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## **REGIONAL CONCENTRATION AND SPECIALISATION IN AGRICULTURAL ACTIVITIES IN EU-9 REGIONS (1950–2000)**

**Abstract:** Both traditional (von Thünen) and modern (Hayami & Ruttan, Krugman) theories on land use suggest that productions with a high value added per unit of land tend to be located near urban centres. In this article it is tested to what extent these theoretical findings are confirmed by empirical data on agricultural land use and production for the EU-9. The focus is not only on the degree of concentration and specialisation, but also on their development over time. Growth and decline of agricultural productions are here related to the degree of rurality. It is found that high value productions indeed tend to be located in urban regions. It is also found that most specialisation patterns that already existed in 1950 are even stronger in 2000.

**Key words:** regions, agriculture, economic development, European Union, concentration, specialisation.

### **1. INTRODUCTION**

Agricultural activities are not evenly spread over the surface of the European Union. This is due to a large number of reasons. For example, land has varying degrees of suitability for agricultural activities as a consequence of physical constraints like mountains, water and salinity. Other parts are in use for non-agricultural purposes such as infrastructure, urban development, recreation and nature reserves. The nearness of markets and the density of population plays a significant role as well. On average, in the EU-15 about 52% of the total area

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is used as agricultural area, but with significant differences among member states, varying from 7% in Finland to 79% in Denmark (EC, 2004).

In addition, there are important regional differences in the mix of agricultural activities and in the intensity of land use. There are a number of studies on regional concentration and specialisation of agriculture, both for the EU as a whole (e.g. van Hecke, 1983) and for individual member states (e.g. Mora and San Juan, 2004). Usually, these studies focus on short time periods. In this article, we aim to analyse regional concentration and specialisation in agricultural activities at the long term: 1950–2000. Our analysis is based on a dataset describing 79 regions, covering the former EU-9, i.e. Belgium, Denmark, France, Western Germany, Ireland, Italy, Luxembourg, the Netherlands and the UK. The regional composition of the dataset originates from a research project of Groningen University (the Netherlands) for Eurostat. The combination of the regional data of that project with more recent data gathered by Eurostat allows for this long-term analysis.<sup>1</sup>

In this article we relate the level of regional concentration and specialisation in agricultural activities, and the changes over time, to the level of rurality of the regions. Using a rural typology of regions, we try to explore the hypothesis that high yielding productions tend to be situated in urban regions.

The plan of this article is as follows. In section 2, we present some basic ideas and theories about the location of agricultural activities with different levels of intensity. In section 3, we describe a typology of regions according to their rurality. Next, the regional concentration and the regional specialisation is analysed (sections 4 and 5), while in section 6 the relation between the two is explored. In the final section concluding remarks are made.

## **2. THE LOCATION OF DIFFERENT KINDS OF AGRICULTURAL ACTIVITIES: EXISTING THEORIES**

Traditionally, agronomists have stressed the importance of physical production qualities of land for the type of agricultural activity and intensity of its use: see e.g. Broekhuizen (1969) for an overview of the suitability of the soil for cereal growing in Europe. The contributions of the ‘production ecological school’ are more recent. According to this school, soil suitability, fertility and availability of water are seen as key factors behind land use, and hence behind the distribution of agricultural production (Bouman *et al.*, 1996; Rabbinge and van Latesteijn, 1992; WRR, 1992, where again an overview of the suitability of the soil for specific agricultural crops is given).

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<sup>1</sup> For details about the data see Strijker, 2008.

Although physical factors play an important role, other factors may also affect the type of land use. This has been put forward by several economic and geographical concepts on the type and intensity of land use. The von Thünen model is the most traditional theoretical concept that is used to analyse the type of land use. In this model, land use is related to the costs of transportation of different agricultural products from the place of production to the market (often an urban centre). By using bid rent curves, this model assumes a spatial pattern of agricultural production, in which perishable products, other products that face high costs of transportation, and productions with a high monetary yield per unit of land, are produced close to the urban centre. Spatial differences in the quality of land, the availability of water, and irregularities in the infrastructure are not taken into account in this model, but could eventually be integrated (as shown by Lösch, 1954). The notions of the ‘new economic geography’ (Krugman, 1991) can be considered as the modern version of the von Thünen model, but now including advantages of scale. Irregularities in for instance infrastructure or the shape of a region can also be included in the Krugman model (Stelder, 2005). By doing so, again it might be expected that perishable and high yielding agricultural products are produced closer to the market and closer to the main infrastructural networks.

