurally changed**. In most years, **raw milk and dairy product prices fluctuated strongly**, reaching a price variation of up to 20% of the price levels. 2011 was the only year that showed a price stability structure comparable to the period before 2007. **Raw milk prices were most unstable in 2007**, but they were also in most other years substantially more unstable than in the period before 2007. In contrast to the price variation before 2007, the **prices of processed dairy products showed a higher instability than raw milk prices**.

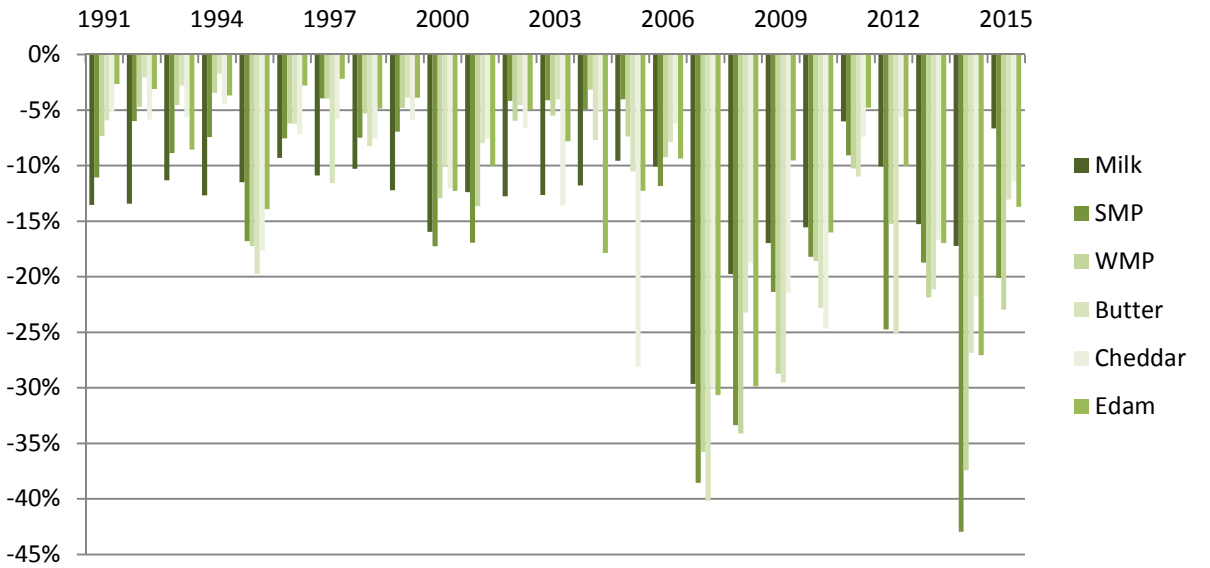
Figure 26: Development of the annual price variation of dairy products in the EU



Source: Authors based on MMO (2016), European Commission (2016n) and European Commission (2016o)
Note: The bars denote the annual coefficient of variation of EU dairy prices for each year, i.e. the quotient between the standard deviation, a measure of stability, and the mean price. The higher the coefficient of variation, the higher the price instability in a given year. A coefficient of variation of 2%, for example, means that roughly during 2/3 of the year (that is more than 8 months in total) the prices of the commodity were in the range between 2% below the annual average price and 2% above this price. Hence, the graph shows to what extent monthly EU dairy prices of a given year varied relative to the average price in that year. The average prices may also vary strongly from year to year as shown in Figure 28.

The years 2007 and 2014 stand out as years of extremely unstable dairy prices in the EU. While the measure of price stability presented in Figure 26 is relatively abstract, Figure 27 presents another measure that is much closer to the daily experiences of dairy farmers as well as consumers.

Figure 27: Development of the maximum annual price ranges of dairy products



Source: Authors based on MMO (2016), European Commission (2016n) and European Commission (2016o)
Note: The bars denote the quotient between the smallest and the largest monthly average prices of a commodity in a given year in the EU. A value of -10% of a given commodity in a given year means that the lowest monthly average price of this commodity in the EU was 10% smaller than the maximum monthly average price of this commodity during this year. Hence, the graph shows the relative differences between the most extreme prices (maximum vs. minimum) within a year.

Figure 27 shows the maximum annual price range as measured by the relative deviation of the smallest monthly price from the largest price in the same year. **In 2007, the lowest monthly price of raw milk was 30% below the largest price, and the maximum range of butter prices even reached 40%**. **In 2014, milk powder prices exhibited extraordinarily large price ranges, reaching up to 40%.** While the difference between the highest and lowest monthly dairy prices within one year used to be in the **range of 5% to 10% until 2006**, the **price volatility** (maximum price ranges) have been in the magnitude of **15% to 30% for most commodities in most years since 2007**.

2.6. Domestic Supply Chain

2.6.1. Structure of the EU dairy sector

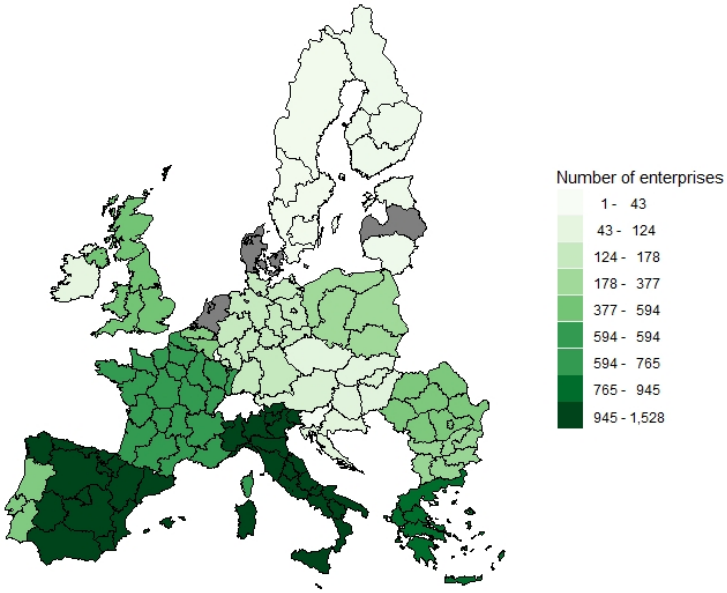
2.6.1.1. General observations about the structure of the EU dairy sector

Error! Reference source not found. suggests the following insights:

- **The main dairy countries** in the EU, based on the annual volume of milk being processed, are Germany and France, where more than 25 million tons of milk are processed each year. More than 10 million tons of milk are processed annually in the United Kingdom, the Netherlands and Italy.
- Apart from Italy, Spain is the largest dairy producing company in the **EU-S** (more than 7 million tons). Among **EU13 MS**, Poland and the Czech Republic have the largest dairy sector (3.5 and 2.5 million tons, respectively).
- **The structure of the processing chain of the EU dairy sector differs substantially between MS and between regions.** The dairy processing in EU-N MS is based primarily on large-scale dairy companies that process more than 100 thousand tons of milk per year. An exception is Ireland, where large-scale dairies process less than 60% of the total milk volume. In the EU-S and the EU13 MS, a larger share of milk is processed by medium- or small-scale dairy companies. This structure holds especially in countries such as Bulgaria and Romania, where the sector is dominated by dairy companies that process less than 50 thousand tons of milk annually.
- **Important structural changes have occurred in the EU dairy sector in the past decade.** Processed milk volumes have decreased continuously over the period 2000–2012 in Ireland, the Netherlands and Sweden. There have been only a few exceptions among all the MS since 2006, including major producing countries such as Germany and Italy.

Map 15 shows the number of dairies per MS. Not surprisingly, the numbers differ per MS. What is remarkable is the high number of dairies in Italy and Spain. A higher number of dairies may illustrate more competition but also a less developed industry. Another important observation is that among the EU13, where we observe a high number of dairy farms, we do not observe a high number of dairies. This illustrates the relative difficulty of EU13 farms to process and market their products reflected by the on average lower amount of milk delivered to dairies. Maps A.28, A.29 and A.30 show the percentage change in dairy numbers per MS between 2006 and 2015, annual milk production per MS in 2015 and the percentage change in milk production per MS between 2006 and 2015, respectively.

Map 15: Number of dairies per MS in 2015



Source: Authors based on Eurostat (2016m)
Note: The data is plotted on MS level in this map, that is, the legend category labels refer to MS level and all FADN regions of a MS have the corresponding identical colour.

2.6.1.2. Main dairy companies and their market shares at EU level

Table A2.31 provides an overview of the 15 largest dairy processing companies (in terms of turnover) within the European market. Taking a total turnover in the EU dairy market of 138 billion € in 2008 (Baking & Biscuit issue 4, 2009) shows that **the four largest dairy companies hold a combined market share of 32% of the European market**. With a turnover of 16.9 billion € in dairy products, the largest dairy company in Europe is Nestlé (Switzerland), followed by Danone (France) with a turnover of 9.2 billion euros. There are five French dairy companies in the top-15: Danone, Lactalis, Bongrain, Groupe Sodiaal and Groupe Bel. Together they claim almost a 20% market share in the EU. The top-15 also features 3 German dairy companies: Nordmilch, Theo Müller and Humana Milchunion, but their combined market share in Europe is less than 5%.

Mergers and acquisitions and joint ventures are key avenues for the major dairy companies to uphold growth rates and profitability (foodmanufacture, 2014a). Recent mergers and acquisitions within the EU dairy market include: the merger of Lactalis (FR) and Parmalat (IT) in 2011 and the merger of Humana Milchindustrie and NORDMILCH in Germany to become DMK Deutsches Milchkontor in the same year. These mergers are reflected in the increase in turnover of the main European dairy companies (Table A2.31). **The concentration ratio of the four largest EU dairy companies increased in the period between 2008 and 2013** from 32% to 36% of the total turnover in the dairy sector.

2.6.1.3. Main dairy companies and their market shares at the MS level

Concentration ratios in individual MS can be much higher than at the EU level. For instance, Arla Foods holds a 95% market share in Denmark. On the other hand, even dominant companies face competition. Map A2.27 provides an overview of the spread of dairy production sites (larger than 10 million kg of milk processed annually) across the Netherlands. The figure shows that while FrieslandCampina is the dominant player on the Dutch dairy market, the company faces competition from more than 20 other dairies with

processing facilities in the territory. Moreover, production sites are distributed more or less equally across the Netherlands but with a lower density in the centre of the country and a relatively higher concentration in the northeast and the south.

Table A2.32 provides an overview of the importance of the dairy sector in selected MS[17] and an estimate of the market share of the main dairy company (companies) for different dairy product categories. A number of interesting observations can be made based on this table:

- **Concentration ratios in dairy product markets differ substantially between MS**. For instance, the dominant company within the Greek cheese market (FrieslandCampina) only represents 7% of the total retail value in cheese, while 73% of the yoghurt market in Denmark is in the hands of one company (Arla Foods).
- **EU15 dairy companies**, such as Danone, Lactalis, Meggle and Hochland, have **invested in the dairy markets of the EU13 MS**. Nevertheless, important market shares remain with domestic producers (Vindija, Croatia; Madeta, Czech Republic; Mlekpol, Poland). The domestic dairy Mlekpol even holds a 12% overall market share in the Polish dairy market.
- **Concentration ratios are the highest in the Scandinavian countries** with a single dairy company dominating the market: Arla Foods holds between 40% and 73% of the market share for different dairy products in Sweden and Denmark; Valio provides 27% to 52% of the dairy retail value in Finland.
- In terms of **product portfolio**, Danone dominates the yoghurt market across the EU, holding more than 10% of the yoghurt market in Croatia, the Czech Republic, France, Germany, Ireland, Italy and Poland. While Lactalis (Group and Nestlé Fresh Products) is dominant in a more diversified product portfolio in several EU countries.
- A final observation is the **importance of private label** dairy products in Germany and the Netherlands. While FrieslandCampina still holds a dominant market share in a number of product categories in the Netherlands, private label products are on the rise, especially in the categories cheese, yoghurts and other dairy products.

2.6.2. Conduct of the EU dairy sector

2.6.2.1. Increased vertical coordination along the supply chain

Long-term contractual arrangements and partnerships between dairy companies and dairy farmers (farmer supply groups) are on the rise. Box 1 gives an example of increased vertical coordination in Nestlé's dairy supply chain in the UK.

[17] Only those MS were selected in which the dairy sector is one of the three main agri-food sub-sectors based on production value (data from Food&Drink Europe, 2015).

Box 1: Industry initiatives

INDUSTRY INIATIVES

Nestlé partners with dedicated farmers to secure milk supply and sustainable sourcing

Nestlé started partnering with First Milk dairy farmers in 2010 to supply one of its production sites in the UK. Mid-2014, the company extended its cooperation with First Milk by setting up a dedicated farmer supply group in the vicinity of another of Nestlé's UK production sites.

First Milk farmers see the partnership as a protection against increased volatility in the dairy market. For Nestlé, the closer cooperation with supplying farms offers opportunities to scale up the company's sustainability efforts. The smaller distance between the land of the dedicated farmers to the production sites saves on travel distance. Moreover, involved farmers automatically join Nestlé's First Milk Sustainability Program, which involves a commitment to reduce greenhouse gas emissions. Partnership farmers are also encouraged to work on biodiversity projects, such as the establishment of wildflower meadows to attract butterflies.

Source: Foodmanufacture (2014b)

2.6.2.2. Sustainability standards driven by downstream actors in the supply chain

The retail and distribution sector but also manufacturers are increasingly pursuing more sustainable supply chains. **Sustainability standards** are introduced through private certification schemes but also through tightly coordinated partnerships with suppliers (see Box 1). Moreover, sustainability standards are not limited to environmental or ecological conduct, but in the dairy and bovine meat sectors they increasingly address animal welfare issues as well. While further steps concerning animal welfare are high on the policy agenda in northern EU countries (see e.g. Council of the European Union, 2016), EU-wide public support for stricter animal welfare standards is lagging. However, private animal welfare standards are likely to spread through the EU dairy supply chain through the commitments of the major dairy companies. For example, Danone published its own Animal Welfare Position Paper in 2016. Box 2 summarizes Danone's initiatives for the supply of fresh milk as specified in the Position paper.

2.6.2.3. Unfair trading practices in the dairy supply chain

In food supply chain relationships between farmers and the downstream market (i.e., processors and retailers), **unfair trading practices (UTPs)** have gained much attention over the last few years. Examples of these unfair practices are **delayed payments, unfair shifting of business risk to the other party, unilateral or retroactive changes to contracts and unfair termination of contracts**. According to European Parliament (2016), UTPs are only partly covered by competition law but there are no EU rules to combat unfair practices between different operations in the agri-food chain. **Farmers are particularly vulnerable as they often face downstream trading partners with high market concentration.** The dairy and bovine meat sectors play an important role in these discussions, as farmers in these sectors (unlike, for example, grain farmers) are associated with strong resource limitations, asset specificity, and high switching costs (Agricultural Market Task Force, 2016).

Box 2: Industry initiatives

INDUSTRY INIATIVES

Danone's Animal Welfare Position Paper 2016 – Fresh Milk

Danone's Animal Welfare Program is built around six priorities:

1) Upgrade the Supplier Assessment process. Already in 2012, Danone defined a set of 10 mandatory animal welfare-related criteria for assessment of their milk suppliers. These criteria covered aspects such as animal health, housing, stress, transport, etc. Each criterion is defined by a set of items to be observed and rated during the assessment process. To further improve the adoption of good animal welfare practices by its supplying farms, the internal auditing methodology will be upgraded and strengthened in the coming years.
2) Raise Danone employees' and farmers' awareness of animal welfare issues by providing guidelines or training to encourage best practices.
3) Encourage progress and reward best practices. For example, in 2015, Dannon US awarded its first "Well-being Award", in which animal welfare is part of the criterion.
4) Achieve higher welfare standards while improving performance of farmers.
5) Strengthen cooperation with partners specialized in farm animal welfare. Partners may have expertise in the development of assessment tools or, for instance, the certification of farmers.
6) Create regional roadmaps based on assessment results. Locally appropriate targets set a meaningful baseline for animal welfare.

Source: Danone (2016)

The dairy supply chain, particularly in northern Europe, is largely organized within cooperatives. Raw milk supplied by farmers is processed by dairy companies into the final dairy products. Retail chains constitute the end of the supply chain. **Both the processing as well as the retailing stages in the EU are characterized by a high degree of market concentration. Dairy products are** besides fruit and vegetables **one of the "loss leaders" in large-scale retailers** meaning these products are sold at a loss to attract consumers. Furthermore, the processing industry often imposes general delivery terms on their farmers to govern the delivery conditions and to set several quality parameters. Examples mentioned in a report of the Agricultural Markets Task Force (2016) are the quality verification of delivered raw milk undertaken by an independent third party and paid by the dairy company. **Because raw milk is a perishable product, dairy farmers have very limited negotiation power in the short term if they disagree on pricing or the quality classification.**

2.6.3. Performance of the EU dairy sector

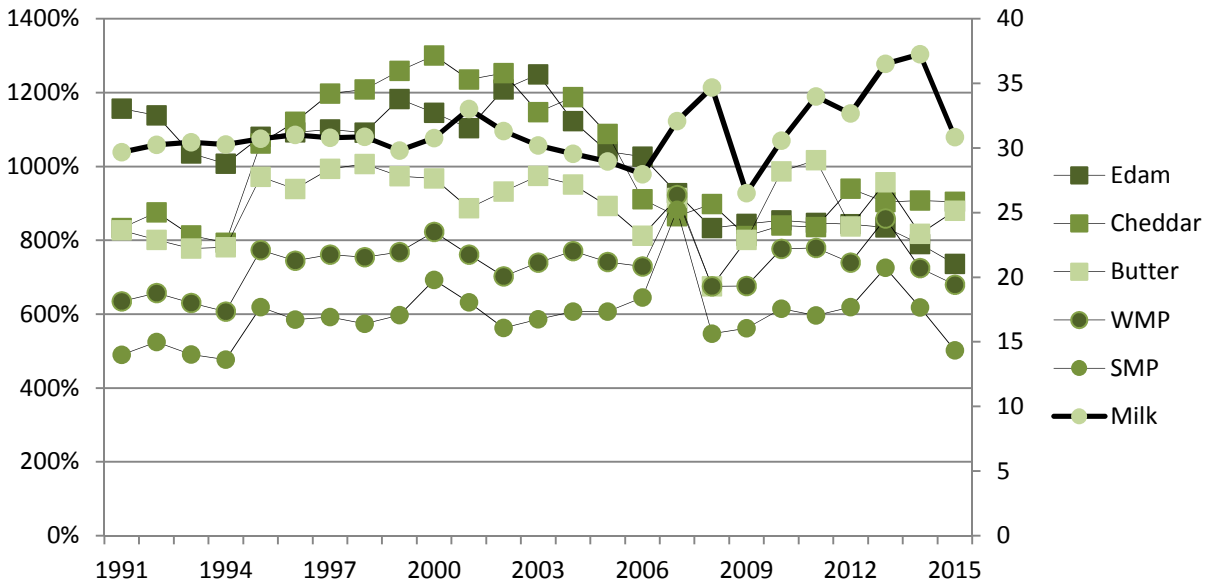
2.6.3.1. Prices and margins

The development of the **annual average prices of processed dairy products is similar to the pattern observed for milk prices** (Figure 28). Prices of processed dairy products are shown as a ratio relative to the milk price of each year. This relation means that the figure expresses the margin between the price of the raw product and the products that are produced from it. While prices have been remarkably stable throughout the 1990s, **prices have been erratically changing from year to year since 2006**. Hence, the relatively

stable price relationships of dairy products relative to milk and relative to each other have been substantially disarranged.

While margins on cheese were much higher than for butter and milk powders before 2006, **the ratio of cheese prices relative to milk prices has reduced by about one quarter** since then. Cheddar price margins, which reached record levels of 1300% of the milk price around the year 2000, decreased to 900% in 2015. The margin between Edam prices and milk prices reduced from 1250% in 2003 to about 750% in 2015. This decrease suggests that **competition in the cheese market has become more severe in the EU in the last decade**. In the same period, consumption of cheese has increased in the EU (Figure 20). Moreover, the **farmers' share in cheese prices**, i.e. the milk price as a share of the selling price of these processed commodities, has **increased from 7.5% around 2000 to 10% to 12% in 2015** (Figure A2.3, p. 246). The **margin between butter, SMP and WMP prices to milk prices has continued to be** comparatively **stable** since 1991.

Figure 28: Development of annual EU dairy product prices in percent relative to average yearly raw milk price (left axis) and in euros/100 kg (right axis)



Source: Authors based on MMO (2016), European Commission (2016n) and European Commission (2016o)
Note: Dairy product prices are EU annual nominal weighted averages expressed as margins relative to milk prices, that is, they are divided by the average milk price of a particular year and 1 is subtracted from the quotient. Hence, for example a value of 500% for SMP in 1991 means that the SMP price was about 5 times higher than the milk price of 1991. Milk prices are annual averages measured in nominal euros/100 kg with the axis on the right-hand side.

2.6.3.2. *Innovation*

The EU dairy sector ranked 2nd after the soft drinks sector in the list of the most innovative sectors in the EU food industry in 2014 (FoodDrinkEurope, 2015). More than 6.9% of all food innovations in the EU are accounted for by the dairy sector.

3. CURRENT SITUATION IN THE EU BOVINE MEAT SECTOR

KEY FINDINGS

- **54% of the SO** of the specialized cattle fattening farms is generated in **France, Germany, Spain and the United Kingdom.**
- **89% of the total bovine meat** produced in the EU is produced in the **EU 15.**
- **Per capita consumption of beef and veal** has decreased by about 10% since 2000, but it has stabilized over the past three years.
- The largest **beef importing countries** outside the EU are China, the United States, Russia, and Japan.
- **China, Russia, Egypt and Canada** are the countries with the largest increase in imports of bovine meat in value terms.
- The **largest exporters of bovine meat commodities** are the United States, Australia, Brazil and India.
- By far the highest number of **specialised beef fattening** farms is located in **Ireland,** followed **by north-western Spain**, and **the Alps and its surrounding areas**.
- **Bovine meat production** in the EU has **decreased since 2000**.
- The **decrease in bovine meat** production in percentage terms was **larger in the EU 13 than in the EU 15.**
- The farms with the **largest average non-dairying cattle herds** are located in **East Germany, Slovakia, the Czech Republic**, but they are also clustered in **Central France** and the **UK.**
- **Stocking density** measured in LSU per ha UAA ranges between **0.3 and 6.4** among the FADN regions in the EU.
- **Highest average densities** are clustered in and around the **Benelux, in north-western France, northern Italy, Croatia, and southern Finland**.
- The pattern of **input cost productivity** of bovine meat production as measured by the ratio between the annual value of beef and veal meat and the total annual input costs of the average specialist cattle fattening farm shows a pronounced **decreasing gradient from the south-western regions towards the north-eastern regions**.
- The **highest input cost productivity** clusters in the **Iberian Peninsula** as well as in **parts of Italy**.
- The **average labour income** of the typical **specialised cattle fattening farm** per EU region as measured by the median amounts to **13,500 € per year and AWU**.
- The **average labour income** for specialized cattle fattening farms in Veneto (IT) is **35 times** higher than in Slovenia.
- In **ten regions**, labour income for specialized cattle fattening farms is **above 20,000 €** per year and AWU, in **54 regions** it is between 10,000 € and 20,000 € and in **23 regions** it is **below 10,000 €**.
- In comparison to dairy prices, **cattle slaughter prices** have shown a much **smother development and lower price variability**.
- As a whole, the **concentration ratio** in the beef and veal sector is **low for the EU**.
- The **concentration levels within individual MS** can be much higher, with the top-5 beef and veal companies **exceeding a 50%** market share in **Germany, France and the United Kingdom**.

This chapter analyses the EU bovine meat sector in detail. It considers the following principal farming type as defined in footnote 7, p. 31, and Table A1.3, p. 179:

- (46) Specialist fattening

since it is the only principal farming type of the EU cattle sector that produces bovine meat at a higher value than it produces milk products (Table A1.3). The chapter analyses several aspects of both primary production as well as the structure, conduct and performance of the EU meat processing industry. It characterizes the structure of the EU bovine meat market and subsequently elaborates on the domestic demand for bovine meat, the global demand, the domestic supply, the EU supply chain and the recent developments of prices of bovine meat.

3.1. Bird's Eye Perspective on the EU Bovine Meat Market

Bovine meat production is similar to milk production, such that it is unevenly distributed across the EU. In particular, structural differences exist between the EU15 and EU13, that is, almost all specialist cattle fattening farms are located in the EU15. This section provides an overview of the EU bovine (both beef and veal) meat market by characterising the current structure of the economic potential and its distribution among the MS.

Figure 29 disaggregates the total SO of the **EU specialist cattle farms** into the contributions of each MS. Similar to mixed farms with cattle, specialist cattle farms account for slightly **less than a quarter of the total SO of the EU cattle sector** (Table A1.8). **54% of the SO** of the specialized cattle farms is generated **in France, Germany, Spain and the United Kingdom**. The **remaining 24 MS** account together for **the other 46% of the gross production value**.

Figure 29: Contributions of MS to the TSO (in bln euros) of EU specialized cattle farms

Source: Authors based on the Eurostat dataset ef_kvftreg
Note: The bar plots the SO of the cattle sector of each MS in descending magnitude. MS belonging to the EU13 are marked in light green. MS belonging to the EU-S are underlined. Data for 2013 in bln euros.

There is again a **structural difference in the average national total SO of specialized cattle farms** between the EU15 and EU13 (Table A1.7). This is also visible in Figure 29, where the EU13 cluster is on the right-hand side. The contribution of the national dairy sector of an EU15 MS to the EU total is on average 1.2 bln € larger than the average contribution of an EU13 MS (Table A1.7). The **EU13 contribute** only **8%**, while the **EU-S contribute 49%** to the total SO of specialized cattle farms (Table A1.8). As suggested by Figure 29, **specialized cattle farms cluster in the EU15. They** are, however, **evenly spread between the North-Western MS and the South-Western MS**.

Table 31 outlines key characteristics of EU bovine meat production and its regional differences across the EU. Farms of the **EU cattle sector keep almost 66 m heads of cattle that are not for purposes other than milk production**. Slightly more than **one tenth of this**

animal herd is kept in the EU13, and 44% is kept in the EU-S. Of that herd, 12.3 m animals are suckler cows, which corresponds to a share of 19% in the non-dairying cattle herd. More than 90% of these animals are kept by farms located in the EU15, and 59% are kept by farms in the EU-S. Hence, **in the EU-S the share of suckler cows in the total non-dairying cattle herd is highest**, amounting to one quarter. **Almost 8 m tonnes of bovine meat are produced in the EU. 89%** and 58% **of that meat** are produced **in the EU15** and EU-N, respectively. Average carcass weight amounts to 290kg per head. Also, a very small percentage of the total non-dairying cattle herd is kept in the EU13. Slaughtered animals are also smaller, on average having 84% of the EU average weight.

Table 31: The structure of bovine meat production in the EU in 2015

(A) REGION	(B) NON-DAIRYING CATTLE		(C) SUCKLER COWS		(D) SUCKLER COWS IN (B)	(E) BOVINE MEAT PRODUCTION		(F) CARCASS WEIGHT	
	NUMBER (M HEADS)	SHARE	NUMBER (M HEADS)	SHARE		QUANTITY (MT)	SHARE	WEIGHT (KG/HEAD)	RELATION TO EU AVERAGE
EU	65.8	100%	12.3	100%	19%	7.7	100%	288	100%
EU15	57.5	87%	11.5	93%	20%	6.8	89%	295	103%
EU13	8.3	13%	0.8	7%	10%	0.9	11%	241	84%
EU-N	36.6	56%	5.0	41%	14%	4.5	58%	293	102%
EU-S	29.1	44%	7.3	59%	25%	3.2	42%	281	98%

Source: Authors based on European Commission (2016m)
Note: The underlying data is contained in Table A3.1.For the rows of the EU15 and EU13 as well as the EU-N and EU-S, each pair adds up to the EU total values.

