Market Openness and Geographical Concentration of Agricultural and Agro-Food Activities: The Challenges for French Regions

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The Doha round of trade negotiations has, for the WTO, confirmed the liberalization of agricultural and food markets which began at the Uruguay Round. This process of openness, which has been in motion since the Marrakech agreements of 1994, has already led to a significant decline in tariff protection at European borders. Thus, it declined by 30 % for agricultural products and by 41 % for food products between 1995 and 2002.[1] At the same time, export subsidies, which have already decreased significantly, should be completely discontinued by 2013.

Even if trade policy is common to all countries in the European customs union,[2] free trade can have differing distributive impacts in different regions. Traditionally, studies in international economics analyze the incidence of openness in terms of markets or countries, without taking into account the diverse nature of production systems, or, consequently, redistributive effects between regions within economic areas. While this liberalization should, in theory, lead to better allocation of resources, it should not obscure the costs of adjustment at both the sectoral and

1. This decline is calculated on the basis of rates applied by the WTO (MFN) Source: TARIC.
2. All EU member states apply the same customs tariffs and receive the same export subsidies.

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regional level.

The aim of this article is to analyze the incidence of European market openness on agricultural and agro-food production structures in French regions from an empirical point of view. The study therefore lies at the boundary between international and regional economics. More specifically, we examine an issue from international economics -- the incidence of market protection decrease -- in terms of its regional implications.

Theoretical work demonstrates that openness has an impact on trade structures and distribution of activities between regions. The more an economy specializes in products which are poorly differentiated and not highly competitive, the greater the incidence on trade. On a regional level, the impact of openness on trade will depend on its production structure and the diversity of its trade relations. New competition and substitutions can arise within national or export markets. Nonetheless, recent studies in international economics that make use of gravity models emphasize the persistence of the so-called "border effects" (McCallum 1995; Head and Mayer 2002) by demonstrating that there is more trade between regions within one nation than between nations. This limits substitution effects when openness takes place.

Beyond this direct impact on trade, openness has effects on the production structure of the region and, more generally, on the distribution of activities between regions. This aspect is not taken into account in classic international economics which assumes a given nation to be a point with no area (Krugman 1991 a, b). Trade being inter-national, specialization is measured between nations. Economic geography models, however, have investigated this question and analyze changes in the location of activities between two productive areas, where there are low trade costs between the areas (transport costs, customs duties, among other costs) (Fujita et al. 1999). The latter authors demonstrate that location of activities is the result of several forces: access to demand, transport costs (or more specifically, trade costs as defined by Anderson and Van Wincoop (2003)), production costs and economies of scale.

Within this context, the aim of this article is to undertake an empirical analysis of the relationship of market openness and sub-national distribution of activities. Can we observe an increase of French imports from world markets and a change in regional supply structures subsequent to diminishing protection of agricultural and food markets? Does this lead to a trend in favour of geographical concentration of activities for the products which are most affected by trade liberalization?

This article comprises three parts. First, we show how the determinants of location of agricultural and food activities are specific compared with those of the manufacturing sector. Over and above elements linked to production organization and markets, public policies (agricultural policy in particular) play an important role in geographical distribution of production. Second, we measure the geographical concentration of agricultural and agro-food activities in France in 1995 and 2002. We then approach the relationship between the geographical concentration of activities and market openness from an empirical standpoint. Finally, in the last part, we identify regions in which production tends to be concentrated, and use a shift-share analysis to highlight the extent to which region-specific dynamics fuel

the growth of their activities.

The Determinants of Geographical Concentration of Activities: The Specificity of Agriculture and Agro-Food

While analysis of location factors for industrial activities has been the subject of many theoretical and empirical studies, there have been few recent developments regarding agricultural production, first dealt with in the 19th century (see the surveys by Capt and Schmitt (2000) and Kellerman (1989a, b)). Von Thunen (1826) demonstrated the organization of agricultural areas is related to the cost of transporting produce and spatial variations in ground rent. Similarly, Ricardo emphasized the role of comparative advantages between production basins as a determinant in international or inter-regional organization of activities. In the field of agricultural economics, this approach has given rise to many empirical studies which estimate production cost differentials between nations or regions. For Weber (1929), localizing firms seek to minimize their transport costs with respect to their suppliers and markets. He considered the concept of location of raw materials (and thus that of agricultural production).

In recent models of new economic geography initiated by Krugman (1991a, b), analysis of the location of agricultural activities does not play a central role. Initial models concentrated chiefly on industrial activities. Transport costs and economies of scale determine clustering of manufacturing activities, while farmers, who are not geographically mobile, produce a uniform good at constant returns to scale with no transport costs. The agricultural sector, which is geographically bound, thus appears as the principal dispersing force on industrial activities, since farmers are also consumers dispersed across all areas. In relation to agro-food industries, concentration factors are similar to those applying to manufacturing industry, but the relative dispersion of agricultural raw materials is a specific centrifugal force for agro-food industries.