A completely different concept on land use is the induced development theory (Hayami and Ruttan, 1985). In this theory, the relative price of the different factor inputs determines the intensity of land use, or – to be more precise – the direction of development. Hayami and Ruttan have shown that the price of land relative to labour determines the way of production (the labour intensity, and hence the yield per hectare). Although there has been criticism on the micro-economic foundation of the theory (Schuh, 1973), the empirical findings are generally accepted. The concept does not lead directly to a spatial pattern of agricultural production, at least not at the level of individual crops (wheat, potatoes etc.). However, since some agricultural products are more labour intensive than others, and since labour intensive products tend to be produced where land is relatively scarce, one can expect labour intensive productions close to urban areas. So, both concepts could roughly lead to the same conclusion: high yielding productions are likely to be found in urban regions. In the rest of this article, in which we analyse the concentration and specialisation levels of regions related to their rurality, we will search for empirical confirmation.

### **3. TYPOLOGY OF REGIONS ACCORDING TO THEIR RURALITY**

In order to explore whether rurality affects the specialisation pattern of crops and animals, we divided our set of 79 regions into urban regions, intermediate regions and rural regions. As yardstick for rurality we used the share of the



#### 4. CONCENTRATION OF AGRICULTURAL ACTIVITIES

In this section we analyse the level and change of regional concentration over time in the three types of regions: rural, intermediate and urban. Concentration arises when the production of product  $p$  in region  $A$  is larger than could be expected according to the size of region  $A$  (Strijker, 1999). The concentration coefficient ( $C.C.$ ) for region  $A$  is derived as follows:

$$C.C. = \frac{Q_{p,A}/S_A}{Q_{p,EU-9}/S_{EU-9}}. \quad (1)$$

In this equation,  $Q$  determines the level of production (in kg) or the number of animals and  $S$  the surface of land in agricultural use. When the level of concentration in the region is the same as the average EU-9 level, the  $C.C.$  is 1. When the concentration level in region  $A$  is higher, the  $C.C.$  will be more than 1. Our analysis includes four types of animals (pigs, cattle, dairy cattle (as a subgroup of cattle) and sheep) and five types of crops (wheat, barley, corn, potatoes and sugar).

##### 4.1. Concentration of Animals

From the four types of animals that are included in our analysis, pigs can be seen as the most intensive production in terms of value per unit of agricultural land, and sheep as the most extensive one.<sup>2</sup> Table 1 shows the average concentration

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<sup>2</sup> The intensity of agricultural production can be approached by so-called Standard Gross Margins (SGM). (Commission Decision 85/377/EEC). In the EU, SGMs are defined at regional level for each crop per ha and for animal production per livestock place, and are periodically updated. For example, SGMs in the Netherlands in 1990 were as follows: 920 ECU for a ha of barley, 1110 ECU for a ha of wheat, 2,400 ECU for a ha of sugar beet, 2,780 ECU for a ha of potatoes, 60 ECU for a sheep, 275 ECU for a breeding sow over 50 kg, 505 ECU for a male bovine 2 years and older, and 1,630 ECU for a dairy cow (LEI, Metabase). In order to compare SGM among animals, we can express the SGM per animal in livestock units (LU). For this conversion, we used the following keys from the EU Farm Structure Survey: a sheep = 0.1 LU; a breeding sow over 50 kg = 0.5 LU; a female bovine under 2 years = 1 LU; a dairy cow = 1 LU. Then the SGM for 1 LU of sheep amounts to 600 ECU, for 1 LU of breeding sow over 50 kg to 550 ECU, for 1 LU of male bovine to 505 ECU and for 1 LU of dairy cow to 1630 ECU. When we take into account that the animal density of pigs per ha is much higher than the animal density of sheep and cattle per ha, and that the lifecycle of pigs is much shorter than that of sheep and cattle, it may be clear that pig production per ha is higher yielding than cattle and sheep production per ha, although this is not directly reflected by using the SGM.

values per animal according to the rurality level of the regions, as well as the number of regions with a relatively high concentration level: at least twice a high as the EU-9 average.