Table 32 assesses to what extent and in what direction these characteristics of the bovine meat sectors of the MS relate to the macroeconomic variables used in Table 16[18]. Carcass weight is only weakly positively associated with the other three meat production variables and moderately positively associated with GDP/capita, suggesting that **in an MS with a higher GDP/capita larger animals are slaughtered on average**. With the remaining macroeconomic variables, they are either weakly positively or negatively correlated or not correlated at all. The quantity of bovine meat production is strongly positively and moderately positively associated with the number of the non-dairying cattle herd and suckler cows, respectively. That correlation points to the fact that **most bovine animals are slaughtered in the MS where they were fattened**. The size of the suckler cow herd tends to be bigger

[18] The analysis here focuses on the relationship of the bovine meat production structure variables to each other and their relationship to the macro-economic variables.

the larger the entire non-dairying cattle herd is, as these two characteristics are strongly positively associated with each other.

Table 32: Macroeconomic characteristics and the structure of meat production of MS

	Population	GDP	Accession year	Population density	GDP/capita	Non-dairying cattle	Suckler cows	Meat production	Carcass weight
Area	++	++	-	o	o	++	++	++	o
Population		+++	--	o	o	+++	++	+++	+
GDP			--	o	o	+++	++	+++	+
Accession year				o	--	--	-	--	-
Population density					o	o	o	o	o
GDP/capita						o	o	o	++
Non-dairying cattle							+++	+++	+
Suckler cows								++	+
Meat production									+

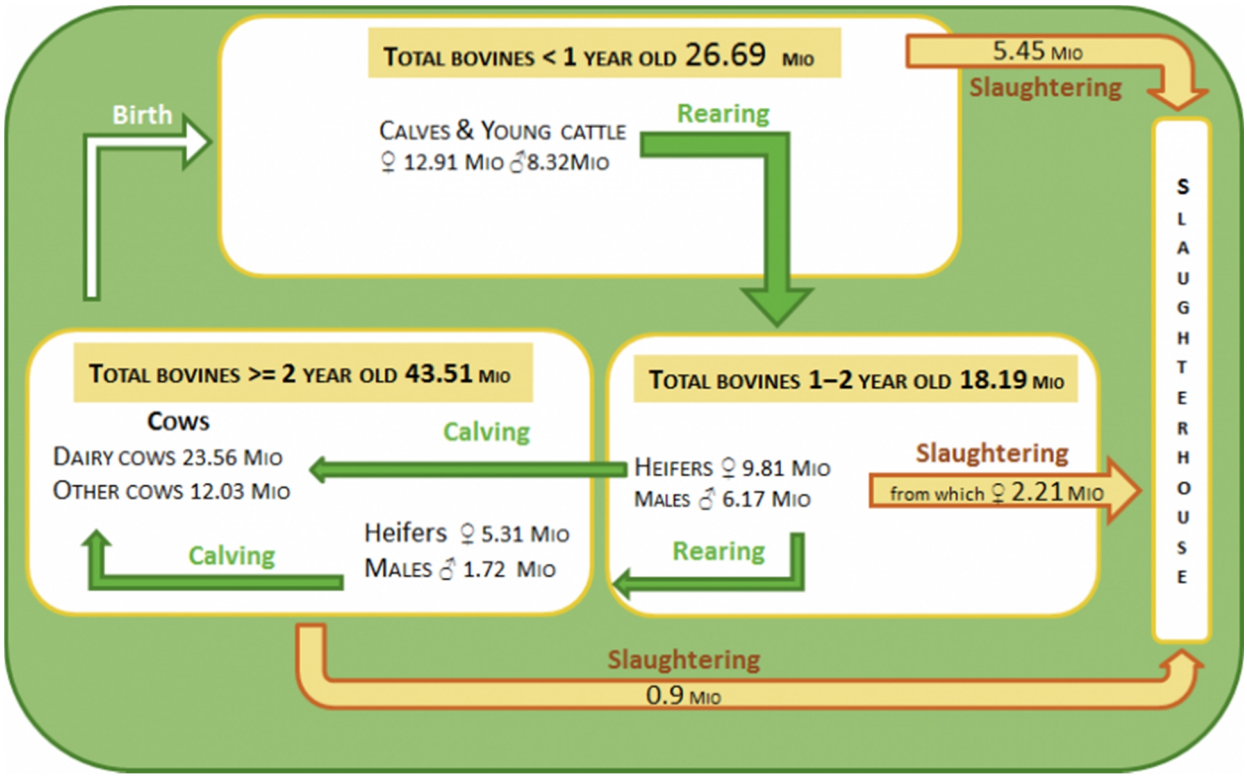
Source: Authors based on European Commission (2016m) and European Union (2016)
Note: The table is based on the bivariate Pearson correlation coefficients of these characteristics for all MS. The underlying data is contained in Table A3.1. The symbols denote the following: +++ means a strongly positive association between two characteristics (correlation ≥0.8), ++ means a moderately positive association (0,8> correlation ≥0.5), + means a weakly positive association (0,5> correlation ≥0.25), o means no association (0.25> correlation ≥-0.25), - means a weakly negative association (-0.25> correlation ≥-0.5), -- means a moderately negative association (-0.5> correlation ≥-0.8) and --- means a strongly negative association. For example, consider the intersection between the row "GDP/capita" and the column "Carcass weight" in the table above. Its value is ++; in other words, if a MS has one of the highest GDPs/capita in the EU, then its average carcass weight will also tend to be among the largest of all MS.

GDP/capita has no relation to the herd size nor the amount of meat production. While the area of the MS is not correlated with the carcass weight, it is moderately positively correlated with the herd sizes and the production quantity. This relationship stresses the fact that **bovine meat production depends on the amount of agricultural land** available. MS population and GDP are identically associated with the bovine meat sector characteristics: weakly positively associated with carcass weight, moderately positively associated with the suckler cow herd size and strongly positively associated with the total non-dairying cattle herd size and total bovine meat production of a MS. This association is stronger than the one with the area of the MS. Hence, the larger a MS population and GDP is, the larger the herd size and bovine meat quantities produced in this MS will be. The **accession year to the EU is moderately negatively associated with the total herd size as well as with meat production quantities and weakly negatively associated with the suckler cow herd as well as the carcass weight**. Thus, the later a MS joined the EU, the smaller these bovine meat sector characteristics will be in this MS in comparison to all other MS.

Figure 30 summarizes the structure of the EU cattle sector and the role of the EU bovine meat sector within it. About **44 m animals of at least 2 years old produce the offspring** of 27 m animals younger than 1 year old. One fifth of these animals as well as almost one million of the animals of at least 2 years of age are slaughtered each year. In total, **8.5 m bovine animals are slaughtered each year**. 80% of the animals younger than 1 year are

reared. Of the 18 m animals between 1 and 2 years, more than 2 m animals are slaughtered. While some of the heifers calve at this age, others are further reared to an age of at least 2 years old, and only then will they enter the reproduction cycle.

Figure 30: Structure of the EU cattle sector



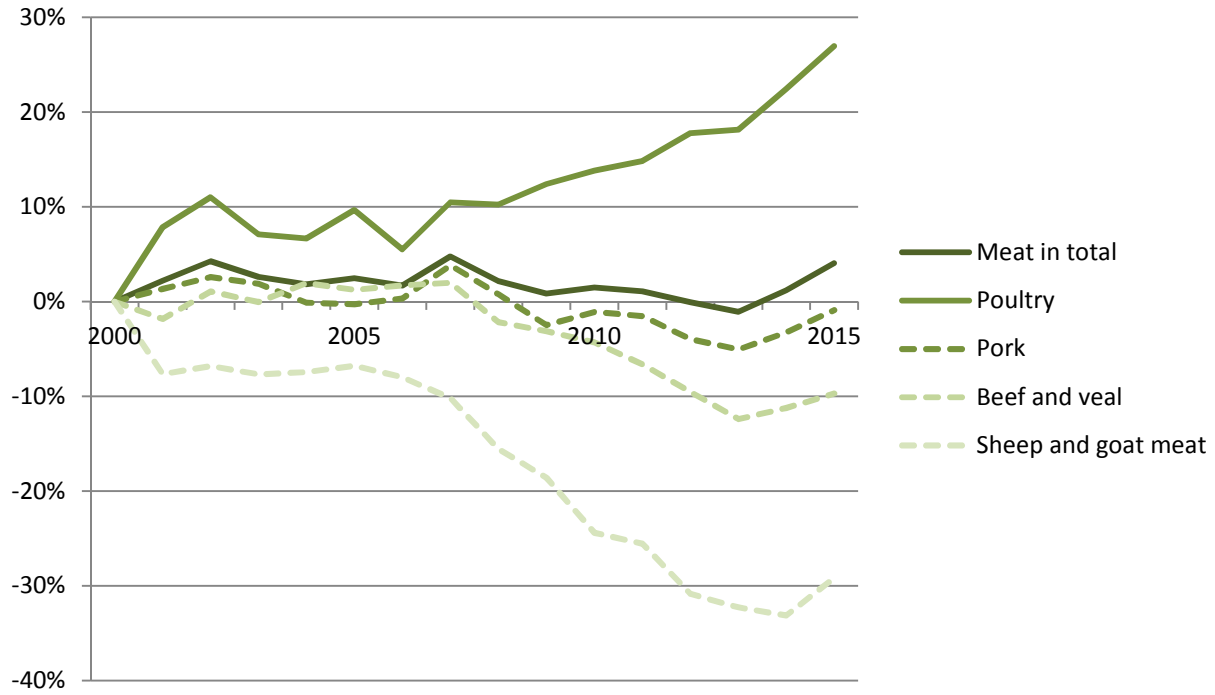
Source: Eurostat (2016d)
Note: Data for 2014.

3.2. Domestic Demand

The quantity of **aggregated EU meat consumption per capita of all types has barely changed since 2000** (Figure 31). While there was a slight decline from 2007 to 2013, it has experienced a slight increase since then and has been only 4% higher in 2015 than in 2000. On average, **Europeans consumed 65 kg of meat per capita in 2000, an amount that has grown to 68 kg in 2015**. However, the average composition of the meat basket consumed by Europeans, i.e. the **structure of the meat types consumed**, **has experienced a substantial change**.

The **type of meat most important in the European diet is pork**. The quantity of pork consumed has stayed virtually constant at 32 kg (Figure 31). Its share in total meat consumption has slightly declined from 50% to 47%, since total meat consumption has grown by 4%. Beef and veal meat account for the third-largest share after poultry meat. The **quantity of bovine meat consumed has shrunk from 11.9 kg per capita in 2000 to 10.7 kg per capita in 2015,** which translates to a **relative change of -10%**. Figure 31 shows that **this decline started in 2007** and has slightly rebounded since 2013.

Figure 31: Evolution of per capita consumption of different meat types in the EU



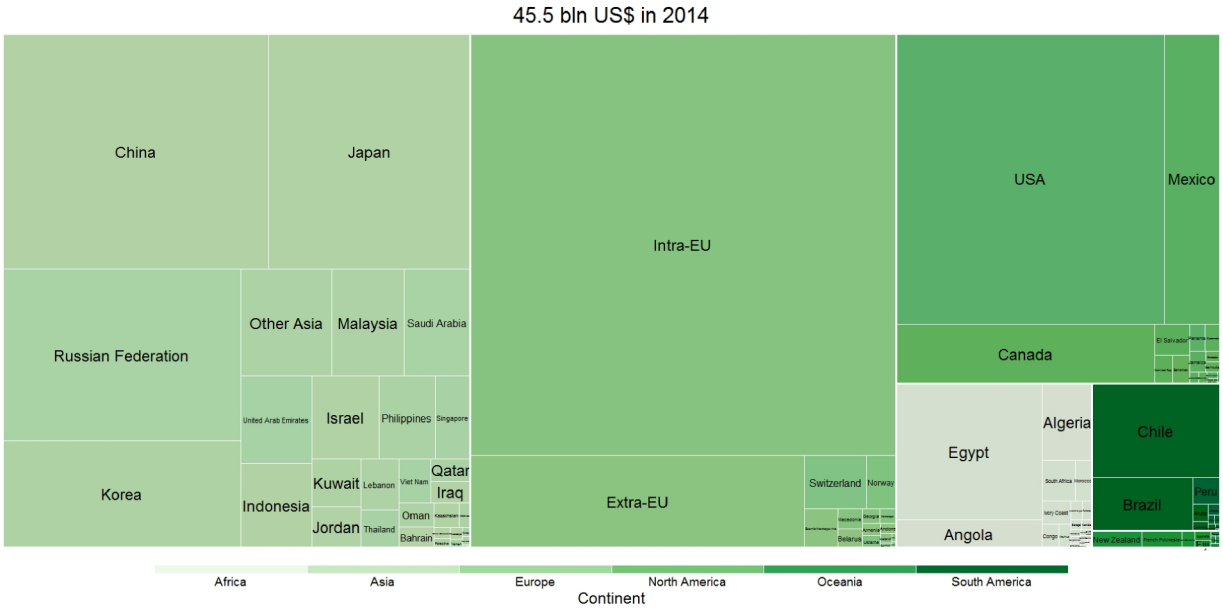
Source: Authors based on European Commission (2016m)
Note: All variables are indexed, that is, the value of 2000 is set to equal 0, the values of the original variables for the following years are each divided by the value in 2000 of the corresponding variable and 1 is subtracted from the quotient. Therefore, this graph shows the relative changes of the variables in comparison with 2000. The original data is measured in kg/capita.

The change in the consumption of bovine meat is moderate in comparison to **the large changes in poultry meat and sheep and goat meat consumption** (Figure 31). While **poultry meat has gained in popularity** such that quantities rose by more than one fifth **from 18 kg in 2000 to almost 23 kg in 2015**, the **consumption of sheep and goat meat declined by one third** from 2.7 kg in 2000 to 1.9 in 2015.

3.3. Global Import Demand

The **total value of global bovine meat imports** (45.5 bln US$, Figure 32) is only about **half of** the magnitude of the value of **global dairy commodity imports** (86.6 bln US$, see Figure 22). Global imports of bovine meat are **dominated by intra-EU trade and imports to the US,** accounting together for **41% of all bovine meat imports**. Intra-EU imports alone accounts for 29% of the value of global imports. **China, Japan and Russia belong to the five largest importers, accounting together for 24%** of the total import value. Imports from extra-EU and bovine meat imports of Korea, Egypt, Mexico and Canada (ranked in decreasing order) amounted to more than 1 bln US$ as well. These **ten importers account for more than 80% of the global import value** (Figure 32). **Besides the EU, Asian countries account for the lion's share** of the rest of global dairy imports (38% in 2014, see Table A1.22). Five Asian countries import bovine meat of about 0.5 bln US$. North America has the third-largest import share of about one fifth (18%, see Table A1.22), with the **US, Canada and Mexico ranking among the ten largest importers**. However, Chile and Brazil also import bovine meat of 0.8 bln and 0.4 bln US$, respectively. The **role of MENA countries in the global meat demand is smaller than their role in the global dairy demand**. The **role of emerging economies is of about the same magnitude as their role in the global dairy demand** (Figure 32).

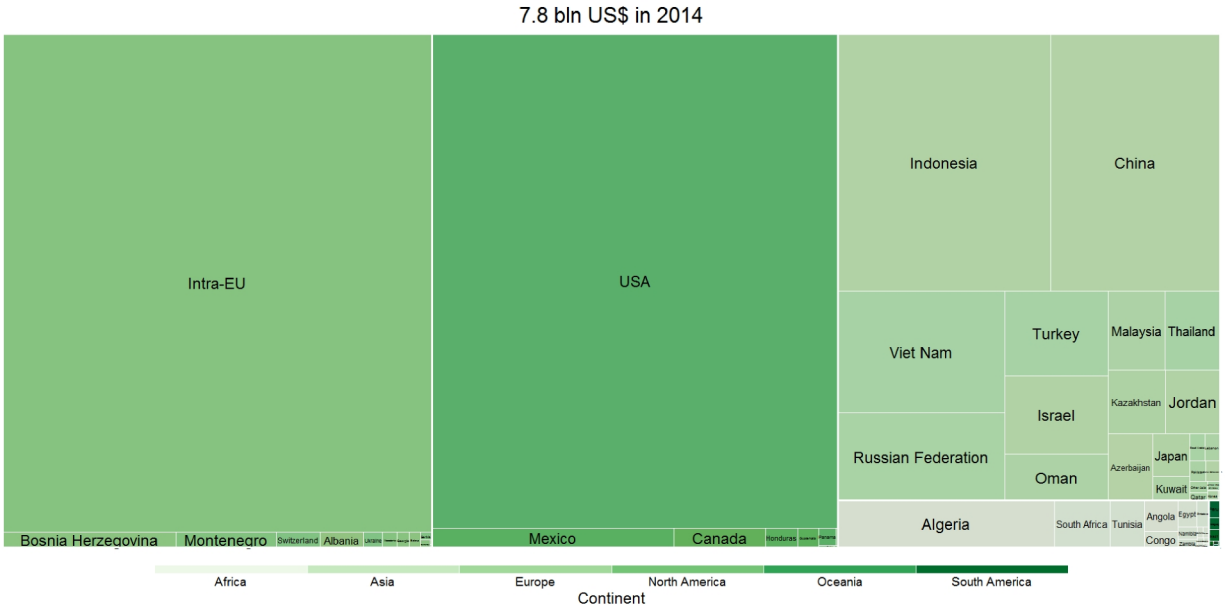
Figure 32: Market shares in global imports of bovine meat commodities



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global bovine meat imports. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the import values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in the global imports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade based on the value shares of 2014 in Figure A1.6. Data for 2014. The summary of trade value shares per continent is given in Table A1.22, p. 206.

The **demand for live bovine animals is limited to a few large players**, as indicated in Figure 33. **Intra-EU imports and US imports account together for 68%** of total bovine live animal imports. The four Asian countries following, in terms of import value size, account for a further 21%, such that **the largest six importers import almost 90%** of the global import value of these animals. **European, North American and Asian imports have almost equal shares** of about one third in the global imports of these animals (Table A1.22). Intra-EU trade and US imports are by far the dominating players in their respective continents. Africa and South-America play a negligible role. Only in Asia are live animals imported by a number of countries in significant magnitudes.

Figure 33: Market shares in global imports of bovine live animals



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global bovine live animals imports. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the import values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global imports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade based on the value shares of 2014 in Figure A1.6. Data for 2014.

Table **33** outlines the major global bovine meat import developments in the last decade. The **largest growth of imports took place in Africa, with a roughly 400% increase. Imports to Asia and South America have been growing by about 250%**. Europe, North America and Oceania, **three of the four continents realizing the largest net earnings from bovine products trade as portrayed in Figure 15, have experienced the lowest increases in bovine meat imports**. Their imports have risen by only a half or a third of the rate of the other continents. **Asia accounts for the largest** share of the import **value** (38%) and has also experienced **the second highest growth rate of bovine meat imports** during the last decade.

Table 33: Development of bovine meat imports (in bln US dollar) by continent from 2004-2014

Continent	Imports 2014	Share 2014	Change 2014 vs. 2004
Africa	2.3	5%	+388%
Asia	17.5	38%	+268%
Europe	15.9	35%	+82%
North America	8.3	18%	+74%
Oceania	0.2	0%	+111%
South America	1.4	3%	+255%
Sum	45.5	100%	

Source: Authors based on Comtrade (2016)
Note: These values are the sum of the import of all the relevant HS6 commodity categories as outlined in Table A1.18. Import values in bln US$. Growth in nominal terms.

Among the importers of significant size in the bovine meat world market, **several countries have experienced very high growth rates of several hundred or thousand percent** (Table 34). Again, **China** stands out since it **not only has a large market share of 10% of all imports but also experienced a growth of 1400%** in the last decade. The four **countries with the largest growth rates of imports are located in Asia**. Among the eight countries with the largest import growth rates, there are two countries with a Muslim population majority. Although half of these countries despite their large growth markets have shares of less than 1% in global bovine meat imports, **they account in total for about one quarter of all bovine meat imports**.

Table 34: Largest increases in bovine meat imports 2004-2014 (in bln dollar)

Country	Imports 2014	Share 2014	Change 2014 vs. 2004
Viet Nam	0.10	0.2%	+3727%
Thailand	0.10	0.2%	+2576%
China	4.56	10.0%	+1402%
Indonesia	0.43	0.9%	+733%
Egypt	1.46	3.2%	+637%
Brazil	0.39	0.9%	+415%
Canada	1.12	2.5%	+378%
Russian Federation	2.97	6.5%	+315%
Sum	11.13	24.4%	

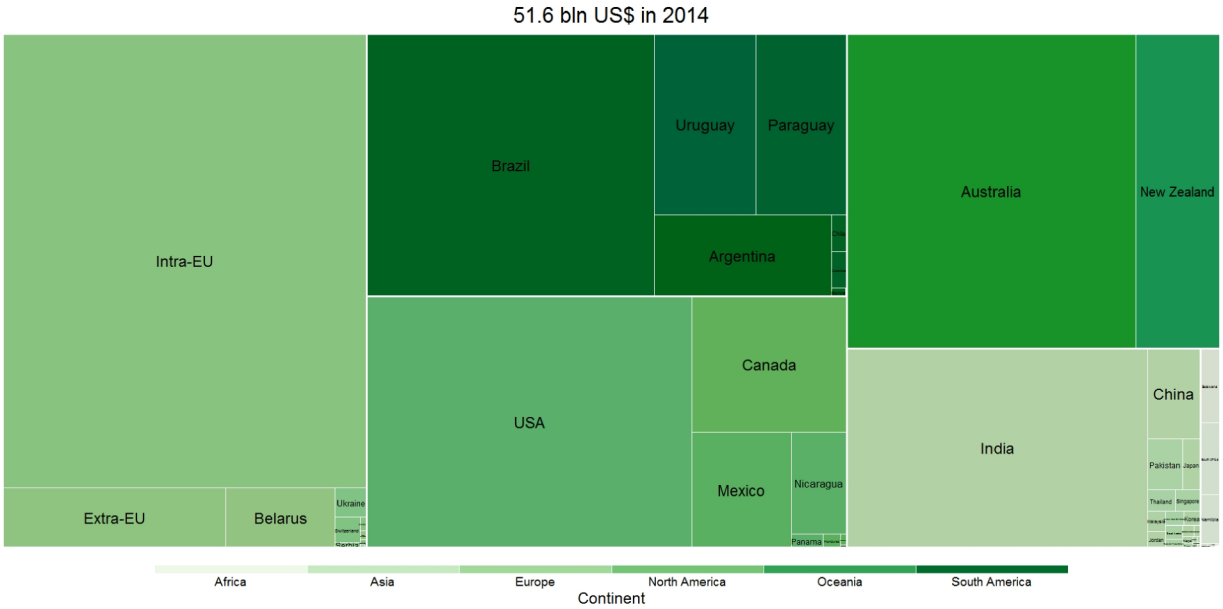
Source: Authors based on Comtrade (2016)
Note: These values are the sum of the imports of all the relevant HS6 commodity categories as outlined in Table A1.18.Import values in bln US$. The column "Shares 2014" denotes the share of the country's bovine meat imports in total global bovine meat imports in 2014. Growth in nominal terms. As there are many countries that had very low import values in 2014 despite huge growth rates of several ten thousand percent, in the table the only countries considered are those that had in 2014 an import value of at least 0.1 bln US$ (corresponding to a world market share of bovine meat imports of 0.22%).

3.4. Domestic Supply

The **value of global bovine product exports adds up to less than three quarters of global dairy exports** (70% in 2014, Comtrade, 2016). The role of the EU is much less dominant than in the case of dairy exports. The ten largest exports, disregarding intra-EU exports, **account for about two thirds of all bovine product exports** (67% in 2014). Disregarding intra-EU trade, **Australia, the US, Brazil and India dominate** global bovine meat exports (Figure 34), each delivering bovine meat products of **at least 5 bln US$** to the world. They are followed by the six exporters that **trade such meat products for at least 1 bln US$: New Zealand, Canada, Uruguay, Paraguay, Argentina and extra-EU**. Africa plays a negligible role.

North America, Oceania and South-America each account for about one fifth of global bovine meat exports (Table A1.22). The **EU accounts for about one quarter** (29% in 2014, Table A1.22). However, **more than 90% of these exports end up within the EU**. Less than 10% of EU exports, corresponding to about 1 bln US$ in 2014, are destined for the rest of the world. **This share has been relatively stable since 2010** (Figure A1.6). **Extra-EU exports have a share of about 2% in global bovine meat products exports** (Table A1.22).

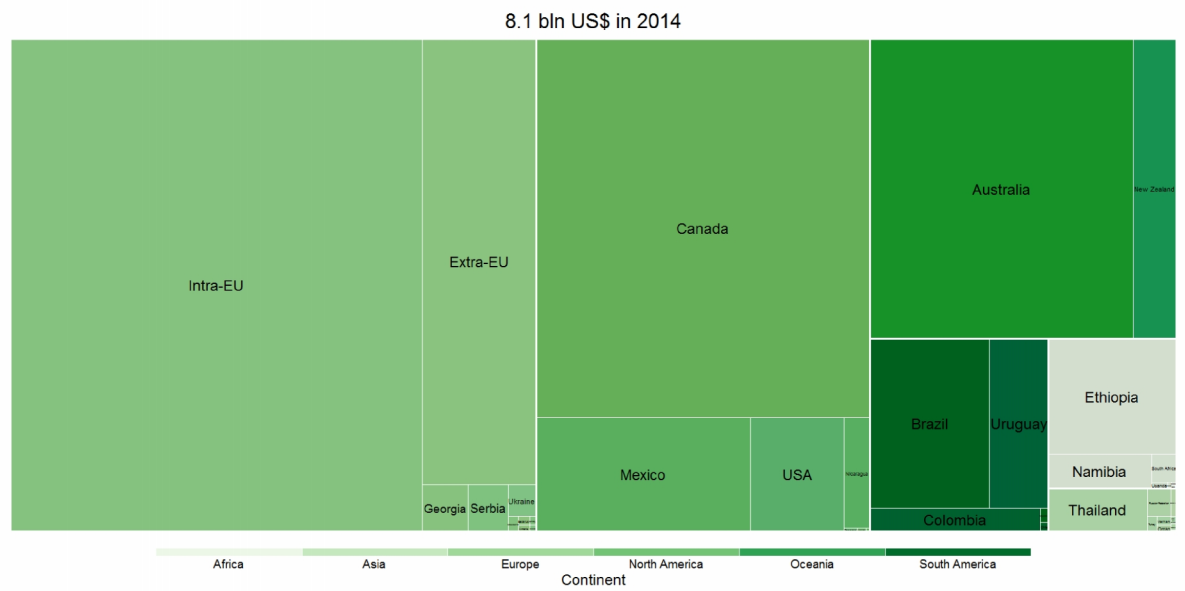
Figure 34: Market shares in global exports of bovine meat commodities



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global bovine meat exports. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the export values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global exports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade based on the value shares of 2014 in Figure A1.6. Data for 2014.

The **value of global exports of live bovine animals totals just less than one tenth of global dairy exports** (9% in 2014, Comtrade, 2016). The role of the EU is of a similar magnitude as for dairy exports, having a market share of 44% in global exports in 2014. The ten largest exports, disregarding intra-EU exports, **account for 60% of all such exports** (62% in 2014). Disregarding intra-EU trade, **Canada, Australia and extra-EU trade dominate** global exports (Figure 35), each delivering bovine animals of **at least 0.5 bln US$** to the world. They are followed by the six exporters that **trade for at least 0.1bln US$**: **Mexico, Brazil, Ethiopia, New Zealand, the US and Uruguay**. Africa plays a negligible role. The **share of EU exports of live bovine animals leaving the EU has been strongly volatile** during the last 15 years, **ranging between 10% and 50%** (20% in 2014, Figure A1.6).