Calmette and Le Pottier (1995) and then Fujita et al. (1999) subsequently introduced into the seminal model of economic geography the cost of inter-regional transport of agricultural products, which constitutes a dispersing force for industrial activities. The higher this cost, the more industrial activities will tend to locate in agricultural production basins, as close as possible to food supply. If this reasoning is pursued and augmented with the introduction of potential mobility of agricultural activities, production should be concentrated as close as possible to demand, i.e. as close as possible to consumption basins. In this case, clustering of agricultural activities should be observed, just as for industry.

Even if the agricultural sector has benefited from the global fall in transport costs, the latter remain relatively high for agricultural and food products compared with those relating to other industrial products (Comité National Routier [French National Road Haulage Committee] 1997). In addition to specific costs related to collecting products from farm enterprises, the cost per unit of distance traveled is high for agricultural products. This is linked particularly to the low value of farm products per unit of volume transported and the perishable nature of some products

which require the use of refrigerated transport, which generates additional costs. Compared with the consumer price, the cost of transporting agricultural and food goods is generally higher than for other industrial goods (Lafourcade and Tropéano 2000; Kilkenny 1998). This factor should therefore contribute to the concentration of agricultural activities as near as possible to consumers (*home market effect*: Krugman 1980).

Economic geography models emphasize the importance of internal economies of scale for firms as a factor of clustering of activities. While this phenomenon can be observed for agro-food industries, it remains limited with respect to agriculture. This can be explained largely by the spatial nature of the activity and the risks linked with production (climate, hygiene, among other factors) (Boussard 1997). However, internal economies of scale realized by agro-food industries may constitute a factor of clustering of agricultural activities around processing sites. The development of agro-food complexes also generates external economies of scale from which farm enterprises and processing industries can benefit.

In summary, location of agricultural activities depends on transport costs, market access, production costs, and interactions with Agro-Food Industries. Above and beyond these forces linked to the organization of production and markets, the agricultural sector, especially in Europe, receives significant support from public policies. The latter directly support production (internal component of the CAP - Common Agricultural Policy) and protect the sector with respect to competition from non-EU countries (external component of the CAP). This intervention skews the determinants of location of agricultural productions by limiting the role of comparative advantages. Based on a protectionist trade policy, which offers price guarantees and provides production subsidies, the Common Agricultural Policy enables activities to carry on in poorly competitive areas (Daniel 2003). On the contrary, market openness is likely to reinforce the role of comparative advantages and further affect the determinants of location.

The relationship between market openness and geographical concentration of activities has not been specifically analyzed for agricultural and agro-food products, but the theoretical results obtained for manufacturing industry indicate that openness magnifies the influence of the forces at work. Crozet and Soubeyran (2004), in their analysis of the incidence of European Community expansion on the distribution of activities within the European area, point out that removing protection from an economic area leads to sub-area concentration of activities to the benefit of the best positioned regions in terms of access to export markets. Krugman and Livas Elizondo (1996), however, using a model with two countries and three homogenous regions, conclude that intra-national dispersion of activities occurs in the event of trade liberalization. When regions making up a national area faced with openness are diverse, market openness reinforces inter-regional inequalities (Paluzie 2001). In similar vein, on the basis of a economic geography model with two countries and four regions, Monfort and Nicolini (2000) and Berhens et al. (2006 a, b) confirm the fact that trends in international and sub-national transport cost comparisons affect both inter-regional location of activities and regional convergence.

Thus, it appears that from a theoretical point of view, sub-national diversity

(production costs, market access, and so on), leads to clustering in the region which offers a competitive advantage. These differences may be due to the internal geography of given economies. Local external factors, generated by know-how, skills networks (including local labour markets) or infrastructures, may be magnified by regional policies which affect the process of concentration or dispersion of activities.

In the remainder of this article, after having measured the geographical concentration of agricultural and agro-food activities, the analysis is centred on the relationship between market openness and geographical distribution of activities, distinguishing sectoral dynamics from those specific to regions.

Concentration of Agricultural and Agro-Food Activities in France: The Impact of Openness

Measuring the Concentration of Activities

The geographical concentration of activities, defined as the distribution of the production of a good between regions or production basins (in this case, French regions), poses both a classic measurement problem in regional economics (the problem of equivalence) and a more specific problem linked to the nature of agricultural production (choice of variable used). The study of the spatial distribution of activities typically runs up against the problem of equivalence between regions (Jayet 1993). French regions are of differing sizes, so equivalency must be established between all observations. The surface area of a region (S_r) is used as a weighting variable. The spatial distribution of production is therefore compared to the available land, and production is found to be concentrated if the two distributions differ significantly.

In seeking to validate the theoretical developments in economic geography, empirical analyses have evaluated the geographical concentration of industrial activities. Using probabilistic models, research has compared the geographical distribution of a group of industries compared to industry as a whole (Ellison and Glaeser 1997, 1999; Maurel and Sédillot 1999). This method cannot be applied directly to agricultural and agro-food production: the size of farm enterprises or the number of employees are insufficiently significant variables by which to characterize or compare the concentration of different types of agricultural production. This is because production conditions differ highly from one agricultural sector to another, making comparison difficult. To compare the concentration of different products and to construct an overall concentration index of production, we chose to use final production in terms of value created at a regional level for each agricultural activity. This measurement poses specific problems of data construction which are dealt with in Appendix 1.