The average concentration coefficients<sup>3</sup> show that already in 1960 the high yielding categories of pigs, cattle and dairy cattle were concentrated in the urban regions of the EU-9. This pattern strengthened over the years. The concentration coefficient for sheep reveals an opposite pattern: the concentration of sheep is higher in rural regions than in urban regions and tend to increase in rural regions in the course of the years. These findings reflect indeed the position of the sheep sector as being low yielding and land extensive.

Table 1. Average concentration coefficients (*C.C.*) for animals in rural, intermediate and urban regions in the EU-9, and the share of regions with a *C.C.* over 2, for 1960–2000

Rurality	Year	Pigs	% <i>C.C.</i> >2	Cattle	% <i>C.C.</i> >2	Dairy cattle	% <i>C.C.</i> >2	Sheep	% <i>C.C.</i> >2
Rural regions (20 regions)	1960	0.5	0	0.9	5	1.0	5	0.7	5
	1980	0.4	5	0.9	5	0.8	5	0.8	5
	2000	0.4	5	1.1	15	1.0	5	1.8	5
Intermediate regions (37 regions)	1960	1.1	16	1.4	19	1.5	19	1.2	11
	1980	1.0	11	1.2	14	1.5	24	0.8	11
	2000	0.8	8	1.3	22	1.6	30	0.6	5
Urban regions (22 regions)	1960	2.3	55	1.5	14	1.6	23	0.5	9
	1980	3.9	41	1.8	41	2.0	55	0.5	5
	2000	4.7	45	2.3	41	2.6	59	0.5	0

In order to explore whether the pattern of the average concentration coefficients for the EU regions also occurs in the individual countries or that the average is biased due to summing up regions with highly varying levels of concentration, concentration coefficients are presented for the rural, intermediate and urban regions in the individual EU-9 countries in annex 1. It appears that concentration coefficients for pigs, cattle and dairy cattle in urban regions tend to exceed those in rural regions in all individual EU-9 countries, except for France. In this country, concentration coefficients are highest in rural regions, whereas the concentration coefficients in intermediate and urban regions are more or less at the same level. Concentration coefficients for sheep production

<sup>3</sup> In this analysis the average *C.C.* of all regions are not equal to 1 because not all regions are of the same size.

are low and hardly differ among the various types of regions, except for Italy and the UK. In Italy, concentration coefficients are highest in rural regions (5.8), whereas in the UK concentration coefficients are highest in urban regions (1.5). From this, it could be concluded that the concentration of sheep in rural regions at EU-9 level is mainly due to the high concentration of sheep in rural regions in Italy.

#### **4.2. Concentration of Crops**

For the analysis of the concentration of crops, we focus on wheat, barley, corn, potatoes and sugar beets. In general, cereals (wheat, barley and corn) can be seen as relatively low yielding crops, while potatoes and sugar beet show higher values per hectare. The concentration coefficients for crops in rural, intermediate and urban regions in the EU-9 are more homogenous (table 2) than those for animals. The average values are not very high and the share of regions with a concentration coefficient above 2 is relatively small. On the whole, cereals are not strongly regionally concentrated, and the level of concentration does not differ much between the classes of rurality. As stated before, from an economic point of view, these types of crops are not very high yielding. It should be noted that for land based crops a change in the degree of concentration can be caused either by a change in land use or by a change in yield. It appears that the concentration coefficients in a few regions in the EU-9 deviate from the general trend of a low concentration of cereals. We found relatively high concentration coefficients for wheat in urban regions in France (3) in 2000, for barley in intermediate regions in Denmark (3.3) and for corn in urban regions in Italy (3.2) (annex 1). Compared to cereals, potatoes and sugar beets are higher yielding crops. Concentration coefficients for potatoes are moderate and these coefficients in rural regions are usually below those in intermediate and urban regions in the EU-9. Potato production seems to be concentrated in urban regions in Belgium (5.6) and in intermediate and urban regions in the Netherlands (14.3 and 6.2 respectively). Finally, concentration of sugar beets is also low in most regions, apart from intermediate and urban regions in Belgium (4.1), urban regions in France (5) and intermediate and urban regions in the Netherlands (4.5 and 2.6 respectively). As in the case of high yielding animal production, we can also perceive a tendency that higher yielding crops tend to be concentrated in urban regions. In addition, the differences in concentration are increasing, in the sense that the concentration of high yielding productions in urban regions tends to rise.