Figure 35: Market shares in global exports of bovine live animals



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global bovine live animals exports. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the export values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global exports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade based on the value shares of 2014 in Figure A1.6. Data for 2014.

In the remainder of this chapter, the regional structure of the farms belonging to the EU cattle sector and the development of domestic supply are analysed in detail.

3.4.1. Farm numbers

The **pattern of specialist cattle fattening farms across EU regions** in Map 12 **differs strongly from the distribution of all cattle-keeping farms** in Map 1. Regions with the **most farms of this type are located in the EU15** (Figure 4). By far, the highest number of farms is located **in Ireland, followed by north-western Spain and in and around the Alps**. Only a few EU13 regions, such as eastern Poland or Slovenia, also have comparatively high numbers of this farm type. The **regional concentration,** measured as the aggregated share of the five regions with the highest farm numbers out of the total number of these farms in the EU, is 32% (Table 35) **comparable to specialist dairying farms and all cattle-keeping farms** (Table 4).

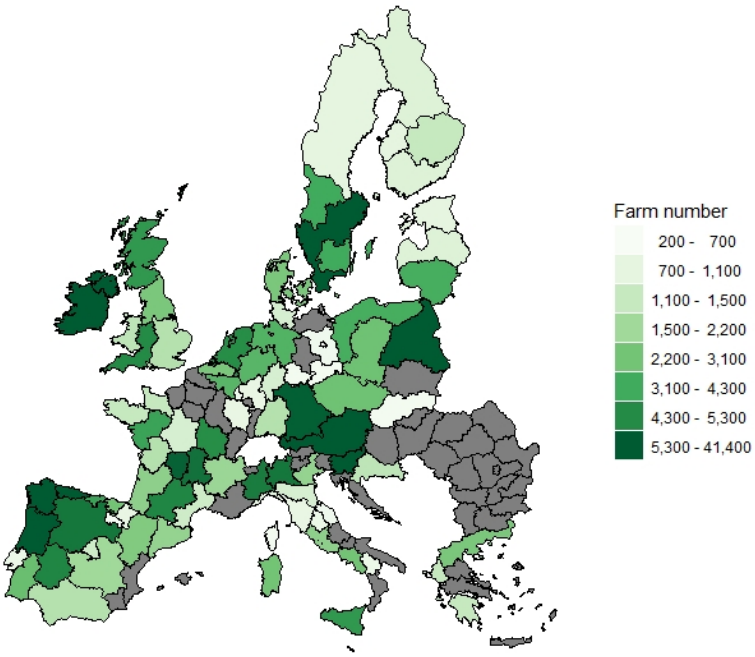
Table 35: Regions with the most and the least specialist cattle fattening farms

Region (MS)	Number of com. farms	Region (MS)	Number of com. farms
Ireland (IE)	41,400	Sachsen (DE)	300
Galicia (ES)	12,200	Thüringen (DE)	300
Slovenia (SI)	9,600	Corse (FR)	300
Mazowsze and Podlasie (PL)	9,200	Slovakia (SK)	300
Asturias (ES)	8,500	La Rioja (ES)	200
Sum (share in total)	80,900 (32%)	Sum (share in total)	1,400 (<0.01%)

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions in which the largest numbers of commercial specialist cattle fattening farms (principal farming type (46)) are located. The two right-most columns show the five FADN regions that have the smallest number of specialist cattle fattening farms (principal farming type (46)). Data for 2010. 37 regions did not report any farms of this type.

The **typical EU region**, as measured by the median of all FADN regions, **has 1800 cattle fattening farms**. In 2013, there were **11 regions that had more than 5000 farms** of this type. Only two of them are located in the EU13. Map 16 indicates that there are only a **few clusters of regions of similar magnitudes of farm numbers**. Neighbouring regions tend to have strongly differing numbers. The **lowest regional farm numbers are found in East Germany as well as several Mediterranean regions**.

Map 16: Regional distribution of specialist cattle fattening farms



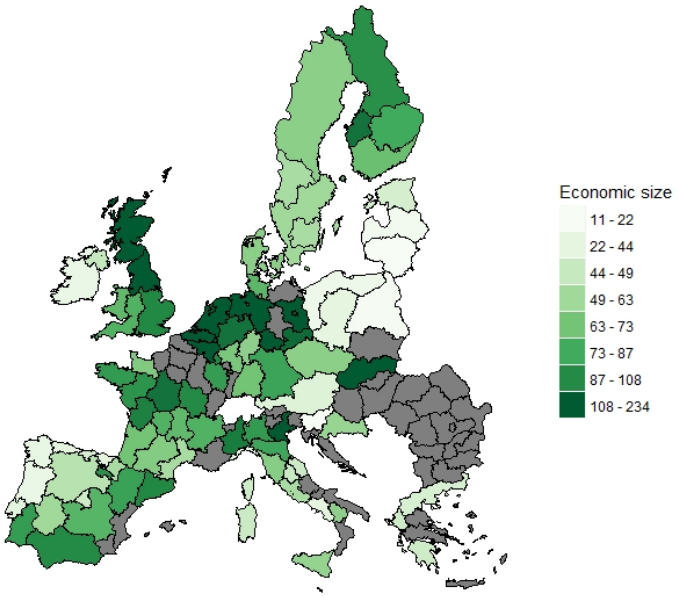
Source: Authors based on European Commission (2016j)
Note: The plot shows the number of farms of the principal farming type (46) per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2010.

3.4.2. Farm size

The distribution of the economic sizes of fattening farms across the EU depicted in Map 17 most closely resembles the pattern shown by mixed livestock farms (Map A2.13): farms (Map A2.13): the **regions having the largest average farm sizes are located in the Benelux countries and Germany**. Regions with **smallest average farm sizes are in the north-eastern regions of the EU**. **Farm sizes tend to be more homogenously distributed than farm numbers**: neighbouring regions tend to have more similar-sized farms of this type, although their density across the regions differs substantially.

There is a reciprocal tendency between farm number and farm size per region apparent: regions that are dark-coloured in Map 16. indicating the highest numbers of fattening farms in comparison to all other regions, tend to be light-coloured in Map 17, indicating the lowest average farm sizes compared to all other regions.

Map 17: Regional distribution of economic size of specialist fattening farms (measured in 1,000 euros standard output per FADN region)



Source: Authors based on European Commission (2016j)
Note: The plot shows the average economic size of specialist cattle fattening farms (principal farming type (46)) measured in SO in terms of 1000 € per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason.

Table 36: Regions with the highest and lowest economic sizes of specialist fattening farms (measured in 1,000 euros standard output per FADN region)

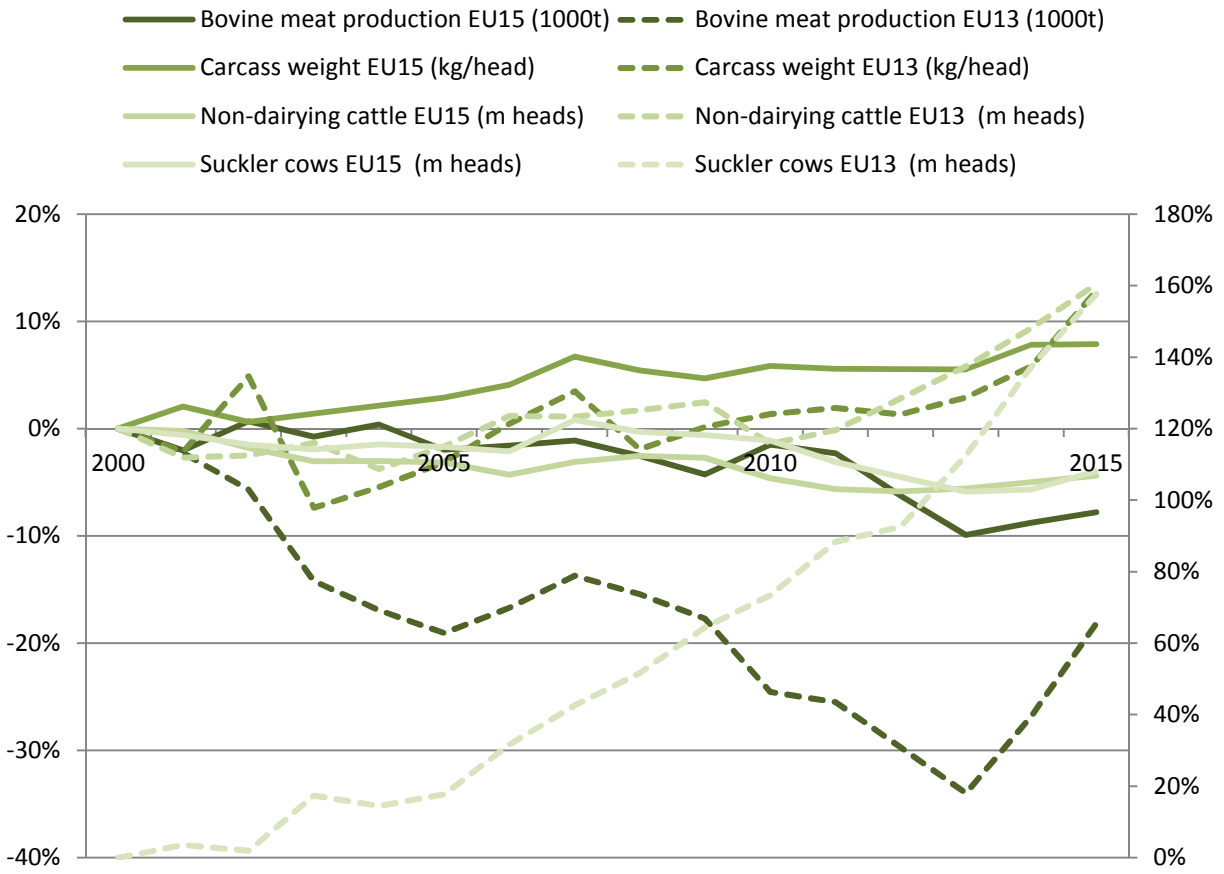
Region (MS)	Economic size	Region (MS)	Economic size
Thüringen (DE)	234	Pomorze and Mazury (PL)	17
Veneto (IT)	192	Latvia (LV)	14
The Netherlands (NL)	176	Mazowsze and Podlasie (PL)	12
Brandenburg (DE)	140	Slovenia (SI)	11
Vlaanderen (BE)	124	Lithuania (LT)	11

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions that have the largest average economic size of specialist fattening farms (principal farming type (46)). The two right-most columns show the five FADN regions that have the smallest economic size of specialist fattening farms (principal farming type (46)). Data for 2013. For 41 regions, no data was available.

3.4.3. Production output

Bovine meat production in the EU13 has experienced stronger change than in the EU15 during the last one and a half decades (**Figure** 36). The output of bovine meat production in the EU15 has been stable from 2000 until 2005. Afterwards, it showed a slight negative trend amounting to 8% less quantity in 2015 than in 2000 (**Figure** 36). In contrast, until 2013 **bovine meat production in the EU13 has experienced a substantial decline of one third** of the quantity. Since 2014, the production quantity has rebounded by about 200,000 t, such that the 2015 production quantity is 18% smaller than the bovine meat quantity produced fifteen years before. Consequently, **total bovine meat production in the EU has declined by almost 800,000 t since 2000, reaching 7.7 mt in 2015** (Figure A3.2).

Figure 36: Development of EU bovine meat production since 2000



Source: Authors based on European Commission (2016i)
Note: All variables are indexed, that is, the value of each of them in 2000 is set to equal 0. The original values of the variables for the following years are each divided by the value in 2000 of the corresponding variable and one is subtracted from the ratio. Therefore, this graph shows the relative changes of the variables in comparison with 2000. The development of suckler cows in the EU13 is measured by the axis on the right-hand side; all other variables are measured by the axis on the left-hand side.

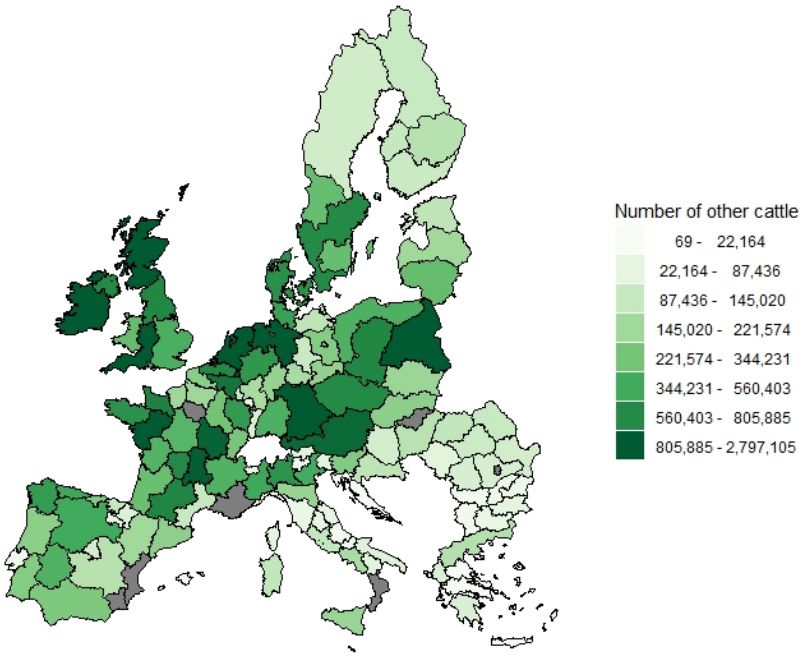
Average carcass weight in the EU increased by 24 kg/head in the same period to 288 kg/head (Figure A3.2). Carcass weight in the EU15 has shown a stable upwards trend since 2000 (**Figure** 36). Carcass weight in the EU13 has been strongly fluctuating around a level that was almost constant until 2013, but has steeply risen since then by 13% in comparison with 2000. **Average carcass weight of the EU13** reduced to 75% of the EU average in 2003 and **has shown a sustained positive trend** since then, reading 84% in 2015 (Figure A3.4).

The development of the herd size of non-dairying cattle had opposing directions in the EU15 and the EU13. The herd size of suckler cows and non-dairying cows remained largely stable in the EU15, each showing a slight decrease of 4%. **The herd sizes in the EU13 expanded substantially**. The number of suckler cows grew by 160% (right-hand side axis of **Figure** 36) and the number of all non-dairying cattle by 14% since 2000. As a result, the share of the EU13 suckler cow herd in the total EU suckler cow herd reached 7% in 2015 (Figure A3.4). The share of the total non-dairying cattle herd of the EU13 in the EU total reached 13% in 2015 (Figure A3.4). **Due to these small shares, the strong growth in the EU13 virtually did not affect the size of the total EU herd**, which remained at a stable level since the year 2000 as illustrated byFigure A3.3.

3.4.4. Production intensity

The **distribution of non-dairy cattle** in Map 18 **is only partly similar to the distribution of dairy cows** (Map 7). While the **regions in and around the Benelux countries and bordering the Alps also have the highest numbers of non-dairying cattle**, other regions with the highest numbers of this cattle are barely located in the south-east of the EU, but instead **concentrated in** its north-west as shown by Map A3.2, i.e. **Ireland, the UK and parts of France**—Denmark and southern Sweden to a lesser extent. The regions with the most numbers of non-dairying cattle are scattered across the north-western part of the EU with only one of them located in the EU13 (Table 37). The **concentration of non-dairying cattle across EU regions is low** as the five regions with the largest herd size account only for 22% of the total EU herd size (Table 37).

Map 18: Distribution of non-dairying cattle



Source: Authors based on European Commission (2016j)
Note: The plot shows the distribution of all other cattle (except dairy cows) numbers per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2013.

Of the **24 regions having a non-dairying cattle population of at least half a million animals, seven are located in France, four in the UK, two in Poland and two in Germany**. Also, in Austria and the Czech Republic more than half a million animals are kept. The **smallest cattle numbers are found in regions along the Mediterranean Sea** (Table 37). **Ireland**, which has the largest share in the EU in total non-dairying cattle among all FADN regions, **has an average herd size per farm of only 46 animals**. The country thus ranks 51st in terms of herd size among all FADN regions, closely above the **typical non-dairying herd size in the EU of 38 heads** as measured by the median.

The **farms with the largest average of non-dairying cattle herds are located in East Germany, Slovakia and the Czech Republic,** but are also clustered in **Central France and the UK** (Table A3.1). **Eleven regions have the average non-dairy herd sizes of at least 100 heads**: the five East German regions, two regions in the UK, two regions in France,

one region in Spain and Slovakia. Also for non-dairying cattle, **discrepancies in average herd sizes per farm are huge across the EU**. While it amounts to 190 and 164 animals in Thüringen (DE) and Slovakia, respectively, farms of the EU cattle sector keep on average only one non-dairying animal in Romanian and Greek regions (Table A3.2).

Table 37: Regions with highest and lowest numbers of non-dairying cattle

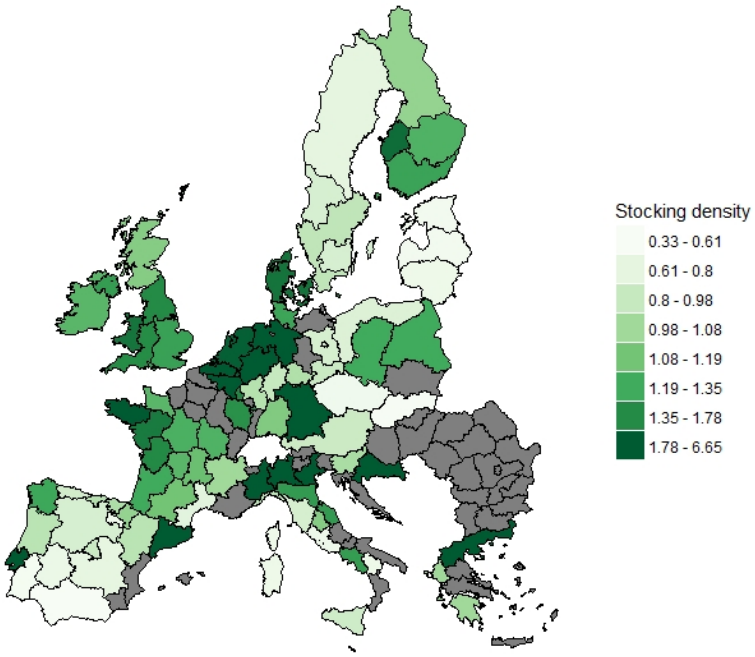
Region (MS)	Cattle number	Region (MS)	Cattle number
Ireland (IE)	2,797,105	Adriatic Croatia (HR)	4,363
Bayern (DE)	1,227,525	Baleares (ES)	4,355
The Netherlands (NL)	1,135,986	Malta (MT)	3,888
Pays de la Loire (FR)	1,058,446	Sterea Ellas-Nissi Egaeou-Kriti (EL)	1,404
Mazowsze and Podlasie (PL)	955,792	Thessalia (EL)	69
Sum (share in total)	7.2m (22%)	Sum (share in total)	14,079 (<0.1%)

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions with the highest cattle numbers except for dairy cows. The two right-most columns show the five FADN regions with the smallest cattle numbers except for dairy cows. Data for 2013.

Map A3.2emphasizes **the regional concentration of specialist cattle fattening farms in the north-west of the EU**. The regions with the largest cattle numbers kept by this farm type are located in Ireland, France and the UK (Table A3.3). Also in the Netherlands, the southern part of Belgium as well as regions in western Spain and northern Italy, specialist fattening farms have a total cattle herd size of more than 250,000 animals.

The **stocking density** of specialist cattle fattening farms in Map 19 **differs markedly from** the one of **specialist dairying farms** (Map 8). Stocking densities of specialist cattle fattening farms are in general only **half the magnitude** of the stocking densities of dairying farms. The **highest average densities are clustered in and around the Benelux, in north-western France, northern Italy, Croatia and southern Finland**.

Map 19: Stocking density (in LSU/ha UAA) of specialist fattening farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the stocking density of specialist cattle fattening farms (principal farming type (46)) per FADN region (in LSU/ha UAA). Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2013.

While the **highest stocking densities** are found **in northern Italian regions**, the **lowest densities cluster in the Baltic states, Slovakia, the Czech Republic and Austria** as well as southern Italy and southern Spain and Portugal (Table 38).

Table 38: Regions with the highest and lowest stocking densities (in LSU/ha UAA) of specialist fattening farms

Region (MS)	Stocking density	Region (MS)	Stocking density
Lombardia (IT)	6.6	Estonia (EE)	0.4
Veneto (IT)	6.5	Latvia (LV)	0.4
Vlaanderen (BE)	2.5	Alentejo e do Algarve (PT)	0.4
Makedonia-Thraki (EL)	2.3	Slovakia (SK)	0.3
Piemonte (IT)	2.2	Andalucia (ES)	0.3

Source: Authors based on European Commission (2016j)
Note: Stocking density measured in LSU per ha UAA, see Table A.1, p. 170, for an exact definition. The two left-most columns show the five FADN regions with the highest stocking density of specialist cattle fattening farms. The two right-most columns show the five FADN regions with the smallest stocking density of specialist cattle fattening farms. Data for 2013. For 37 regions, no data was available.

3.4.5. Farm productivity

Regions in which farm productivity per animal of specialist cattle fattening farms is largest are clustered in and around the Benelux, in and around the Alps, in central Italy as well as in Finland (Map 20). This productivity is measured as the value of total annual livestock output per Livestock Unit (LSU). It differs across the EU by a factor of eleven,

i.e. animal productivity in Denmark is eleven times higher than in Latvia (Table 39). Regions with highest animal productivity are located in Denmark and Italy, while regions of lowest animal productivity are found in the Mediterranean region as well as in the north-eastern part of the EU (Table 39).

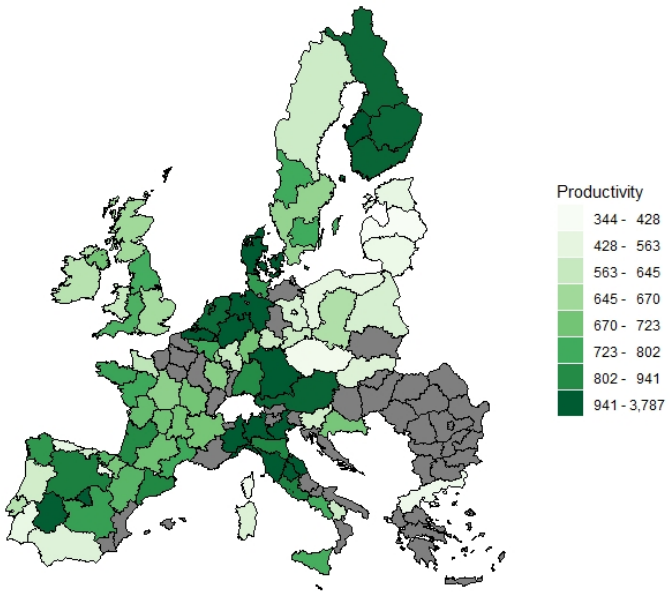
Table 39: Regions with the highest and lowest total livestock output per LSU

Region (MS)	Productivity	Region (MS)	Productivity
Denmark (DK)	3,787	Makedonia-Thraki (EL)	382
Umbria (IT)	1,395	Corse (FR)	379
Toscana (IT)	1,335	Czech Republic (CZ)	374
Liguria (IT)	1,332	Acores e Madeira (PT)	352
Veneto (IT)	1,229	Latvia (LV)	344

Source: Authors based on European Commission (2016j)
Note: Total livestock output per LSU of specialist cattle fattening farms measured in €/LSU. The two left-most columns show the five FADN regions with the highest total livestock output. The two right-most columns show the five FADN regions with the lowest total livestock output. Data for 2013. For 42 regions, no data was available.

Average **animal productivity of specialist cattle fattening farms tends to vary markedly between neighbouring regions in the EU15**, while neighbouring EU13 regions tend to have similar productivity levels (Map 20).

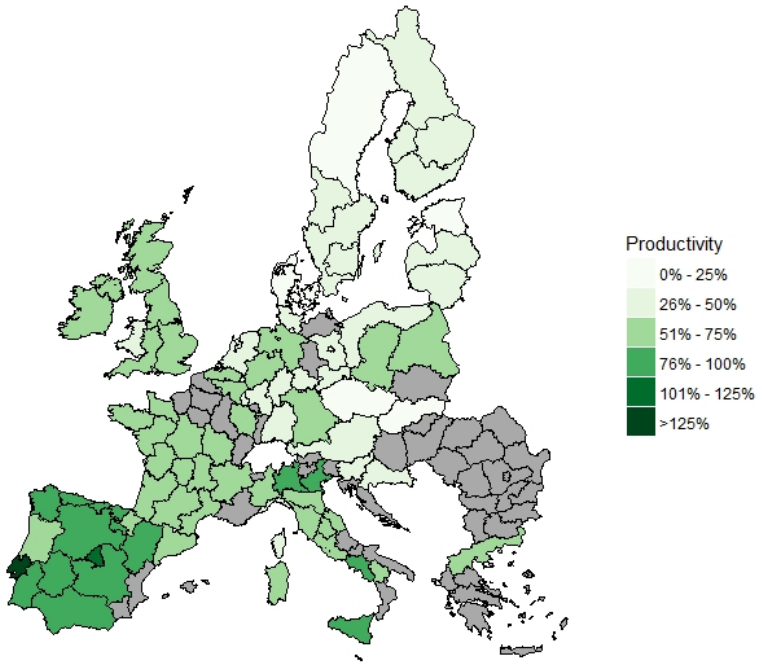
Map 20: Distribution of total livestock output (in euros) per LSU of specialist fattening farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the annual value of livestock-based production per LSU of specialist cattle fattening farms (principal farming type (46)) per FADN region measured in €/LSU. Data for 2013. For 42 regions, no data was available.

The pattern of **input cost productivity** of bovine meat production, as measured by the ratio between the annual value of beef and veal meat and the total annual input costs of the average specialist cattle fattening farm, is much more smoothly distributed across the EU (Map 21) than livestock output. It **shows a pronounced decreasing gradient from the south-western regions towards the north-eastern regions**.

Map 21: Bovine meat production productivity of specialist fattening farms (measured as ratio between production value and total input costs per farm)



Source: Authors based on European Commission (2016j)
Note: The plot shows the bovine meat production productivity of specialist cattle fattening farms (principal farming type (46)) per FADN region as measured by the ratio between the annual production value of beef and veal produced by a farm and the total input costs of the farm. Data for 2013. For 42 regions, no data was available.

The highest input cost productivity levels cluster on the Iberian Peninsula as well as in parts of Italy (Table 40). The lowest input cost productivity levels are found in the Baltic and Scandinavian MS. Also in the Netherlands, Germany, Austria, Hungary and Croatia, productivity is low (Map 21). The regions within most MS show very similar input cost productivity levels.