The Theil index (1) measures the concentration of production in the case of a continuous variable. With GP representing the total gross product, S representing surface area, and regions indexed as r, it takes the following form:

TABLE 1 Concentration of Agricultural and Agro-food Activities in France - Theil Index 2002

	Agriculture	Agro-food industries
Products not supported by the CAP	0.185	0.204
Products supported by the CAP	0.126	0.172
Total	0.149	0.198

Source: Calculations from New Chronos REGIO (Eurostat) and ERE (INSEE)

$$T = \sum_r \frac{GP_r}{GP_{FR}} \ln\left(\frac{GP_r\, S_{FR}}{GP_{FR}\, S_r}\right) \quad (1)$$

The nearer this index is to 0, the less production is geographically concentrated. The upper limit of this index calculated using the surface of the smallest region (S_{rmin}) (2) corresponds to the hypothetical case of a total concentration of production in the smallest region (T_{max}=4.18 for France).

$$T_{max} = -\ln\left(\frac{S_{r\,min}}{S_{FR}}\right) \quad (2)$$

Evaluated according to a typology established by Egghe and Rousseau (1990), the Theil index meets the criteria required to define a 'good' concentration index. It considers the principle of nominal growth which states that an equivalent nominal growth of the variable studied in all regions reduces inequalities (Massoumi 1986). It also abides by the transfer principle (Dalton 1920) which our case states that a transfer of production from the least productive regions to regions with more developed production will lead to an increase in the index.

When calculated for each agricultural and food sector as defined by French national accounts (76 in all), this index shows (Table 1) that agro-food products are, on average, more concentrated than those from agriculture (the index being, for 2002, 0.198 and 0.149 respectively). In addition, production benefiting from support under the internal component of the CAP is less concentrated than production which does not. This is also true for agro-food industries which process products benefiting from strong support under the internal component of the CAP; they are less concentrated than enterprises processing non-supported products. This phenomenon points to the fact that geographical dispersion of agricultural production constitutes a dispersion factor for the processing industry to which it is linked.

However, these averages conceal a wide degree of diversity between products (Appendix 2). In agriculture, fresh vegetable, barley, and potato production are the most concentrated, while poultry production tends to be dispersed. For agro-food

products, a high degree of concentration can be observed in the butcher's meat sector. It should be noted that changes in geographical concentration of activities between 1995 and 2002 is not directly linked to the initial levels of concentration (1995).

Market Openness

Since the Marrakech agreement, the EU has been committed to lowering its customs duties, which has resulted in a significant opening of its market. For agricultural products, average protection has dropped from 15.1% to 11.7% between 1997 and 2002 and for food products from 29.8% to 20.2%. However, this protection remains highly diverse, with high tariff peaks for products which are important for French agriculture or agro-food -- fresh or frozen beef (78 % in 2002), butter (79 %) or mushrooms (91 %), and products with an extremely open market -- protection for soft wheat was 2.5 % in 2002.

It would seem that France's specialization concerns highly protected products, especially in 1997. Thus, if the French production structure is taken into account in calculations of mean protection, the rate of protection of French agriculture in 1997 was not 15.1 % but 36 %.[3] The map of French regions highlights the diversity of French regional specializations in 1997 and the *a priori* differentiated dependency in respect of market openness (Figure 1). The degree of regional dependency varies from 84.4 % in the Limousin to 19.4 % for the Provence - Alpes - Côte d'Azur (PACA) region. In cattle breeding and dairy regions, protection is naturally higher, as these products are heavily taxed. Fruit, vegetable, and flower producing regions are more exposed to international markets.

Between 1997 and 2002, although protection decreased for all regions, differentiation between breeding- and crop-oriented regions increased (Table 2). Protection remains high for breeding-oriented regions with a rate of over 30 %. On the contrary, while in 1997 only two regions had a protection rate of less than 20 %, 8 out of 22 are now in this category. This corresponds not only to the opening up of flower-growing regions but also cereal basins.

3. Generally, market protection is measured in two ways: (1) The arithmetical mean of the rates applied at national or European borders is calculated. This measurement has the disadvantage of weighting all products equally, including those that are not traded or produced within the nation. (2) To counteract this difficulty, a commonly-used solution is to weight tariffs by import values. This enables a synthetic indicator of access to the European market to be calculated *for all products imported into this market.* Our aim here is to measure the protection enjoyed by French producers whether or not the products are imported. We have therefore chosen to weight by production of various regions.