Table 2. Average concentration coefficients (C.C.) for crops in rural, intermediate and urban regions in the EU-9, and the share of regions with a C.C. over 2, for 1950–2000

Rurality	Year	% C.C.		% C.C.		% C.C.		% C.C.		% C.C.	
		Wheat	>2	Barley	>2	Corn	>2	Potatoes	>2	Sugar	>2
Rural regions	1950	0.9	5	0.7	0	0.7	10	0.4	0	0.6	5
	1980	0.9	15	0.5	0	1.2	15	0.4	10	0.8	10
	2000	0.8	10	0.5	5	0.9	10	0.3	5	0.7	10
Intermediate regions	1950	1.0	8	0.8	5	1.4	19	1.5	27	1.5	22
	1980	0.8	8	0.7	3	1.1	11	2.7	22	1.7	22
	2000	0.6	3	0.7	3	1.0	11	2.7	19	1.5	27
Urban regions	1950	1.1	18	0.8	5	1.3	14	2.0	46	2.3	46
	1980	1.0	9	0.8	5	0.7	9	2.6	41	2.5	50
	2000	0.8	9	0.6	0	0.9	5	3.3	50	2.2	50

From the data of the individual regions, it appears that a high concentration coefficient for one crop does not imply that the concentration coefficients for all other crops in that region will be high too. This is quite different from the situation for the types of animals. The Alsace region, for example, has low concentration and growth values for the production of barley and potatoes but high values for the production of corn. This could be explained by the fact that the different crops compete with each other for land, whereas animals are less land based.

## 5. SPECIALISATION OF REGIONS IN DIFFERENT KINDS OF AGRICULTURAL ACTIVITIES

When in a region high concentration coefficients are found, this does not necessarily mean that the region is also specialised in that product. Regions can be characterised as more or less narrowly specialised in a limited range of activities, or as being more diversified. Here we use a ‘coefficient of specialisation’ as described by Hoover and Giarratani (1984). The coefficient shows the degree to which the mix of a region’s economy differs from a standard, in this case the EU-9. We compare the mix of agricultural activities in crop and animal production. A first step in the calculation is to derive the specialisation coefficient by subtracting the share of the production ( $Q$ ) of a good ( $p$ ) in the total production of the standard area (EU-9) from the share of the production of a good in the total production of a single region ( $A$ ) (equation 2).



$$P.C. = \frac{Q_{p,A}}{Q_{total,A}} - \frac{Q_{p,EU-9}}{Q_{total,EU-9}} * 100 \quad (2)$$

When the share of, for example, potatoes in a certain region is higher than the average share in the EU-9, the partial specialisation coefficient (*P.C.*) will be positive and the region is more specialised in potatoes than the EU-9. On the other hand, when the share of a crop in total production in a region is below the share of that crop in total EU-9 production, the partial specialisation coefficient will be negative and the region can be said to be less specialised in that crop than the EU-9. The sum of all partial specialisation coefficients (per crop) of all regions will be (by definition) zero. The overall specialisation coefficient (*S.C.*) of a region is determined as the sum of all positive (or negative) partial coefficients. An overall specialisation coefficient of zero indicates no specialisation at all; the region's mix of activities is the same as the EU-9 mix. A specialisation coefficient close to 100 would indicate that only one activity takes place in that region, not present in any other region.

The difference between the concentration coefficient and the specialisation coefficient is that the concentration coefficient deals with the production of a product related to the production of that product in the agricultural production of the EU-9, whereas the specialisation coefficient deals with production of a product related to the total production in a region.