Table 40: Regions with the highest and lowest bovine meat productivity (measured as ratio between production value and total input costs per farm)

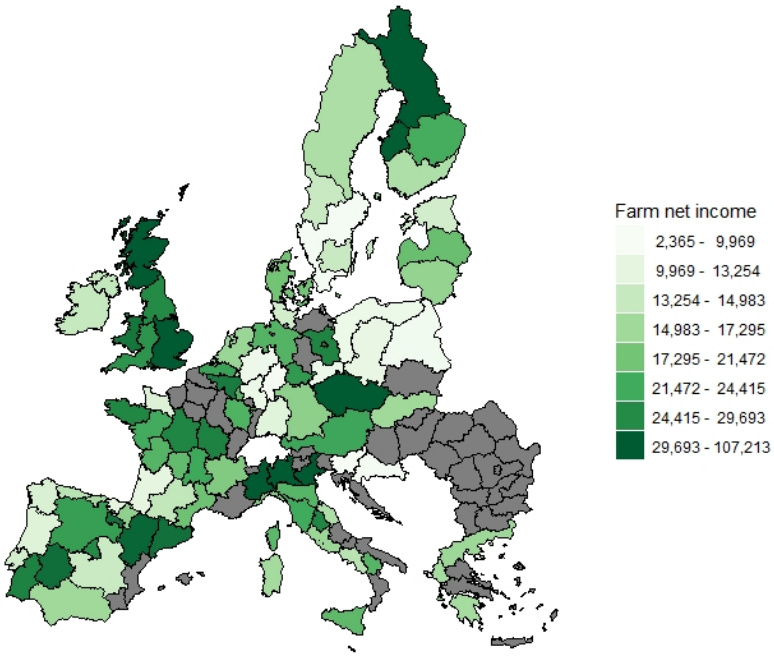
Region (MS)	Productivity	Region (MS)	Productivity
Ribatejo e Oeste (PT)	162%	Estonia (EE)	25%
Madrid (ES)	120%	Czech Republic (CZ)	21%
Campania (IT)	99%	Lan i norra (SE)	17%
Extremadura (ES)	98%	Denmark (DK)	17%
Galicia (ES)	97%	Slovakia (SK)	10%

Source: Authors based on European Commission (2016j)
Note: Input cost productivity of specialist cattle fattening farms is measured as the ratio between the value of annual farm production of beef and veal and the total input costs of a farm. The two left-most columns show the five FADN regions with the highest input cost productivity in the EU. The two right-most columns show the five FADN regions with the smallest input cost productivity. Data for 2013. For 42 regions, no data was available. A value of 162% states that in the region of Ribatejo e Oeste (PT) the value of bovine meat produced by the average specialist cattle fattening farm is 62% larger than its total input costs.

3.4.6. Farm income

Farm income of specialist cattle fattening farms is erratically scattered across EU regions. Map 22 shows that the **regional average farm income varies strongly within almost all MS of a large area**. This statement holds for Finland, Germany, Italy, France and Spain. The distribution of average farm income shows no clear pattern across the EU. Neighbouring regions often differ substantially in income levels from each other. The **income of specialist fattening farms in the typical EU region** as measured by the median **amounts to 17,300 € per year**. In 34 regions, the average annual farm income exceeds 20,000 €, in 40 regions it is between 10,000 and 20,000 € and in 13 regions it is below 10,000 €.

Map 22: Regional distribution of farm income (in euros/year) of specialist fattening farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the average farm net income of specialist fattening farms (principal farming type (46)) measured in € per year and FADN region. Data is the average of net farm income of years 2011, 2012 and 2013. For 41 regions, no data was available.

Table 41: Regions with highest and lowest income per specialist fattening farm

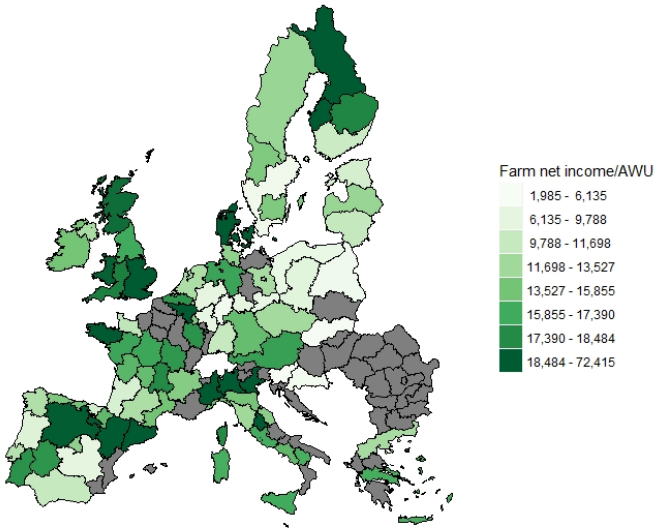
Region (MS)	Net farm income	Region (MS)	Net farm income
Veneto (IT)	107,213	Mazowsze and Podlasie (PL)	4,836
Czech Republic (CZ)	33,898	Kontinentalna Hrvatska (HR)	3,623
Lombardia (IT)	33,093	Slattbygdslan (SE)	3,580
Piemonte (IT)	32,090	Hessen (DE)	3,036
England-East (UK)	30,680	Slovenia (SI)	2,365

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions that have the largest average farm net income in euros/year of specialist fattening farms (principal farming type (46)). The two right-most columns show the five FADN regions that have the smallest farm net income of specialist fattening farms (principal farming type (46)). Data is the average of net farm income of years 2011, 2012 and 2013. For 41 regions, no data was available.

The **highest regional farm incomes cluster in northern Italy, the Czech Republic, the UK and northern Finland** (Table 41). The lowest levels of farm income of this farm type cluster in Poland, southern Sweden, south-west Germany and Slovenia. Net income per farm varies between the largest and smallest regional averages by 45-fold. Irish cattle fattening farms belong to 30% of the regions with the lowest average farm income for this farm type amounting to approx. 13,000 € per year.

The distribution of labour income in the EU bovine meat farming shown in Map 23 appears to be similarly scattered, but deviates slightly from this pattern. The **highest labour incomes are found in northern Italy, northern Spain and northern Finland** (Table 42). Also in Denmark, Belgium, north-western France and the UK, labour income tends to be highest. The lowest average labour income levels are found along the north-eastern EU border as well as in west Germany, south-western France and the southern half of the Iberian Peninsula.

Map 23: Regional distribution of labour income (in euros/year) of specialist fattening farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the average farm net income/AWU of specialist fattening farms (principal farming type (46)) measured in € per year and FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data is the average of years 2011, 2012 and 2013.

Table 42: Regions with highest and lowest labour income (farm net income in euros per year) of specialist fattening farms

Region (MS)	Labour income	Region (MS)	Labour income
Veneto (IT)	72,415	Mazowsze and Podlasie (PL)	3,604
Lombardia (IT)	33,611	Hessen (DE)	3,462
Aragon (ES)	23,637	Continental Croatia (HR)	2,912
Piemonte (IT)	23,416	Slovakia (SK)	2,178
Pohjois-Suomi (FI)	22,124	Slovenia (SI)	1,985

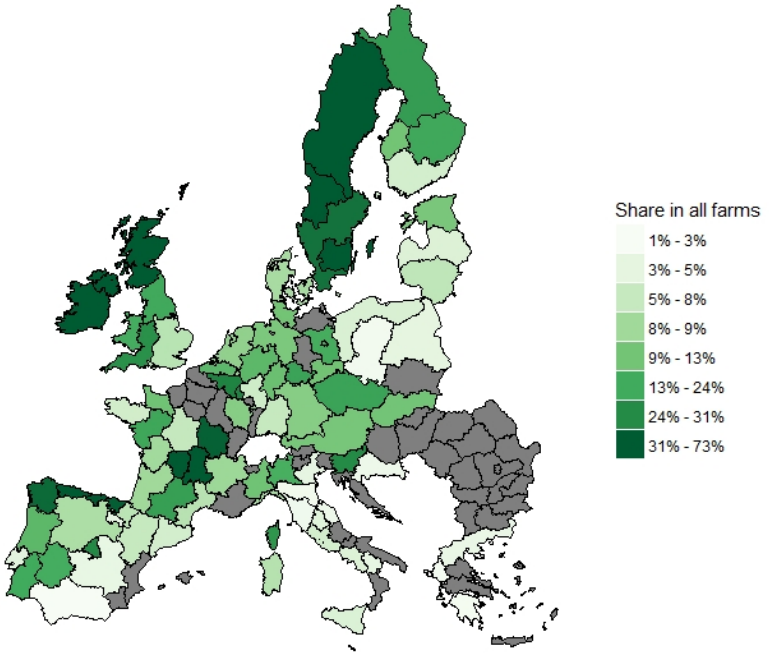
Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions that have the largest average labour income (farm net income/AWU) in euros/year of specialist fattening farms (principal farming type (46)). The two right-most columns show the five FADN regions that have the smallest labour income of specialist dairying farms. Data is the average of years 2011, 2012 and 2013. For 41 regions, no data was available.

The average labour income of the typical EU region as measured by the median **amounts to 13,500 € per year and AWU**. Average labour income in Veneto (IT) is 35 times higher than in Slovenia (Table 42). In ten regions, labour income is above 20,000 € per year and AWU. In 54 regions, it is between 10,000 € and 20,000 €, and in 23 regions it is below 10,000 €.

3.4.7. Role in regional economies

The **role of specialist cattle farming in the agricultural sectors of EU regions,** as measured by its share in total regional farm numbers, appears to be **erratically scattered** across the EU (Map 24). Only northern and north-eastern regions show a more homogenous pattern. The share of this farm type in the total number of commercial farms in EU regions ranges between 73% (northern Spain) and 1% (southern Spain, Table 43).

Map 24: Regional distribution of the shares of specialist fattening farms



Source: Authors based on European Commission (2016j)
Note: The plot shows the share of specialist fattening farms (principal farming type (46)) in all commercial farms per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2010.

The farm type plays the **largest role in northern Spain, central France, Ireland, Sweden and Scotland**. In regions bordering the Mediterranean Sea and in the north-east EU, the farm type has a very small role, accounting for less than 10% of the total farm numbers (Table 43). **Specialist cattle fattening farms account for 9% of the total farm numbers in the typical EU region** as measured by the median. In 20 regions, the share exceeds 20% of the total farm numbers, in 15 regions it is between 10% and 20% and in 51 regions below 10%.

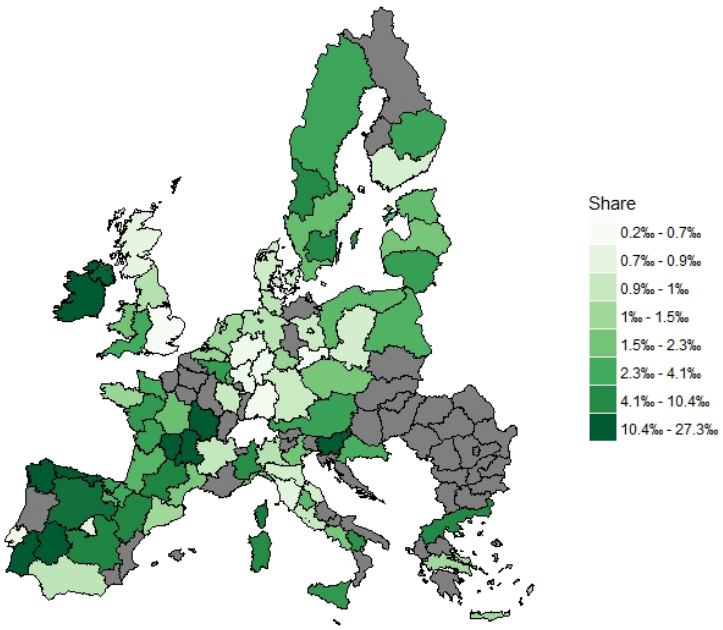
Table 43: Regions with highest and lowest share of specialist fattening farms

Region (MS)	Share in com. farms	Region (MS)	Share in com. farms
Asturias (ES)	73%	Toscana (IT)	2%
Limousin (FR)	69%	Emilia-Romagna (IT)	2%
Cantabria (ES)	55%	Wielkopolska and Slask (PL)	1%
Ireland (IE)	52%	Ipiros-Peloponissos-Nissi Ioniou (EL)	1%
Skogs-och mellanbygdslan (SE)	48%	Andalucia (ES)	<1%

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions in which the share of the number of specialist dairying (principal farming type (46)) is highest among all commercial farms in the FADN region. The two right-most columns show the five FADN regions in which the share of the number of specialist fattening farms among all commercial farms in the FADN region is lowest. Data for 2010. For 37 regions, no data was available.

Specialist cattle fattening farms employ between 2,7% (Ireland) and 0.2‰ (England-East) of the total regional labour force (Table 44). They are thus of smaller importance for the regional agriculture and labour markets than specialist dairying farms (Map 13). Also, the regional pattern diverges substantially from the one of specialist dairying farms. In contrast to the latter farm type, specialist fattening farms in Ireland, regions on the Iberian Peninsula and central France employ the highest shares of regional labour (Table 44, Map 25). In the EU13 regions, it plays a minor role in regional labour markets.

Map 25: Share of labour employed by specialist fattening farms in total labour



Source: Authors based on European Commission (2016j) and European Commission (2015b, table C.05 – Employment rate)
Note: The plot shows the share of the total labour in AWU per year employed by specialist fattening farms (principal farming type (46)) in the total labour force employed in the FADN region. Total regional labour is defined as the number of total employed persons aged 20-64 in the FADN region based on suitable aggregation of the NUTS2-level data in European Commission (2015b, table C.05 – Employment rate). Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Agricultural labour for 2013, total regional labour for 2014.

The smallest shares of regional labour the farm type employs are located in central EU regions (west Germany), parts of the UK and in Mediterranean regions (Table 44). In three regions, the share exceeds 2% of the regional labour force. In eight regions, the share is between 1% and 2% and in 72 regions below 1%. In the typical region as measured by the median, the specialist fattening farms employ 1.9‰ of total labour in the region. In Ireland, this share is about 15 times higher than in the typical region, while it is 90% smaller in England-East.

Table 44: Regions with highest and lowest share of labour employed by specialist fattening farms in regional labour

Region (MS)	Share in regional labour	Region (MS)	Share in regional labour
Ireland (IE)	2.7%	Nordrhein-Westfalen (DE)	0.04%
Limousin (FR)	2.6%	Hessen (DE)	0.04%
Asturias (ES)	2.4%	Baden-Wurttemberg (DE)	0.03%
Extremadura (ES)	2.0%	Sachsen (DE)	0.03%
Alentejo e do Algarve (PT)	2.0%	England-East (UK)	0.02%

Source: Authors based on European Commission (2016j) and and European Commission (2015b, table C.05)
Note: The two left-most columns show the five FADN regions in which specialist fattening farms (principal farming type (46)) employ the highest share of regional labour. The two right-most columns show the five FADN regions in which this share is lowest among all FADN regions. Agricultural labour for 2013, total regional labour for 2014.

In four regions, the labour income in specialist cattle fattening farming is higher than the regional average labour income (Table 45). In several regions, it amounts to about 10% of the average income in the region. In the typical region, as measured by the median, this ratio amounts to 55% of the regional average. In 43 regions, it is between 50% and 100%, and in 36 regions it is below 50%. The **ratios are unregularly scattered across the EU and do not show any particular regional clustering** (Map 26).

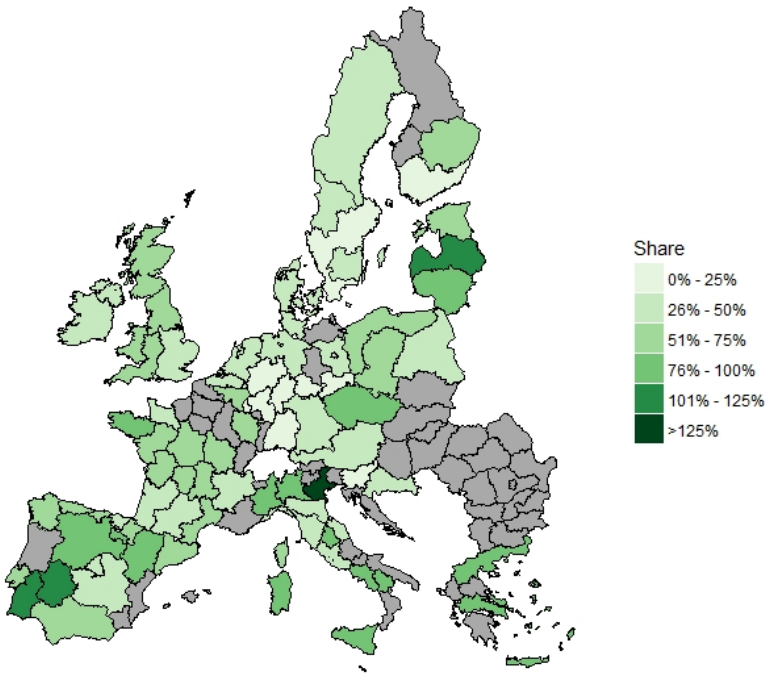
Table 45: Regions with highest and lowest levels of labour income (euros/AWU) of specialist fattening farms in comparison to regional average income (GDP/c.)

Region (MS)	Share in av. income	Region (MS)	Share in av. income
Veneto (IT)	242%	Nordrhein-Westfalen (DE)	17%
Extremadura (ES)	110%	Luxembourg (LU)	15%
Alentejo e do Algarve (PT)	103%	Slovenia (SI)	11%
Latvia (LV)	102%	Hessen (DE)	8%
Lombardia (IT)	96%	Slattbygdslan (SE)	8%

Source: Authors based on European Commission (2016j) and European Commission (2015b, tables CCI 1 & C.08)
Note: The two left-most columns show the five FADN regions in which the share of income per AWU of specialist fattening (principal farming type (46)) is highest in the average income of the FADN region, defined as GDP per capita. The two right-most columns show the five FADN regions in which this share is lowest among all FADN regions. Agricultural income is the average of years 2011, 2012 and 2013 as well as regional income for 2014.

The regions in which this ratio is highest are located on the Iberian Peninsula as well as in Latvia (Table 45). The lowest relative income levels are found in and around western Germany as well as southern Sweden.

Map 26: Labour income (euros/AWU) of specialist fattening farms compared to the regional average income (GDP/capita)



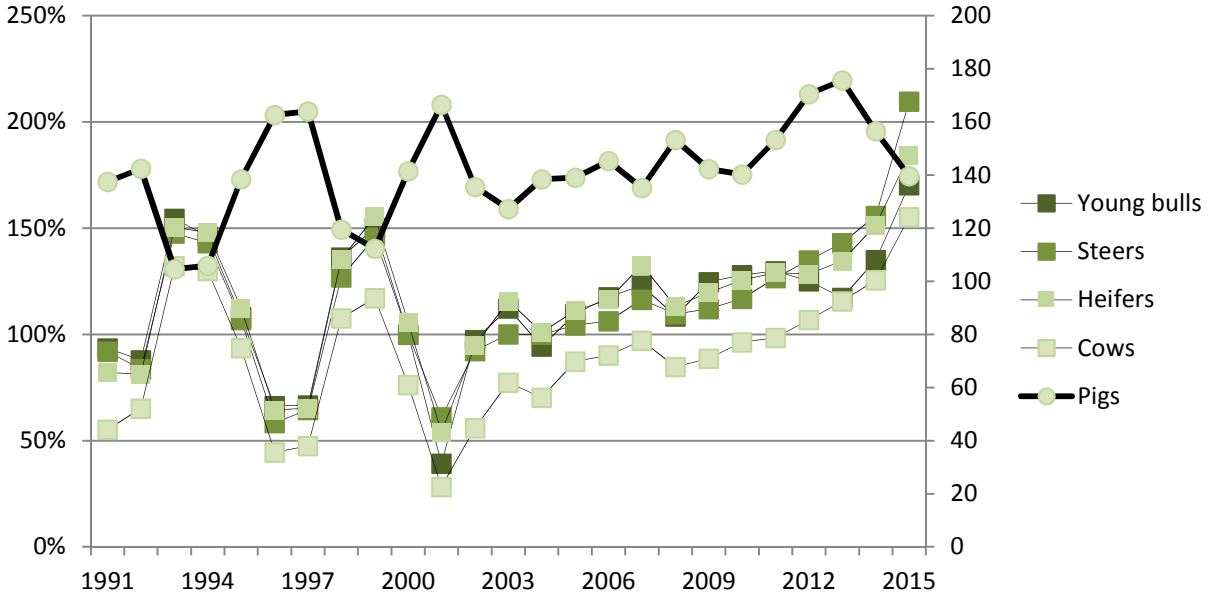
Source: Authors based on European Commission (2016j) and European Commission (2015b, tables CCI 1 - Population and C.08 - GDP per capita)
Note: The plot shows the average income per AWU of specialist fattening farms (principal farming type (46)) as a share in the average income per FADN region. Average income per FADN region is defined as GDP/capita calculated from the European Commission (2015b, tables CCI 1 - Population and C.08 - GDP per capita). Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Agricultural income is the average of years 2011, 2012 and 2013 as well as the regional income for 2014.

3.5. Cattle Slaughter Prices

3.5.1. Price levels

Slaughter prices of different cattle types, among which cows have the lowest price, have been moving closely together **showing the same pattern since 1991** (Figure 37). Cattle slaughter prices are showing a **steady upward trend** almost doubling during the last 25 years **from 250 euros/100 kg** in 1991 **to** about **400 euros/100 kg** in 2015 (Figure A3.1). While they have been 50% to 100% higher than pig slaughter prices 25 years ago, this **price difference has grown to 130% to 160%** in 2015 (Figure 37). Particularly **since 2010**, cattle slaughter prices in the EU have experienced **a steep rise of about 100 euros/100 kg**, while pig slaughter prices remained almost constant (Figure A3.1). Hence, the margin between them and pig slaughter prices has risen from about 130% in 2009 to about 200% in recent years.

Figure 37: Development of annual EU cattle and pig slaughter prices in percent of yearly average prices (left axis) and in euros/100 kg (right axis)

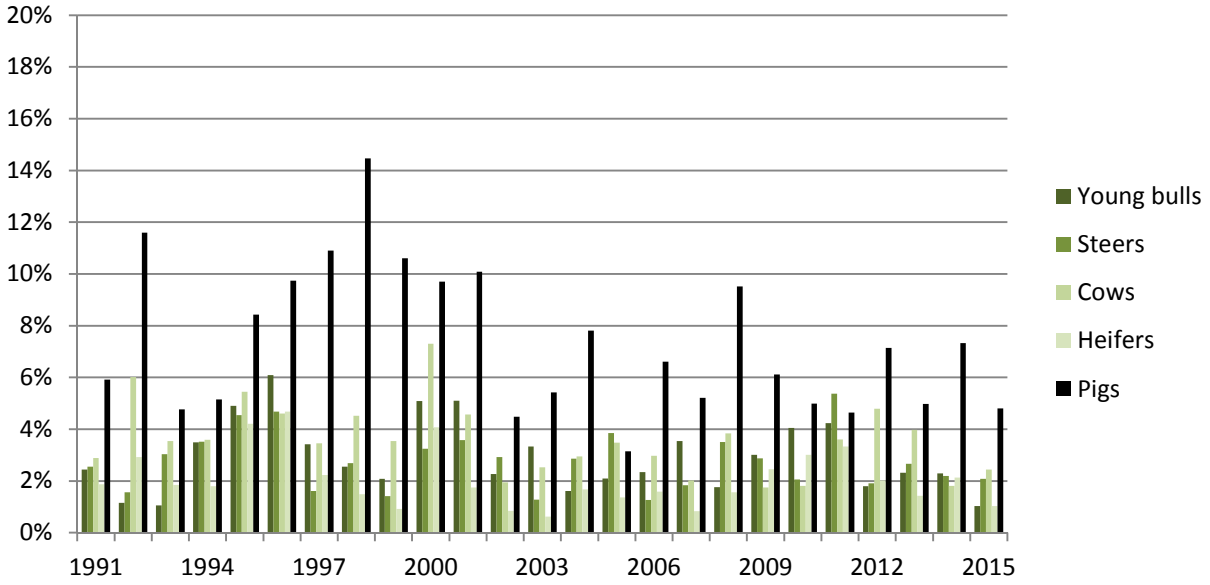


Source: Authors based on European Commission (2016n) and European Commission (2016o)
Note: Nominal annual weighted average prices in euros/100 kg of carcass weight at the EU level. The slaughter prices of bovine animals are expressed as margins relative to pig slaughter prices, that is, they are divided by the average pig slaughter price of each year and 1 is subtracted from the quotient. For example, a value of 210% for steers in 2015 means that the steer slaughter price was about 2.1 times higher than the pig slaughter price of 2015. A value of 55% for cows in 1991 means that the cow slaughter price was 55% higher than the pig slaughter price in 1991. Pig slaughter prices are also nominal annual averages measured in euros/ 100 kg of carcass weight. The corresponding scale is on the axis on the right-hand side.

3.5.2. Price stability

In comparison to dairy prices, **cattle slaughter prices have shown a much smoother development** (Figure 38), **not** experiencing **the structural change** in price developments **since 2007**, such as the extreme price movements of raw milk and dairy products shown in Figure 26. **Price variation** within years **has in tendency even slightly decreased in comparison with the 1990s**: while it reached about 4% of the price level around 1995, it has been around 2% in almost all years since 2002. Slaughter prices of the various cattle types in comparison to each other do not show a discernible pattern. **Cattle slaughter prices have been substantially more stable than pig slaughter prices** (Figure 38). The latter is occasionally experiencing variation of magnitudes between 6% and 14% which cattle slaughter prices virtually never experienced.

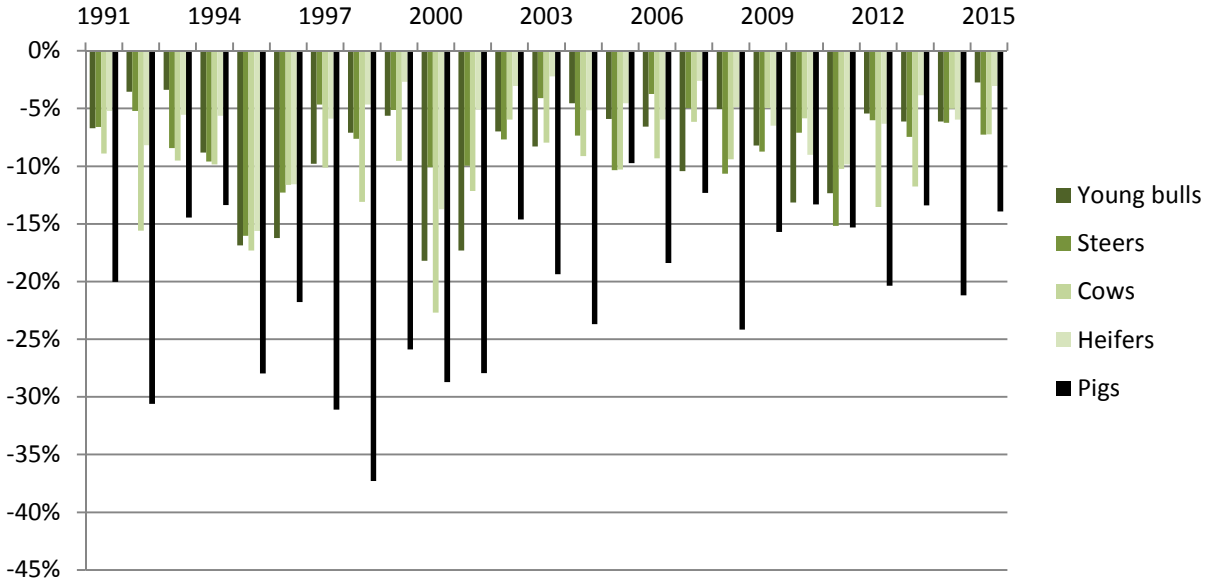
Figure 38: Development of the annual price variation of EU cattle slaughter prices



Source: Authors based on European Commission (2016n) and European Commission (2016o)
Note: The bars denote the annual coefficient of variation of EU bovine meat prices, that is, the quotient between the standard deviation (as a measure of stability) and the mean price of each year. The higher the coefficient of variation, the higher the price instability in a given year. A coefficient of variation of 2%, for example, means that roughly during 2/3 of the year (that is more than 8 months in total) the prices of the commodity were in the range between 2% below the annual average price and 2% above this price. Hence, the graph shows to what extent monthly EU bovine meat prices of a given year varied relative to the average price in that year. The average prices may also vary strongly from year to year as shown in Figure 37. The graph has the same scale as Figure 26 in order to enable the direct comparison with dairy price stability.