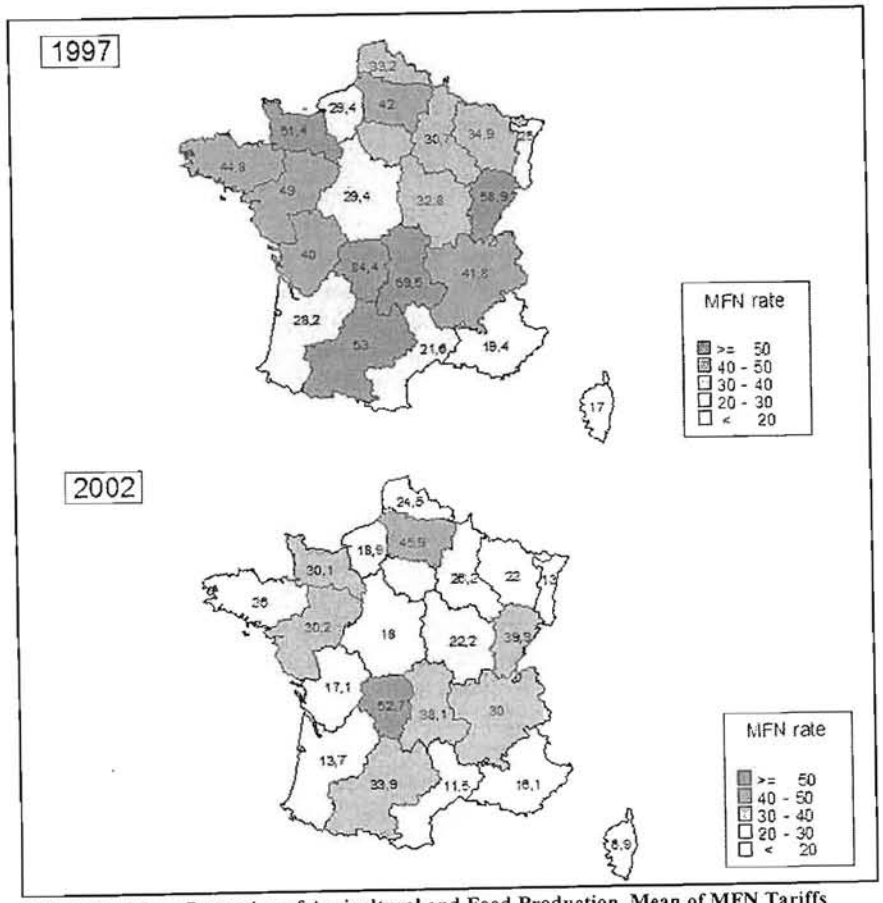

FIGURE 1 Mean Protection of Agricultural and Food Production. Mean of MFN Tariffs Weighted by Structure of Regional Production for 2002 and 1997.
Source: Authors' calculations based on TARIC and Comext

Incidence of Openness on Imports and Geographical Concentration of Production

Between 1995 and 2002, imports from the rest of the world increased greatly in terms of value: +25 % for agricultural products and +31 % for food products (Table 3). Compared with trends in French demand (+5.5 % for agricultural products and +18.9 % for agro-food products), this dynamic means that non-EU countries have indeed benefited from the opening of the European market. Over the same period, intra-European trade was reinforced, and France's European partners also benefited from the positive dynamic of national demand.

From an econometric point of view (Table 4), a significant inverse relationship can be observed between imports and protection: imports from the rest of the

TABLE 2 Changes in Protection of the Agricultural and Food Sectors between 1995 and 2002

	1997		2002	
	MFN rate, arithmetical mean	MFN rate weighted by French production	MFN mean Arithmetical mean	MFN rate weighted by French production
Agriculture	15.1%	36.1%	11.4%	20%
Agro-food prod	29.8%	35%	20.2%	25%
Total	26.2%	35.3%	18.4%	23.6%

Source: authors' calculations based on TARIC and Comext

TABLE 3 Changes (1995-2002) in French Demand by Source of Supply

	Total demand	Sales in French regions	Imports from within EU	Imports from non-EU countries
Agriculture	5.5%	3.8%	19.5%	25.4%
Agro-food prod	18.9%	18.2%	20.2%	31.0%
Total	15.2%	14.1%	20.1%	29.2%

Source: ERE, INSEE

TABLE 4 Incidence of Protection on French imports (OLS). Variables are Converted into Logs

	Explained variable = imports from the rest of the world	Coefficient.	Sdt. Err	P>|t|
Adj R2 = 0.34 Number of observ. = 75	Protection	-4.12	1.616	0.013
	National demand	0.67	0.197	0.001
	Animals	-2.603	0.731	0.001
	Animal products	-0.0823	0.799	0.918
	Dairy products	-0.172.	0.825	0.835
	Drinks	-0.998	0.665	0.138
	Processed grain products	-0.927	0.816	0.260
	Other food products	0.392	0.484	0.421
	Year 2002	-0.19	0.351	0.578
	Constant	18.77	7.69	0.017

Note: 1. Protection is estimated by product from the mean value of the *ad-valorem* equivalent applied within the multilateral regime (MFN). In order to take into account products for which protection is nil, the protection variable (t) calculated as a log, has been converted into log(1+t).
2. Dummy variables have been introduced to capture sector diversity. Value coefficients should be compared to the reference variable (vegetable products).