### **5.1. Specialisation in Animals**

The level of specialisation in animal production of the regions under research fluctuates between 6 and 70. High values are found in regions in the UK and in Italy, such as Wales and Sardinia where many sheep are kept. Since 1960, also regions in the Netherlands, Belgium and the northern part of France are getting more specialised, mainly due to the keeping of pigs or cattle.

In order to relate the specialisation to the degree of rurality, in table 3 the overall specialisation coefficient is presented for the three groups of regions. In general, a tendency towards more specialisation can be perceived in both rural, intermediate and urban regions in the EU-9. The average specialisation coefficient in all EU-9 regions increased from 26 in 1960 to 30 in 2000. In 1960, the highest average specialisation coefficients were found in the intermediate regions, whereas in 2000 rural regions showed the highest specialisation coefficients. The rate of increase in specialisation differs somewhat between the

regions: the level of specialisation in rural and intermediate regions especially increased in the period 1960–1980, whereas urban regions showed an increase in specialisation in the years 1980–2000.

Table 3. Average specialisation coefficients (*S.C.*) in animal production in rural, intermediate and urban regions in the EU-9, 1960–2000

Rurality	Average specialisation			Share of regions with <i>S.C.</i> >26 (%)			
	Year	1960	1980	2000	1960	1980	2000
All regions (79)		26	26	30	42	58	68
Rural regions (20)		25	33	35	45	75	75
Intermediate regions (37)		28	32	32	49	57	59
Urban regions (22)		24	25	29	27	45	55

In the right half of table 3, the share of regions with an overall specialisation coefficient >26–26 being the average specialisation coefficient in 1960 and 1980 – is presented. The share of regions in the EU-9 with high values for the specialisation coefficient increased from 42% in 1960 to 68% in 2000. It appears that during the period 1960–2000, the group of urban regions shows the smallest share of highly specialised regions. Nevertheless, this share doubled between 1960 and 2000, mainly due to pig breeding. The largest share of specialised regions is located in rural regions. These regions were especially getting more specialised in cattle and sheep between 1960 and 1980, as were the intermediate regions.

Table 4. Partial specialisation coefficients for animal production in rural, intermediate and urban regions in the EU-9, 1960–2000

Rurality	Year	Pigs	Cattle	Dairy cattle	Sheep
Rural regions	1960	-8.5	4.9	4.3	-0.7
	1980	-18.3	10.4	-0.4	8.3
	2000	-19.6	13.9	1.1	4.6
Intermediate regions	1960	-3.7	5.5	3.1	-4.9
	1980	-7.6	4.9	2.2	2.1
	2000	-12.5	7.7	3.3	1.5
Urban regions	1960	7.5	4.5	4.0	-16.0
	1980	8.4	1.7	0.7	-10.8
	2000	6.1	1.5	1.5	-9.1

Taking a closer look at the partial specialisation coefficients for each kind of animal, a specialisation in pig production in urban regions in the EU-9 can be perceived, whereas rural regions tend to be specialised in cattle and sheep production (table 4). This is not surprising, since cattle and sheep production are rather land extensive activities whereas pig production is a high yielding type of production. However, urban regions in France and Italy have higher degrees of specialisation in cattle production than the rural regions (annex 2). Specialisation in dairy cattle hardly differs among urban, intermediate and rural regions in most EU-9 member states, apart from Belgium and the Netherlands. In these two countries, specialisation in dairy cattle in intermediate regions is considerably higher than in urban regions.

## 5.2. Specialisation in the Production of Crops

Concerning the production of crops (wheat, barley, corn, potatoes and sugar), the overall specialisation coefficient of the EU-9 regions fluctuates between 8 and 85. On the whole, the overall specialisation coefficient in the EU-9 regions slightly increased from 36 in 1950 to 38 in 1980 and remained stable afterwards (table 5). This pattern can also be perceived in rural, intermediate and urban regions. Average specialisation coefficients in urban regions are slightly below those in intermediate and rural regions.