These findings are supported by Figure 39, showing the maximum annual ranges of cattle and pig slaughter prices. **Until 2001, there have been a few years,** such as 1995, 2000 and 2001, **in which the lowest** monthly average **prices of a year differed as much as 15% to 20% from the highest** monthly average **prices** of that year. **Since 2002, cattle prices have been remarkably stable, mostly having a maximum price range of less than 10%** of the average annual price level. The years 2011 and 2012 were somewhat exceptional in this respect, with a slightly elevated maximum range; however, **major price crises**, as shown in Figure 27 **for dairy products, did not occur for cattle slaughter prices** during the last two and a half decades. Cattle prices were also much **more stable than pig slaughter prices**, which have shown much higher maximum price ranges of 20% or more with one year. This difference for seasonal patterns might partly be explained by cattle feeders having more freedom in the timing of marketings than have hog producers who are generally forced by capacity constraints to market on a set time schedule.

Figure 39: Development of the maximum annual ranges of EU cattle slaughter prices



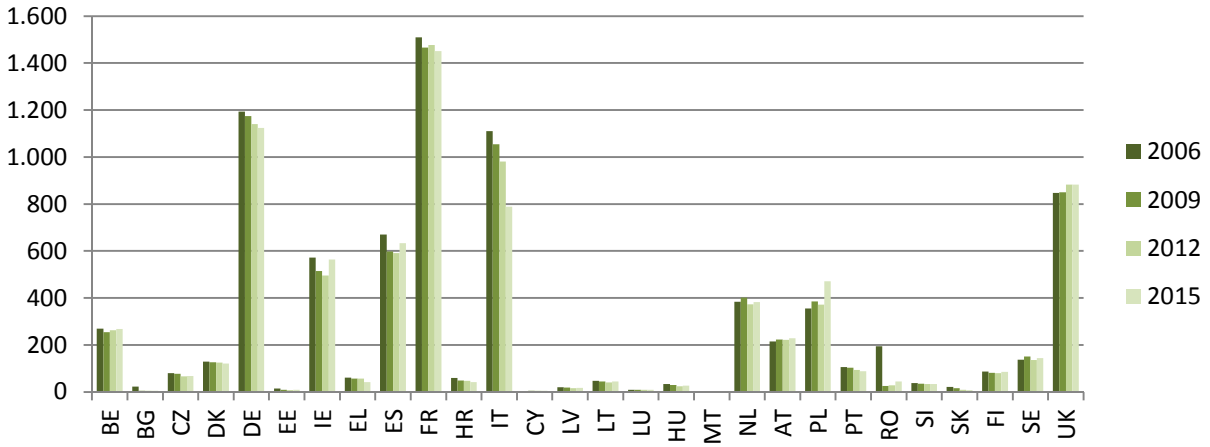
Source: Authors based on European Commission (2016n) and European Commission (2016o)
Note: The bars denote the quotient between the smallest and the largest monthly average prices of a commodity in a given year. A value of -10% of a given commodity in a given year means that the lowest monthly average EU price of this commodity was 10% smaller than the maximum monthly price of this commodity in this year. Hence, the graph shows the relative differences between extreme prices (maximum vs. minimum) within one year. The graph has the same scale as Figure 27 in order to enable the direct comparison with dairy price stability.

3.6. Domestic Supply Chain

3.6.1. Structure of the EU bovine meat sector

The main producers of beef and veal meat in the EU are France, Germany, Italy and the United Kingdom (Figure 40), with total volumes of around 800,000 tons (Italy and the UK) to almost 1,450,000 tons in France in 2015. Compared to 2006, the total slaughtered volume has decreased in France, Germany and Italy (with almost 30% in the latter), while it slightly increased in Austria, Sweden, and the UK.

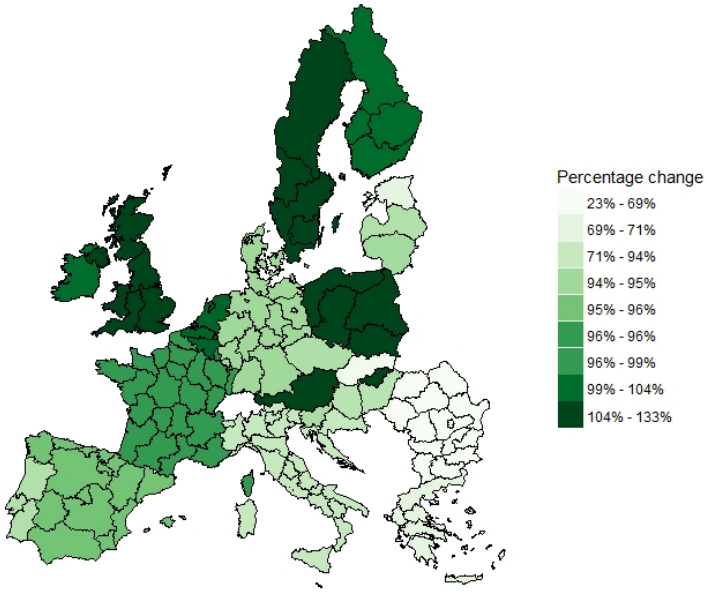
Figure 40: Total volume of EU cattle slaughterings



Source: Authors based on Eurostat dataset apro_mt_pann
Note: Data in thousand tons. See also Map A3.5 to Map A3.7.

Interesting dynamics are also observed in EU13 countries. While the slaughtered volume has decreased significantly in Bulgaria, Estonia and Romania, beef and veal production has increased by almost one third in Poland, as illustrated in Map 27. Maps A3.5, A3.6 and A3.7 illustrate total slaughterings of bovine animals per MS in 2015 (in thousand tons), slaughterings of bovine animals per MS in 2015 (in thousand heads) and the percentage change in cattle slaughterings (in thousand heads) per MS in the period of 2006–2015, respectively.

Map 27: Percentage change of cattle slaughterings per MS 2006 - 2015



Source: Authors based on Eurostat (2016o)
Note: The data is plotted at the MS level in this map, that is, the legend category labels refer to the MS level, and all FADN regions of a MS have the corresponding identifying colour. Underlying data in 1000 t. 100% would mean no change. For example a value of 95% means that cattle slaughterings in 1000 t in the MS were 5% smaller in 2015 than in 2006.

Table 46 compares the dynamics in the sector between EU15 and EU13 MS in more detail. This comparison shows that the **structural changes in the past decade have been much more severe in EU13 countries than in the EU15**.

Table 46: Changes in total volume of EU cattle slaughterings

EU15	2006 (1000t)	2015 (1000t)	Change	EU13	2006 (1000t)	2015 (1000t)	Change
Belgium	269	268	**-0.4%**	Bulgaria	23	5	**-76.7%**
Denmark	129	121	**-6.3%**	Czech Rep.	80	68	**-14.3%**
Germany	1,193	1,124	**-5.8%**	Estonia	14	10	**-33.6%**
Ireland	572	564	**-1.4%**	Croatia	59	42	**-28.8%**
Greece	61	42	**-30.9%**	Cyprus	4	5	**+26.0%**
Spain	670	634	**-5.5%**	Latvia	21	17	**-16.1%**
France	1,510	1,451	**-3.9%**	Lithuania	47	44	**-6.7%**
Italy	1,111	788	**-29.0%**	Hungary	34	26	**-21.3%**
Luxemburg	9	9	**-2.7%**	Malta	1	1	**-26.4%**
Netherlands	384	383	**-0.3%**	Poland	355	471	**+32.6%**
Austria	215	229	**+6.6%**	Romania	195	44	**-77.1%**
Portugal	105	89	**-15.8%**	Slovenia	38	34	**-11.4%**
Finland	87	86	**-1.5%**	Slovakia	21	8	**-60.8%**
Sweden	137	144	**+4.8%**				
UK	847	883	**+4.2%**				
EU15 total	**7,299**	**6,814**	**-6.6%**	**EU13 total**	**893**	**777**	**-13.0%**

Source: Eurostat (2016o)

Table 47 provides an overview of the 15 main beef and veal processing companies in the EU. Together, these 15 companies held 36% of the total beef and veal market share in the EU in 2010/11, up from 30% in 2005/6 (Gira, 2012).

Table 47: Top-15 beef and veal processing companies in the EU

Company	MS	Volume (1000t)	EU market share	Company	MS	Volume (1000t)	EU market share
Bigard	FR	500	6.1%	Dunbia	UK	136	1.7%
VION	NL	441	5.4%	SVA	FR	133	1.6%
ABP Food Gr.	IE	342	4.2%	Tönnies	DE	132	1.6%
Inalca	IT	195	2.4%	Unipeg	IT	114	1.4%
Van Drie Gr.	NL	180	2.2%	Westfleisch	DE	105	1.3%
Terrena	FR	170	2.1%	Müller Gr.	DE	104	1.3%
Danish Crown	DK	154	1.9%	Gausepohl	DE	103	1.3%
Dawn Meats	IE	154	1.9%	**Total**		**2963**	**36%**

Source: Own calculations based on Gira (2012)
Note: Total volume in 1000 t carcass weight equivalent.

While the concentration ratio in the beef and veal sector is low for the EU as a whole, Map A3.3, p. 254, shows that **concentration levels within individual MS** can be much higher for the **top-5 beef and veal companies, exceeding a 50% market share in Germany, France and the United Kingdom**. Mergers and acquisitions are happening in the sector, but they are to a large extent limited within MS borders. Map A3.4, for example, shows how Bigard, the market leader in France, has extended its presence throughout the French territory through acquisitions of different meat brands.

3.6.2. Conduct of the EU bovine meat sector

The retail and distribution sector and manufacturers are increasingly pursuing more sustainable supply chains. Sustainability standards are introduced and applied throughout the meat supply chain, for example, through private certification schemes such as QS (Qualität und Sicherheit) in Germany, Red Tractor in the United Kingdom and Label Rouge in France.

The role of retailers as drivers of change has especially increased in recent years. For instance, retailers are increasingly taking control of the cutting and packaging of red meat products, and as such they take a much larger stake in shaping the interface with final consumers (based on Gira, 2012). Moreover, retailers are also more involved in dictating the specifications of the carcasses that they procure in terms of weight or age, but also in terms of breeds, for instance through an increasing preference for native cattle breeds (e.g. Angus beef). Currently, there is a move towards more dedicated supply chains: larger processors are increasingly working together with retail customers on integrating supplies to maintain more control over the animals that arrive in the abattoir.

3.6.2.1. Unfair trading practices in the bovine meat supply chain

UTPs are also an issue in the bovine meat supply chain. **Slaughterhouses impose delivery conditions and quality parameters on farmers.** For example, slaughterhouses pay third parties to classify the carcasses, and farmers have limited options if they disagree with the classification. According to European Commission (2014), a **"Supply Chain Initiative" was developed, which agreed on a set of principles of good practice in vertical relationships within food supply chains.** Several retail and manufacturing groups and companies registered with the initiative. However, representatives of farmers and the meat processing industry "have refrained from participating in the scheme's governance group at EU level". **One of the main concerns of these groups is that the initiative would not handle the "fear factor"** (i.e., the fear of the weaker party to lose their client when lodging a complaint about UTPs imposed by the stronger party).

3.6.3. Performance of the EU bovine meat sector

The EU meat sector in general is faced with low processor margins and capacity utilisation challenges (Gira, 2012). A number of factors that contribute to this situation are (Gira, 2012): resistance to price increases at the retail level; raw materials remain the major cost item, with prices subject to volatility and crises; relative costs and the availability and flexibility of labour are also key drivers.

4. CHALLENGES AND OPPORTUNITIES

KEY FINDINGS

- Most farms in the cattle sector in the **EU15** are either **specialized** in dairy or in meat production. Cattle production in MS of the **EU13** is located mainly on farms of **mixed production** focus.
- The **major challenge** for farms in the EU dairy sector is the structural change in milk price formation in the EU since 2007, resulting in increased price uncertainty and volatility.
- Most of the farms in the EU dairy sector are highly specialized. Such income dependence on a single commodity can become a substantial threat as it increases farmers' **vulnerability to withstand income shocks** that result from increased price volatility.
- The economic survival of farms in the **EU13 dairy sector** is **threatened by their small economic size**.
- **Dairy indicators** (milk yields, farm numbers and farm and labour income) are likely to **converge** between EU13 and EU15 MS the longer the time since a country's accession.
- The **domestic demand in the EU** for processed dairy products is largely **saturated**. Prospects for the EU dairy sector will depend on the continuity and macro-economic and political developments in major dairy importing countries.
- The **strong position of Extra-EU dairy exports** in global dairy markets suggests that the sector is highly competitive at the global level, even without explicit export support. This situation provides opportunities to the sector to also profit from future growth in demand in major dairy importing regions.
- The growing middle class in main dairy export markets creates health-conscious and environmentally aware consumer demand and therefore **opportunities for further diversification of processed dairy commodities** into high-quality and high-value products.
- **Cattle fattening farms** are almost exclusively located in the **EU15**. Moreover, bovine meat production decreased by about one third on average for the EU13 since 2000. This development points to **challenges related to the competitiveness among the EU13 MS** and regions in comparison to the EU15 and may ultimately lead to a further concentration of bovine meat production in the EU15.
- While bovine meat production decreased substantially in the EU13, the suckler cow herd more than doubled. **Suckler cow farming**—often based on extensive production techniques—may hence present a **competitive strategy in the EU13**. Moreover, it provides an alternative for dairy farms that operate on a very small scale in many EU13 MS and that are under pressure due to volatile raw milk prices. Extensive farming also provides opportunities for landscape management and conservation.
- High stocking densities in the bovine meat sector are an issue of societal discussion, particularly in regions of the Benelux, north and south of the Alps and north-western France. National regulation to address such **societal and environmental concerns** might pose a threat to the economic viability of the sector.
- A major medium-term challenge to the EU bovine meat sector is the **decline of per capita consumption of beef and veal in the EU**.

- The EU is a net importer of bovine meat. The world market is dominated by four **major bovine meat exporters that are highly cost-competitive**. Gaining market share on the EU market or in export markets may therefore pose a serious challenge to the sector.
- High-quality and premium meat products that may be explicitly connected with labels of designated origin and other non-food benefits for society might be promising options for **marketing** within the EU and **to affluent consumers** in medium-income export markets.
- The ability **to address challenges and opportunities** in the cattle sector will depend on: the further use of ICT technologies, increasingly stringent environmental regulations, aging farm populations, access to third country markets through entrepreneurship, high value-adding and integration consumer concerns and cost developments in input markets.

This chapter elaborates on the interlinkages between farm production in the EU dairy sector and the EU bovine beef sector. The chapter also summarizes and evaluates which of the characteristics discussed so far are important challenges and opportunities the EU cattle sector will be faced with for the coming years. Stakeholders' View 5 and Stakeholders' View 6 on pages 262 et seqq. outline perspectives of stakeholders from various MS on challenges and opportunities of the EU cattle sector.

4.1. Interlinkages Between both Sectors

Farm production of the EU dairy sector and of the EU bovine meat sector are closely interlinked with each other as both keep cattle as the basis of their production. The differentiation consists in the cattle breed that is used for production (for an overview of European breeds see Oklahoma State University, 2016). Cattle breeds are commonly categorized according to whether they produce mainly milk, mainly bovine meat or meat and milk. Consequently, they are referred to as milk, beef or dual-purpose breeds (Hiemstra et al., 2010; Eurostat, 2016p). While milk breeds have a high milk productivity but only produce low quantities of meat, beef breeds grow quickly, show large daily weight gains but have lower milk yields. Dual purpose-breeds are in-between, producing milk amounts smaller than the ones of pure milk breeds but substantially above the milk yield of beef breeds. On the other hand, they show a faster growth and develop more meat than pure milk breeds but less than pure beef breeds. Hence, milk breeds are predominantly used for milk production, while beef breeds for bovine meat production. Cows of dual-purpose breeds are usually milked, but they and their off-spring also provide good meat yields. Finally, the breeds of each cattle type can be freely crossed with breeds of other types so that the off-spring is crossbred.

Figure 30 summarizes the relationships between both sub-sectors of the EU cattle sector. The cows are central to the reproduction of cattle herd. For the reproduction of the dairy herd, female calves of the milk-type are needed, while for the reproduction of the beef cattle herd, female calves of the meat-type are needed. However, for meat production male calves of the meat-type are preferred, as they show larger daily weight gains than female calves. The choice of the sperm used for insemination of the cow in combination with the breed of the cow determines to which cattle type the resulting calf will belong to.

EU cattle farms typically decide whether they would like to mainly produce milk or meat from the cattle they keep. Table 3 indicates that three of the four general classifications of EU farms that keep cattle at a significant magnitude mainly produce dairy products[19]. Figure 4 shows that almost one million of the 1.2m commercial cattle-keeping farms in the EU chose milk as their main product (78%) and 255 thousand farms chose meat. Hence, the owners of these farms decide whether

- they specialize in cattle farming in the production of one of these two products:
  - milk production (farm type (45), see also Table A1.1) or
  - cattle fattening (farm type (46)),
- they specialize in cattle farming, producing significant quantities of milk and meat (farm type (47)) or
- keep a mixed production portfolio by either combining cattle
  - with other livestock (farm type (73)) or
  - with crop production (farm type (83)).

Moreover, they not only decide which of the two major cattle products they place their focus upon, but they usually also decide which cattle breed they will use for the production on their farm. The breed they choose will mainly be determined by their production focus. Figure 5 gives some idea of the cattle distribution across the types of commercial farms. For example, commercial specialist dairy farms keep 54% (30m animals) of the total cattle, of which 74% are dairy cows (22m).

Hence, when a farmer has decided on a production focus as well as for a breed, she/he needs to invest in technical equipment and buildings in order to be able to produce. Investments for dairy production are higher because besides buildings, the farmer needs to install the milking machines. Costs per fattening cattle are about 2000 euros, while costs per milk cow for a comparable stable size of 130 animals is about 4-fold that amount (Annex to chapter 4, p. 258). Once these investments have been made, the farmer has to pay off the loan taken for the next years. The more specialized and the larger the farm, the higher the initial investments are.

These biological and managerial characteristics of dairy and bovine meat farming imply certain relationships between the two sectors. Most importantly, switching production focus from (specialized) milk (production) to (specialized) meat (production), and vice versa, in the short run is not possible due to the biology of cattle production. Second, the more recent an investment has been made and the larger the amount invested, the less the inclination of the farmer will be to change her production focus because the change would require additional investments in new machinery without having paid back the loan for the investment just made. However, if the last major investment has been made far enough into the past and loans have been paid back or can be paid back with other more beneficial activities that require low additional investments, then a switch of the production focus or an abandonment of the farm is more feasible. Also, if cattle farms are of a very small economic size (as is the case in several EU13 regions, see Map 6), i.e., keeping only a few animals and milking is done manually or with simple equipment, then an abolishment of milk production or a switch to meat production can be more easily implemented. Since the lactation cycle of cows of a farm is often not synchronized, farmers might opt for a gradually switch.

[19] For farm types (45), (70) and (80), the total value of dairy products produced (column (C)) exceeds the value of bovine meat produced (column (D)). Only farm type (49) produces mainly meat. See also Table A1.3, p. 117.

If farmers decide to switch, then this switch will often be quitting milk production and giving up cattle keeping altogether or starting meat production instead of milk. Switches from meat to milk production seem in the given situation of media attention to the challenging levels of raw milk prices rather unlikely. The EU milk quotas were introduced in 1984 precisely because of a massive expansion of EU milk production that was partly due to herd size expansion and productivity gains, but also partly due to a substantial production type switch to milk production.

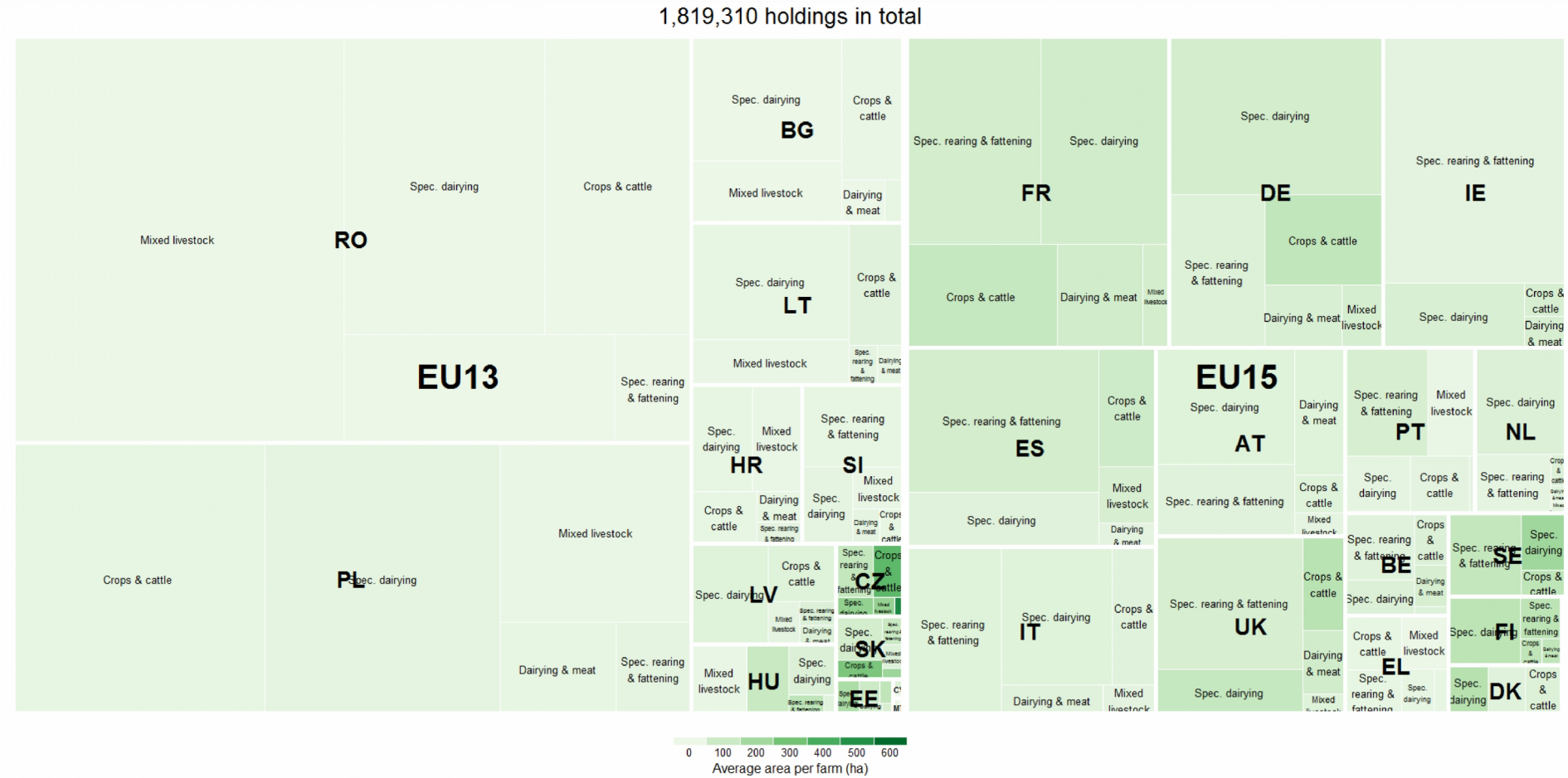
Farmers have some flexibility in partly profiting from the cattle production focus they have not specialized in, since they can choose to adapt their reproduction scheme. This benefit could, for example, be achieved by producing calves through crossbreeding milk cows with beef-type bulls. Although such calves are not of pure beef-type, they are suitable for fattening. Thus, they might either be sold for higher prices than milk-type calves to specialized cattle fattening farms. Alternatively, they might be reared or even fattened on dairy farms, to the extent that this is technically possible given the production factors the farmer owns and economic profitability. Keeping dual-purpose breeds instead of pure milk-type animals increases this flexibility because depending on which bull breed is used, the milk-focus or the meat-focus of the offspring can be emphasized, although it also means that yields from milking will be lower than for pure milk-breed animals.

Hence, farmers can to some extent switch between the five farm types that constitute the EU cattle sector (Figure 41) or can quit cattle keeping altogether, if economic conditions in the market for which they are currently producing become too adverse. A switch from specialist dairying to specialist fattening in the short run is very unlikely, due to the biological and managerial limitations of cattle farming explained above. However, these limitations might allow certain shifts in the production focuses of cattle farms, depending on the specific farm characteristics. Specialist dairy farmers might reduce their specialization and start to produce meat to some extent as well, i.e. adapting to have a dairy and meat (farm type (47)) production focus. By investing in farming equipment suitable for other livestock, a transition to farm type (73) can be made. Similarly, if mixed livestock farms expand their cattle keeping and reduce the other livestock, they might also shift their production focus more towards cattle. Furthermore, by reducing the cattle number kept on the farm and using the released UAA for field crops, the production focus can be moved towards crops and cattle farming (farm type (83)), or vice versa.

Figure 41 shows the relative distribution of farm numbers across the five farm types of the EU cattle sector and the MS. The pronounced difference in cattle sector structures between the EU13 and the EU15 found in earlier chapters also becomes visible here. While in the EU15 most farms of the EU cattle sector have either specialized in dairy or in meat production, this is not the case for several MS of the EU13. In Romania, Poland and Bulgaria, most cattle-keeping farms are of a mixed production focus. The light colour of these rectangles indicates the very low average area farmed by these farms. The number of mixed livestock farms in Romania, for example, is larger than the total number of cattle-keeping farms in France, Germany and Ireland, as the size of this rectangle is larger than the total area of the rectangles of all five cattle-keeping farm types of the latter countries. Figure 41 emphasizes that about half of all farms of the EU cattle sector are located in these three countries, as their rectangles cover about half of the graph.[20]

[20] One has to note that the differences are also caused by the definition of a commercialized farm, as discussed in chapter 1.

Figure 41: Distribution of the numbers of cattle-keeping farms across MS in 2013



Source: Authors based on Eurostat dataset ef_kvftreg

Note: This figure shows the relationship between farm type, the number of all farms (commercial and non-commercial ones) and the average area per farm. This figure shows the numbers of farms that keep cattle (either for milk or meat production) separated into each of the five farm types belonging to the EU cattle sector in each MS. MS are distinguished by whether they belong to the EU13 or EU15. The size of the rectangles is relative to the size of the entire figure and is proportional to the share of the farm number belonging to a specific farm type in a specific country. Interpreted at the MS level, it shows the total number of beef sector farms of a MS as a share of the total number of farms belonging the entire EU cattle sector. The colour of the rectangles shows the average farm size category measured by agricultural land per farm in ha of a specific farm type in a specific country. The legend for the colours is located below the figure.

However, for several EU13 MS, such as Lithuania, Slovenia, Latvia and the Czech Republic, the share of specialized farms is roughly at the EU15 level. The Czech Republic, Slovakia and to a lesser extent Hungary and Estonia stick out because of their larger average farm sizes, which are visible by the dark colours of their respective rectangles. The national cattle sectors of Romania, Poland, Bulgaria and Lithuania differ markedly from the cattle sectors of other MS with respect to the distribution of farm types, the share of non-specialized cattle farms as well as the mere farm numbers. Hence, these national cattle sectors might be prone to pronounced structural change in the coming decade. The probable result of this transition will be the convergence of the farm type compositions and farm numbers of MS in the EU.