TABLE 5 Changes in Protection of the French Market and Imports

	Protection Variation 2002/1997 (%)	Import variations 2002/1995 (%)	Penetration rate (%) -1- Imports from ROW/ Demand, 2002	Penetration rate (%) -2- Total Imp/Demand, 2002
Corn	-87	60.9	6.3	8.3
Nuts		10.9	24.9	30
Fresh vegetables	-7.2	106.5	8.9	29.7
Fruit	-0.9	16.3	24.9	51.5
Butcher's meat	-32.4	12.3	3.4	17.6
Butter	-31	616.7	2.1	18.1
Fish	-22.8	26.8	30.8	47.1
Potato preparations	-5.3	10.5	7.4	33.2
Fruit and vegetable juice	-3.2	-15.9	9.5	36.8
Fruit preparations	-15.4	33.3	13.6	34.7
Biscuits	-32.5	21.9	2.5	27.9
Confectionery	-19.3	149.3	7.1	30
Teas and coffees	-22.5	83.0	4.0	16.8
Condiments	-46.8	90.0	12.7	35.7
Misc. food production	-49.3	66.7	6.9	31.6
Champagne and wines	-1.1	150.8	2.0	6.6
Total Agriculture + Agro-food industry			4%	9.5%

Note: 1. Only products for which imports from other countries make up more than 2 % of internal demand have been selected.
2. The penetration rate is the share of imports in the total demand. The first ratio takes only imports from the rest of the world into account; the second one takes the total imports (EU and extra EU imports) into account.

Source: Authors' calculations from TARIC database (European Commission, DG Taxation), ERE (INSEE)

world increase as customs duties decrease.

For some products, this growth is very pronounced and reinforces the weight of non-EU countries in French demand (Table 5). Thus, for instance, French imports of fresh vegetables from the rest of the world doubled between 1995 and 2002, accounting for nearly 9 % of French demand at the end of that period as against 5 % at the outset. For the sector as a whole, the share of non-EU countries still remains marginal on the French market (around 4 % in 2002 compared with 3.6 % in 1995). However, the share of imports from EU countries is much higher for all products, revealing the role played by European integration in the development of intra-community trade and thence in the penetration of the French market by products of other European origin.

Since we are specifically interested in the link between geographical concentration of activities and market openness, we tested the relationship between the geographical concentration of production and the penetration rate in the French market (imports from the rest of the EU and the rest of the world). This relationship has been estimated by level using the OLS method and observations from 1995 and 2002 have been pooled. Introducing a dummy CAP variable allows the CAP to be accounted for (Table 6).

TABLE 6 Relationship between Concentration and Market Openness (var. converted into logs)

Explained variable = Rate of product concentration		Coefficient.	Sdt. Err	P>|t|
Adj. R2 = 0.2139 Number of obs. = 75	Penetration rate	0.16	0.058	0.006
	CAP products (dummy)	-0.43	0.131	0.002
	Constant	-1.39	0.134	0.000

TABLE 7 Relationship between Concentration and Market Openness. Taking into Account the Differentiated Effect of the CAP (variables are converted into logs)

Explained variable = Rate of geographic concentration by product		Coefficient.	Sdt. Err	P>|t|
Adj. R2 = 0.2127 Number obs.: 75	Penetration rate (CAP)	0.32	0.124	0.014
	Penetration rate (non-CAP)	0.12	0.065	0.062
	Constant	-1.45	0.159	0.000

It appears that the penetration rate has a positive effect on sub-national concentration of activities. Thus, the more a sector is exposed to international competition, the more the associated activity is concentrated geographically within a country. The penetration rate included in the regression takes into account not only imports from the rest of the world but also those from other EU countries. As has been seen previously, European competition plays a significant role in French demand and thus reflects the extreme case of total abolition of all trade barriers. This enables us to predict that a new phase of liberalization of access to the European market leading to a rise in imports from the rest of the world would have effects on the geographical distribution of activities.

In addition, these initial results confirm the fact that products subject to the CAP are less concentrated than other processed products. However, when the penetration rate is compared between products subject and exempt from the CAP (Table 7), it can be seen that openness nonetheless leads to concentration, particularly for products which benefit greatly from the internal component of the CAP. This relationship has also been verified, but is less pronounced, for products which are not directly subject to the Common Agricultural Policy. This result emphasizes the fact that the location of products which are strongly supported by the CAP is highly sensitive to openness. This is an important issue, since these products are, at present, those which are the least concentrated and the most evenly distributed between areas. Thus, a drop in production in these sectors, combined with a reform of the Common Agricultural Policy tending towards greater decoupling of production aid, could have cumulative effects in terms of geographical concentration of agricultural activities within France and within Europe as a whole. This result is of all the more interest given that the European Union has stated aims in terms of

rural and regional development.

Regional Dynamics Fuelling Concentration

The analysis carried out above highlights the role of the volume of imports on the one hand, and, on the other, the role of the CAP on the determinants of location of agricultural and food activities within France. Since concentration represents the distribution of the production of one product across various regions (or production basins), it also depends on regions' ability to react in the face of changes in both competition and demand. Models in economic geography emphasize the role of production costs, or, more generally, the competitiveness of a region in a given sector, as determinants of location of activities. This competitiveness may be built around production costs, but also around all externalities generated at a regional level (industrial agglomeration economies and urban externalities). It may also be built through a policy of product differentiation carried out at a regional level, in particular with the use of appellations of origin or regional labels.