Table 5. Average specialisation coefficients (*S.C.*) in crop production in rural, intermediate and urban regions in the EU-9, 1950–2000

Rurality	Average specialisation			Share of regions with <i>S.C.</i> >38 (%)			
	Year	1950	1980	2000	1950	1980	2000
All regions (79)		36	38	38	37	47	47
Rural regions (20)		36	39	38	35	40	40
Intermediate regions (37)		38	40	39	43	49	59
Urban regions (22)		31	35	36	27	50	55

In the right half of table 5, the share of regions with a specialisation coefficient >38 – 38 being the average specialisation coefficient in 1980 and 2000 for crops – is presented. The share of regions in the EU-9 with high values for the specialisation coefficient increased from 37% in 1950 to 47% in 2000. This share increased most in the urban regions: it doubled between 1950 and 2000. Although the level of specialisation in urban and rural regions is not very

different, the mix of activities in the production of crops differs considerably (table 6). In crop production, rural regions tend to show a higher specialisation in wheat and corn in most EU-9 countries relative to urban regions. However, the UK deviates from this tendency in wheat production and Italy in corn production (annex 2). On the whole, rural regions in the EU-9 seem also to be more specialised in barley production than urban regions, although this is not reflected in the EU-9 averages. This is due to the inclusion of Denmark, Ireland and Luxembourg, countries consisting of only one intermediate region with a relatively high specialisation in barley production. For potato and sugar production no common trend in specialisation in rural and urban regions in the EU-9 can be perceived. In Belgium and Italy, urban regions tend to have the highest degree in potato specialisation, whereas urban regions in France and the Netherlands show the highest specialisation in sugar beet production.

Table 6. Partial specialisation coefficients for crop production in rural, intermediate and urban regions in the EU-9, 1950–2000

Rurality	Year	Wheat	Barley	Corn	Potatoes	Sugar
Rural regions	1950	15.2	-0.6	2.6	-1.2	-16.3
	1980	10.7	-2.2	9.1	1.7	-19.4
	2000	7.9	-0.9	10.5	-2.3	-15.3
Intermediate regions	1950	4.2	-2.0	2.0	4.1	-8.4
	1980	-2.6	-0.6	1.2	10.3	-8.4
	2000	-3.8	0.5	-0.7	10.2	-6.1
Urban regions	1950	-4.8	-3.7	1.0	7.4	0.1
	1980	-7.3	-6.9	-2.3	11.0	5.3
	2000	-12.0	-4.5	-1.7	14.9	3.4

## 6. SPECIALISATION AND CONCENTRATION RELATED TO THE LEVEL OF RURALITY

Table 7 shows the Pearson correlation between the degree of rurality and the levels of specialisation and concentration of crops and animals in EU-9 regions. We focus here on the years 1960, 1980 and 2000 (1950 is left out because of too many missing data).

When we first look at the correlation between rurality and specialisation, it appears that the crops wheat, barley and corn are positively correlated with the level of rurality: the more rural the region, the stronger the specialisation. However, only for wheat the correlation is statistically significant for all three

years. In addition, also for extensive animal breeding such as sheep and cattle, production is positively related to the level of rurality. The specialisation in sugar and pigs is negatively correlated with the level of rurality, indicating that a stronger specialisation in these sectors often occurs in urban regions. In particular for wheat, sugar, pigs and cattle, there seems to exist a clear relationship between the level of specialisation and rurality.

Table 7. Correlations between the level of rurality and the partial specialisation coefficients and concentration coefficients for crop and animal products in the EU-9 regions, 1960–2000