Figure A1.4 contrasts this pattern by showing the distribution of the total area farmed by these farm types across the MS, looking at the farms of the EU cattle sector from a land use perspective. About 75% of the area utilized by cattle keeping farms is located in the EU15. The cattle-keeping farms of France and Germany farm about one third of the total area farmed by all farms of the EU cattle sector. Within the EU15 MS, the area utilized by specialist fattening farms varies greatly.

Map 28 and Table 48 characterize the distribution of the share of dairy cows in total cattle numbers kept by commercial farms across EU regions. It shows a pronounced gradient where this share is highest in the EU's south-east and that has a decreasing tendency in the direction of the EU's north-western regions. Also in central France the share of dairying cattle in total cattle is of very low levels.

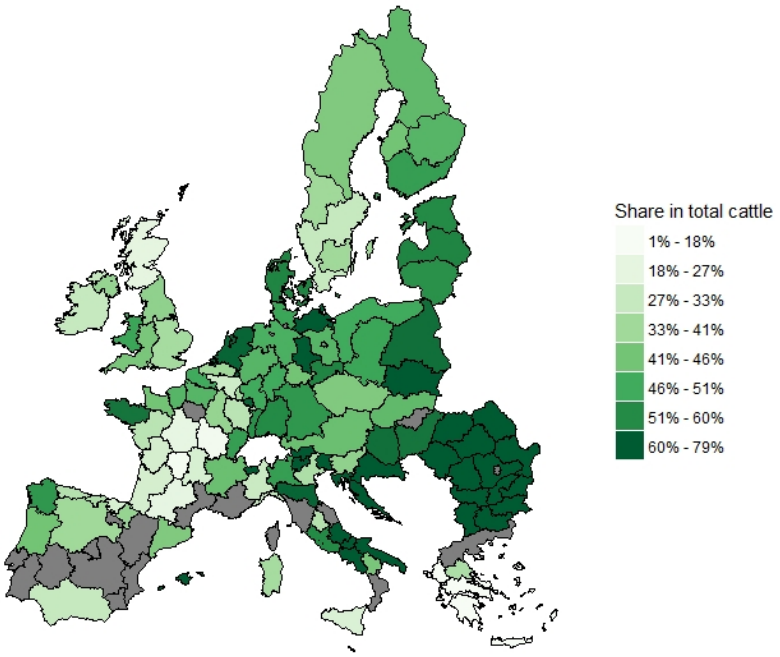
Table 48: Regions with highest and lowest share of dairy cows in total cattle

Region (MS)	Share of dairy cows	Region (MS)	Share of dairy cows
Yuzhen tsentralen (BG)	79%	Bourgogne (FR)	6.5%
Nord-Est (RO)	77%	Limousin (FR)	3.6%
Adriatic Croatia (HR)	75%	Sterea Ellas-Nissi Egaeou-Kriti (EL)	1.5%
Sud-Vest-Oltenia (RO)	75%	Ipiros-Peloponissos-Nissi Ioniou (EL)	<1%
Baleares (ES)	74%	Makedonia-Thraki (EL)	<1%

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the five FADN regions with the highest share of dairy cow numbers in total cattle numbers. The two right-most columns show the five FADN regions with the smallest share of dairy cow numbers in total cattle numbers. For 10 regions, no data was available. Data for 2013.

In parts of East Germany, in Denmark, the Netherlands, Bretagne (FR), Galicia (ES), the Baleares (ES) and parts of Italy, very high preferences for dairy farming are found. In Scotland, Ireland, southern Sweden as well as Greece, this share is very low.

Map 28: Distribution of the share of dairy cows in total cattle numbers



Source: Authors based on European Commission (2016j)
Note: The plot shows the distribution of the share of dairy cow numbers in total cattle numbers per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2013.

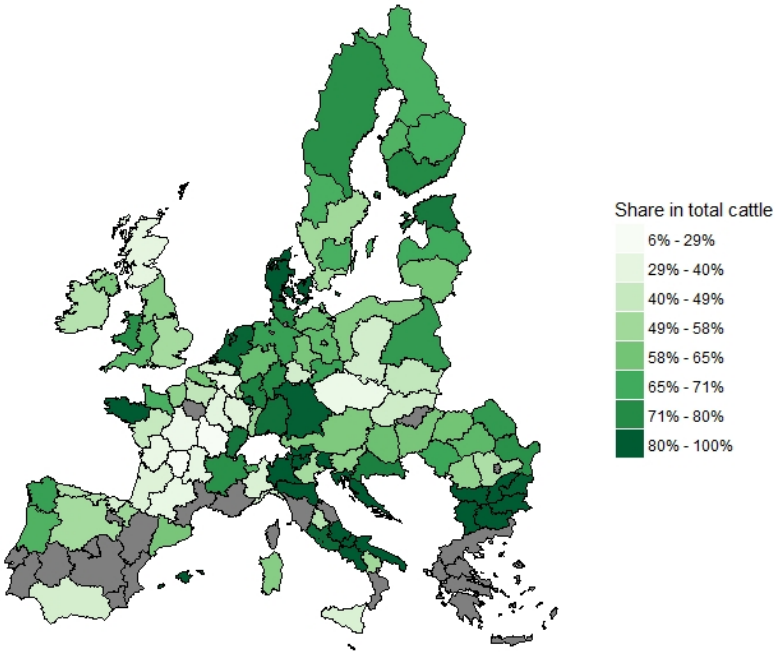
However, large shares of cattle are not kept by specialist dairying farms, especially in the EU13, except for Bulgaria and Croatia, as shown in Table 49 and Map 29. Hence, the role of specialist dairying for regional cattle numbers appears to be rather limited.

Table 49: Regions with highest and lowest share of total cattle kept by specialist dairying farms in total cattle

Region (MS)	Region (MS)	Region (MS)	Share of dairy cows
Abruzzo (IT)	Saarland (DE)	Poitou-Charentes (FR)	23%
Adriatic Croatia (HR)	Severen tsentralen (BG)	Czech Republic (CZ)	20%
Alto-Adige (IT)	Severozapaden (BG)	Centre (FR)	18%
Baleares (ES)	Trentino (IT)	Bourgogne (FR)	6%
Friuli-Venezia (IT)	Yugozapaden (BG)	Limousin (FR)	6%
Malta (MT)	Yuzhen tsentralen (BG)		
Puglia (IT)			

Source: Authors based on European Commission (2016j)
Note: The two left-most columns show the 13 FADN regions in which all cattle are kept by specialist dairying farms. The two right-most columns show the five FADN regions with the smallest share of total cattle kept by specialist dairying farms in total cattle numbers. For 15 regions, no data was available. Data for 2013.

Map 29: Distribution of the share of total cattle kept by specialist dairying farms in total cattle numbers



Source: Authors based on European Commission (2016j)
Note: The plot shows the distribution of the share of total cattle kept by specialist dairying farms (type (45) as defined at the principal type of farming level) in total cattle numbers per FADN region. Dark grey regions indicate either that the number of sample farms of this production type fell below the FADN reporting threshold or an observation is missing due to some other reason. Data for 2013.

4.2. Prospects for the EU Dairy Sector

4.2.1. Challenges

The major challenge for farms in the EU dairy sector is the structural change in milk price formation in the EU since 2007, as analysed in detail in subchapter 2.5. As elaborated in 2.5, this change has taken place due to price levels and price stability since 2007. Price formation of raw milk switched from a remarkably stable annual seasonal pattern of small price differences of 10% to 15% to multiannual cycles oscillating between 40 ct/l and 25 ct/l. Hence, maximum price ranges per year reached a magnitude of 20% or more, such that milk producers have been facing substantially increased variability in prices in recent years. As milk is often the major or even the only output of most farms of the EU dairy sector, increased price fluctuations are of key importance for the future of these farms, since they yield substantial effects on farm income.

The changes of the CAP over the past decades have resulted in increased border openness. This openness also means that the milk price in the EU market will continue to be more strongly and directly affected by international price developments than it was in the past. The preliminary bottom of the price development during the last years was reached in summer 2016. The macro-economic environment and the political framework suggest that these cycles will persist in the near future. That is, the average EU raw milk price is likely to tend upwards in the next four to six years if it follows a similar pattern as it has since 2009. For EU dairy farmers this implies that they need to adapt to a variation of price levels between

25 ct/l and 40 ct/l in order to ensure economic survival. The evidence from the past decade (Figure 25) suggests that dairy farmers need to expect phases during which the price of their major output product will drop below 30 ct/l. Past experience suggests that such phases can last one to two years.

Average milk prices in the EU have dropped from a peak at the end of 2013 (40 ct/kg) to a historic low in 2016 (~25 ct/kg). Several factors have contributed to this dramatic decline in prices. Internal factors include, for instance, an increase in the supply of milk on the EU market because of (the anticipation of) the abolishment of the milk quota. In some EU markets, such as the UK, the rise of discounters like Aldi and Lidl in the retail market has also sparked price wars, in which milk was often one of the main products over which the war was fought (Sustainable Food Trust, 2015). External factors included an increase in supply in response to the 2013/14 price spike within the main global dairy producing countries, such as New Zealand, combined with a decrease in demand due to the Russian ban on EU dairy products, decreasing oil prices that hit consumer demand in oil-exporting countries and a lower than anticipated demand coming from the Chinese market (Matthews, 2016; Sustainable Food Trust, 2015). Stakeholders' View 4 on page 261 contains stakeholders' perspectives on the drivers of the EU milk price crisis.

As production quantities in the EU are no longer limited since the abolishment of the milk quota on April 1, 2015, the upward trend in total milk deliveries observed since 2010 (Figure 24) is likely to continue so sustained pressure on raw milk prices can be expected. This expectation seems to be supported by the continuous growth in the dairy cow herd in the EU15 since 2011 (Figure 24). As the dairy cow herd in the EU13 has continued to reduce further since 2011, EU dairy farming might experience a shift in its regional structure in the following years. Highly productive regions in the EU15 (Map 9) might see a further growth in their dairy herd, while the potentially low price levels might lead to a significant abandonment of dairy farming in many EU13 regions with low productivity.

Most of the farms of the EU dairy sector are highly specialized as they earn 67% to 81% of their production value from bovine products, the lion's share of this from milk (Table 3). Their importance for EU agriculture is substantial. The two categories of specialist milk and specialist cattle fattening farms (categories (45) and (49)) account for 20% of the total number of commercial farms (Table A1.5). These farms realize specialization advantages on the one hand; however, on the other they also suffer from missing income diversity, as their farm revenues depend on only one or two products. Given the market environment of the last decade of increased price instability and uncertainty, **such income dependence on one or two commodities can become a substantial threat, since it increases farmers' vulnerability to withstand income shocks.** Farms of a less specialized production type, such as the mixed types (70) and (80) which are mostly located in some MS of the EU13, are less prone to this threat, since they earn their revenues with a more varied output.

The substantial difference in contributions to the EU dairy sector between the EU15 and the EU13, to a lesser extent between the EU-N and EU-S and among regions within individual MS (see Figure 16, Figure 17 and Table 15) indicates that regions of the EU and individual MS will be differently affected by challenging market conditions—Germany, France and Poland are likely to be most affected.

Most of the dairy sector farms of the EU13 suffer threats to their economic survival due to their small economic size (Map 6). This statement holds for specialist and non-specialist dairy farms in the EU13 because they are numerous (Map 4, Map A2.1, Map A2.2) and have the smallest economic sizes of farms of the EU dairy sector (Map A2.11 to Map

A2.13). The smaller and the more specialized these farms are, the more vulnerable they are to withstand challenging market conditions and the higher the economic pressure on them will be, since they possess less resources for buffering negative income shocks. As most of these farms in the EU13 are operated by a manager-owner, the incomes of many households depend on the farms. Consequently, challenging conditions in output markets might pose a danger of more pronounced economic effects in these regions. A similar challenge might emerge from the quite **heterogeneous regional distribution of specialist dairying farms**. Map 12 indicates the regional dependence of the regional agricultural sectors on specialist dairy farms. The highest shares in regional farm numbers are found in parts of France, in and around the Alps, the Netherlands, parts of Scandinavia and the Baltic states. In these regions, an above-average share of farmers will have to cope with challenging market conditions.

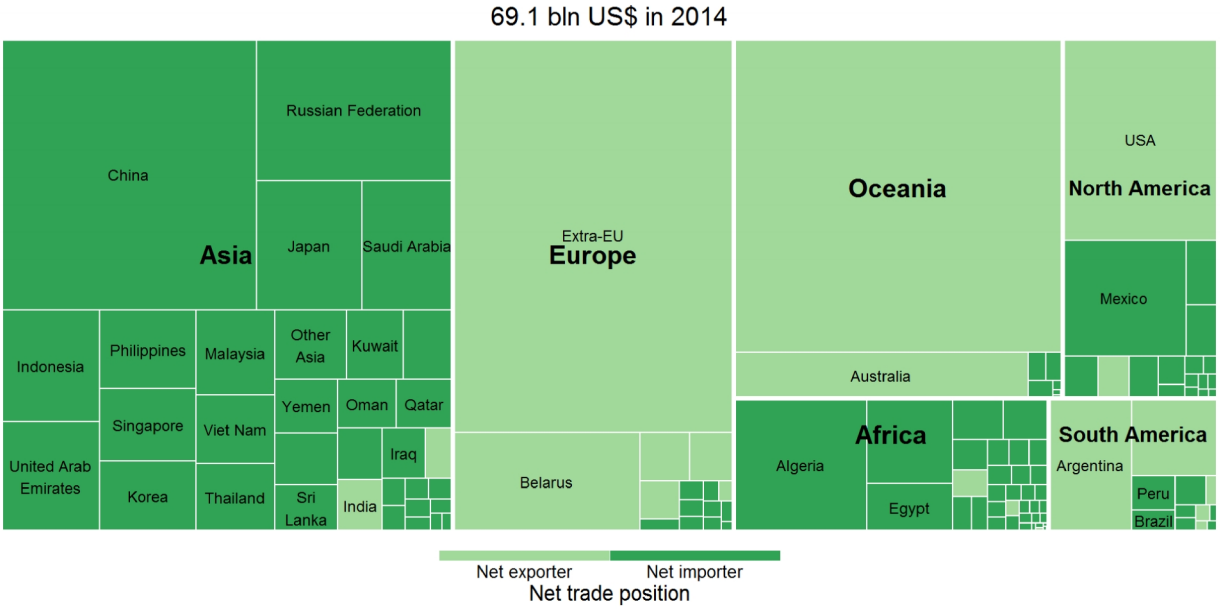
Analysis showed that the more recent the time of accession into the EU, the lower milk yields, cow numbers and milk production in a MS (Table 16). Therefore, an increasing duration of the membership in the EU is likely to result for many EU13 MS in a structural change of their national dairy sectors. That is, the often pronounced **differences in the structure of the dairy sectors of the EU15 and EU13 regions highlighted in subchapter 2.4 are likely to converge during the coming decades.** The economic sizes of dairy farms in the EU13 will grow. Consequently, the **dairy output per farm as well as the productivity will rise, farm numbers will reduce and farm and labour income are expected to converge on the EU15 levels.** However, this process might also lead to a reduction of the role of dairy farms in providing regional employment, so EU policies should be prepared to accommodate such a change in rural employment structures. Depending on the speed of this structural change of dairy farming in comparison to the change that will happen for other agricultural production types, dairy farming might lose importance in the agricultural sectors of these regions; however, it might also support the transition towards a viable farming structure. Hence, EU regional policy will have an important role in accompanying this change. Policy-makers might also wish to maintain public goods, such as specific landscapes or biodiversity whose provision is strongly linked with such small-scale agriculture.

The substantial and persisting income differences among farms of the EU dairy sector (Map 10 and Map 11) also influence the vulnerability of farm households to withstand potential future income shocks originating from output markets. Higher income facilitates the investment in crisis-coping strategies, such as productivity increases and production cost reductions, while low income levels might hinder the convergence of productivity and competitiveness between EU15 and EU13 regions. Investments in improvements towards farm resilience are favoured by high farm incomes. As these farms account for a significant share of the economy in many EU13 regions as shown in section 2.4.7, they are able to provide in periods of good conditions in output markets a viable livelihood strategy in the rural areas of these regions. However, if the price of raw milk is low, then many of these livelihoods might be threatened because these farms are temporarily or persistently no longer capable of providing acceptable income levels for significant shares of the regional labour force. Alongside herd size differences are these differentials, to some extent, due to persisting differences in animal productivity levels as shown in Map 9.

Domestic demand in the EU for processed dairy products is largely saturated. As shown in Figure 21, per capita consumption of dairy products, with the exception of cheese, has been declining since 2000. As marketing potentials in the domestic market seem to be limited, exports will gain a larger role. Hence, the success of future EU foreign trade in dairy commodities will also depend on productivity and competitiveness developments in dairy farming in the main competing countries, which are New Zealand and the US, as indicated

by Figure 23. For many regions in the EU13, such international competition might pose substantial challenges in the near future (Map 9).

Figure 42: Trade balances in global dairy commodity trade



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global dairy exports. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the export values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global exports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade based on the value shares of 2014 in Figure A1.6. Data for 2014.

Currently the EU is one of the few stakeholders in international dairy products trade that realizes significant net revenue from dairy products trade (Figure 42). Export **prospects of the EU dairy sector will depend on the continuity and stability of the macro-economic and political developments in the major dairy importing countries** (Figure 22). Additionally, it will also be subjected to the growth rates of the fastest growing dairy importing countries, which are mainly located in Asia and Africa (Table 17, Table 18). Incidents as the Russian import ban against food imports from the EU (for details, see, e.g. European Commission, 2016q) might also be issued by other major importers in the future and threaten the EU dairy sector.

The EU dairy sector will be challenged in sustaining milk production, subject to increasing legislation of the EU and of a MS on environmental, food safety and animal health issues that influence production conditions and production costs. Unfair trading practices have recently been acknowledged as posing a threat to EU dairy farming (European Commission, 2014; Transfob, 2016; Agricultural Markets Task Force, 2016). If the concentration of the dairy processing industry and of the retail sector in MS and across the EU in general will increase in the coming years, then market power might develop to the disadvantage of EU dairy farmers.

4.2.2. Opportunities

The strong market price fluctuations that characterized the milk market during the last decade is by many farmers perceived as a threat, since the sector was used to a stable market environment that was maintained by the political framework of the CAP before 2007

(Figure 26). Until 2006, raw milk prices used to be more unstable than consumer prices of processed dairy products (Figure 26). Although the instability of raw milk prices has been higher than in the years before 2007, prices of processed dairy commodities showed smaller instabilities than prices of processed products (Figure 26). Such a dampening of retail price volatility leads to smoother price development at the farm gate price level. As the EU dairy sector needs to adapt to this volatile and therefore less predictable market environment, a continuation of structural change within the sector is likely to happen. **The strong position of Extra-EU dairy exports in global dairy markets (Figure 23), however, suggests that the sector is highly competitive at the global level without export subsidy support from the CAP.** The adaptation to the challenging conditions of international markets, which are no longer shielded from the domestic market, is also an opportunity for the EU dairy sector. In this respect, attention should be given to opportunities that are provided through bilateral or multilateral trade agreements as well. For instance, CETA (trade agreement with Canada) has provisions for extra exports of cheese.

The strong position of the EU dairy exports in the global dairy market suggests that **in the future the sector is likely to also profit from the rapid growth in demand of major large dairy importing regions.** The values of EU dairy exports to 59 countries have at least doubled over the last decade[21]. Among these countries are several countries in Asia with several hundreds of millions of inhabitants, such as China, Pakistan, India and Indonesia (subchapter 2.3). Export values of dairy products to major competitors, such as Australia and New Zealand, have more than tripled. Demand for dairy products has been quickly growing, especially in emerging economies.

Asia and Africa have experienced the largest dairy product import growth, by approximately tripling their total import values during the last decade. However, in contrast to Asia, which imports about one third of all global dairy imports, the share of Africa is only 6%. This suggests that the largest changes in absolute amounts of import quantities and values will continue to happen in Asia, while the African continent is likely to experience the largest growth rates.

A sufficient diversification of export destinations and of the development of export markets can be a promising strategy for future development. Such an approach of **a diversified export portfolio, not only in terms of dairy commodities but also in terms of export destinations, will aid the EU dairy sector to prevent it from becoming dependent on certain single export markets.** This approach will improve the ability to withstand unpredictable macro-economic or political shocks emerging from single major trading partners like the import ban against EU food imports implemented by Russia in August 2014. Hence, the EU dairy sector is likely to profit from the development of political and economic stability in countries of its neighbouring regions in Asia, the MENA and Sub-Saharan Africa. A coordinated, responsible and sustainable development of international dairy export markets might thus be a substantial opportunity for the EU dairy sector.

As food produced in the EU enjoys in general a very positive international image, the further promotion of EU food production standards might create a substantial opportunity for international marketing. Kearney (2010) points out that many emerging economies are experiencing a 'nutrition transition' in recent years and will continue to experience it in the coming decades. He emphasizes that the 'increasing importation of foods from industrialized countries' is a crucial aspect of this transition. Thus, the EU dairy sector could profit from this

[21] Table 13 shows the partners with which EU dairy exports experienced maximum rates.

transition too. **The growing middle class in these countries, which is health-conscious and environmentally aware, might appreciate the added value and production standards of EU dairy products.** Due to the rapid economic development in these countries, they will have the willingness and the income for purchasing them.

During the past 15 years, the EU dairy sector has shown that it is capable of raising its productivity substantially (Figure 24). Since about 2010, farms in the EU13 have shown higher productivity growth rates than farms in the EU15. If these growth rates persist, they will result in the convergence in animal productivity between the EU13 and EU15 over the coming decades, so that dairy farmers in all parts of the EU will be able to profit from export opportunities. For the agricultural input sector, this development might mean that there will be significant investments in equipment due to such a growth in farming scale.

Market developments in the domestic EU market over the last 10 years suggest that there exist also marketing opportunities for dairy products within the EU. Figure 28 highlights the price decline of cheese experienced by EU consumers since approximately the year 2000. Consumers appreciated this decline by expanding their per capita cheese consumption by more than 15% during the same period (Figure 21). However, this consumer price decline for these highly processed dairy commodities did not happen for less processed commodities such as milk powder or butter. Most importantly, it did not affect the prices of raw milk producers. Milk prices even reached unusually high levels, in comparison with the past two decades during this phase (Figure 24). Thus, such a substantial reduction of the price margin between the consumer prices of cheeses and the farm gate price of raw milk had very beneficial effects, i.e. a consumption expansion in the domestic EU market. As this margin is partly earned by the dairy processing industry, food logistics as well as food retailers, it points to an increased competition in the cheese processing and/or retailing sector. The very example of cheese prices and domestic demand points to the fact that sufficient competition in the supply chain might yield very beneficial effects, by increasing domestic demand for milk[22] without pushing farm gate prices of milk downwards. Besides supply chain competitiveness, a **further diversification of processed dairy commodities especially in the high-quality and high-value branch also might yield substantial opportunities for the EU dairy sector to increase domestic as well as international demand for EU dairy products**[23].

Income diversification might be one option for dairy farms to reduce their dependence on the market and the potentially challenging conditions of the sole product they might market (raw milk). For a farm that earns 100% of its revenue from selling raw milk, a price drop of raw milk of 25% will directly translate into a 25% drop in income. For a farm whose revenue only depends 30% on milk, such a price drop will—assuming that the prices of the other commodities sold by the farm do not change—lead to a 7.5% revenue drop. In the EU dairy sector, these are farm types of a mixed production portfolio, i.e., category (73) that keeps various kinds of livestock, category (83) that obtains some income from cattle and some from field crops and to a lesser extent category (49) that mainly produces milk, but also significant amounts of bovine meat (Table 3). Hence, such mixed farm types might help to buffer income shocks, since not all of their output will be affected by (potentially unfavourable) conditions in the raw milk market. As many of these farms are located in the

[22] For example, Hausman and Leibtag (2005) find strongly positive effects on consumers from increased competition in retail markets.

[23] For more details on the potential of high-value food products, see, e.g. Senauer (2006) or Buck and Minvielle (2013).

EU13 regions (Map 5, Table 21), this characteristic can become an asset in times of market turbulences, since it is a form of a natural hedge.

The regional concentration of the EU dairy herd in various regional clusters across the EU (Map 7) is an opportunity to realize economies of scale in milk production in these regions. Such an development can lead to further increases in competitiveness in these regions. It could ensure that large quantities of milk can be produced at low costs, that is, being competitive at global level. On the other hand, the spread of dairy production across the EU ensures that traditional regional dairy products continue to be produced. A wide choice of regional and/or traditional specialities throughout the EU provides consumers a varied choice of dairy products. It yields also beneficial effects from a regional policy perspective, since the production of the speciality is limited to a particular region, such that the creation of an added value for this particular commodity is also bound to the region. Hence, an expansion of the EU product quality schemes and geographical indications (European Commission, 2016r) might represent an opportunity for the EU dairy farming.

The spread of dairy farming across the entire EU, might furthermore open opportunities for using this farm type in a more pronounced fashion for landscape management and preservation. The importance of dairy farming for the regional economies, especially in EU13 regions as discussed in section 2.4.7, contributes to employment in EU13 regions (Map 13) that are below average in income per capita in comparison with the EU average. These regions often have a PPS/inhabitant of around or less than 50% of the EU average (Eurostat, 2016l). Dairy farming can offer viable livelihood strategies in these regions, since the spread of labour income between specialist milk farms and general regional income is relatively small (Map 14, Map A2.26). In south-western regions, labour income from dairy farming even exceeds the average regional income.

4.3. Prospects for the EU Bovine Meat Sector

4.3.1. Challenges

The major challenge of the EU bovine meat sector is the extremely unequal distribution between the EU15 and EU13 regions and the competitiveness with bovine meat imports. **Cattle fattening farms are almost exclusively located in the EU15.** EU13 regions contribute a negligible share to the TSO of the EU bovine meat sector (Figure 29). Hence, the sector is characterized by a pronounced division in contributions to total EU bovine meat production between the EU15 and EU13 and selected MS within the EU15. MS in the EU-S play a relatively larger role in cattle fattening than in dairy production (Table 31 vs. Table 15). France, Germany, Spain and the UK have the largest shares in the EU bovine meat sector (Figure 29).

The pronounced differences in economic size of specialist cattle fattening farms, as shown in Map 17, pose another challenge to this farming type mainly at the edges of the EU (north-western, north-eastern, south-eastern as well as south-western corners), while in the centre of the EU very large farm sizes prevail. Similarly, as was the case for dairy farms, the smaller highly specialized farms are, the more vulnerable they become: they have less reserves for investments and innovation as well as for buffering phases of hardship due to challenging conditions in output markets. The suckler cow herds, as the national non-dairying cattle herds, as well as the total of bovine meat production quantities are not correlated with population density nor with average labour income. The distribution of these farms is not linked to these macro-economic variables of the MS. However, productivity measured as carcass weight is positively associated with income levels, suggesting that in MS in which

income is low, bovine animals for slaughter are smaller and revenue per animal tends to be lower.

The higher the share of specialised cattle fattening farms in a region, the higher the potential vulnerability of the entire farming sector at the regional level. While most of the farms of the EU bovine meat sector are located in Ireland, north-western Spain, eastern Poland and in and around the Alps (Map 16), they do not have a particularly important role in the farming sectors of all of these regions (Map 24). Nevertheless, cattle fattening farms account for at least one third of all farms in Ireland, Scotland, northern Spain, central France and Sweden. In these regions, the performance of the agricultural sector is highly dependent on these farms and may therefore be challenged if these farms face economic hardships.

From an environmental point of view, high stocking densities might become an issue in societal discussion. Map 19 points out that this shit in particular is the case in and around the Benelux, north and south of the Alps as well as north-western France. As a result, additional national regulation, as issued for example in the Netherlands, might pose a threat to the economic viability of the sector.