In this part, we do not have the means to distinguish the various elements which come into play in regional competitiveness. However, we seek to demonstrate the extent to which dynamics specific to regions can modify the geography of production activities. To do this we use a shift-share analysis (Bonnet 1997) to explain changes in regional supply.

Here, regional performance is defined as a region's ability to increase its production more than others (on average). It should become apparent that calculating this performance over the period from 1995 to 2002 is another way of approaching the question of the concentration of activities.

The aim of a 'structure-performance' breakdown is to compare the changes in sales of a region r for a product b ($\tilde{Q}_{rb}$), with overall change in French demand (T_{IAA}).

Thus, three elements are calculated:

$$Global\ Change = G_{rb} = \tilde{Q}_{rb}^{02} - \tilde{Q}_{rb}^{95}\ (1 + T_{IAA})$$

If the overall difference is positive, the progression of sales of product b in region r on the French market is greater than the progression of French demand for agricultural and food products. The region has increased its market share in the French market. How can this dynamic be explained? This difference can be broken down into two parts.

$$Sectoral\ Change = S_{rb} = \tilde{Q}_{rb}^{95}\ (1 + T_b) - \tilde{Q}_{rb}^{95}\ (1 + T_{IAA})$$

The growth of supply in sector (T_b) is thus compared with French demand for agricultural and food products (T_{IAA}). This difference is applied to each region taking into account its initial production. If the difference is positive, the region specializes in products for which French demand has increased faster than overall demand for agricultural and food products. The dynamic observed is due partly to a positive sectoral dynamic.

$$\begin{aligned} Regional\ Change = R_{rb} &= \tilde{Q}_{rb}^{95}\ (1 + T_{rb}) - \tilde{Q}_{rb}^{95}\ (1 + T_b) \\ &= \tilde{Q}_{rb}^{02} - \tilde{Q}_{rb}^{95}\ (1 + T_b) \end{aligned}$$

Progression in supply in the region for product b under consideration (T_{rb}) is compared to the overall trend in the product (T_b). If the difference is positive, this indicates good performance specific to the region, adjusted for the sectoral effect. The dynamic observed is due to a regional dynamic. It should be verified that

$$G_{rb} = S_{rb} + R_{rb}$$

To some extent, the structural or sectoral effect indicates supply trends with constant distribution across product production within the country. By contrast, the regional effect reveals the dynamic of the region within the inter-regional distribution of activities. These effects can be calculated both by product and by region. They can also be summed for each region: in this way, the overall dynamic of a region can be evaluated, taking into account its product specialization.

If production trends could be explained solely by sectoral effects, sub-national geographical concentration of production would be stable and the new map of regional specialization would simply illustrate the overall dynamic of the sector. If only sectoral effects are considered (Figure 2), we can see that the regions of Bretagne, Pays de la Loire, Basse Normandie, Picardie, and Centre seem to have been particularly affected by a negative dynamic in the sectors in which they specialize. Some of these regions compensate for a poor sectoral position with a very pronounced regional dynamic. This occurs, for example, in the Pays de la Loire region. For this region, the overall effect is broadly positive, even if the region is focused on sectors with a weak dynamic. The same effect enables supply offered by the Bretagne region to remain comparable to national levels, since the positive regional level compensates for the negative sectoral level. By contrast, the Picardie and Basse Normandie regions suffer from negative sectoral and regional effects.

Analysis of the shift-share model results applied to French regions show that the amplitude of regional effects is greater than that of sectoral effects. Logically, regions for which the overall effect is positive will be those where production will concentrate. These regional dynamics, constructed within each product, fuel concentration of activities, such that 'winning' and 'losing' regions can be identi-

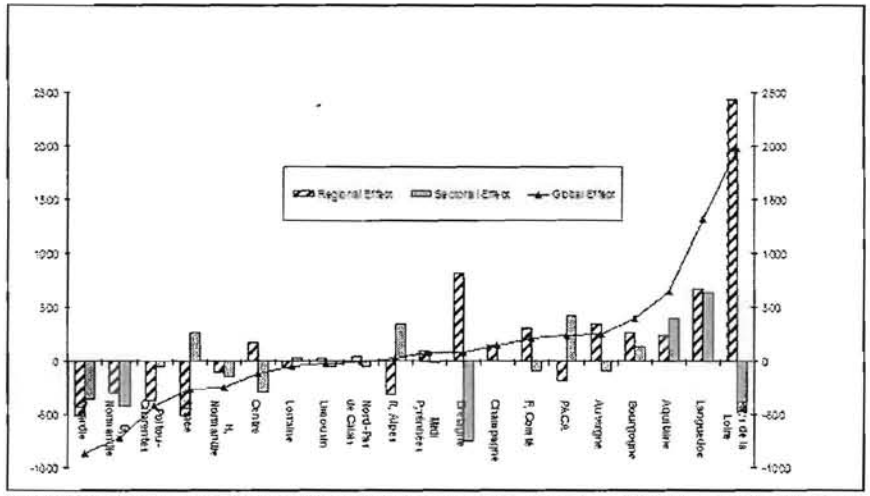

FIGURE 2 Breakdown of Total Supply Trends for Agricultural and Food Products of French Regions (Regional And Sectoral Effects). Results of the Shift-Share Analysis (1995-2002)

fied in terms of the progression of their supply offer. For example, for butcher's meat, the geographical concentration of production is skewed by regional dynamics (Pays de la Loire, Bretagne) in a context of weak dynamics in overall demand.