Correlations		Specialisation			Concentration		
		1960	1980	2000	1960	1980	2000
Wheat	Pearson Cor.	0.34	0.41	0.37	-0.15	-0.08	-0.02
	Sig. (2-tailed)	0.00	0.00	0.00	0.17	0.44	0.83
	N	86	86	76	86	86	83
Barley	Pearson Cor.	0.13	0.12	0.20	-0.17	-0.19	-0.03
	Sig. (2-tailed)	0.24	0.29	0.09	0.13	0.08	0.77
	N	86	86	76	86	86	83
Corn	Pearson Cor.	0.07	0.22	0.13	-0.02	-0.01	-0.07
	Sig. (2-tailed)	0.53	0.04	0.26	0.86	0.96	0.56
	N	86	86	74	86	86	81
Potatoes	Pearson Cor.	-0.03	-0.13	-0.21	-0.27	-0.15	-0.20
	Sig. (2-tailed)	0.78	0.23	0.07	0.01	0.16	0.07
	N	86	86	76	86	86	86
Sugar	Pearson Cor.	-0.35	-0.32	-0.39	-0.25	-0.25	-0.26
	Sig. (2-tailed)	0.00	0.00	0.00	0.02	0.02	0.02
	N	86	86	75	86	86	82
Pigs	Pearson Cor.	-0.28	-0.52	-0.40	-0.44	-0.49	-0.39
	Sig. (2-tailed)	0.01	0.00	0.00	0.00	0.00	0.00
	N	86	84	86	86	77	86
Cattle	Pearson Cor.	0.09	0.31	0.36	-0.31	-0.25	-0.26
	Sig. (2-tailed)	0.43	0.00	0.00	0.00	0.02	0.01
	N	85	84	86	85	86	86
Dairy cattle	Pearson Cor.	0.10	-0.01	0.07	-0.29	-0.41	-0.31
	Sig. (2-tailed)	0.37	0.91	0.55	0.01	0.00	0.00
	N	85	84	86	85	77	86
Sheep	Pearson Cor.	0.13	0.10	0.11	-0.07	0.00	0.10
	Sig. (2-tailed)	0.22	0.38	0.33	0.54	0.97	0.36
	N	85	84	86	85	85	86

The correlation between the degree of rurality and the level of concentration (in the right half of table 7) shows a slightly different picture. Now we find negative signs for all products, except for sheep. Cattle, with relatively high positive correlation values for the level of specialisation, shows negative values for the correlation between rurality and concentration. This indicates that higher levels of concentration are more often found in urban regions. This holds in particular for potatoes, sugar beet, pigs, cattle and dairy cattle.

So, on the one hand it seems that higher levels of concentration are usually found in urban regions, except for sheep. On the other hand, specialisation is more common in rural regions as far as low yielding productions (wheat, barley, corn, cattle and sheep) are concerned, and in urban regions for more intensive productions (potatoes, sugar beet and pigs).

## **7. CONCLUSIONS**

In this article, we analysed the relation of the level of concentration and specialisation in agricultural production to the degree of rurality in EU-9 regions in the period 1950–2000. Our analysis seems to support theories which assume that land intensive, high yielding products tend to be produced in urban regions.

We found that the concentration of the high yielding production of pigs, dairy cattle, sugar beet and potatoes was highest in urban regions of the EU-9, whereas the concentration of the extensive production of sheep was highest in rural regions. Moreover, concentration seems to have increased in the period 1950–2000. It appeared that the concentration of the relatively low yielding production of cereals (wheat, barley and corn) does not differ strongly between urban and rural regions of the EU-9. With regard to specialisation of agricultural production, a tendency towards specialisation in pig production in urban regions and a tendency towards specialisation in the more land extensive production of cattle, sheep, wheat, barley and corn in rural regions in the EU-9 can be perceived. On the other hand, specialisation in dairy cattle hardly differs among rural, intermediate and urban regions in the EU-9. This could be due to the fact that dairy production is both relatively land and labour intensive, whereas the other studied products are either more labour intensive or more land intensive. The tendency towards specialisation in pig production in urban regions in this period is also enhanced by the common agricultural policy of the EU, which favoured pig production in regions with good accessibility for feed components from overseas (Blom, 1992). As a result, pig production moved to regions with nearby harbours and a good hinterland infrastructure, primarily urban regions.

Annex 1. Concentration coefficients for animal and crop products in the regions of the EU-9 countries, 2000