Some MS belonging to the EU13 experienced a profound change in the production structure of the sector during the past 15 years (Figure 36). Their **national bovine meat production collapsed by about one third on average for the EU13 since 2000.** This occurrence points to challenges in competitiveness **EU13 countries and regions are facing in comparison with EU15** production as well as imports. Such divergence may ultimately lead to the disappearance of this farm type from several EU13 regions and induce a further rise in concentration in the EU15.

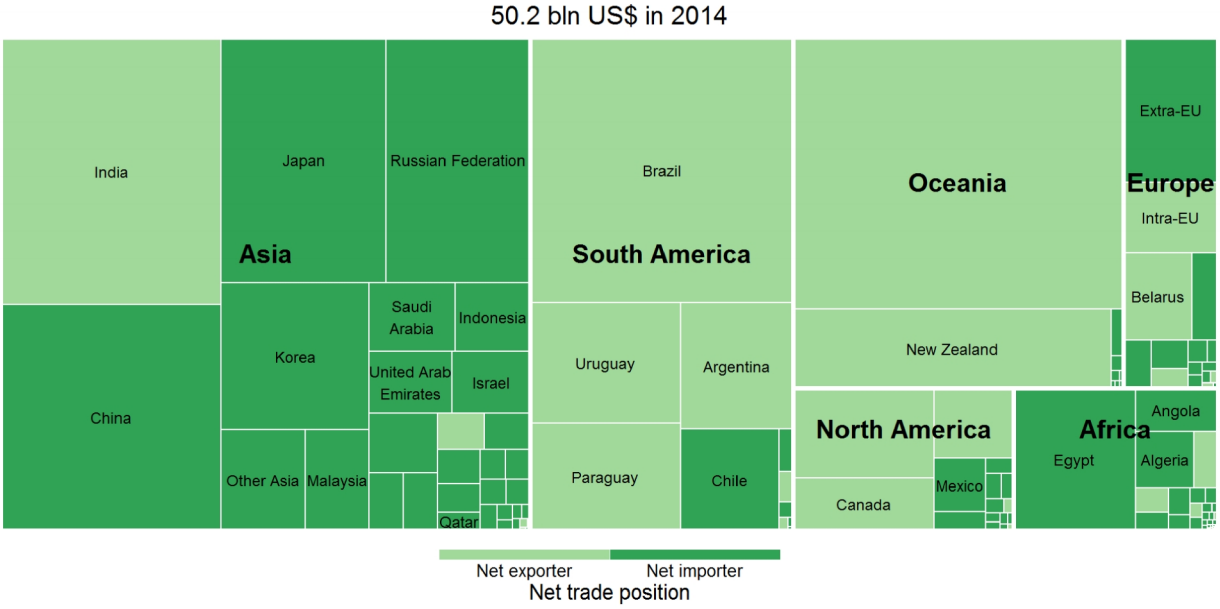
Farm and labour income in the EU bovine meat sector show erratic changes between neighbouring regions (Map 22, Map 23). Regions of high average income are interspersed with regions of very low income. Also, within large MS the variation of the average income between regions appears to be substantial. Especially looking at the fact that average labour income in some EU15 regions is at very low levels and that the distance to average regional income can be larger than 50% (Map 26) challenges the viability of this farming type in various regions. In several regions in the western EU border, cattle fattening farms provide 1% to 3% of the regional employment. As some of these regions have a GDP/capita lower than 90% of the EU average, cattle fattening has in these regions a significant economic role.

A major medium-term challenge to the EU bovine meat sector is the decline of per capita consumption of beef and veal, as observed over the past decade (Figure 31). In 2015, average consumption amounted to less than 11 kg per year, which was a decrease of about 10% in comparison with the consumption in 2000 (European Commission, 2016m). This difference corresponds to a share of one sixth of total average meat consumption in that year. Bovine meat has substantially lost ground in consumer popularity vis-à-vis poultry meat. While the average EU citizen consumed 50% more poultry meat than beef and veal in 2000, it was more than 100% more poultry meat than beef and veal in 2015. Health alerts such as by WHO (2015) might accelerate a change in nutritional habits towards white meat or meatless diets. Both developments might result in further decline in average per capita consumption as well as total consumption of bovine meat in the EU.

As the EU is a net importer of bovine meat (Figure 8), domestic production is smaller than domestic demand. **Several major bovine meat exporters (Figure 43) are more competitive in the production of bovine meat.** As there are four major players in the global bovine meat market that have approximately equal shares in global exports, **gaining**

market shares might pose a substantial challenge to the EU bovine meat sector. In contrast to dairy production for which EU agriculture is dominating world markets and can therefore follow an export-oriented approach, this proposal does not seem like a promising strategy for bovine meat production.

Figure 43: Trade balances in global bovine meat commodity trade



Source: Authors based on Comtrade (2016)
Note: This figure gives a visual impression of the market shares of single countries and continents in global bovine meat exports. Countries are grouped (coloured) according to the continent most of their territory inhabits, e.g. Russia and Turkey are classified as belonging to Asia. These values are the sum of the export values of all the relevant HS6 commodity categories outlined in Table A1.18. The size of a rectangle is relative to the size of the entire figure and is proportional to the share of the country/continent in global exports of these HS6 categories. The value of the EU is the added value of all MS. EU trade is divided into intra-EU trade and extra-EU trade based on the value shares of 2014 in Figure A1.6. Data for 2014.

4.3.2. Opportunities

The **sustained rise of cattle slaughter prices as well as their relative stability** in relation to, for example, pig slaughter prices (section 3.5.1) may open an important opportunity for future EU bovine meat production. This price stability contrasts with raw milk price developments in recent years (Figure 26). Hence, the EU bovine meat sector might represent an attractive income alternative for cattle-keeping farmers. EU cattle fatteners will hardly be able to compete with major exporting countries (Figure 34). Therefore, **high-quality and premium meat products, which might be explicitly connected with labels of designated origin and other non-food benefits for society, might be promising options for marketing within the EU** (see also the stakeholder views in the part 'Methodology used for the expert interviews', p. 259). A different situation exists in the exports of live bovine animals, for which the EU is the third-largest player behind Canada and Australia (Figure 35). Exports of live animals seem to be another opportunity for the EU cattle sector to successfully participate in world agricultural markets.

The EU bovine meat sector might try to profit from the huge import value growth in Asia and Africa (Figure 32), although the market potential for high-value premium beef and veal might be limited to high-income consumers in affluent partner nations. Such a strategy has been successful over the past decade, as EU bovine meat export values increased most with Hong Kong, Israel and Switzerland during the last decade (Table 13). EU meat exports could aim to profit from the immense bovine meat growth rates occurring in recent years in several

countries in Asia, but also in Egypt and Russia (Table 33), all of which have large populations exceeding the populations of most MS. Egypt might be an especially promising option, as its beef and veal imports more than sextupled over the last decade, such that it currently accounts for more than 3% of all total bovine meat imports (Table 13). EU bovine meat exports to Egypt have grown by the same magnitude (Table 33). Similarly, for dairy products, the EU bovine meat sector might aim to profit more from the general international image of EU food production. This strategy might open high-value markets for premium EU bovine meat, even in South American countries such as Chile or Brazil[24].

While bovine meat production decreased substantially in the EU13, the suckler cow herd more than doubled for the EU13 over the same time period since 2000 (Figure 36). Hence, suckler cow farming, which often follows extensive production techniques, seems to be a competitive strategy in the EU13. As the expansion of the suckler cow herd size keeps having high annual growth rates and did not show a slowdown in recent years, a substantial expansion can be expected in the EU13, so that bovine meat production might return to the levels of 2000. This production type could hence be **an alternative for dairy farms which operate in the EU13 on a very small scale and can no longer withstand the economic pressure from volatile raw milk prices.** Hence, extensive cattle fattening production approaches might constitute an option for EU13 regions. As non-dairying cattle is spread across the EU (Map 18), using these cattle **for landscape management and preservation** might be an opportunity. Extensive cattle keeping is likely to be even more suitable in a number of regions, as it does not require daily human monitoring for milking and animals can stay for months on the meadows[25]. In several peripheral regions of the EU, such as the Baltic MS and on the Iberian Peninsula, the regional bovine meat sector already provides incomes that exceed the general regional income, as pointed out in Map 26. While milk production does not play a large role in the EU-S, several of these regions show a high productivity in bovine meat production (Map 21).

4.4. Stakeholders' perspectives

Stakeholders' View 2 summarizes the key drivers determining the future of the EU cattle sector. In the appendix, Stakeholders' View 5 and Stakeholders' View 6 provide additional insights into what key sector exports are seen as major challenges and opportunities for the dairy and bovine meat sectors in the years to come. According to the stakeholders, **the main drivers of change in the cattle sector—and hence the ability to address challenges and opportunities—will come from**: the introduction of ICT technologies, increasingly stringent environmental regulations, aging farm population, access to third country markets through entrepreneurship, high value-adding and integration of consumer concerns and cost developments in input markets.

[24] Brazil experienced the sixth-largest growth of bovine meat imports globally (Table 34).

[25] An example is the Swiss initiative 'Mutterkuh Schweiz' (Swiss Beef Cattle, 2016), which promotes premium meat from suckler cow farming practiced in hardly accessible mountainous areas of the Swiss Alps.

Stakeholders' View 2: Key determinants of the future of the EU cattle sector

Respon-ent (MS)	Answer
Cattle sector:	
R1 (IT)	• IT in dairy farms (robot milking, automated feed systems, high tech pedometers, etc.) → better efficiency monitoring • Limits on further growth and geographical concentration of dairy farms in some EU regions (NL, IE, Northern Italy, Lower Saxony, etc.) ○ Reasons: constraints from Nitrate Directive and National Emission Ceilings Directive
Dairy sector:	

R2 (NL)	• Level of entrepreneurship
	  ○ Young and entrepreneurial farmers (aging farm population in NL)
	• Number and variation in marketing opportunities
	  ○ NL will keep securing important international markets for dairy exports
	  ○ A problem in other MS (e.g. in DE)
	• EU market is saturated, growth needs to come from global markets
	  ○ Internationalisation of EU dairy sector needs to increase in the future
	  ○ Competitiveness beyond price: sustainability & other consumer demands
	  ○ Focus needs to be on high value-added products
	• EU dairy sector will remain vulnerable to world market price developments
	• Role of policies:
	  ○ Agreements with third countries can be very influential
	  ○ Phosphate policy in NL: limits production level & export opportunities

R3 (PL)	• Awareness of market volatility and continuously changing market conditions
	• Farmers need to improve their entrepreneurial skills to survive
	• PL farmers should base their investments more on costs, less on cash flow
	• PL farmers need to reach EU15 competitiveness levels
	• Role of policies:
	  ○ EU policy is important, but EU dairy sector will mainly depend on EU farmers' competitiveness
	  ○ No question of size but of entrepreneurial mindset (continuous develop.)
	  ○ Adapt to consumer demands (sustainability, GMO free, etc.)

Bovine meat sector:	

R5 (UK)	• Matching supply to demand
	• Adaptation to changing consumer demands and consumption preferences
	• Growth of Extra-EU exports
	  ○ EU is not cost-competitive in beef compared to its very extensive production (e.g. in South America)
	  ○ Focus on quality meat (e.g. finish cattle at younger age, improve genetics, limit moves, improve welfare, monitor antibiotic use)
	  ○ High value products for exports (e.g. dry aged, strip loin beef)
	  ○ Look at developments of major competitors (Australia)
	  ○ Grading system used by some competitors are much more customer focused
	• In UK: more than half of the beef produced are from the dairy herd

R6 (DE)	• Development of feed prices • Development of the markets for high quality products • International trade ○ Low quality products are difficult to sell in EU markets
R7 (DE)	• Consumer behaviour • Breeding progress • Technical progress

Source: Authors based on stakeholder interviews
Note: This is the summary of stakeholders' statements responding to question II.1 as outlined in Table A4.4.

5. POLICY FRAMEWORK OF THE EU CATTLE SECTOR

KEY FINDINGS

- Analysis of the Direct Payment Scheme and farm incomes shows that on average about **70 percent of the income of dairy farmers is reliant on CAP payments**, while for **beef farms** this number is even more than **100 percent**.
- Income simulations under the new CAP conditions show that in the majority of cases, **farm incomes are higher under the new CAP compared to the old CAP**. This effect may be partly explained by changes in farm structure (e.g. farm scale increase) or by distributional changes within MS. The latter can be particularly more pronounced in those MS that switched from the Single Farm System to a flat rate per hectare.
- **Pillar I support**, especially direct income support, is **smoothening** the adverse effects of increasingly volatile output markets in the dairy sector but may also **limit opportunities for structural change** and improved technical or labour productivity that can enhance the sector's competitiveness.
- The **EU (crisis) support package for the dairy sector**, which provides incentives for the reduction in milk production and support for private storage of specific dairy commodities, has been used to smoothen volatility in the market but is argued to have a too limited scope to significantly affect the sector.
- Experts in the bovine meat sector argue **in favour of CAP measures that improve competitiveness of the sector** through innovations that are more predictable, take a **long-term perspective** and create a **level playing field** within the EU as well as vis-à-vis international competitors.

This chapter provides an overview of the relevant CAP measures in the EU cattle sector. The effects of DPs and VCS for cattle keeping are estimated under the new CAP (2014-2020) given the limited data available so far; their effects on farm income are compared to the old CAP (2007-2013). The chapter also analyses the regional distribution of the role of DPs and cattle-relevant VCS. Finally, the chapter suggests and discusses several options for future CAP policies that could benefit the EU cattle sector. Stakeholders' View 7 until Stakeholders' View 11 on page 265 et seqq. outline stakeholder perspectives from various MS on the role of the CAP and the EU cattle sector. Stakeholders' View 12 summarizes perspectives on potential consequences of the Brexit on the EU and the UK cattle sectors.

5.1. Overview of Relevant Current CAP measures

Table 50 provides an overview of the specific CAP measures, derived from both pillars, that are affecting the EU beef and dairy sectors. In the assessment of the existing measures, most attention is given to the measures that involve a relatively large share in the EU's CAP expenditure and/or that are identified to have a relatively large impact. As is demonstrated below, the direct payment measure is clearly a very important one to be discussed. For other measures, effects are less easy to quantify, even though they are relevant. An example: the investment in physical assets measure is mentioned as being potentially relevant; a selection of sub-measures will be made (e.g. submeasure M4.3: support for investments in infrastructure related to development as well as modernisation or adaptation of agriculture and forestry will not be taken into account—see Table A5.1, p. 271 for an overview of RDP submeasures). Moreover, it is accounted for that the impact of some measures can be quantified (e.g. impact of direct payments), whereas for others, due to their complexity and lack of good data, a more qualitative approach was followed (e.g. product quality schemes and risk management instruments). Still other measures may not be operational in the period

covered by this assessment (e.g. safety net provision in beef), due to the nature of these instruments (they are triggered when extreme situations occur).

In the analysis of the CAP measures, we will especially focus on their role on farm incomes. Table 50 provides a summary of the relevant measures that apply to the dairy and bovine meat sectors. While the selected measures usually apply to both sectors, the implementation options with respect to specific sectors might be different. This differentiation especially holds for the so-called voluntary coupled support measures.

Table 50: CAP measures targeted at the EU cattle sector

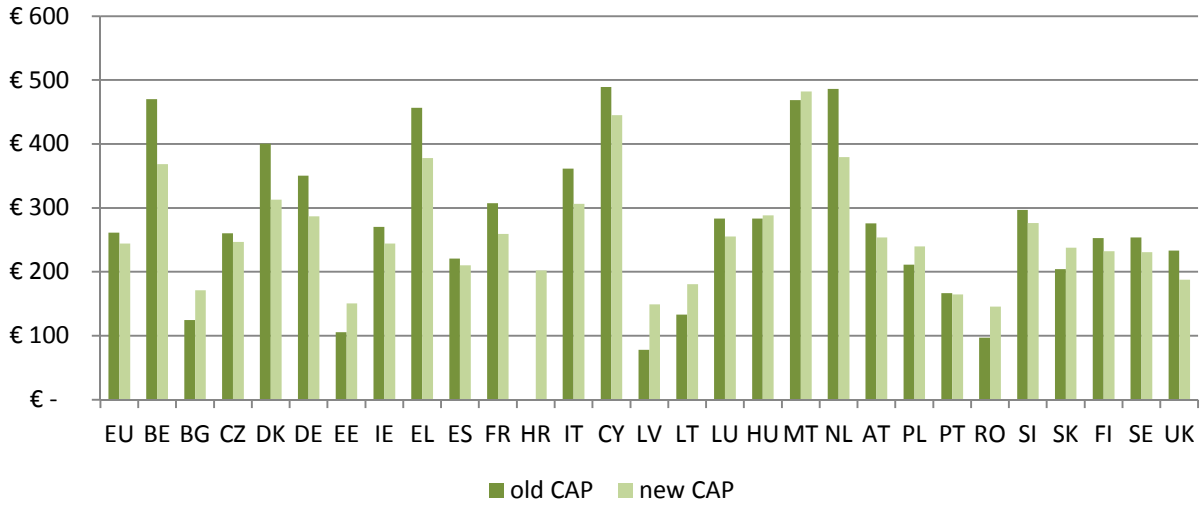
(A) Cate-gory	(B) Measure	(C) EU dairy sector	(D) EU bovine meat sector
Direct payments			
	Decoupled support (BPS, GP, YFS, SFS, TP)	X	X
	Voluntary coupled support (VCS)	X	X
Common Market Organisation			
	Safety net provision	X	X
	Trade policy	X	X
	Calamities (animal disease)	X	X
Horizontal measures (cross compliance)		X	X
Rural development policy			
	Advisory services and farm management (M2)	X	X
	Quality schemes for agricultural products (M3)	X	X
	Investment in physical assets (M4)	X	X
	Farm and farm business development (M6)	X	X
	Setting up of producer groups and organisations (M9)	X	X
	Organic farming (M10)	X	X
	Payments to areas facing natural handicaps (M13)	X	X
	Cooperation (incl. short supply chains) (M16)	X	X
	Risk management (M17)	X	X

Source: Authors
Note: A "X" indicates whether a measure is directed at the respective sector according to the current (2014-2020) RDP design. The numbering (M10) etc. refers to the submeasures of the current RDPs, see Table A5.1, p. 271, for details.

5.2. Effects of Current Policies on Farm Income

The impact of CAP measures on farmers' income is very important, as this is one of the specific objectives of the CAP and adequate income formation is crucial for a viable food production. Unfortunately, no farm data is as yet available that would make it possible to assess the impact of the measures included in the new CAP reform. Figure 44 shows the estimated impact of the Direct Payment Scheme on farm income (measured in terms of payment per hectare equivalents) under the old and the new CAP. From an assessment of the direct payments under the old CAP and the new CAP, it turns out that total direct payments per hectare are of the same order of magnitude before and after the CAP reform.

Figure 44: Effect of DPs on farm income under the old and the new CAP



Source: Authors based on European Commission (2013a)

On average, under the new CAP the payments per hectare are a bit lower than before, which is due to the general reduction in these payments by about 1.8 percent. As Figure 43 shows that for most of the EU13, the payments per hectare are expected to increase with the recent CAP reform. This estimation is due to the redistribution of the EU direct payment envelope form the EU15 to the EU13. However, irrespective of these shifts it can be verified that the order of magnitude of the direct payments farmers will receive after the reform is similar to the direct payments they received before the reform. So, continuity prevails over change. As such an argument can be made, in general terms the impact of the new CAP measures applicable to the dairy and beef sectors will be of the same order of magnitude as in the old situation.

The annex to chapter 5 (Table A5.16 till Table A5.19) shows the average income of specialized dairy and cattle farmers (income averaged over period 2011-2013), both per farm and per farm working unit. After that, the income per farm including the direct payments (as they are playing a role under the old CAP) are provided. The share of these direct payments in farm income are also provided. The estimates show that **on average about 70 percent of the income of dairy farmers is reliant on CAP payments, while for beef this number is even higher than 100 percent. These percentages reflect that without such payments, farm income would be not only be much lower, but also even negative.** The level of farm income per working unit (including payments) is also given. This value has substantially increased due to the direct payments. For reference purposes, the GDP/capita has been added as a benchmark, indicating the average income earned outside

agriculture. It should be noted that these averages mask a lot of heterogeneity. In the next section, more details at the MS and farm type level are provided.

Although one should be careful of using a comparable reference or benchmark income earned outside agriculture (see European Court of Editors, 2016), it helps to provide an indication of farmer income relative to that of the general economy. In dairy farming, on average farm incomes are lagging behind the benchmark level, whereas in beef some overcompensation is suggested. Although in some cases agricultural incomes are higher than the benchmark income, the general pattern is that agricultural incomes lag behind the incomes earned in the general economy, even after direct payments are taken into account. For example, for the EU28 on average the dairy farmer's income is about one third of the benchmark income, whereas after the DPs are included this increases to two thirds. For specialized beef farmers the corresponding shares are 10% without DPs and close to 50 % including DPs. This result allows two conclusions to be drawn with respect to the situation before the CAP reform. First, the direct payments to (specialized) dairy and beef farmers were relevant (i.e. address a clear need); without these payments, farm incomes would lag far behind the benchmark income (income earned elsewhere in the economy), irrespective to the benchmark standard that is used. Secondly, as shown in Table A5.16 till Table A5.19, the direct payments were effective in increasing farm incomes. However, in most cases the income support derived from the direct payments was insufficient to create income parity, even though the farm income situation was substantially improved in all cases (for a few cases there even was overcompensation).

Taking into account the observed impacts of direct payments before the CAP reform on the income of specialised dairy and beef farmers and given that the **order of magnitude of the direct payments after the CAP reform is of a similar order as before the CAP reform**, there is strong evidence that the **direct payments after the CAP reform will be both relevant and (partially) effective with respect to improving the income situation of dairy and beef farmers** in such a way that their income is more fair (closer to the reference of benchmark income than without direct payments).

5.3. Evaluation of Current CAP Measures

The lack of data provides a serious limitation in evaluating the impact of the current CAP measures. Nevertheless, this section will be more specific than Section 5.2. It provides a first indication of the new CAP and in particular the impact of the direct payments support, which is one of the largest EU budget items in support of dairy and cattle farmers. Table 51 shows the attempt that has been made in a stylized way to simulate the payments to cattle and dairy farmers under the new CAP. For this attempt, an estimate has been made of the voluntary coupled support (VCS) for beef cows and dairy cows (see Table 9). The payments a farm receives under the new CAP is the VCS per animal type times the number of eligible animals. The new direct payments per hectare land has been calculated by dividing the total amount of the direct payment envelope (for 2015) by the total number of hectares of eligible land. The resulting calculated payment per hectare is multiplied by the number of hectares (owned and rented) per farm in order to calculate the total and based payments per farm under the new CAP. With respect to agricultural income and other CAP payments, values from the 2013 FADN data are used. Table 51 provides the simulated direct payments for five different farm types. As can be seen in many cases, the simulated farm incomes under the new CAP are higher than those under the old CAP (see the green coloured cells). Even in the cases where the payments are lower than in the past, they are still high (Croatia, which entered the EU most recently, being an exception). As such, Table 51 confirms the more general conclusion drawn in section 5.2.

Table 51: Cattle-related CAP payments by MS under the new CAP relative to the old CAP

(A) MS	(B) SPECIALST DAIYING (45)	(C) SPECIALST FATTENING (46)	(D) DAIYING AND MEAT (47)	(E) MIXED LIVESTOCK (73)	(F) CROPS AND CATTLE (83)
AT	110%	94%	120%	98%	85%
BE	106%	120%	122%	103%	99%
BG	147%		163%		123%
CY	117%	113%	120%	119%	116%
CZ	95%	93%	93%	95%	98%
DE	84%	82%			80%
DK	127%	123%	119%		114%
EE		89%			114%
EL	117%	137%	128%	157%	119%
ES	104%	91%			100%
FI	102%	95%	98%	92%	89%
FR	49%	68%	40%	73%	54%
HR	124%	112%			115%
HU	93%	94%	94%		79%
IE	119%	131%	174%	131%	103%
IT	138%	129%	138%	134%	132%
LT	97%	96%	100%		103%
LU	122%	98%	107%	120%	117%
LV	118%				
MT	113%	124%	134%	115%	
NL	128%	119%	120%	117%	115%
PL	77%	130%	94%		161%
PT	209%	204%	160%	186%	142%

RO	94%	93%			89%
SE	84%	96%	93%	91%	84%
SI	118%	114%	115%		116%
SK	105%	111%	119%	112%	104%
UK	110%	94%	120%	98%	85%

Source: Authors based on the Methodology used for the income estimations, p. 274
Note: The table shows estimated CAP payments for 2015 as a percentage of the CAP payments under the old CAP based on the average income of years 2011 to 2013.

Table 52 shows how the simulated incomes under the new CAP deviate from the incomes (including CAP payments) under the old CAP. As the table shows, in the majority of cases (69 cases out of 121) farm income is higher, although there is considerable variation. Note that this impact may be partly due to changes in farm structure (e.g. farm scale increase), although this impact is likely to be limited given the short time period taken into account. This result may in part also be due to distributional changes within MS, which can be particularly more pronounced in those MS that switched from the Single Farm System to a flat rate per hectare system. In general, this switch favoured farms with a low production intensity per hectare of land.

Table 52: Farm income by cattle sector and MS under the new CAP in comparison to the old CAP

(A) MS	(B) SPECIALST DAIYING (45)	(C) SPECIALST FATTENING (46)	(D) DAIYING AND MEAT (47)	(E) MIXED LIVESTOCK (73)	(F) CROPS AND CATTLE (83)
AT	+7%	-6%	+20%	-2%	-13%
BE	+2%	+25%	+27%	+1%	-0%
BG	+34%		+63%		+25%
CY	+34%	+33%	+34%	+44%	+31%
CZ	-4%	-15%	-13%	-7%	-4%
DE	-28%	-22%			-107%
DK	+32%	+46%	+113%		+19%
EE		-13%			+9%
EL	+7%	+33%	+23%	+33%	+12%
ES	+7%	-36%			+1%
FI	+1%	-10%	-3%	-5%	-12%
FR	-32%	-60%	-72%	-11%	-47%

HR	+30%	+15%			+18%
HU	-3%	-8%	-7%		-20%
IE	+4%	+14%	+28%	+8%	+2%
IT	+18%	+29%	+36%	+22%	+24%
LT	-4%	-10%	-1%		+6%
LU	+25%	-3%	+17%	+26%	+23%
LV	+10%				
MT	+5%	+33%	+47%	+6%	
NL	+12%	+21%	+22%	+12%	+14%
PL	-13%	+26%	-5%		+59%
PT	+28%	+53%	+39%	+19%	+14%
RO	-11%	-29%			-47%
SE	-13%	-10%	-11%	-45%	-26%
SI	-64%	+122%	+24%		-61%
SK	+2%	+17%	+27%	+7%	+4%
UK	+7%	-6%	+20%	-2%	-13%

Source: Authors based on the Methodology used for the income estimations, p. 274
Note: The table shows the percentage changes of estimated farm incomes under the new CAP relative to farm income under the old CAP based on the average income of years 2011 to 2013.

The conclusion from this simulation exercise confirms the hypothesis derived in Section 5.2, based on an assessment of the situation before the CAP reform. The simulations show that **the DPs are still a relevant and effective instrument under the new CAP, contributing to an increase of dairy and beef farm incomes.** It should be noted that the simulations have a stylized character and are missing more refined elements in the targeting of direct payments under the new CAP (e.g. small farmers scheme, convergence).