Distribution of regional dynamics between sectors is the result of distinct mechanisms at work. While regional dynamics affect a small number of strongly represented sectors within the regions studied, they reveal dynamics relative to the sector in each region. They may be related to the achievement of internal economies of scale and fuel reinforcement of specialization. However, if the regional effect is spread out over the sectors represented, external economies of scale are shown to be responsible and the region concerned can de-specialize.

In the long run, trends in regional profiles are important because in general, it can be observed that sudden external disruptions of supply and demand in the context of market openness are often sectoral in nature (e.g. lowering of customs duties, sudden drop in demand of one type of product for hygiene reasons . . .). Thus, for regions, a low level of specialization may constitute a means of protection against economic risks linked to disruption of this type.

Conclusion

The aim of this article was to approach, from an empirical point of view, the relationship between the lowering of tariff protections, the growth of imports and the geographical distribution of production between French regions, in the light of openness of agricultural and food markets. Economic theory suggests that openness should lead to a rise in imports and a shift of activities towards the most competitive regions. This phenomenon has been observed, to a certain extent, for

the French agricultural and food sectors, since the implementation of the Marrakech agreement as well as in the context of stronger European integration.

It would seem that the more a sector is open to competition, the more related activity is concentrated in French regions. In terms of forecasting, our results therefore suggest that the increasing openness of markets should strengthen subnational concentration of production. It is interesting to note that the relationship that has been identified between openness and concentration is particularly strong for products benefiting from the internal component of the Common Agricultural Policy. The most subsidized products are more sensitive to openness than other products. This result is important in terms of economic policy since these products are, for now, those which are the most dispersed across the country.

In this context, trends in location of activities in various French regions are governed by sectoral effects and dynamics specific to regions. Depending on their production structure, regions are affected to varying degrees by external sectoral disruptions (openness, sudden drop in demand . . .). Positive regional dynamics may, for example, compensate for unfavorable sectoral positioning. The dynamics observed reveal regions' competitive advantages and, ultimately, affect their specialization and the overall concentration of activities. If regional dynamics reinforce regional specialization, the areas concerned are increasingly exposed to any sudden sectoral disruptions. However, if regional performance is generically constructed and shared between all sectors, it reinforces the region's competitive position without affecting the structure of specialization.

Examination of the patterns highlighted by our analysis allows some suggestions in terms of public regional policies to be made, since regions have particular responsibility for economic development. Over and above the necessary support during adjustment effects for sectors facing specific difficulties, it would appear that regions should favour 'transversal' economic policies rather than sectoral policies. In the long run, sectoral policies supporting activities which are strongly represented in the region will reinforce the region's vulnerability to economic risks, whilst transversal policies go some way to fostering diversification and therefore minimize exposure to sudden future sectoral disruptions. Examples of policies of this nature include policies supporting innovation, training and infrastructures.

The research reported on above has revealed performance levels specific to regions but this descriptive tool is not sufficient to investigate the determinants of this performance. The next phase of research requires progress to be made in understanding regional competitiveness mechanisms and the role of public policy in this dynamic.

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Appendix 1 Data Sources

Breakdown of French Demand for Agricultural and Food Products According to Geographical Sources of Supply

The study of changes in French demand for agricultural and food products was carried out based on the Employment Resource Equilibrium (ERE) provided by INSEE (French National Statistics Office) for 24 agricultural products and 39 agro-food products. In terms of national accounts, the equilibrium describes the use of goods and services (employment) and their origin (resources).

Following the method set out by Monceau (1999), 'partial' market equilibrium, not including margins, was established from the ERE elements. To analyze changes in supply and demand, synthetic aggregates were produced.

Two aggregates were chosen for resources

Deliveries	= Distributed production – (Intermediate consumption in the agriculture sector of agricultural product not including margins) – Gross Fixed Capital Formation, GFCF for agricultural products – Variations in producers' stocks

Imports = CIF imports not including margins + Customs duties + Import subsidies

Two aggregates were chosen for employment

Internal demand = Final household consumption (FC) - margins on FC + Intermediate consumption (IC) – IC for the agricultural sector of agricultural products not including margins + User stock variations + Commercial stock variations.

Exports = Exports – Margins on exports – Export subsidies

Thus, for each product, we were able to produce an equilibrium in terms of value and volume (at 1995 prices):

Delivery + Imports = Internal demand + Exports:

$$Q_b + M_b = D_b + X_b$$

From this equilibrium, geographical sources of supply for French demand were reconstituted. The equilibrium thus allows products from foreign markets; imports M_b to be distinguished from national production:

$$Q_b - X_b + \tilde{Q}_b$$

At this stage, however, supply from the different regions of France cannot be distinguished. For this, it was necessary to use other sources of data:

Agricultural products

The production of the different French regions Q'_{rb} was obtained from Eurostat data from the REGIO database[4] (data given in values and product nomenclature comparable to that used by the French National Statistics Office for agriculture EREs).