Concentration		Animals				Crops				
		pigs	cattle	dairy cattle	sheep	wheat	barley	corn	potatoes	sugar
Belgium	Rural	0.1	2.2	0.8	0.1	0.2	0.2	0.0	0.3	0.1
	Intermediate	0.4	2.0	1.7	0.1	1.3	1.1	0.0	1.1	4.1
	Urban	7.2	4.2	3.9	0.2	0.9	0.5	1.3	5.6	4.1
Denmark	Intermediate	4.8	5.3	7.2	0.3	1.7	3.3	0.0	1.4	1.1
Germany	Rural	–	–	–	–	–	–	–	–	–
	Intermediate	1.0	1.2	1.4	0.2	0.9	1.3	0.3	1.0	0.9
	Urban	2.2	1.4	1.4	0.2	1.0	1.6	0.7	1.2	1.3
France	Rural	0.5	1.4	1.2	0.5	1.0	0.7	1.2	0.4	1.0
	Intermediate	0.2	0.9	1.0	0.3	1.0	0.7	1.7	1.1	1.2
	Urban	0.0	1.0	0.9	0.4	3.0	1.7	1.8	0.6	5.0
Ireland	Intermediate	0.4	1.1	0.8	0.7	0.2	0.6	0.0	0.3	0.3
Italy	Rural	0.2	0.7	0.5	5.8	0.4	0.2	0.3	0.1	0.2
	Intermediate	0.4	1.0	1.2	0.7	0.4	0.2	1.8	0.4	0.7
	Urban	1.6	1.9	2.5	0.2	0.1	0.1	3.2	0.3	0.4
Luxembourg	Intermediate	0.6	0.1	0.1	0.0	0.4	0.9	0.1	0.4	0.0
Netherlands	Rural	–	–	–	–	–	–	–	–	–
	Intermediate	2.0	2.4	4.3	0.9	0.7	0.6	0.1	14.3	4.5
	Urban	8.7	2.7	4.0	0.8	0.4	0.2	0.5	6.2	2.6
United Kingdom	Rural	–	–	–	–	–	–	–	–	–
	Intermediate	0.2	0.7	0.6	1.3	0.6	0.6	0.0	0.0	0.0
	Urban	0.6	0.7	0.7	1.5	1.3	1.2	0.0	0.0	0.0
EU-9	Rural	0.4	1.1	1.0	1.8	0.8	0.5	0.9	0.3	0.7
	Intermediate	0.8	1.3	1.6	0.6	0.6	0.7	1.0	2.7	1.5
	Urban	4.7	2.3	2.6	0.5	0.8	0.6	0.9	3.3	2.2

Annex 2. Specialisation coefficients for animal and crop products in the regions of the EU-9 countries, 2000

Specialisation		Animals				Crops				
		pigs	cattle	dairy cattle	sheep	wheat	barley	corn	potatoes	sugar
Belgium	Rural	-35	55	0	-20	9	8	-11	10	-15
	Intermediate	-24	38	7	-21	-10	-6	-12	-5	33
	Urban	22	0	-1	-22	-22	-11	-3	19	16
Denmark	Intermediate	44	-18	-3	-23	4	16	-11	-1	-7
Germany	Rural	-	-	-	-	-	-	-	-	-
	Intermediate	-5	13	4	-12	7	8	-9	3	-9
	Urban	7	6	2	-15	5	14	-7	-2	-10
France	Rural	-18	18	1	0	9	-1	17	-8	-17
	Intermediate	-23	13	3	6	12	-2	9	-4	-15
	Urban	-22	21	4	-3	0	-6	-5	-10	20
Ireland	Intermediate	-27	15	1	11	-10	16	-12	1	6
Italy	Rural	-20	-5	2	24	6	-4	-5	11	-9
	Intermediate	-12	0	2	10	-3	-9	10	7	-6
	Urban	-8	6	2	0	-23	-11	30	24	-20
Luxembourg	Intermediate	-16	31	6	-21	8	26	-9	5	-30
Netherlands	Rural	-	-	-	-	-	-	-	-	-
	Intermediate	-1	4	8	-10	-26	-10	-12	40	8
	Urban	14	-7	2	-9	-23	-11	-9	29	15
United Kingdom	Rural	-	-	-	-	-	-	-	-	-
	Intermediate	-29	-2	-2	32	10	22	-11	-2	7
	Urban	-15	-9	-2	26	38	17	-12	-12	-31
EU-9	Rural	-20	14	1.1	4.6	7.9	-0.9	10.5	-2.3	-15.3
	Intermediate	-13	8	3.3	1.5	-3.8	0.5	-0.7	10.2	-6.1
	Urban	6	1.5	1.5	-9.1	-12	-4.5	-1.7	14.9	3.4

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