Regarding the other CAP measures (see Table 50), it is still too early to assess their impact on the dairy and beef sectors. This conclusion holds especially for the measures under the RDP program (second pillar of CAP). With respect to the safety net provision (CMO), it did become operational during the milk crisis in the form of public intervention purchases in the first half of 2016. These measures have contributed to dampen the downward milk price movement and have had, as such, an impact on the dairy farm sector. The precise impact at this point in time is however difficult to quantify.

5.4. Stakeholders' perspectives

Stakeholders' View 3 summarizes sector expert opinions on the main effects of the CAP on the EU cattle sector. Stakeholders in the dairy sector uniformly agree that pillar I support,

especially **direct income support, has had a major impact on the sector in both the EU13 and EU15 MS**. Opinions diverge when it comes to the interpretation of this impact as either aiding or constraining further development of the sector. On the one hand, income support is **smoothening the adverse effects of increasingly volatile output markets** for the sector. On the other hand, this type of support may **also limit opportunities for structural change** and improved technical or labour productivity that can enhance the sector's competitiveness. Moreover, the **EU (crisis) support package for the dairy sector, i.e. "the milk package" which provides incentives for the reduction in milk production and support for private storage of specific dairy commodities, has been used to smoothen volatility in the market but is argued to have too limited scope to significantly affect the sector.** Experts in the bovine meat sector argue in favour of **CAP measures that**

- **improve competitiveness of the sector through innovation,**
- **are more predictable and take a long-term perspective and**
- **create a level playing field within the EU as well as vis-à-vis international competitors.**

Stakeholders' View 3: Main effects of the CAP on the EU cattle sector

Respon-dent (MS)	Answer
Cattle sector:	

R1 (IT)	• Steeply increasing milk price volatility due to the dismantling of EU border protection and price stabilization
	  ○ Will remain a future challenge
	  ○ Insurance against strong income fluctuations announced, not implemented so far
	• Decoupled calf premia distort milk prices
	  ○ Dairy industry may depress farm gate milk prices
	• High decoupled and coupled premia for beef fattening slow down technical efficiency and labour productivity improvements, depress beef prices as slaughterhouses may want to 'enjoy' part of the premia
	• Incentives to improve technical efficiency of suckler cow and beef fattening farms (FR, ES, IT) and veal sector (NL, FR, IT) from downscaling these premia until 2019-2020

Dairy sector:	

R2 (NL)	• Direct income support of Pillar 1 is the most relevant support in NL
	  ○ Substantial magnitude and reduces income volatility
	  ○ A welcome kind of support in difficult times
	  ○ Slows down structural change - a benefit for a cooperative: if members can cope with market conditions, then less need for cooperative to do so
	• Pillar 2: no major direct influence on Dutch dairy farms
	• Milk package: support for private storage of dairy products most important in NL as main instrument to tackle volatility

R3 (PL)	• PL dairy sector received substantial support since EU accession
	• As farmers got used to direct payments - alternatives difficult to imagine
	• No financial support can solve the problem that there is currently too much milk and not enough demand, structural change is the only solution
	  ○ Crisis funds for the milk sector were too low
	  ○ Funds temporarily limiting milk production - not enough to have impact

	○ Time and structural change needed to overcome the situation - some farmers will quit their business
R4 (UK)	• UK farmers don't benefit a lot from CAP, they are more tuned into the market
Bovine meat sector:	
R5 (UK)	• CAP is unfair: coupled support or other pillar 2 support in some MS • Need to encourage innovation • Some form of protection from market volatility is needed as well as encouraging producers to raise competitiveness • Limited support from the UK government to develop new markets in comparison with IE
R6 (DE)	• Effectiveness of the CAP is highly questionable as most benefits go to landowners • Removal of direct subsidies cannot be implemented from one day to the other as this would be too drastic • CAP has resulted in different production standards in the EU vis-a-vis the rest of the world ○ Chinese farmers can do almost everything, e.g. cultivate crops that have no approval in the EU ○ Differences in standards makes it more difficult to compete ○ Strong need for reassessing regulatory polices at the EU level
R7 (DE)	• CAP might help the cattle sector if it would incorporate a long-term perspective and be predictable in a uniform European framework ○ Agricultural policy usually uses short-term measures that are being changed after the next elections ○ Not helpful for cattle farmers and the sector in a European market if each MS pursues its own policy ○ Cattle farmers in Europe need the same competitive conditions in each MS, otherwise competition becomes distorted

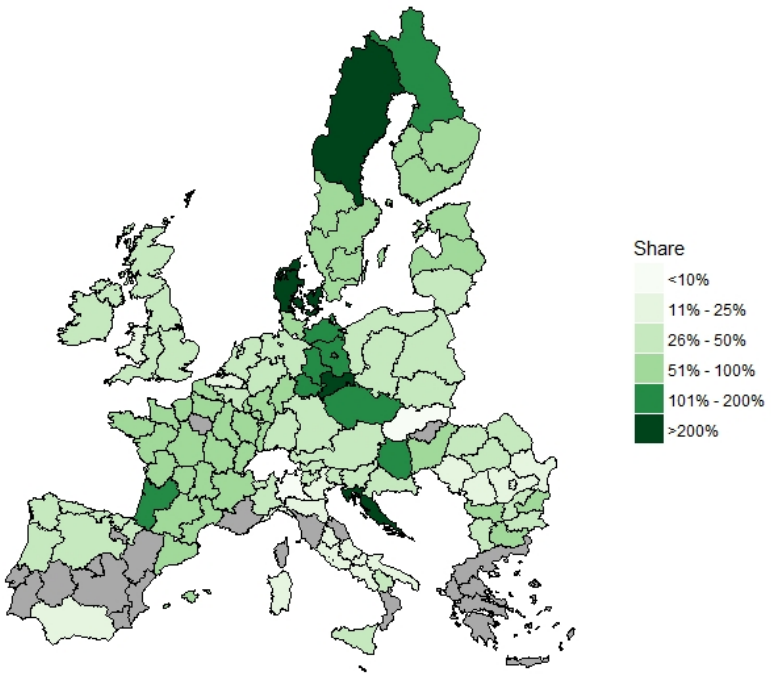
Source: Authors based on stakeholder interviews
Note: This is the summary of stakeholders' statements responding to question III.1 as outlined in Table A4.4

5.5. Regional Effects of the Current CAP Measures

The current CAP measures relevant for the EU cattle sector yield very heterogeneous regional effects. Map A5.18 to Map A5.22 show how the importance of the cattle-related CAP payments which consist of the DPs as well as VCS for dairying and non-dairying cattle in farm income has changed in the 2014-2020 CAP ('new CAP') in relation to the 2007-2013 CAP ('old CAP'). **For specialist dairying farms, the importance of these payments has increased mainly in EU13 regions as well as in Italian, Scandinavian and some French regions** (Map A5.18). **For specialist fattening farms, it increased most strongly in Swedish, French and northern British regions** (Map A5.19). Also for farm types (47), (73) and (83), it is mostly peripheral regions in which the importance grew, while it reduced in regions located in central EU (Map A5.20 to Map A5.21).

Map 30 indicates that in several regions the amount of cattle-related payments received on average by a specialist dairying farm was larger than the farm income. It amounted as measured by the median to 42% for the typical region (for the other farm types considered see Map A5.10 to Map A5.13). This ratio points to the fact that in the former regions farm income would not be positive without these cattle-related payments.

Map 30: Share of cattle-related CAP payments in farm income under the new CAP of specialist dairying farms



Source: Authors based on the Methodology used for the income estimations, p. 274
Note: The plot shows the share of DPs and VCS for dairy and non-dairy cattle in total farm income per FADN region for farm type (45). If the share is larger than 100%, then the farm income without CAP payments was negative (the sum of this negative income plus the CAP payment resulted in a positive income that is smaller in magnitude than the amount of the payment such that the share of the payment in the final income, including CAP payments, is larger than 100%).

Table 53 shows that the **regions in which dependence on the cattle-related CAP payments is highest are located in Scandinavia, East Germany and Croatia**.

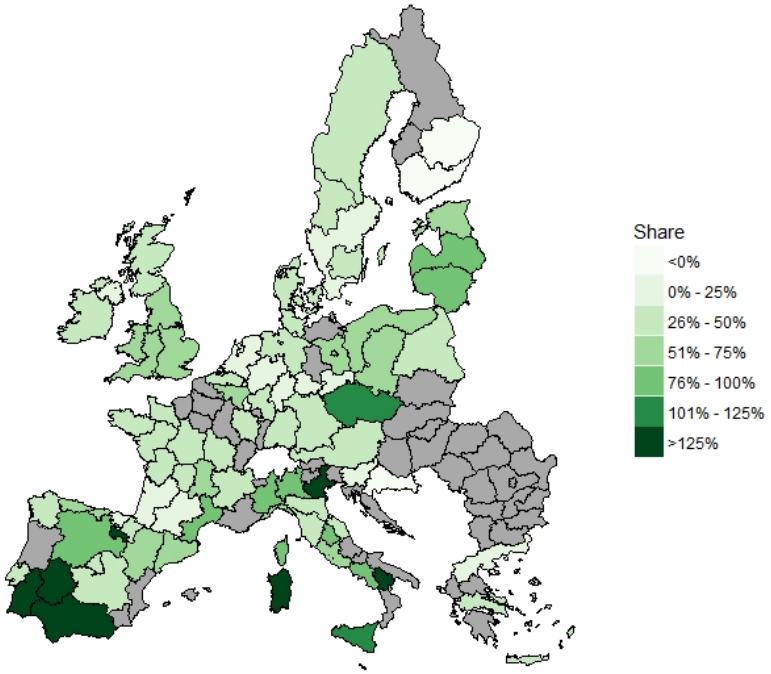
Table 53: Regions with the highest and lowest share of cattle-related payments in farm income under the new CAP for farm type (45)

Region (MS)	Share	Region (MS)	Share
Adriatic Croatia (HR)	293%	Umbria (IT)	13%
Lan i norra (SE)	253%	Campania (IT)	13%
Sachsen (DE)	209%	Emilia-Romagna (IT)	12%
Denmark (DK)	208%	Liguria (IT)	11%
Thueringen (DE)	198%	Lombardia (IT)	10%

Source: Authors based on the Methodology used for the income estimations, p. 274

Map 31 shows for specialist fattening farms how the estimated labour income under the new CAP relates to the general average income in EU regions (Map A5.11 until Map A5.14 give details for the other farm types considered). **In regions in the EU-S as well as partially in the EU13, this relation appears to be highest, that is, labour income from specialist cattle fattening farming exceeds the regional benchmark income.**

Map 31: Distribution of labour income (in euros per AWU) of specialist fattening farms in relation to the benchmark income (GDP/capita) under the new CAP



Source: Authors based on the Methodology used for the income estimations, p. 274
Note: The plot shows the size of labour income/ AWU of farm type (46) in relation to the average labour income of the FADN region. If the share is larger than 100%, then the labour income derived from the farm income including all CAP payments was larger than the non-agricultural benchmark income. Negative values indicate that the labour income was estimated to be negative despite including all CAP payments (the cattle-specific ones as well as any further payments).

Table 54 shows that the **regions that are best off regarding income from specialist cattle farming in comparison with the regional average income are located in Italy, Spain and Portugal**.

Table 54: Regions with the highest and lowest share in benchmark income for farm type (46) under the new CAP

Region (MS)	Share	Region (MS)	Share
Veneto (IT)	164%	Nordrhein-Westfalen (DE)	5%
Andalucia (ES)	144%	Slattbygdslan (SE)	1%
Alentejo e do Algarve (PT)	144%	Continental Croatia (HR)	0%
Extremadura (ES)	142%	Etela-Suomi (FI)	-10%
Sardegna (IT)	139%	Sisa-Suomi (FI)	-20%

Source: Authors based on the Methodology used for the income estimations, p. 274
Note: Negative values indicate that the labour income was estimated to be negative despite including all CAP payments (the cattle-specific ones as well as any further payments).

5.6. CAP Policy Options for Supporting the Sector

In this section, we suggest policy options for supporting the EU cattle sector in the years to come. Before doing that a few remarks with respect to the existing policy measures are in place. First, as shown from the results obtained in Section 5.3 it is suggested that the current system of direct payments and voluntary coupled support is relevant (addressing income needs in the sector) and effective (contributing to substantial income improvement). Moreover, the policy mix that Member States have chosen allow for targeting the payments, although given the lack of data and the recent implementation it is still too early to make a more detailed evaluation with respect to the targeting. Note that the legislation on voluntary coupled support allows this support to be only granted to the extent necessary to create an incentive to maintain current levels of production in the sectors or regions concerned. In case this condition is not respected, the level playing field and the unity of market in the EU will be threatened. It is beyond the scope of the current analysis to assess this, but it needs future attention when evaluation the impacts of the current policy measures applicable to the dairy and beef sectors. From a longer run perspective, support via direct payments may have a negative impact on the general competitiveness because these payments may reduce structural change and the associated possibilities to exploit economies of scale.

As regards policy options for future consideration, there are three policy options (see text below). One option is a specific policy measure in the tradition of the historical CAP addressing agricultural production directly. The other two options are strategies which go beyond a specific policy measure. They rather represent long-term approaches towards how the EU cattle sector could be sustainably supported in the coming decades and from which the entire sector would profit. They could be realized with a number of specific measures which need to be developed when the concrete goals are agreed upon. They are most likely to be reached by combining specific measures from various policy areas beyond traditional agricultural policy. These latter two options would strengthen the competitiveness of the sector vis-à-vis competitors on the world markets of bovine products. They also would emphasize the role of the EU in providing its share for global food security by exporting healthy bovine products of reliable quality, which have been produced within the EU according to the environmental and ethical production standards. These standards belong to the most ambitious ones found worldwide. The three policy options discussed are the following:

Policy option 1: Grazing premium for beef and suckler cows,
Policy option 2: Market transparency and market information initiatives and
Policy option 3: Product differentiation and institutional export promotion.

Policy option 1: One option for a policy scheme supporting the sector could be a grazing premium either for cattle in general or limited to beef and suckler cows. Such support could be defined by the production technology of letting the animals graze outside on meadows for a minimum period per year. Such a premium would be an additional VCS measure, continuing the logic of the current (2014-2020) CAP that farmers need "to maintain an agricultural area in a state suitable for grazing and/or cultivation" (European Commission, 2013a, p. 113). Such a coupled payment could be designed in a way such that it also contributes to one or a combination of several other goals of EU policies. Examples are biodiversity preservation, farming in disadvantaged regions or extensification. It could take the form of a graded scheme whose basic payments are determined per animal for a certain minimum grazing period per year. This payment could be topped up by an extensification bonus. Such a bonus would compensate for a more extensive production technology either defined via the increase of the payment per animal if a maximum stocking ratio is implemented or keeping the animals outside for an extended grazing period. Currently, only Austria is implementing such a VCS

premium (European Commission, 2013b, p. 9). However, it is currently limited to alpine pastures. **Implementing such a VCS at a broader scale for more MS would facilitate the maintenance of cattle farming in disadvantaged regions throughout the EU**. By not limiting the measure to the type of land, farmers located in regions in which labour and animal productivity is high would be given a choice about whether or not to reduce production intensity. A suitable design of such a measure could incentivize extensification throughout the EU. If such a scheme is combined by farmers with food quality initiatives of high-value meat that has been slowly grown, it might also contribute to broadening the possible set of products for consumer choice. This strategy has also an important regional component, as it would under the current production structure in the EU mainly reach regions with, on average, low rural incomes per capita.

Policy option 2: Another option could be a market transparency and market information initiative. One of the main challenges that is identified in this report is the volatility of EU milk prices. Figure 24 shows that prices have ranged between 40ct/l and 25ct/l since 2007, and it is a widely held view of stakeholders of the sector (Stakeholders' View 4 and Stakeholders' View 11) that price uncertainty and volatility will remain in the EU milk market. In this respect, increased transparency in the sector both at EU and the global level via improved systems for market intelligence, market analysis and forecasts are crucial tools to help farmers and other supply chain actors to cope with these variable market conditions. While attention has been given mainly to milk price crises in recent years, improved market and supply chain transparency is equally valuable in the bovine meat sector (Stakeholders' View 9 and Stakeholders' View 10). Concrete policy options go towards the extension of the facilities and information provided through the EU milk and meat market observatories (European Commission, 2016s and 2016t). Such extensions should include daily information on milk and dairy products and beef and veal products that is in line with the detailed information that is provided for example by the USDA Agricultural Marketing Service (USDA, 2016)[26].

Policy option 3: A third option includes supporting product differentiation in domestic and international markets. Voluntary animal welfare schemes and special dairy and bovine meat products could benefit from general support at the EU level. This scheme can contribute to the improvement of the reputation of the sector within the EU, increase consumer trust and might reduce the negative impacts of food crises on consumer behaviour and as a result on farm income. The export of EU dairy and bovine meat products, which have a good reputation in international markets, could equally profit from such a scheme. Policy can support improving access for those products to international markets. Concrete examples include the organisation of more international fares abroad to bring EU producers and foreign buyers together in key markets such as China, Egypt and Indonesia[27]. Infrastructure projects that reduce transportation costs, such as improving the Trans-Eurasia-Express, are other examples where policy can support the sector. The advantage is that such kinds of support, i.e. product differentiation promotion, promotion in international markets, and infrastructure support, are in line with international trade regulations, benefit both sides (producers and buyers), increase market diversity and thereby contribute overall to reducing volatility in the market.

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[26] Note that this proposal aligns with the recent proposals on transparency made by the Market Task Force: http://ec.europa.eu/agriculture/agri-markets-task-force/improving-markets-outcomes_en.pdf

[27] It is acknowledged that the EU promotion policy has been reinforced recently. The budget for this measure has increased to EUR 200 million/year (see http://ec.europa.eu/agriculture/promotion_en). This is a step in the proper direction, but still felt to be not sufficient relative to the challenges that are faced.

6. CONCLUSIONS

KEY FINDINGS

- The EU cattle sector can be considered of high importance with a share of about 39% of the total EU production value in agriculture.
- The EU cattle sector is very heterogeneous as measured by income per AWU.
- Substantial income disparities can be observed between the EU13 and the EU15 but also within a MS.
- The income development of the cattle sector can be of importance for rural development in low income regions.
- There still exists a substantial productivity gap of more than 25% on average between farms of the EU15 and EU13.
- Milk and bovine meat production will further increase in the EU over the mid-term.
- The cattle sector has to develop marketing strategies if a further increase in supply should not result in a decline in product prices.
- Strategies should include: product diversification within the EU and export growth outside the EU in key markets (China, Egypt, Indonesia).
- The policy sector can contribute to **maintaining the reputation** of EU dairy and bovine meat products by **increasing the enforcement** of food quality and safety standards.
- Direct payments under the CAP continue to play an important part of farm-household income.
- Direct payments are more important among specialised beef fattening farms.
- Extensively produced bovine meat will increase in importance in EU13 countries.
- This trend can be supported by EU policies supporting premia for grazing cattle, reducing the pressure on bovine meat prices.

6.1. The Future of the EU Cattle Sector

The overall results show that the cattle sector in the EU with a **share of about 39% of the total production value of agriculture**, 17% of all farms, and a use of 30% of UAA is of importance. The cattle sector is very heterogeneous. In some regions of the EU, farmers receive an income measured in AWU per year of 70,000 € or more. But this is the exception. The majority of farmers have a much lower income per AWU.

In general, substantial **income disparities can be observed between the EU15 and the EU13,** but also **within a MS** and **between specialised dairy farms and specialised beef fattening farms**. This observation is important, since the cattle sector has a relatively large share among farms in the EU. The share is larger in the EU13 than in the EU15, and the share is larger in the low income regions in the EU13. Hence**, the income development of the cattle sector can be of importance for rural development in low income regions**.

The results further show that there are substantial differences in productivity (milk yield per cow) among specialised dairy farms between the EU15 and the EU13. These differences have decreased over time, but **there still exists a substantial productivity gap of more than 25% on average**. Considering the lower opportunity costs of land and labour, one can expect that specialised dairy farms in the EU13 will be able to further increase milk production

in the short to medium term (next ten years). The same can be expected for the EU15, where highly productive dairy farms will increase their production. In total, this development will increase the pressure on prices for raw milk. A similar picture can be drawn for the bovine meat market. Hence, the cattle sector has to develop **marketing strategies if a further increase in supply should not result in a decline in product prices.** National and EU policies can support such kinds of strategies by helping to improve access to major export markets and to support product diversification in domestic markets as discussed in chapters 4 to 5 based on the results of chapters 1 to 3.

In this context, it is important to note that the EU dairy and bovine meat products have a **strong reputation in international markets**. This reputation needs to be preserved and can even be improved. One important strategy is to **maintain trust in product quality**. Once again trust in product quality is threatened by food scandals such as the horse meat scandal of 2013 or the mislabelling of food products. The policy framework should contribute to maintaining the reputation of EU dairy and bovine meat products by increasing the enforcement of food quality and safety standards. The margins for fraudulent practices, for instance in the organic labelled product market, are substantial and similar to those in the markets for narcotics, and hence incentives are high.

The **direct payments under the CAP continue to play an important role in farm-household income**. In some cases, the share of direct payments reaches more than 100% of the net farm income. DPs have contributed in softening the structural change that has been observed in agriculture and contributed to higher employment in the sector. This softening has been of importance in some regions where the average income of cattle farming per AWU has been higher than the average regional income.

The **direct payments are more important among specialised beef fattening farms** than among dairy farms. Direct payments will continue to be of importance for bovine meat producing farms and in particular for extensively produced bovine meat. The **extensively produced bovine meat will increase in importance in EU13 countries** where the relative share of marginal land is higher and urban centres of high demand are far. Hence, those areas will be more suitable for extensive meat production and benefit from the suckler cow premiums. This trend can be supported by **EU policies supporting premia for grazing cattle** that can be directly paid to farmers under a **"greening the CAP"** strategy under Pillar 1, be **linked with environmental** targets, such as increasing biodiversity **and other services** such as maintaining unique landscapes and hence also become part of **rural development policies** under Pillar 2.

6.2. Limitations of the Analysis

A major challenge that we were faced with was the absence of sufficiently recent data to perform our analysis. Recent data was especially hard to find for disaggregated information on the structure of the EU cattle sector across FADN regions. This posed serious limitations to our quantitative analysis to inform evidence-based decision making about challenges that appeared only very recently such as the phase of very low raw milk prices.

Ideally, one would wish to use data from 2015 and 2016 for being able to base the analysis on the most current data which immediately reflects the latest market developments at EU and at global level. This is only feasible to a very limited extent because of limitations in the current EU-level data information system. Costs and efforts for collecting highly disaggregated datasets are high so that they are not necessarily collected at an annual basis. Furthermore, the processing of large disaggregated datasets needs substantial time which

introduces another time lag. In the context of the given analysis such time lags are inherent in the following datasets used in the analysis:

- The FSS (Eurostat, 2016a) is conducted every three years and the latest data available is from 2013 (the data from the 2015 FSS have not yet been published),
- FADN data (European Commission, 2016c, 2016j) is gathered annually, however, the latest dataset available is from 2013,
- The farm type classification of the FADN dataset is based on the last available FSS which means that the 2013 FADN dataset is based on the 2010 FSS and
- The Comtrade dataset (Comtrade, 2016) seems to suffer from missing observations and incomplete panel observations, especially for 2015 so that 2014 was used for the analysis.

According to our understanding the Eurostat Comext dataset DS-016893 is the most recent and complete dataset as it is available up to a few months ago and covers the complete extra-EU and intra-EU trade.

The distinction of EU farms into non-commercial and commercial farms - as outlined in section 1.3 – poses another challenge for empirical analysis. The FADN datasets (European Commission, 2016c, 2016j) provide extremely detailed and comprehensive statistical information of EU commercial farms which is representative in the three dimensions: farm type, economic size and region (European Commission, 2016a). The FSS (Eurostat, 2016a) and other Eurostat data covers only few characteristics of all farms in the EU which exceed a certain minimum threshold. European Commission (2016a) outlines this contrast between the FADN and FSS datasets: "A commercial farm is defined as a farm which is large enough to provide a main activity for the farmer and a level of income sufficient to support his or her family. In practical terms, in order to be classified as commercial, a farm must exceed a minimum economic size. However, because of the different farm structures across the European Union, a different threshold is set for each MS. Consequently, the set of farms which constitute the FADN field of observation in a given country is represented by those agricultural holdings surveyed by the FSS, with an economic size exceeding the threshold set for that country."

This implies for empirical analysis a certain trade-off between the number of farms covered and the detail of the analysis as these two datasets differ in terms of the

- Comprehensiveness and level of detail of the datasets measuring the socio-economic situations of the two underlying farm populations (number of socio-economic areas covered by the data collection and, thus, numbers of variables measured),
- Time lag between data gathering and data publication and
- The farm population they represent.

Since the commercial farms account for the lion's share of EU agriculture in terms of the use of production factors, income generation and output of EU agriculture as outlined in chapter 0, most of the analysis carried out in this report was based on FADN data. Hence, the results have to be interpreted with care always keeping in mind the underlying farm population that is represented by the data used in the analysis.

6.2.1. Limitations of the FADN datasets

European Commission (2015a, p. 4) emphasizes "that the FADN survey does not contain all agricultural holdings in the EU-27, only those of a certain minimum size (as specified in Council Regulation (EC) No 1217/2009). Based on this criterion many small farms have been excluded from the field of survey. Accordingly, it should be emphasised that the average farm size […] does not correspond to the average farm size in the total agricultural

population." – This insight stresses that results based on FADN data do not necessarily coincide with analysis results based on Eurostat data.

Furthermore, FADN data is on data protection grounds only published if at least 15 farms were sampled in a given cell as outlined in European Commission (2016u). Hence, regions in which very few farms of a given farm type exist and have been sampled might appear to have a missing observation due to this reason. Furthermore, the numbers of sample farms mentioned in the FADN data as SYS03 are rounded to the nearest 20 while the number of farms represented by a given cell (SYS02) are rounded to the nearest 100. This rounding introduces measurement error to a certain degree.

Comparing FADN to NUTS2 level data poses another challenge since in some MS, FADN regions and NUTS2 regions coincide, in others they do not as shown in Map A.2, p. 175. Due to the partly missing direct geographical correspondence between these two regional classifications of the EU, a direct comparison of general socio-economic indicators—such as average per capita income—collected by Eurostat at NUTS2 level is not always possible. Instead, NUTS2 level data needs to be partly aggregated so that they correspond to the FADN region. This is particularly the case for the UK, the Benelux, Germany, Austria, the Czech Republic, Slovakia, Hungary, Poland and Sweden.

6.2.2. Limitations of the Eurostat FSS datasets

Although the FSS data covers a much larger farm population, it does not cover all farms operated in the EU as farms being eligible for this data collection also have to meet certain minimum size conditions as outlined in Table A1.4. Hence farms of less than 1 ha of area or which are operated mainly for subsistence or non-income related reasons such as leisure, lifestyle or traditions are not accounted for in the official FSS of Eurostat.

6.2.3. Limitations of Comtrade datasets

When downloading data from Comtrade (2016), major amounts of missing data became apparent in the most recent available dataset for 2015. This mattered to the extent that international trade data of several emerging economies with populations sizes of at least 100 m inhabitants were missing. The data seemed to be much more complete for 2014 so that the international trade analysis has been based on this year. However, there is, to our knowledge no transparent information available on this missing data so that one could know whether data of certain countries is not accounted for in general, missing for a certain year (and for which) or whether the data is just being delivered with some delay. This implies that the graphs and analysis generated based on that data and the implications drawn from them are also subject to these data availability and data completeness issues.

The EU—although acting at global markets as one country due to the single foreign trade regime of all MS towards the rest of the world—is not explicitly accounted for in the Comtrade dataset neither is the distinction between extra-EU and intra-EU trade made. These aggregations which were of particular interest for this study had therefore to be generated based on the data available.

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