4. This database is kept available online free of charge at the following URL: http://epp.eurostat.cec.eu.int/portal/page?_pageid=1090,1137397&_dad=portal&_schema=PORTAL

Thus

$$\frac{Q'_{rb}}{\sum_r Q'_{rb}}$$

the share of each region in the national production of product b, calculated from the REGIO database. In order to keep product consistency, this structure was then applied to Q_b French production of b, as estimated from the EREs. Thus,

$$Q_{rb} = \frac{Q'_{rb}}{\sum_r Q'_{rb}} Q_b$$

The proportion of production of the different French regions destined for the French market. There is no statistical source providing information about regional sales to the French market, only the value of export sales is known from the French Customs database. Thus,

$$\frac{X'_{rb}}{\sum_r X'_{rb}}$$

the part played by each region in French exports of product b, can be determined from the Customs database. Thus, as beforehand and to ensure equilibrium, the value of regional exports product b may be recalculated:

$$X_{rb} = \frac{X'_{rb}}{\sum_r X'_{rb}} X_b$$

From which an estimation may be made of the proportion of regional production destined for the French market, thus

$$\tilde{Q}_{rb} = Q_{rb} - X_{rb}$$

and it is verified that

$$\sum_r \tilde{Q}_{rb} = \tilde{Q}_b$$

Agro-food products

The production of the different French regions Q_{rb} : no data are available with respect to agro-food production at the regional level. The Eurostat PRODCOM database supplies information about production in the product but at a national level. To achieve this, the only solution is to use plant data from annual company surveys provided by the INSEE National Statistics Office. The geographical situation and the number of employees in these plants is known. Thus N_{rb} is the number of employees in region r, in production for a given agro-food product b. In the same way, regional production for the sector is obtained:

$$Q_{rb} = \frac{N_{rb}}{\sum_r N_{rb}} Q_b$$

This means that it is supposed that the level of productivity for a given product b is the same in all French regions.

The proportion of production of the different French regions destined for the French market is estimated in the same way as for agricultural products.

Data for customs tariffs

The source used is that of the TARIC database (The Integrated Tariff of the Community) of the Tax and Customs Union directorate of the European Commission. This database includes all EC legislation and therefore shows all the EU rates applicable to third party countries (MFN rates and preferential duties).

APPENDIX 2 Concentration of Agricultural and Agro-food Productions - Theil Index 1995 and 2002

Agricultural product	Theil 1995	Theil 2002	Var 2002/1995	AFI product	Theil 1995	Theil 2002	Var 2002/1995
Poultry	0.190	**0.170**	-10.46	Teas, coffees	0.437	**0.310**	-29.11
Other cereals	0.039	0.036	-9.48	Milled products	0.072	0.053	-26.40
Hard wheat	0.261	**0.238**	-8.94	Miscellaneous food products	0.213	**0.163**	-23.27
Forage plants	0.057	0.053	-7.99	Baby food	0.200	**0.158**	-20.77
Large cattle	0.062	0.060	-3.44	Fruit preparations	0.189	**0.156**	-17.64
Corn	0.106	0.102	-3.27	Vegetable and Fruit juice	0.263	**0.218**	-16.92
Soft wheat	0.103	0.099	-3.20	Beer+malt	0.563	**0.488**	-13.44
Raw milk	0.102	0.102	-0.45	Other dairy products	0.214	**0.188**	-12.34
Sugar plants	0.386	**0.395**	2.21	Sugar	0.332	**0.297**	-10.48
Pigs	0.271	**0.279**	2.84	Water	0.186	**0.169**	-9.12
Tobacco	0.203	**0.211**	4.21	Bread	0.088	0.081	-8.14
Nuts	0.087	0.091	4.35	Butter	0.407	**0.376**	-7.71
Eggs	0.160	**0.169**	**5.96**	Alcohol	0.239	**0.228**	-4.46
Sheep, goats	0.065	0.069	**6.05**	Potato preparations	0.196	**0.191**	-2.47
Fruit	0.119	0.128	**8.17**	Milk and yoghurts	0.094	0.094	-0.19
Fresh vegetables	0.085	0.106	**23.55**	Cheese	0.088	0.088	0.40
Barley	0.085	0.105	**23.59**	**Confectionery**	0.171	**0.180**	**5.06**
Potatoes	0.212	**0.271**	**27.61**	**Champagne+wines**	0.180	**0.190**	**5.97**
				Fish	0.244	**0.260**	**6.32**
				Meat preparations	0.103	0.109	**6.33**
				Poultry meats	0.206	**0.223**	**8.34**
				Biscuits	0.105	0.114	**8.91**
				Pasta	0.269	**0.304**	**12.89**
				Animal food	0.093	0.105	**13.28**
				Condiments	0.252	**0.295**	**17.14**
				Butchers' meats	0.105	0.131	**25.25**

Source: Calculated from Eurostat Regio Newchronos and ERE national statistics office